Matrix Solutions Inc.
A Montrose Environmental Company

COOKSVILLE CREEK EROSION CONTROL PROJECT
UPSTREAM OF MISSISSAUGA VALLEY BOULEVARD
TO THE CANADIAN PACIFIC RAILWAY RAIL CROSSING
MISSISSAUGA, ONTARIO
PROJECT REPORT

Prepared for:
CITY OF MISSISSAUGA

Prepared by:
MATRIX SOLUTIONS INC., A MONTROSE ENVIRONMENTAL COMPANY

Version 1.0
April 2024
Guelph, Ontario

Unit 7B, 650 Woodlawn Rd. West
Guelph, ON, Canada N1K 1B8
T 519.772.3777 F 226.314.1908
www.matrix-solutions.com

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Prepared for City of Mississauga, April 2024

Julia Howett, M.Sc.
Fluvial Geomorphology Specialist

reviewed by
Mariëtte Pushkar, M.Sc., P.Geo.
Principal Fluvial Geomorphologist

CONTRIBUTORS

Name	Job Title	Role
Julia Howett, M.Sc.	Fluvial Geomorphology Specialist	Primary author
Jeff Prince, P.Eng.	Principal Water Resource Engineer	Reviewer
Matt LeGrand, M.Sc., E.I.T.	Water Resources EIT	Section author
Liam Connolly, B.Eng., E.I.T.	Water Resources EIT	Section author
Karen Hofbauer, M.A.Sc., P.Eng.	Principal Water Resource Engineer	Reviewer
Mariëtte Pushkar, M.Sc., P.Geo.	Principal Fluvial Geomorphologist	Project manager, reviewer

VERSION CONTROL

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1 INTRODUCTION

The City of Mississauga is undertaking an Erosion Control Municipal Class Environmental Assessment (EA) for Cooksville Creek for the reach located upstream of Mississauga Valley Boulevard extending to the Canadian Pacific Railway (CP) rail crossing. The study area originates upstream of Mississauga Valley Boulevard (approximately 100 m) and continues downstream to the CP rail crossing (Figure 1). Through its ongoing erosion monitoring program, the City identified this section of creek as a high priority site in need of rehabilitation. Based on the continued erosion and risk to adjacent property and infrastructure, the City has initiated a Schedule "B" of the Municipal Class EA process. The objective of this study is to identify potential causes of the erosion and to develop, evaluate, and ultimately recommend erosion control alternatives. The City intends to proceed to detailed design for the preferred alternative within the study area.

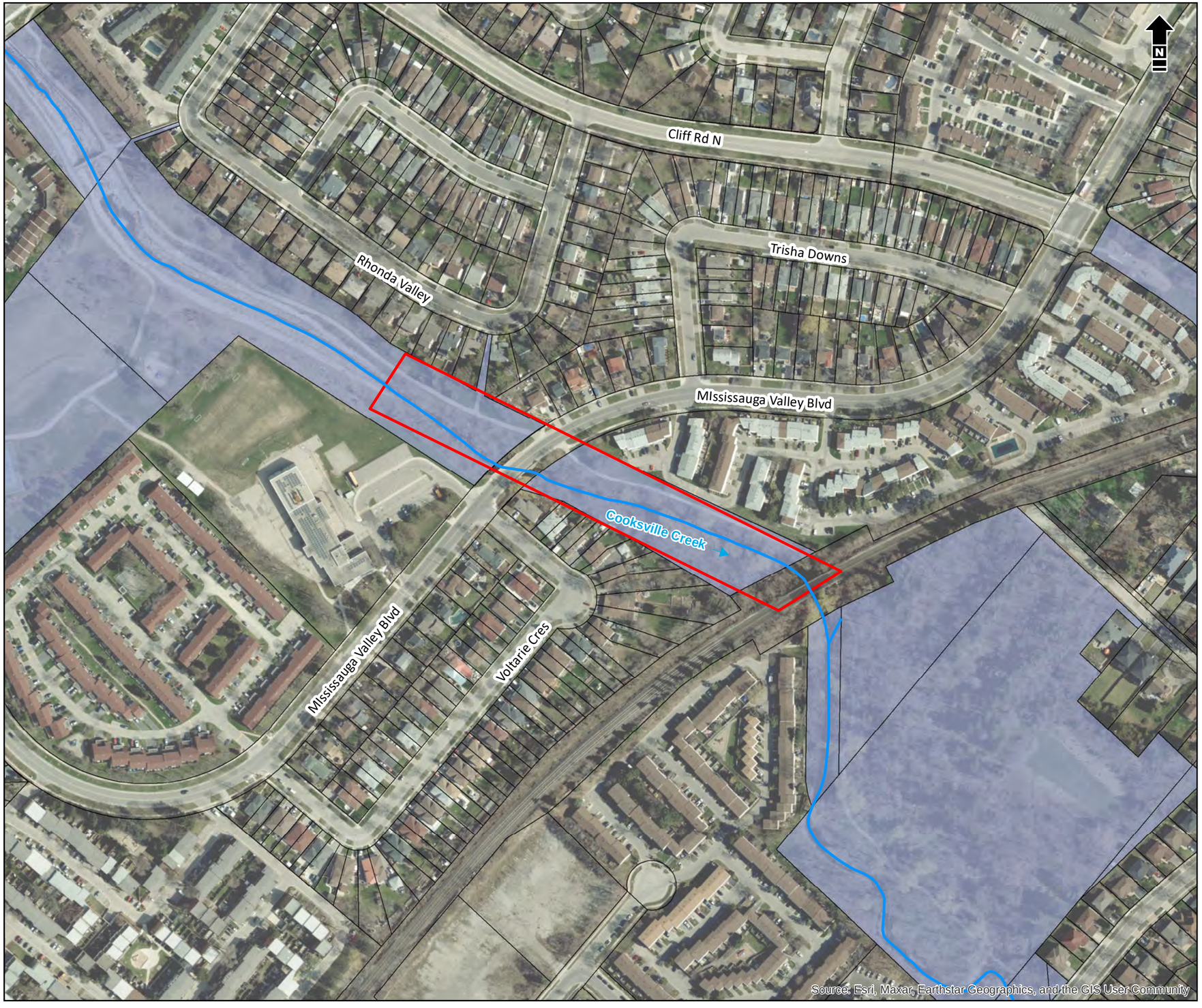
1.1 Study Area

The Cooksville Creek watershed, situated east of the Credit River within the City of Mississauga, drains an area of approximately 33.9 km^2 and flows directly into Lake Ontario. Cooksville Creek is located within a highly urbanized area of Mississauga and has undergone extensive channel modifications over the years to accommodate increased urban development. It is currently channelized over 92% of its length through a variety of methods and materials, including gabion baskets, concrete, rip-rap, armour stone and grass lining (Aquafor Beech 2011). Flooding and drainage issues exist within the watershed in areas where development has reduced channel conveyance and restricted floodplain capacity, and has resulted in backwaters to flood upstream reaches (Aquafor Beech 2011).

The erosion control project area is situated within the lower watershed, and extends approximately 360 m between Mississauga Valley Boulevard and the CP rail crossing; the downstream limit is approximately 5.8 km upstream of the creek outlet to Lake Ontario. The study reach is located entirely within City-owned property connecting Stonebrook Park in the north to Richard Jones Park in the south. Upstream of Mississauga Valley Boulevard, Cooksville Creek flows between Thornwood Public School (south) and private property (low density residential properties; north). Downstream of Mississauga Valley Boulevard, the creek flows between private property (low density residential homes to the south and townhomes to the north; Figure 1). The channel is bordered by relatively sparse riparian forest habitat and pedestrian walking trails (north). A sanitary sewer runs parallel to the creek; a lateral sewer crosses the creek in two locations within the study area.

Easting (m)

Northing (m)



- Study Area
- City of Mississauga Property
- Property Parcels
- Watercourse

1:3,000 metres

30 0 30 60

NAD 1983 UTM Zone 17N

Reference: please refer to reference spreadsheet

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City of Mississauga
Cooksville Creek Erosion Control

Study Area

Date:	Project:	Submitter:	Reviewer:
October 2, 2023	34715	J. Howett	M. Pushkar

Figure 1

N:\PROJECTS\34715 - Mississauga - Cooksville MVB to CPR EA\10 GIS\01 MXD\Figure 1 - Study Area.mxd - Tabbott_L - 07-Feb-24, 09:18 AM - BAMiller - TID005

1.2 Background

The large amount of urban development within the Cooksville Creek catchment, and the alterations to the channel to accommodate both development and servicing infrastructure, have greatly impacted channel form and the erosion and evolutionary processes of the creek channel. The channel response to the urban flow regime, altered drainage network, and erosion engineering countermeasures, have increased the rate of channel degradation and erosion processes, and have created a risk of damage to, or failure of, adjacent infrastructure from flooding and/or erosion. In response, the City initiated several studies and assessments over more than a 20-year time period in an attempt to gain better understanding of geomorphic processes and adjustments along Cooksville Creek, an entirely urban watercourse, that is situated within a bedrock setting.

A list of the key reports and papers that have resulted from City initiated studies include:

- The Effect of Channelization on Cooksville Creek Flows (Dillon M.M. Ltd. 1985)
- Cooksville Creek Erosion Study (Public Works Technical Services Division, City of Mississauga 1990)
- Cooksville Creek Erosion Control Study (Winter Associates 1991)
- Cooksville Creek Geomorphic Assessment (Parish Geomorphic 1997)
- Cooksville Creek Rehabilitation Study (TSH Associates et al. 1997)
- Recent Adjustments to the Long Profile of Cooksville Creek, an Urbanized Bedrock Channel in Mississauga, Ontario (Tinkler and Parish 1998)
- Cooksville Creek Flood Remediation Plan (Environmental Water Resources Group Ltd, 2002)
- Cooksville Creek Special Policy Area Report (Phillips Engineering et al. 2003)
- Cooksville Creek Watershed Study and Impact Monitoring Characterization (Aquafor Beech 2011)

The section of channel that is included within the current study exhibits many of the characteristics of the overall Cooksville Creek system. The channel has been straightened and modified with bank protection works, undercutting and deterioration of the erosion countermeasures has been noted.

No specific areas of erosion concern were identified in the City of Mississauga's (1990) report within the current study area. Since the 1997 Geomorphic Assessment (Parish), ongoing monitoring efforts have identified continued channel bed incision and widening along Cooksville Creek. The current study is intended to further examine conditions within Reach 4 (TSH 1997) of Cooksville Creek, and specifically focuses on the area between Mississauga Valley Boulevard and the CP rail crossing (Reach 4 d). The 1997 TSH report identified the occurrence of bank erosion and deposition immediately downstream of the CP rail crossing. The recommended approach for rehabilitation was to replace gabion baskets with armourstone and to provide a plunge pool at the sanitary sewer (TSH 1997).

Specific concerns identified by the City of Mississauga include:

- uplifting of the gabion baskets on the bed of the channel which contribute to the collection of debris
- undermined sewer outfalls
- failed gabion basket walls that are slumping and undermined
- excess deposited stone

1.3 Key Project Objectives

Rehabilitation objectives identified for the section of Cooksville Creek that is situated between Mississauga Valley Boulevard and the CP rail crossing include the following:

- provide long-term erosion protection that is compatible with the natural tendencies of the creek
- maintain or improve the hydraulic capacity of the creek
- replacement of the existing hardened creek bed and banks with more 'natural' forms of erosion and grade control, where feasible
- provide environmental enhancements wherever possible
- improve fish habitat and fish passage
- minimize environmental impacts during and post construction
- decrease property and infrastructure loss
- minimize capital and maintenance costs

2 ENVIRONMENTAL ASSESSMENT PROCESS

2.1 Ontario's Environmental Assessment Act

The Cooksville Creek Erosion Control Project: Upstream of Mississauga Valley Blvd. to CP rail crossing is subject to the provisions of Ontario's *Environmental Assessment Act*. The *Environmental Assessment Act* requires that an EA of any major public sector project that has the potential for significant environmental effects be undertaken prior to implementation to determine the ecological, cultural, economic, and social impact of the project.

The *Environmental Assessment Act* exists to "provide for the protection, conservation, and wise management of Ontario's environment." The *Environmental Assessment Act* mandates clear terms of reference, focused assessment hearings, ongoing consultation with all parties involved - including public consultation - and, if necessary, referral to mediation for decision. EA is a key part of the planning process and must be completed before decisions are made to proceed on a project.

To comply with the requirements of the *Environmental Assessment Act*, two types of EA processes can be applied to projects:

- Individual EA (under Part II of the *Environmental Assessment Act*): This process includes the development of a project-specific terms of reference that is submitted for review and approval to the Minister of the Environment. This process is typically applied to large, unique or complex projects that do not have precedents that demonstrate a predictable and manageable environmental impact.

- Class EA: This process applies to routine projects that have predictable and manageable environmental effects, and follow a terms of reference that has been previously approved for certain types of projects. Provided that the approved Class EA process is followed, the project will comply with Section 13(3) a, Part II.1 of the *Environmental Assessment Act*.

2.2 Municipal Class Environmental Assessment

The Cooksville Creek Erosion Control Project: Upstream of Mississauga Valley Boulevard to the CP rail crossing study falls under the Class EA process as a project with predictable and manageable environmental impacts, and will be carried out under the terms of reference established in the Municipal Class EA document, prepared by the Ontario Municipal Engineers Association in June 2000 (as amended in 2007, 2011, and 2015).

Figure 2 illustrates the Municipal Class EA process for the planning and design of projects, which is divided into five phases as outlined below:

- **Phase 1:** Identify the problem (deficiency) or opportunity.

- **Phase 2:** Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution taking into account public and review agency input.

- **Phase 3:** Examine alternative methods of implementing the preferred solution, based upon the existing environment, public and review agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects.

- **Phase 4:** Document, in an Environmental Study Report, a summary of the rationale, and the planning, design and consultation process of the project as established through the above Phases, and make such documentation available for scrutiny by review agencies and the public.

- **Phase 5:** Implementation. Complete contract drawings and documents, and proceed to construction and operation; monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the completed facilities.

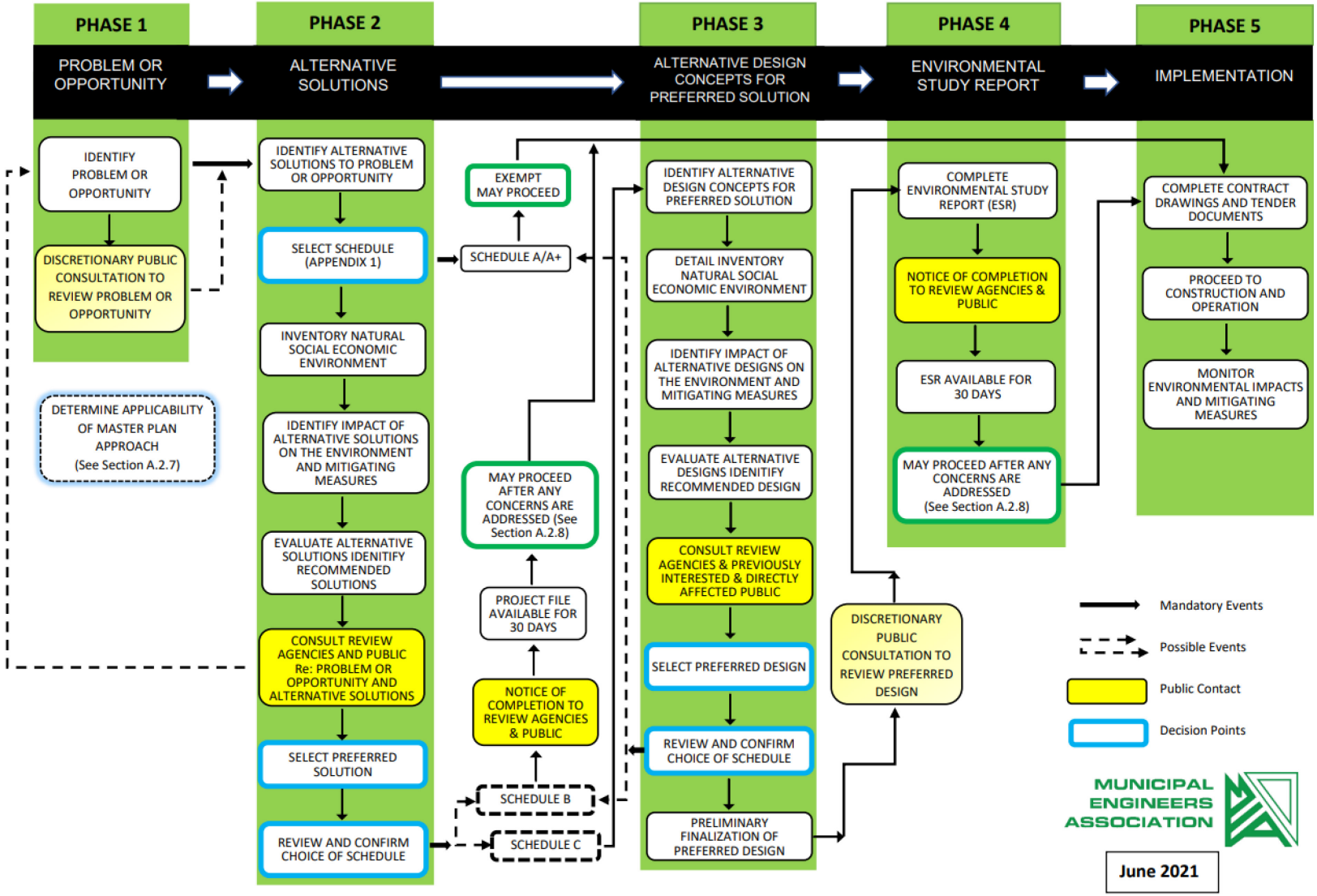


FIGURE 2 Municipal Class Environmental Assessment Planning and Design Process

The Municipal Class EA applies to municipal infrastructure projects including roads, water, wastewater, and stormwater projects. There are several classifications of projects under the Class EA process, known as schedules, based on their potential environmental impact:

- **Schedule "A"** projects generally include normal or emergency operational and maintenance activities, where environmental effects are minimal. Only Phase 1 of the Class EA process must be completed prior to these projects being implemented.

- **Schedule "A+"** projects were introduced in 2007 and include an additional consultation component wherein the public is to be advised prior to the implementation of a Schedule "A" project.

- **Schedule "B"** projects generally include improvements and minor expansions to existing facilities, where there is the potential for some adverse environmental impacts. A screening process is followed which includes consultation with agencies and members of the public who may be affected by the project. The first two phases of the Class EA process are completed for these projects, including the preparation and submission for public review of a project file, prior to implementation.

- **Schedule "C"** projects generally include the construction of new facilities and major expansions to existing facilities and have the potential for significant environmental impact. A complete Class EA process is required for these projects prior to implementation, including the production of an Environmental Study Report.

The present study is being completed under Schedule "B" of the Municipal Class EA process as the project involves works undertaken in a watercourse for the purposes of flood control or erosion control, which may include:

- bank or slope regrading
- relocation, realignment or channelization of watercourse
- revetment including soil bio-engineering techniques

2.3 Part II Order

A project that is carried out following an approved Class EA process will comply with Part II of the *Environmental Assessment Act*, and will thus not require an Individual EA and approval from the Minister of the Environment and Climate Change. However, if during the project planning and consultation process there are agency or public concerns that cannot be resolved, the concerned party may request that the project comply with Part II of the *Environmental Assessment Act* and undertake a higher level of assessment. Such a request is called a "Part II Order."

The request for a Part II Order should be made only when there are outstanding significant environmental issues that cannot be resolved through the Class EA process, through discussions with the proponent or through mediation. The Part II Order must focus on potential environmental effects of the project, and must not be made for the sole purpose of delaying or stopping the project or include issues that are not related to the project.

The request must be made in writing to the Minister of the Environment, Conservation and Parks (MECP) after the proponent has issued a Notice of Completion of the environmental study report. The proponent must also be copied on the request. MECP staff will review the request, consider evaluation criteria, consult with other technical staff and make a recommendation to the Minister. Depending on the project, the MECP's review typically lasts between 30 and 66 days. The Minister can:

- deny the Part II Order request, with or without conditions
- refer the matter to mediation
- require that an Individual EA be prepared in order to comply with Part II of the *Environmental Assessment Act*

If a Part II Order request is made prior to filing of the Notice of Completion, the requestor will be advised to bring the concerns to the attention of the proponent (i.e., the City of Mississauga).

3 EXISTING CONDITIONS

This section provides a detailed characterization of the study area, including assessments of the existing hydraulics, geomorphology, natural and social environment, and outlines the key erosion issues and potential opportunities for consideration.

3.1 Physiography, Geology, and Topography

The physiography and surficial geology of an area in which a stream corridor is situated provide an overview of the influences that determine channel form and sediment supply.

The physiography of the lower watershed along Cooksville Creek comprises the Iroquois Sand Plain with areas of outcropped bedrock and till plain (Halton); the area generally has a high groundwater recharge rate (Aquafor Beech 2011). The bedrock and Quaternary geology of the study area are described in detail within Tinkler and Parish (1998) and TSH (1997) and are summarized below:

- The Cooksville Creek drainage basin is underlain by late Ordovician Georgian Bay Formation; this is characterized by a dark gray shale that contains interbeds of limestone (8 cm thick, but can range from 3 to 12 cm).

- Shale comprises 50 to 60% of the bedrock, and weathers easily.

- Bedrock is commonly exposed along Cooksville Creek banks. The bedrock unit is 175 m thick.
- The limestone interbeds are more resistant than the shale and provide temporary stability in exposures. Once shale is exposed, it is easily weathered and breaks down into fine-grained clay.
- Downcutting of the channel occurs primarily as adjacent shale is eroded and removes the support of limestone blocks delimited by joints and bedding planes, and opened up by dissolution.
- The Iroquois Plain is predominantly of deltaic and lacustrine deposits that consist of gravelly sand and silty sand; the overburden is generally considered thin (3 to 6 m).

The surficial Quaternary geology within the study area includes modern alluvial deposits, which comprise a narrow corridor that encompasses the channel and floodplain. The deposits are made of clay, silt, sand, and gravel.

3.2 Watershed and Drainage Network

The Cooksville Creek watershed is approximately 33 km^2 and extends from north of Highway 401 to its mouth at Lake Ontario. The watershed is entirely located within the City of Mississauga and, as of 2014, was considered to be 97% urbanized (Aquafor Beech, 2014). Cooksville Creek includes two branches (west and east) that join to form the main branch of Cooksville Creek at Mississauga Valley Boulevard; the creek then continues to Lake Ontario.

The total length of Cooksville Creek is approx. 11 km which has an average slope of 0.77%; local slope variations range from 0.1 to 1.92% (Tinkler and Parish 1998). The drainage density of the Cooksville Creek subwatershed is 1.34 km/km^2; this value, which did not consider the storm drainage network, and was considered low by Tinkler and Parish (1998).

Cooksville Creek is currently channelized over 92% of its length through a variety of methods and materials, including gabion baskets, concrete, riprap, armour stone and grass lining (Aquafor Beech 2011). Flooding and drainage issues exist within the watershed in areas where development has reduced channel conveyance and restricted floodplain capacity, and has resulted in backwaters to flood upstream reaches (Aquafor Beech 2011).

Through previous studies, reaches were defined along Cooksville Creek to enable spatial organization of information and to facilitate communication. The study area is situated in Reach 4 (TSH 1997) and includes the entirety of Subreach 4(d).

3.3 Hydrology and Hydraulics

Credit Valley Conservation (CVC) CVC maintains two HEC-RAS hydraulic models for this portion of Cooksville Creek. A traditional 1D HEC-RAS model is used for the 2-year through 50-year flows. A 1D-2D

integrated HEC-RAS model is used for the 100-year and Regional events to represent spills out of the valley. Specifically, the left bank of Cooksville Creek spills at the pedestrian bridge downstream of Central Parkway and enters the Rhonda Valley Drive area. A second spill point occurs further south at Mississauga Valley Drive where spill on the left banks enters Trisha Downs from Mississauga Valley Boulevard. On the right bank the spill impacts the Thornwood Public School property and Voltarie Crescent. The spilling is contained by the Canadian National Railway berm and does not continue further downstream. (Matrix 2020)

Modelling results presented in this study are based on the "future" flow rates provided in the HEC-RAS models by CVC. These flows are summarized in Table 1. The table includes the difference in flows upstream of a bounding HEC-RAS cross-section 16114 and downstream of the extent of HEC-RAS cross-section 16446.

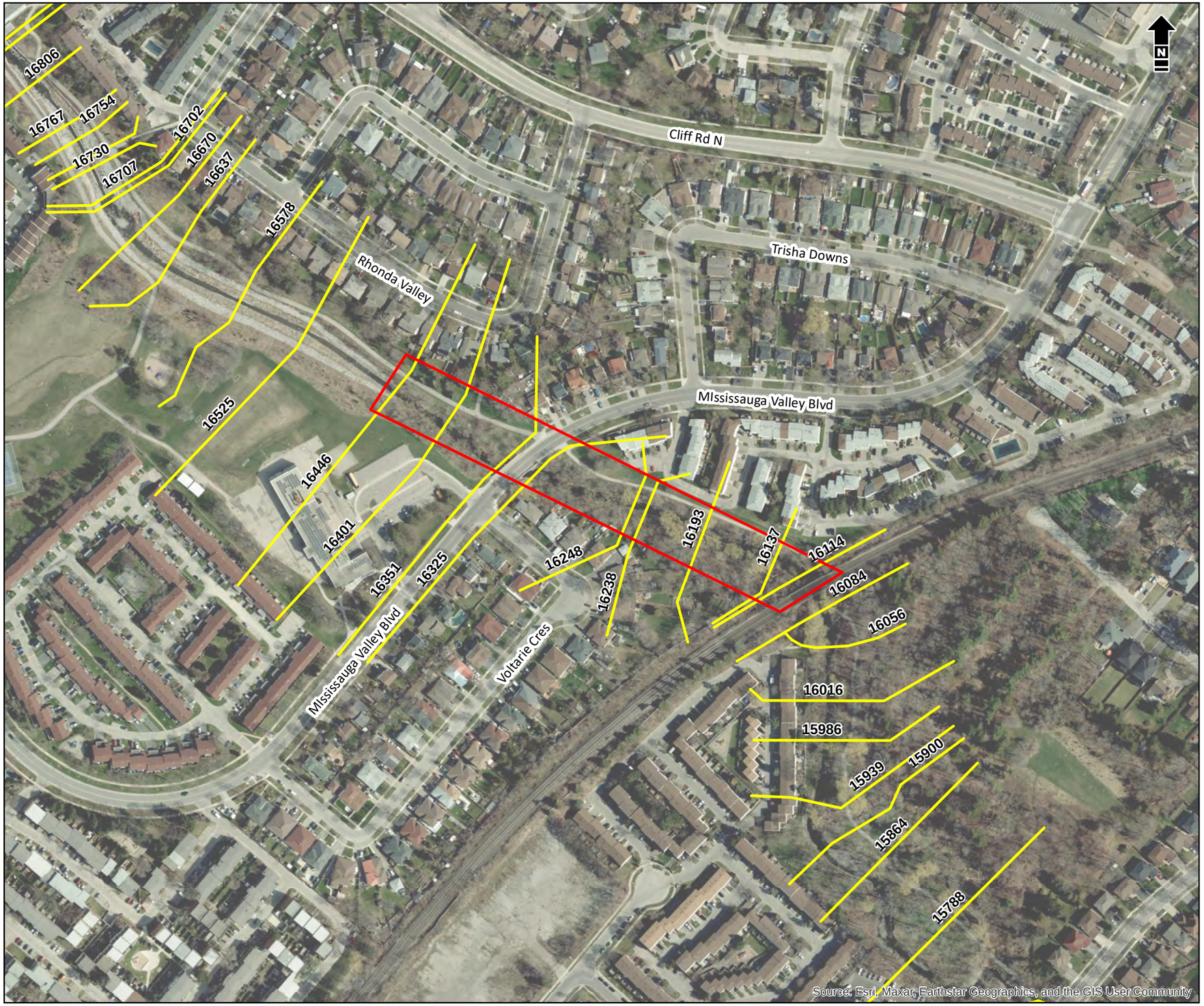
TABLE 1 Summary of Return Period Flows within the Study Area of Cooksville Creek

	2-year (m^3/s)	5-year (m^3/s)	10-year (m^3/s)	25-year (m^3/s)	50-year (m^3/s)	100-year (m^3/s)	Regional (m^3/s)
Future (16806 to 16137)	58.9	92.2	123.2	147.6	171.1	196.7	240.9
Future (16137 to downstream)	60.2	94.1	125.6	150.5	174.3	200.3	246.9

Each of the hydraulic models were updated by Matrix with the 2022 topographic survey data of the study area; this included updates to the cross-section geometries and crossings from cross-section 16114 to 16446 (see Figure 3 for section locations in the 1D model). The basis of comparison (BOC) model includes lower bed elevations ranging from 0.05 to 0.39 m lower than the existing model bed elevations, with reductions. The updated HEC-RAS models provide a BOC for changes to modelled water surface elevations and channel velocities under existing conditions.

Easting (m)

Northing (m)



Hec-Ras Cross-Sections

Study Area

1:3,000 metres

30 0 30 60

NAD 1983 UTM Zone 17N

Reference: please refer to reference spreadsheet

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Cooksville Creek Erosion Control

HEC-RAS Stations

Date:	Project:	Submitter:	Reviewer:
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Figure 3

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A comparison between the original (Existing) 1D-2D model and BOC 1D-2D model water surface elevation and flow velocities, during the Regional flow event was completed at the cross-sections within the study area (Table 2). The BOC model results differ slightly from the existing conditions for water surface elevation and flow velocity because of the updated geometry data from the 2022 topographic survey. The water surface elevations in the BOC model tend to be slightly lower, on average, than the existing model, although they are all within 0.05 m of the existing model results. Velocities are also generally reduced under BOC model conditions; the velocities are within 0.53 m/s of the existing model. A visual comparison of the Existing and BOC Regional inundation results are provided in Figure 4. No additional properties or buildings are impacted by the 0.05 m water surface elevation increase at section 16325. The complete model output data for the Existing and BOC HEC-RAS models are included in Appendix A.

TABLE 2 HEC-RAS Modelled Results for the Regional Flow Event

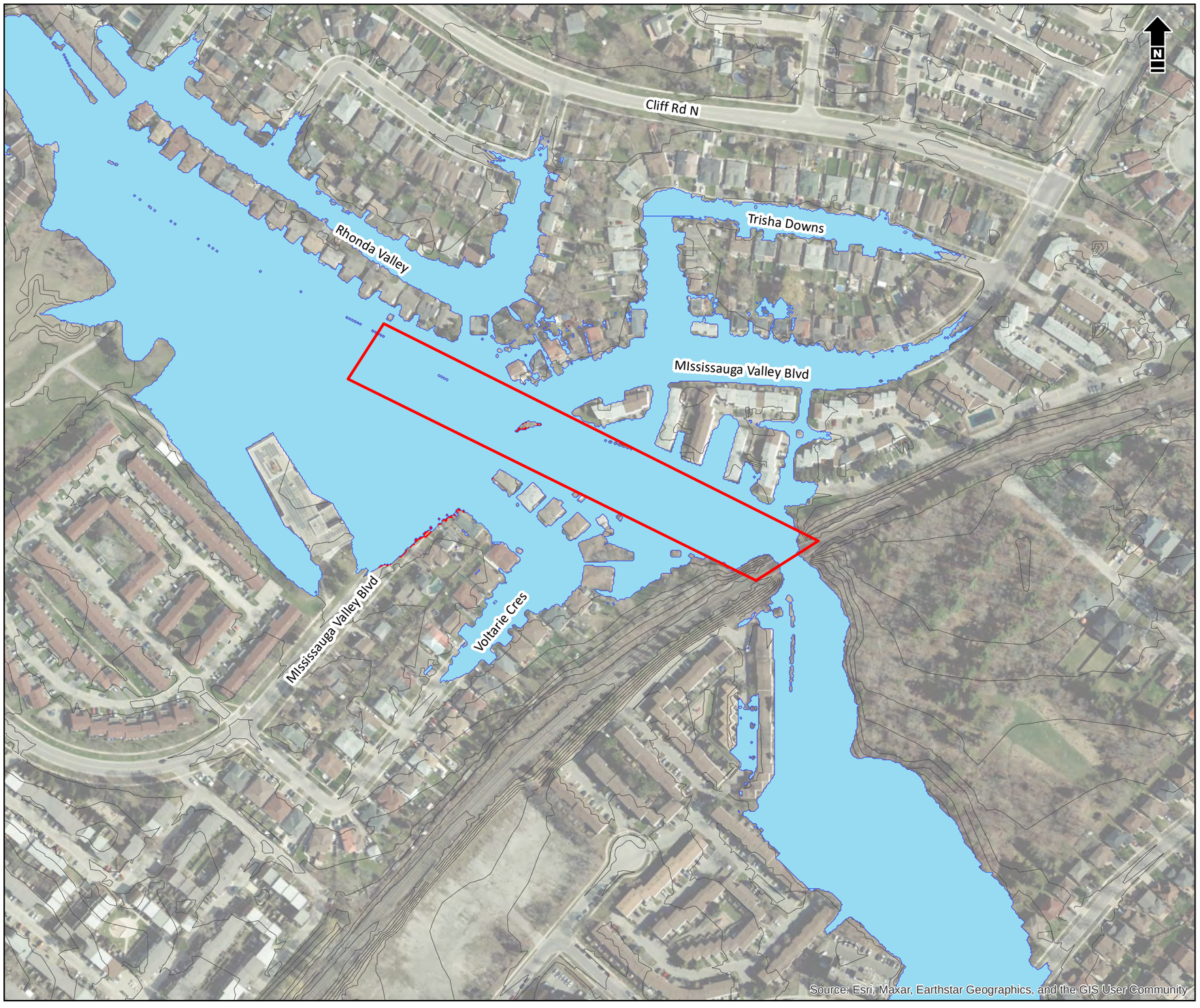
River Station	Flow (m^3/s)	Existing		Basis of Comparison		Comparison	
		Water Surface Elevation (m)	Channel Velocity (m/s)	Water Surface Elevation (m)	Channel Velocity (m/s)	Water Surface Elevation (m)	Channel Velocity (m/s)
Mississauga Valley Boulevard							
16446	230.37	118.7	1.39	118.68	1.4	-0.02	0.01
16401	225.93	118.71	0.98	118.69	0.96	-0.02	-0.02
16351	216.93	118.58	2.07	118.56	2.06	-0.02	-0.01
CP Rail Crossing							
16325	216.92	117.73	2.63	117.78	2.1	0.05	-0.53
16238	229.4	117.69	2.75	117.67	2.74	-0.02	-0.01
16193	235.75	117.65	2.81	117.64	2.97	-0.01	0.16
16137	237.14	117.55	3.1	117.54	3	-0.01	-0.1
16114	240.76	117.48	2.68	117.48	2.6	0	-0.08

Notes:
Comparison = Basis of Comparison-Existing

The City of Mississauga initiated the Cooksville Creek Flood Evaluation Master Plan Environmental Assessment; the study was completed in 2012. That study identified various opportunities to enhance flood storage along Cooksville Creek. Implementation of these measures is expected to reduce the extent of flooding in the current study area (i.e., Cooksville Creek between the CP rail crossing and Kirwin Avenue). The current study is focused on addressing erosion risk.

Easting (m)

Northing (m)



Study Area
Contour (1 m)
Original Regulatory Flood Line
BOC Regulatory Flood Lines

1:3,000 metres
30 0 30 60
NAD 1983 UTM Zone 17N

Reference: please refer to reference spreadsheet

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City of Mississauga
Cooksville Creek Erosion Control

Regulatory Floodline

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Figure 4

3.4 CHANNEL CONDITIONS

Through the field reconnaissance, it became apparent that there was spatial variability with respect to boundary materials, channel conditions, and processes within the study area.

Along much of Cooksville Creek, erosion control measures have been placed within the channel and along its banks. Of the 720 m of channel banks within the study area, 65% (465 m) was engineered (i.e., gabion and/or armourstone; Table 3). The channel bed is locally protected with concrete grade control structures around the sanitary sewer crossings through the study reach. Further discussion regarding the grade control structures is provided below in Section 3.4.4. Additionally, the channel bed is concrete-lined for approximately 15 m at the upstream limit of the study area; this lining extends along the channel bed upstream of the study reach. The location of the erosion control measures are shown in Figure 5, and illustrated in the following section. Further discussion, from a geomorphic perspective, is provided in Section 3.5.

TABLE 3 Extent of Erosion Control Measures along Channel Bed and Banks

	Value
Total channel length (m)	360
Total length of banks (m)	720
Total length of engineered banks (m)	
Armourstone Stone	280
Gabions	185
Percent of banks hardened banks (%)	65
Total length of engineered bed (m)	
Concrete-lining [(1)]	18
Percent of banks hardened bed (%)	5

Note:
(1) Total length of concrete-lining on channel bed includes 3 m of concrete associated with grade control structures.

The subsections below summarize characteristics of erosion control measures, grade control structures, outfalls, and sanitary and stormwater infrastructure within the study area.

3.4.1 Armourstone

The predominant engineered erosion control measure in the study area was armourstone along the channel banks. A total for 280 m (~39%) of banks were protected by armourstone through the study area. Armourstone protection ranged from single to three-tiered armourstone walls. In general, the armourstone erosion protection along the Cooksville Creek banks was considered to be in good condition with little evidence of undermining, failure and undercutting/outflanking.

PHOTOGRAPH 1 **Three-tier Armourstone Protection on the North Bank of Cooksville Creek, Armourstone Intact, Vegetation Establishment on Top of Armourstone Wall**

PHOTOGRAPH 2 **Upstream View of Channel Cross-section, North Bank (right) Protected by Three-tiered Armourstone Wall, South Bank (left) Protected by Single-tier Armourstone Wall**

3.4.2 Gabion Bank Protection

Gabion baskets (single tiered) accounted for approximately 26% of the total length of channel banks in the study area. The condition of the gabions was generally degraded (sagging, corroded) or failed (empty, fallen). Gabion stone was observed on the channel bed in proximity to failed gabion bank protection; however, gabion baskets were not observed on the channel bed.

PHOTOGRAPH 3 **Emptied Gabion Cage Remains Intact with Channel Bank; Gabion Stone has been Disbursed from the Erosion Protection**

PHOTOGRAPH 4 **Degraded Gabion Cage; Slumping and Deformation of the Erosion Control Measure, Some Gabion Stone has Washed into Channel**

Easting (m)

Northing (m)

- Study Area
- Existing Gabion
- Existing Armourstone
- Concrete (Lining or Slabs)
- Watercourse

1:2,000 metres
20 0 20 40
NAD 1983 UTM Zone 17N

Reference: please refer to reference spreadsheet

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A Montrose Environmental Company

City of Mississauga
Cooksville Creek Erosion Control

Exsiting Erosion Control Works

Date:	Project:	Submitter:	Reviewer:
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Figure 5

There are two grade control structures present within the study area, both constructed, which influence flow energy. Below is a summary of the existing conditions of the grade control features present in the assessed length of Cooksville Creek:

- A concrete sanitary sewer encasement (grade control structure) was located between the CP rail crossing and Mississauga Valley Boulevard (St. 0+240 m; Photograph 5). The concrete cap extends approximately 2.5 m in length along the channel profile. The maximum drop in bed elevation was measured at 0.64 m from the top of the concrete encasement to the channel bed. The concrete encasement was intact.

- A concrete weir grade control structure was located at the upstream limit of the CP rail crossing (Photograph 6). The weir appears to be intact and directs flow through the CP rail crossing.

PHOTOGRAPH 5 **Concrete Sanitary Sewer Encasement at Sewer Crossing 0+240 ; Sanitary Sewer Encasement Creates a Maximum Drop in Bed Elevation of 0.64 m**

PHOTOGRAPH 6 **Concrete Weir at Upstream Limit of Canadian Pacific Railway Rail Crossing**

3.4.3 Concrete-lining

A small portion (approx. 15 m) of the channel bed profile is lined with concrete immediately downstream of the upstream study area limit. The concrete was considered to be intact, with little evidence of cracking or undermining. The concrete lining extended along the profile of Cooksville Creek, upstream of the study reach.

PHOTOGRAPH 7 **Concrete-lined Channel Bed Through the Upstream Lengths of the Study Reach**

PHOTOGRAPH 8 **Upstream View of Approximately 15 m of Channel Bed Profile Protected by Concrete lining in Upstream Lengths of Study Reach**

3.4.4 Stormwater Outfall Structures

Throughout the study area, two stormwater outfalls discharge into Cooksville Creek. Two concrete outfall headwalls were observed (See Photographs 9 and 10). The outfall structures were observed to be in relatively good condition (i.e., no undercutting of outfall structure, no substantial deterioration of concrete headwalls).

Further discussion of the stormwater infrastructure occurs in Section 3.7.4.

PHOTOGRAPH 9 **A 750 mm diameter Stormwater Outfall Enters the Channel on the North Bank of Cooksville Creek Upstream of the Mississauga Valley Boulevard Crossing; the Concrete Outfall was Grated and had a Concrete Headwall Structure**

PHOTOGRAPH 10 **A 400 mm diameter Storm Outfall on the South Bank of Cooksville Creek Upstream of the Mississauga Valley Boulevard Crossing**

3.4.5 Bank Erosion

Where no erosion control measures were in place, some evidence of ongoing channel bank erosion was exhibited. Areas of bank erosion were concentrated directly downstream of Mississauga Valley Boulevard on the north channel bank, and upstream of Mississauga Valley Boulevard on the north bank near the upstream limit of the study area.

PHOTOGRAPH 11 **Vertical Eroded Bank with Exposed Roots and Gravel and Sand Material within the Bank; Located Directly Downstream of Mississauga Valley Boulevard (North Bank)**

PHOTOGRAPH 12 **Slumping Bank Material Directly Upstream of the 750 mm Concrete Stormwater Outfall (North Bank); Located Near Upstream Limit of Study Area**

3.4.6 Mississauga Valley Boulevard Bridge Crossing

Underneath Mississauga Valley Boulevard, the cross-section was trapezoidal; concrete slabs with embedded cobble were on the slopes. These slabs were generally in-tact. At the toe of the slope, the concrete slabs created a defined low flow channel; these gabions were placed on top of a foundation of gabions. These gabions were corroded and emptied of gabion stone. On the upstream south side of the bridge, scour has occurred along the banks and the slope toe slabs now interfere with a continuity of flow in the channel.

PHOTOGRAPH 13 **Scour of Channel Banks has Occurred on the Upstream South Side of the Bridge Inlet**

PHOTOGRAPH 14 **Corrosion of Gabions Underneath the Concrete Slabs**

3.4.7 Sanitary Infrastructure

The sanitary sewer is generally situated along the north side of the creek corridor. There are two lateral sanitary sewer crossings under the creek. The upstream (0+240 m) crossing is oblique to the channel and based on current Region mapping and recent survey appears to be situated under the shale bed; an exposed concrete weir/sill is exposed in the channel bed immediately downstream of the sewer crossing and associated with an ~0.3 m vertical drop. The downstream sanitary sewer crossing (0+374 m) is concrete encased. Both the concrete weir/sill and concrete encased sewer have resulted in grade control structures (see Section 3.4.2). The precise location of the upstream (0+240 m) sanitary crossing, in relation to the concrete weir/sill needs to be confirmed in the event of any works within the channel.

Within the study area, there are five manholes. Four manholes were in proximity to the pedestrian trail on the north channel bank and are associated with the sanitary sewer that runs parallel to the Cooksville Creek bank. One manhole was located on the south bank associated with the sanitary sewer crossing at 0+240 m. None of the manholes were directly exposed to the creek; the nearest manhole to the channel bank was located ~5 m from the south bank.

Further discussion of the sanitary infrastructure occurs in Section 3.7.4.

PHOTOGRAPH 15 Manhole within the Cooksville Creek Corridor Associated with a Sanitary Sewer Crossing

PHOTOGRAPH 16 Manholes Exist Along the Pedestrian Pathway and are Generally Associated with the Sanitary Sewer which Runs Parallel to Cooksville Creek

3.5 GEOMORPHOLOGY

Observations of channel instability and/or erosion concerns along any watercourse should be placed in the context of its geomorphic system. This includes recognizing that the form and function of watercourses are a result of the interaction between controlling (e.g., geology, flow) and modifying (e.g., vegetation) factors to which the channel has adjusted. When a change in one or more of these factors is greater than what the channel is able to accommodate, then a temporary or permanent channel

response may occur as the channel seeks to regain a dynamic equilibrium form. Since the response of a watercourse to a disturbance may take years or decades to accomplish, and since a specific site is part of a continuum along a drainage network, analyses of channel morphology should include a broader spatial and temporal perspective.

Characterization of the geomorphological conditions along the 376 m of Cooksville Creek from the CP rail crossing to Mississauga Valley Boulevard was accomplished through review of historical data, background materials, field assessments, and data analyses. The intent of the geomorphic assessment was to gain insight into channel form and functions to inform the selection and evaluation of alternatives for channel restoration. Findings from the geomorphic assessment are presented and discussed in detail in Appendix B, and summarized in this section.

3.5.1 Historical Overview

Cooksville Creek has been the focus of numerous studies since the early 1990s. Historical changes along Cooksville Creek date back to 1954, with identifiable changes beginning in the study area in 1975 when agricultural land was converted to residential land use adjacent to the Cooksville Creek corridor in the surrounding area. TSH (1997) indicate that land use and development within the Cooksville Creek watershed changed from about 20% urbanized in 1954 to over 90% urbanized in 1990; this has resulted in significant changes to flow regime conditions, particularly with lower base flows and higher peak flows.

In the Cooksville Creek study completed by Parish and Tinkler (1998), their comparison of the 1954 and 1990 channel planform configurations between the Central Parkway and Dundas Street, demonstrated a 188 m loss of channel length (i.e., approx. 10.5% reduction); during this same time period, channel width increased by 0.9 m (i.e., approx. 17% increase). Channel bed degradation rates were measured to be 0.071 m/year between 1978 and 1994 (Tinkler and Parish 1998).

Historical maps and aerial imagery of the Cooksville Creek area in the Stage 1 archaeological assessment for this study show that the creek has moved in spatial position over the past approximately 150 years, only nearing its current alignment in 1954 (Figure 6) as opposed to crossing the current study area as shown in the 1859 and 1877 maps. This migrating channel moved laterally to the southward or underwent a realignment during the works shown in the 1966 (Figure 7) likely coinciding with placement of sanitary infrastructure.

FIGURE 6 1954 Aerial Image of the Cooksville Creek Study Area (Screen Capture from Stage 1 Archaeological Report)

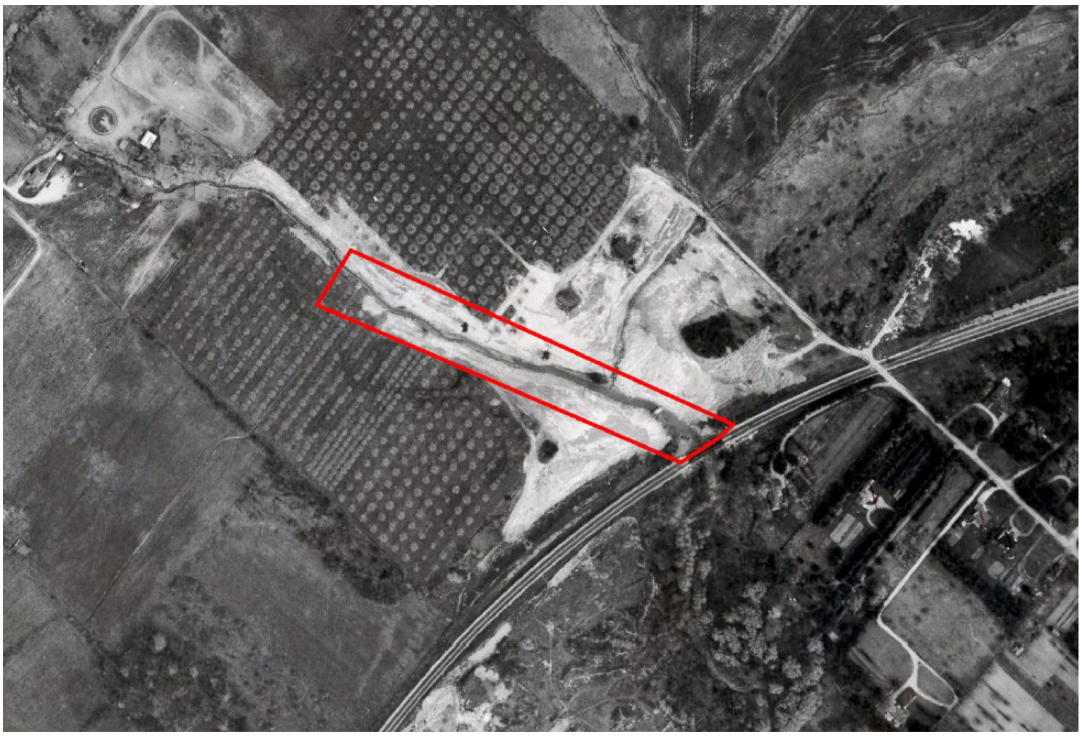


FIGURE 7 1966 Aerial Image of Cooksville Creek Study Area Showing Creek has Migrated Southward and Ground Works are Occurring Throughout the Entire Study Area (Screen Capture from Stage 1 Archaeological Report)

3.5.2 Existing Conditions and Processes

A geomorphological field assessment was completed in April 2022 to document existing conditions and to gain an understanding of channel functions and processes within the study area.

3.5.3 Bed and Bank Materials

Alluvium consisting of sand, gravel, and cobble sized sediment generally covers the channel bed; areas of bedrock exposure were not observed.

As noted in Section 3.4, only 35% of banks are not protected with erosion control measures. Where unprotected, root control was commonly present along the channel banks. Local evidence of active bank erosion was present along natural channel banks through the study reach.

3.5.3.1 Channel Bed Profile

The channel bed has historically been modified through the study reach. The bed morphology is most defined as a discernible riffle-pool sequence. Backwatered conditions were evident along the channel profile upstream of the grade control structures; maximum backwatering extended approximately 55 m upstream of the concrete weir/sill near the sanitary sewer crossing at 0+240 m. This concrete weir/sill is oblique to the channel planform and associated with a vertical drop in channel bed profile of ~0.3 m to the water surface; a scour pool was observed downstream of this weir.

Where sediment had accumulated on the channel bed in pools, then this sediment was considered to be loose or moderately packed (i.e., a boot would leave a depression in the sediment). Based on the measured grain size distribution, the study area would be classified as a gravel bed stream according to Bunte and Abt (2001).

3.5.3.2 Channel Cross-section

The topographic survey of Cooksville Creek was processed and used to assess nine cross-sections and the channel bed profile configuration; the data were used to quantify channel parameters (Table 4) and as a basis for hydro-geomorphic analyses. Key findings are summarized below:

- The cross-sections generally appeared to be symmetrical and reflected the influence from the erosion control measures (gabions and/or armourstone protection).

- Cooksville Creek is generally well-connected to its floodplain throughout the study area. The cross-sectional capacity decreases in the downstream direction. Channel capacity ranges from estimated bankfull flows (60% of 2-year flow event) to the 2-year event in the upstream section, while less than the estimated bankfull flows can spill into the floodplain in the downstream section of the study area (i.e., approaching the CPR crossing).

- Substrate material smaller than the D84 of the grain size gradation is considered to be mobile during bankfull flows. During larger flows, the D95 is not anticipated to be entrained within the study area. TSH (1997) had suggested that sediment transport within Cooksville Creek is very efficient; mid-channel bars and point bars, when present, change dramatically during high flows. Results from the geomorphic assessment support this observation.

- The unit stream power within the study area generally demonstrates high energy which was within the naturally occurring braided stream type classification developed by Nanson and Croke (1992).

TABLE 4 Overview of Field Site Measurements

	Minimum	Maximum	Average
Average grade (%)		0.59	
Section length (m)	22.87	39.90	32.66
Bankfull Width (m)	7.16	13.38	10.11
Max. Bankfull Depth (m)	0.88	2.09	1.50
Avg Bankfull Depth (m)	0.68	1.71	1.06
Bankfull Channel Area (m^2)	5.71	21.17	10.88
Width: Depth ratio (m/m)	6.78	15.96	10.21
Channel Perimeter (m)	8.79	17.10	12.61
Hydraulic radius (m)	0.46	1.24	0.85
Substrate			
D5		5	
D10		10	
D16		10	
D25		20	
D35		25	
D50		50	
Substrate			
D65		80	
D75		100	
D84		120	
D90		150	
D95		150	

Further discussion of channel conditions, issues, and processes within the study area are outlined in the geomorphic assessment report provided in Appendix B.

3.5.4 Summary and Recommendations

A geomorphological assessment was completed for the section of Cooksville Creek that extends approx. 376 m from upstream of Mississauga Valley Boulevard to the CP rail crossing. The intent of the assessment was to document existing conditions and to gain an understanding of channel functions and processes within the study area. The geomorphic assessment included a review of background materials, a review of historical aerial imagery, field investigations, and data analyses.

Cooksville Creek, including the study area, has been the focus of various studies, dating back to the 1990s. Background information provides a context and understanding of existing conditions. Key controls on the configuration of Cooksville Creek included armouring of the channel banks (armourstone, gabion baskets), infrastructure within the channel corridor including sanitary sewer crossings beneath the channel, and the urban influence of the surrounding landscape.

Key factors that affect morphological form and function, and those which contribute to the failure of erosion control materials within the study area were identified. Results from analyses indicated that the channel cross-section is generally undersized, conveying up to the 2-year event towards the upstream extent of the study area, but enabling flows less than the estimated bankfull flow to spill onto the floodplain towards the downstream extent of the study area. Considerations for enhancement of existing conditions were recommended.

3.6 NATURAL ENVIRONMENT

3.6.1 Aquatic Habitat and Fish Community

A detailed aquatic habitat assessment, following a modified OSAP protocol (Stanfield 2013) was conducted by Matrix ecologists on November 25, 2022, to characterize aquatic features in the study area. Within the study area, Cooksville Creek was a single channel, but two branches converged approximately one km upstream of the study area. The creek was divided into three assessment reaches based on similar aquatic habitat and channel morphology. It should be noted these reaches are identical as defined in the geomorphic assessment completed by Matrix in 2022. Within the study area, Cooksville Creek meanders through conservation land and alongside a low residential neighbourhood and Thornwood Public School, beginning upstream at Stonebrook Park.

Reach 1 was located directly between the northeast side of the CP railway and southwest side of Mississauga Valley Boulevard. This reach contained armourstone on both banks and was generally in good condition; however, there were a few areas of failed armourstone sections exposed. Scouring was observed behind the left armourstone bank. Multiple concrete weirs were observed within this reach, indicating barriers to fish movement. Woody debris and detritus were observed within the creek and occasional garbage within Reach 1 and salt from off the adjacent pedestrian pathway were observed. Emergent, rooted floating, submergent, and free floating macrophytes were absent. Floating algae was absent; however, attached algae was abundant and filaments and slimes/crusts were present.

Reach 2 began on the northwest side of Mississauga Valley Boulevard and extended approximately 98 m to the edge of the deciduous forest section, with a pedestrian pathway close by. This reach was a very uniform channel with a four-metre-wide concrete base on the bottom of the creek. Two outfalls were located across from each other, and the smell of sewage was noted during the time of assessment. Minor undercutting and exposed roots on the banks were present, with approximately 14 to 20 cm of undercut. Occasional areas of scouring were noted on the left bank. No aquatic macrophytes were observed.

Attached algae and slimes/crusts were abundant and filaments were present. A small log jam and piles of wood was located on the edge of the creek.

Reach 3 (creek) was located upstream of Reach 2 and consisted of occasional riffles. A four-metre-wide concrete base on the bottom of the creek was observed and the left and right banks appeared stable. Native plantings were located along the shoreline, and it appeared as if the whole area was recently restored. Emergent vegetation such as cattail species (*Typha sp*.) and soft stemmed bulrush (*Schoenoplectus tabernaemontani*) were present along the shore; however, no other aquatic macrophytes or algae were observed.

Overall, most of the watercourse has been channelized using concrete, armourstone, and gabion baskets. Portions of these measures are failing and erosion to the channel banks is occurring both around the protection measures and the natural banks. The study area had riffles, pools, bank overhangs and cobble present, which is considered potential fish habitat; however, overall, the reaches of Cooksville Creek within the study area provide poor quality fish habitat.

3.6.2 Terrestrial Habitat

Vegetation communities were characterized and using the Ecological Land Classification (ELC) systems for southern Ontario (Lee 1998, 2008) during two site visits on June 3 and July 1, 2022. Vascular flora inventories were conducted in conjunction with the ELC surveys.

Six ELC community in total were represented within the study area. Of these, none of the communities were rare.

- **Cultural Urban Thicket/Cultural Urban Meadow (CUT/CUM):** This community was comprised of cultural thicket and cultural meadow was located at the northwest extend of the study area, on either side of Cooksville Creek. This community was heavily influenced by the urban environment and a pedestrian pathway was observed within this community. The community consisted of 47% native and 52% exotic species.

- **Sugar Maple Deciduous Forest Ecosite (FOD5):** This information was pulled from background resources, as the FOD5 community was not visited during Matrix field investigations. This forest community is located on the southeast side of the CP railway. This community was heavily influenced by the urban environment. Old foundation stone and concrete structures, informal walking trails and fire pits were noted within the community.

- **Fresh Moist Lowland Deciduous Forest Ecosite (FOD7):** This forested community was in two areas, southeast of the CUT/CUM community and south of Mississauga Valley Boulevard. This community was influenced by the urban environment: a pedestrian pathway fell within the community and evidence of clearing was observed along with large amounts of cut and downed woody debris.

The community consisted of 51% native and 48% exotic species, and a lot of edge habitat was observed.

- **Fresh Moist Ash Lowland Deciduous Forest (FOD7-2):** This information was pulled from background resources, as the FOD5 community was not visited during Matrix field investigations. This forested community was observed in two areas, southeast of the CUT/CUM community and south of Mississauga Valley Boulevard. Like the other woodlands, this wooded area was likely impacted by the surrounding urban environment.

- **Residential Low Density (CVR_1):** This community was comprised of predominantly single residential dwellings and Thornwood Public School. The landscape consisted of manicured grass with sporadic trees, shrubs, and groundcover. Most of the species observed were non-native. Informal walking trails and roads are present within this community.

- **Parkland:** Two areas of parkland were located within the study area. The first area was located on Thornwood Public School property, south of Cooksville Creek. The second area was located north of the CUT/CUM community and the FOD7. The first area was manicured lawn and dominated by red fescue (*Festuca rubra*). The second area was also manicured lawn, with scattered shrubs and trees, some of them planted. The community consisted of 48% native and 51% exotic species.

Three regionally and/or locally rare species were observed within the parkland, red pine (*Pinus resinosa*), (planted), great lakes sand cherry (*Prunus pumila var. pumila*) (a release, not naturally established), and a planted northern mountain-ash (*Sorbus decora*). Four regionally and/or locally species were observed within the FOD7 community: a planted hobblebush (*Viburnum lantanoides*), cleavers (*Galium aparine*), planted ninebark (*Physocarpus opulifolius),* and great lakes sand cherry. Three regionally and/or locally rare species were observed within the CUT/CUM1 community: great lakes sand cherry, northern mountain-ash, and cleavers. No vegetation species at risk (SAR) were observed within the study area. One S3 species, great lakes sand cherry was observed within the study area; however, this was a planted specimen, not naturally established.

A SAR assessment was completed, and it was determined that suitable habitat for four SAR bat species have the potential to occur within the forested communities within the study area: Eastern small footed myotis (*Myotis leibii*) (END), Little brown myotis (*Myotis lucifugus*) (END), Northern myotis (*Myotis septentrionalis*) (END), and Tri-colored myotis (*Perimyotis subflavus*) (END). Candidate suitable habitat for monarch (*Danaus plexippus)* has the potential to occur within the study area and eastern wood-pewee (*Contopus virens*) habitat was confirmed within the study area.

Two categories for Significant Wildlife Habitat (SWH) were met during the screening: bat maternity colonies SWH type (candidate) and SC and rare wildlife species SWH type (candidate for monarch and confirmed for eastern wood-pewee).

Significant woodlands, residential woodlands, and Special Management Areas were also identified within the study area, as constraints for creek restoration opportunities.

3.6.3 Wildlife

Breeding bird surveys and incidental wildlife surveys were conducted by Matrix ecologists and no other wildlife-specific surveys were conducted.

Two breeding bird surveys were conducted on June 3 and July 1, 2022, and data was recorded using the OBBA protocols (OBBA 2001). Thirty-three species were detected during breeding bird surveys and eight species were detected during incidental observations. One SCC bird species was observed within the study area, the eastern wood-pewee (*Contopus virens*), during incidental wildlife surveys. OBBA and eBird records have confirmed the eastern wood-pewee as potentially occurring within the study area; however, this species was not detected during the breeding bird surveys.

Incidental species observations were recorded during all site visits for all wildlife (mammals, birds, reptiles, amphibians, insects). Eight bird species were detected during incidental observations. Two mammal species were detected during incidental observations. One insect species was detected during incidental observations. Of all the incidental species, only one SCC bird species was observed within the study area, the eastern wood-pewee (which was indicative of breeding bird evidence). No other SAR, SOCC, or rare wildlife species were observed incidentally during Matric field investigations.

See in terrestrial habitat section above for SAR, SCC, and rare wildlife species results.

3.6.4 Summary and Recommendations

Matrix reviewed available background information and completed ecological field investigations to enable an understanding of the natural heritage features and species that are known to and/or have the potential to occur within the study area.

Main constraints for creek restoration opportunities included the watercourse (Cooksville Creek) and associated fish habitat, significant woodlands, residential woodlands, Special Management Areas, candidate habitat for threatened and endangered species (four SAR bat species), confirmed habitat for eastern wood-pewee (SC), SWH for bat maternity colonies and SC and rare wildlife species. Main recommendations are provided below:

- Cooksville Creek is connected to fish bearing waters and is considered fish habitat by MNRF and Department of Fisheries and Oceans (DFO). As such, a DFO request for review will be completed for the proposed channel works and MNRF will be consulted for timing windows and fish permits. In addition, development and site alteration within watercourses and their associated fish habitat are prohibited unless permitted by the CVC.

- Potential alternative implementation impacts will need to consider trees which are identified with suitable cavities for SAR bats. A cavity tree assessment is recommended, followed by an acoustic survey following MNRF protocol if suitable roosting habitat is found.

- Removal of vegetation must adhere to the *Migratory Birds Convention Act*, which protects migratory birds, their eggs, and nests from being harmed or destroyed during the breeding bird window. The study area is within zone C3 of the map of nesting zones in Canada (ECCC 2023) and within a forest habitat. The core breeding period is April 20 to August 10. All clearing and grubbing should be undertaken outside of this window. If clearing is required during this period, a qualified avian biologist can undertake nest searches of "simple" habitats, such as hedgerows, trees, and construction features.

- Tree removals will be required for the proposed undertakings including access routes. Tree removals should be completed by or overseen by a certified arborist following proper arboriculture techniques. The removals should be following the Tree Permit By-Law Number 474-05 (City of Mississauga 2006).

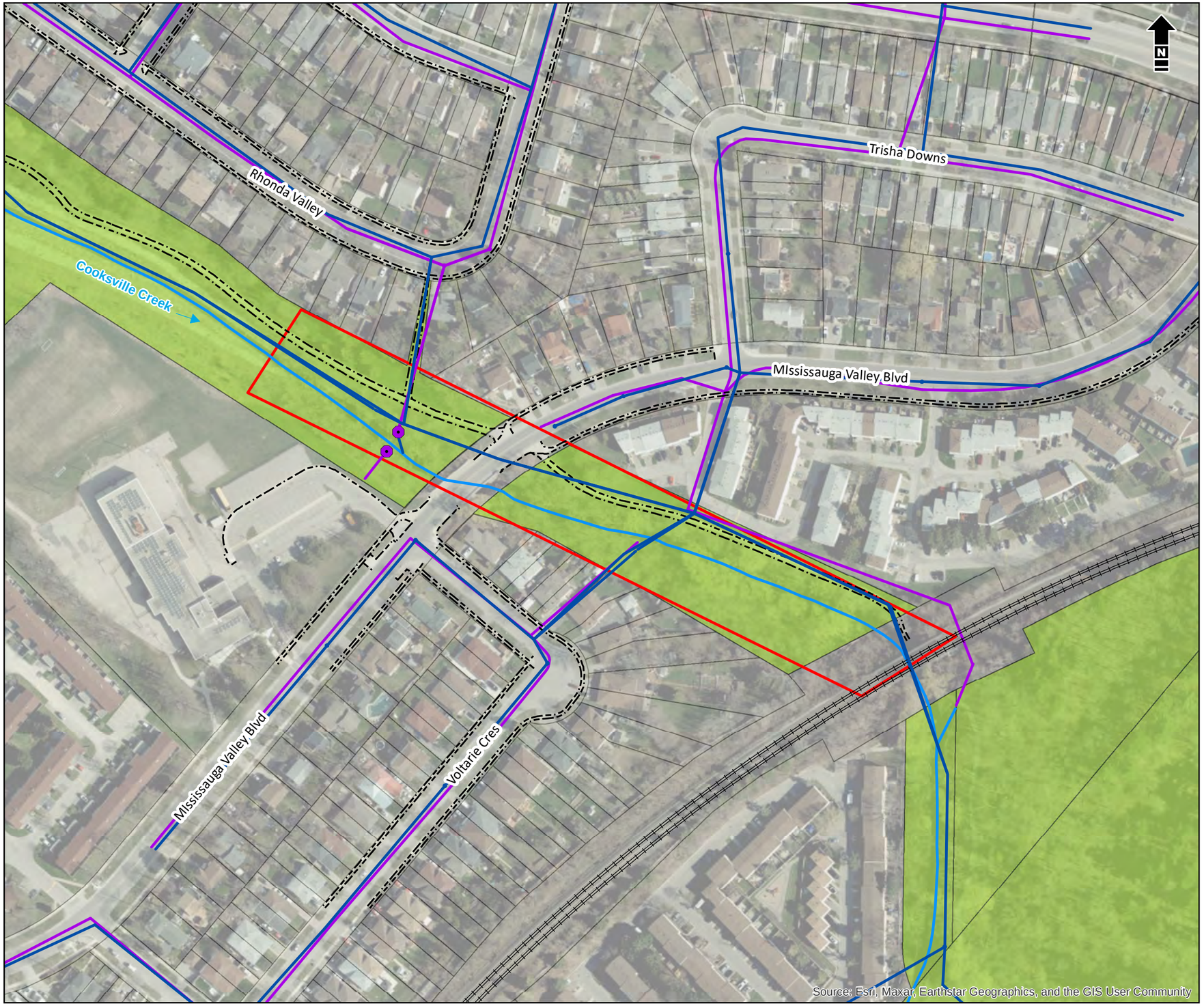
- Construction activity and site alteration within or adjacent to a Significant Natural Area would be permitted unless all reasonable alternatives have been considered and any negative impacts have been minimized. Any negative impact that cannot be avoided would need to be mitigated through restoration and enhancement to the greatest extent possible. Lands within residential woodlands are subject to Site Plan Control. Site alteration for lands within a Residential Woodland will have a regard for protecting, enhancing, restoring, and expanding the existing tree canopy and understorey. Site alteration is not permitted within or adjacent to Special Management Areas unless it is demonstrated that there will be no negative impact to the natural heritage features and their ecological functions and opportunities for protection, restoration, enhancement, and expansion have been identified.

3.7 SOCIAL ENVIRONMENT

Typical social environment factors to consider during an EA include built infrastructure, property impacts, recreational areas and uses, and other components of the human environment (Figure 8). The study area is located in the highly urbanized core of Mississauga, and is situated in City owned property connecting Stonebrook Park in the north to Richard Jones Park in the south. This section describes the different aspects of the social environment that may impact the evaluation and selection of a preferred erosion control alternative.

Easting (m)

Northing (m)



- Study Area
- City of Mississauga Property (Parks)
- Private Property
- Watercourse

Existing Infrastructure

- Existing Trails/Sidewalks
- Sanitary Sewer
- Storm Sewer
- Train Tracks
- Storm Outfalls

1:2,000 metres

20 0 20 40

NAD 1983 UTM Zone 17N

Reference: please refer to reference spreadsheet

Matrix Solutions Inc.
A Montrose Environmental Company

City of Mississauga
Cooksville Creek Erosion Control

Social Environment and Infrastructure

Date:	Project:	Submitter:	Reviewer:
October 2, 2023	34715	J. Howett	M. Pushkar

Figure 8

N:\PROJECTS\34715 - Mississauga - Cooksville NVB to CPR EA\10 GIS\01 MXD\Figure X - Infrastructure.mxd - Tabloid_L - 12-Feb-24, 03:16 PM - BAMiller - TID005

3.7.1 Archaeology Potential

A Stage 1 archaeological assessment was conducted for the study area (Appendix D). The assessment was conducted in accordance with the provisions of the *Environmental Assessment Act* and the *Provincial Policy Statement, 2020*. The purpose of the assessment was to determine whether there was potential for the discovery of archaeological resources present within the study area.

The Stage 1 background study included a review of current land use, historic and modern maps, past settlement history for the area and a consideration of topographic and physiographic features, soils and drainage. It also involved a review of previously registered archaeological resources within 1 km of the study area and previous archaeological assessments within 50 m. The background study indicated that the study area had potential for the recovery of archaeological resources due to the proximity (i.e., within 300 m) of features that signal archaeological potential, namely:

- Proximity to primary water sources (Cooksville Creek)
- Features indicating past water sources (Glacial Lake Iroquois Beach)
- Mapped nineteenth-century transportation routes (Credit Valley Railway)

As the study area is in proximity to features that signal archaeological potential, a Stage 1 property inspection was conducted to evaluate the current conditions of the project area and its integrity. The Stage 1 property inspection visually confirmed that the majority of the project area contains areas of previous disturbance (paved roads, sidewalks, pathways, and bridges). It also determined that portions were sloped and low and wet. However, portions of the project area that are grassed and treed are not obviously disturbed and retain archaeological potential (approximately 11% of the study area) and would require Stage 2 assessment.

Based on the Stage 1 background research and property inspection, the following recommendations are made:

- The grassed and treed areas within the study area, are not obviously disturbed, retain archaeological potential and are recommended for Stage 2 assessment. As these lands are non-ploughable, the Stage 2 assessment should consist of a standard test pit survey at a 5 m transect interval, in keeping with provincial standards.

- Portions of the study area have been previously disturbed and are considered to no longer retain archaeological potential. These areas have been photographed and no further assessment work is recommended.

- The areas of slope and low and wet areas within the study area are considered not to retain archaeological potential. These areas have been photographed and no further assessment work is recommended.

3.7.2 Public Recreation

The study area is located in City-owned land connecting Stonebrook Park in the north, to Richard Jones Park in the south. This park is characterized as a treed/wooded corridor which includes a pedestrian trail along the north creek bank; there are no pedestrian bridges across Cooksville Creek within the study area. Access to the trail through the study area is available from Rhonda Valley, and via sidewalk connections from Mississauga Valley Boulevard (north and south). The trail is a popular recreational and aesthetic feature among the area's many residents.

Considering the prominence of the park-setting and pedestrian trails through this portion of the study area, maintaining the utility of the trail and aesthetic character of the park will be important factors in the evaluation of potential alternatives. Opportunities for continued access and interaction with river flow must be balanced with safety considerations.

3.7.3 Private Property

Private property surrounds City-owned parkland through the study area. Low density residential properties are situated adjacent to the City-owned parkland. Townhomes are situated on the north tablelands of Cooksville Creek; single-family residential dwellings are situated on the south tablelands along Voltarie Crescent. The potential impacts of erosion control approaches on private property, including any benefits to flood management, should be considered during the evaluation of alternatives.

3.7.4 Utilities and Infrastructure

Utilities and other infrastructure are often located adjacent to watercourses due to the availability of space in an urban setting and the natural available gradient to facilitate gravity drainage (i.e., sanitary sewers). The following infrastructure is known to be within the study area:

- 750 mm storm sewer outfall from Rhonda Valley
- 400 mm storm sewer outfall from Mississauga Valley Boulevard
- 375 mm regional sanitary sewer that flows between Voltarie Crescent to Mississauga Valley Boulevard beneath the creek
- 1,200 mm regional sanitary sewer that runs parallel to the creek

Mapping from the City suggests that additional stormwater outfalls may be located in proximity to the exposed sanitary sewer, downstream of Mississauga Valley Boulevard. These were not observed during the field assessment. Further, based on mapping provided from the Region and field survey, it appears that the sanitary sewer crossing at 0+240 m is upstream of the concrete sill/weir. Additional confirmation will therefore need to occur in the event of any proposed works within the area.

3.8 Summary of Key Issues, Constraints and Opportunities

The Cooksville Creek watershed is located in a highly urbanized area of Mississauga and has undergone channel modifications such as channel hardening and straightening to protect private property and to accommodate urban development. Due to the urbanization, the hydrologic regime of Cooksville Creek has been altered, and generally lacks stormwater management. As a result, the Cooksville Creek watershed exhibits a flashy hydrologic response typical of highly urbanized watersheds.

The study reach originates upstream of Mississauga Valley Boulevard (approximately 100 m) and continues downstream to the CP rail crossing, where previous in-stream works have occurred. Through the field assessment various erosion risks and compromised/failed erosion protection measures were identified. Characterization of the study area was completed from a multi-disciplinary perspective as described in the preceding sections of this chapter. A summary of the key erosion issues and the key factors contributing to the observed conditions are summarized in Table 5; the table also includes an overview of constraints and opportunities for the study area**.** Illustrations of existing conditions have been presented within the preceding subsections.

TABLE 5 Overview of Key Issues, Opportunities and Recommendations

Key Issue	Description
Erosion Control Measures	• Erosion control measures through the study area comprised of gabions and armourstone, all of which are in various conditions. Overall, 65% of channel banks are lined with armourstone and gabions. • In general, armourstone was relatively intact, with some armourstones locally displaced. Gabion basket treatments have generally failed, with some baskets emptied of gabion stone, and others demonstrating corrosion. Repair and/or replacement of failed or deteriorated erosion control measures should be considered through alternative development and design. Additionally, consideration of the private properties and/or infrastructure that gabion basket treatments are protecting should be considered to identify whether these erosion control measures are required in the future. • Opportunities to remove, and/or replace failed gabions should be explored. Further, opportunities to integrate bioengineered materials into bank erosion protection measures should be considered. For any harder erosion control materials, these must account for future channel bed lowering by being placed sufficiently deep to avoid exposure for an acceptable “maintenance time cycle.”
Subsurface Infrastructure	• There are two lateral sanitary sewer crossings under Cooksville Creek. The concrete encasements of both sanitary sewer crossings are exposed; the downstream crossing concrete encasement is deteriorated with partial exposure of the sanitary sewer pipe. • Long-term protection of these sewer crossings should be considered within any proposed alternative. The sanitary trunk sewer situated to the east of the creek must also be protected in the long-term since it is at risk from both horizontal and lateral channel erosion.
Storm Sewer Outfalls	• Throughout the study area, three outfalls were observed (Section 3.7.4). Opportunities to improve/repair existing stormwater outfalls should be incorporated into the detailed design where necessary.

Key Issue	Description
Bedrock	• The study area is underlain by interbedded dolomitic siltstone, limestone and shale. Most of the bedrock is protected by an accumulation of alluvium and was not observed to be directly exposed during the 2022 field assessments. Given the underlying geology, any alterations within the study area should maintain cover over the bedrock. • Permitting sediment to accumulate on the bed will mimic natural rock bed channels which exhibit a coarse sediment veneer on the bed (TSH, 1997). This will also protect the bed from weathering processes such as wetting and drying (i.e., less bed is exposed to flow and once wet, will dry more slowly). Higher flows will not be able to move weathered bed material as easily due to the added roughness from the coarse sediment.
Channel Capacity and Flooding	• Results of the hydraulic modelling indicated that the estimated bankfull flows generally spill onto the floodplain in the downstream lengths of the study area; this indicates that the cross-sectional area is undersized for the flows that are regularly conveyed through the study area. Channel capacity increases in the upstream direction, with the 2-year event contained within the cross-section. Results of the geomorphic assessment suggested that, given the flow and grain sizes measured on the channel bed, then a wider channel would typically be expected. TSH (1997) recommended that flow events up to the 2-year flow should be kept within the channel with the design having proper side slopes to reduce floodplain scour. • While the volume of water that enters the study area is derived from the upstream drainage area, any opportunity to reduce the volume of water that is conveyed to the Creek, from the local drainage area would be beneficial (e.g., Low Impact Development measures). • Any proposed alternatives must not cause an increase to the regional flood elevations.
Urban Hydromodification	• TSH (1997) indicated that "… the existing flow regime exhibits a flashy, peaked hydrograph, especially in response to summer convective storm events. Baseflow levels and the presence of the spring melt-out flows have decreased over time. The magnitude and frequency of channel defining flows have increased as the channel adjusts." • The altered flow regime due to urbanization has resulted in an increased frequency and duration of flows that do work within the channel. This may lead to an increased frequency of bank overtopping and outflanking of erosion control materials, leading to a faster rate of failure. Likewise, the rate of and volume of bank erosion and of substate entrainment may increase, which can deteriorate aquatic habitat and increase the risk to infrastructure and property. • The altered hydrograph has implications for fish passage potential, and the erosive potential of the channel. Any proposed alterations in the study area should promote the long-term sustainability of implemented measures.

Key Issue	Description
Hydraulic Conditions and Stream type	• Review of hydraulic parameters from the updated HEC-RAS model indicated that the unit stream power was variable (8.78 - 406.99 W/m^2) with an average estimated bankfull unit stream power of 68.48 W/m^2. The highest values occurred locally within proximity to Mississauga Valley Boulevard. • A similar trend was observed with the shear stress values. High energy conditions within the study area contribute to erosion bank materials and increased rates of substrate entrainment. • The observed stream power values for estimated bankfull flows generally correlate to the meandering stream types (Nanson and Croke, 1992). Evidence of planform adjustment was observed through the study area. Design alternatives should consider the potential to enhance the channel planform from the currently straight configuration into a meandering type of channel.
Sediment supply	• Approximately 65% of the channel banks are hardened, leaving only 35% of banks as a potential natural source of sediment supply within the study area to replenish riffle bed morphology, enable meso-scale channel adjustments, or provide substrate for aquatic species. • Where possible, natural sediment supply sources should be available to support natural channel processes (i.e., remove erosion control measures in areas where there is no clear risk and/or where erosion protection could be placed closer to the risk element).
Channel Adjustment Processes	• With the extensive channel bank hardening, the natural widening process of Cooksville Creek in response to alterations in flow volume section is restricted; erosive flow energy may, instead, be directed at the channel bed. The lack of channel widening potential, poses a further risk to erosion control measures (outflanking).
Thalweg alignment	• The thalweg of the flow is oriented towards, or along, the erosion controls works in several areas; this exacerbates erosive stresses leading to displacement of armourstone and undermining/failure of gabions. Management of the flow trajectory should occur as part of any restoration work, to direct the flow away from areas where risk to structures or property may occur.
Channel form and function	• The form and function of Cooksville Creek have been altered and constrained. This includes a loss of sediment supply, loss of diversity in cross-section, planform, and profile. Hydraulic conditions increase the potential of substrate entrainment. Re-establishment of channel form and function, in support of aquatic habitat creation, and flow management is recommended. Naturalization of the channel banks provides roughness to the flow (i.e., flow energy reduction), a source of sediment to downstream reaches, and a benefit to both terrestrial and aquatic habitat. • Opportunities exist to enhance the morphological form and function of the study area. • Opportunity may exist to modify in-channel hydraulic conditions through re-configuration of the channel (e.g., widening, enhanced floodplain occupation).

Key Issue	Description
Aquatic	• The creek does not currently support a fish community and no fish were captured or observed during this study. The study reach contains a lack of natural and diverse aquatic habitats; there is a lack of cover and refuge habitats such as deep pools, backwater areas, aquatic vegetation and accumulated wood debris that would act to protect fish from high flow volumes during flashy rain events and the spring freshet. • Fish movement into the reach is restricted by upstream and downstream constraints. The relatively uniform substrate simplifies aquatic habitat for fish and benthic invertebrates. Improvement of fish habitat would assist in restoring a fish community within Cooksville Creek when barriers to migration into the study area are mitigated. Habitat restoration would include providing more diversity in bed morphology, diverse bed morphology and addition of in-stream cover and removal of any vertical drops in channel bed (e.g., at the concrete weir/sill at 0+240 m).
Terrestrial Habitat and Vegetation	• An opportunity exists to remove invasive and non-native species and to re-establish native vegetation communities. Removal and replacement of vegetation alters the visual aesthetic of the study area; it is important to recognize that maturation of trees will take time. • There is opportunity to provide enhancement of the riparian system that will improve water quality and aquatic habitat.
Threatened and Endangered Species	• Tree and vegetation removal of suitable nesting habitat will need to take place outside of April 1 to August 31, in accordance with the MBCA (CWS 2013). A cavity tree assessment for roosting bats should be conducted within the treed area that may be impacted by the preferred alternative, with follow up acoustic surveys following the Ontario Ministry of Natural Resources and Forestry protocol if suitable bat maternity roosting habitat is found.
Public Recreation	• Maintaining or increasing access to, and accessibility of, the adjacent pedestrian trial should be considered. This includes establishing a naturalized aesthetic for park users.
Connectivity to Adjacent Reaches	• Previous works have been undertaken to address erosion and/or instability issues immediately upstream and downstream of the study area. Any proposed works within the study area should not compromise the effectiveness or stability of the adjacent reaches.

4 DEVELOPMENT OF ALTERNATIVE SOLUTIONS

The section of Cooksville Creek from upstream of Mississauga Valley Boulevard to the CP rail crossing has been modified and includes banks protected by erosion control measures that are adjacent to the multi-use trail and sanitary infrastructure. The existing bank treatments have become compromised and range in condition from intact, to undercut, outflanked, and failed.

Through the technical assessments completed for this study (Section 3), an understanding of the factors contributing to the condition of the erosion control works within the study area was established. Contributing factors include age of the erosion control measures, altered flow regime (urban hydromodification), thalweg alignment, undersized channel cross-section, and interference with natural channel adjustment processes (see discussion in Table 5).

The alternative solutions should address the key erosion issues identified, if feasible, and consider site-specific aspects for enhancement or restoration as discussed in Section 3. These include, but are not limited to:

- corroded/deteriorated and failing gabion baskets
- outflanked armourstone
- failing angular stone (outflanked, toppled, undermined) and failing gabions (corroded, deteriorated) adjacent to private property and sanitary infrastructure
- channel adjustment processes (widening, profile development).
- long-term protection of Underlying interbedded dolomitic siltstone and shale bedrock
- enhancement of aquatic habitat
- enhancement of riparian vegetation

The TSH (1997) study was comprehensive and identified several mitigation and remediation concepts for the study area (see Table 6). An overall recommendation from the TSH (1997) report was to improve the riparian system; such improvement would address water quality, habitat, and erosion control (TSH 1997; Tinkler and Parish 1998).

TABLE 6 Summary of Key Issues and Remedial Solutions Identified in TSH (1997), Reach 4d

Issue	Alternatives	Factors Affecting Remediation	Recommended Approach
• Deterioration of gabion baskets • Bank erosion	• Do nothing • Maintain gabions • Replace gabions with armour stone and widen cross-section, protect sanitary sewer	• Channel is confined • Some bank and floodway erosion • Gabion baskets not providing appropriate protection • Significant flood potential	• Replace gabion baskets with armour stone and bioengineer upper banks • Enlarge cross-section

In 2002, TSH finalized the Cooksville Creek Flood Remediation Plan report (TSH 2002) with the objective to mitigate actual and potential flood damages along Cooksville Creek. The plan identified structural measures that would reduce the extent of the regulatory flood plain. One of the recommended measures intended to modify the extent of flooding in the surrounding area was to channelize the creek. This measure was recommended to be implemented between Mississauga Valley Blvd and the CP rail line; channelization was perceived to reduce the spatial extent of flooding.

In 2019, Matrix updated floodplain mapping and flood risk analyses along Cooksville Creek and Cawthra Creek for the CVC. The flood risk analyses and mapping included the area upstream of Mississauga Valley Blvd. Given the floodplain extents in the study area, any channel works to modify size or flow capacity within Cooksville Creek would result in minimal benefit to reducing the spatial extent of flood lines. Given these findings, channelization between Mississauga Valley Blvd and the CP rail line is not recommended,

and additional alternatives must be identified. However, recommendations from TSH (1997) regarding the improvement of the riparian system remain relevant and should be considered in the development of alternative solutions.

As part of the EA process, several feasible potential alternative solutions or approaches are required to be identified to address the defined erosion issues or concerns. Each alternative must represent a different but viable solution (i.e., is constructible, is an effective method to mitigate the erosion concerns). The recommendations provided within background reports (e.g., TSH 1997), where they remain relevant, have been incorporated into the alternatives developed for this study. The alternatives include:

- Alternative 1: Do Nothing
- Alternative 2: Local Channel Repairs/Enhancements
- Alternative 3: Channel Realignment

In addition to Alternatives 1 to 3, consideration was given to lowering the sanitary sewer at each of the lateral sewer crossings. Review of the sanitary sewer design drawings indicated that due to the grade of the trunk sewer, that only minimal lowering of the lateral sanitary sewer pipe under the creek would be possible; the need for protection of the sewer would remain. Therefore, this alternative was not advanced further.

The alternatives are described below and evaluated in Section 5. Further detail of the preferred alternative is described in Section 6.

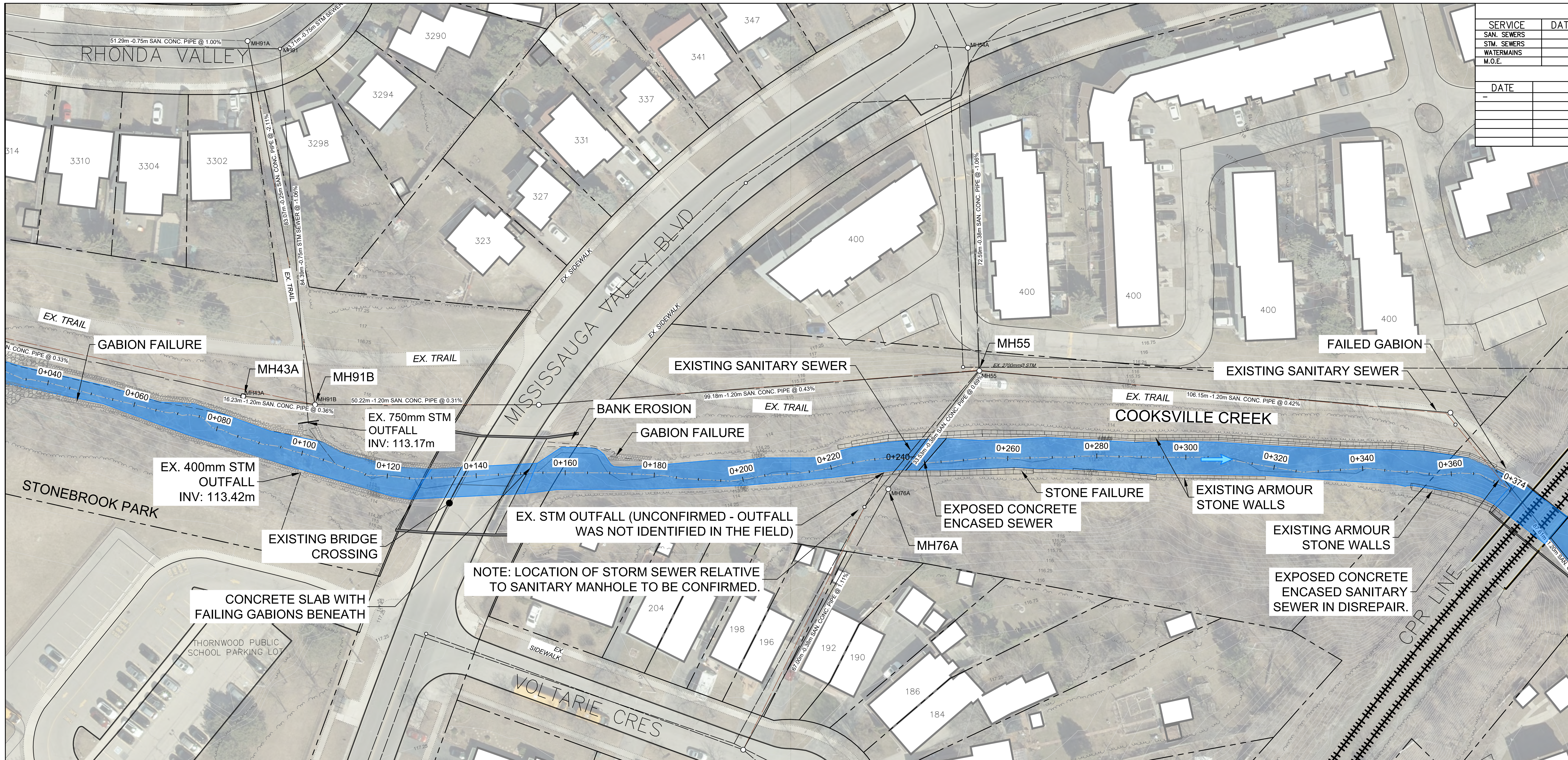
4.1 Alternative 1: Do Nothing

In the Do-Nothing alternative (Figure 9), no action is taken to address the identified erosion issues outlined in Section 3. This alternative is always considered in an EA to assess the impact of taking no action to address the issues under evaluation. In the Do-Nothing alternative, existing channel processes, such as widening, incision, sediment deposition, and planform development, would continue. Failure of gabion baskets, armourstone, and rock riprap bank treatments would continue to occur through hydraulic displacement, outflanking, corrosion, and undercutting. Portions of the trail would be at risk and the concrete pad under Mississauga Valley Boulevard may be compromised. The sanitary sewer would remain unprotected and risk to the manhole that is close to the channel bank would remain; overtime, channel widening would expose the manhole.

The Do-Nothing alternative will result in no impacts to the natural environment within the study area related to construction activity or site alteration. Although this alternative protects the natural environment from impacts of site alteration and construction, impacts to the natural environment will result from continued erosion and failure of channel bank protection. Aquatic habitat will continue to generally lack complexity and remain in poor condition, and likely worsen over time; vertical barriers to fish passage will persist. Erosion, degradation, and outflanking of existing erosion control measures

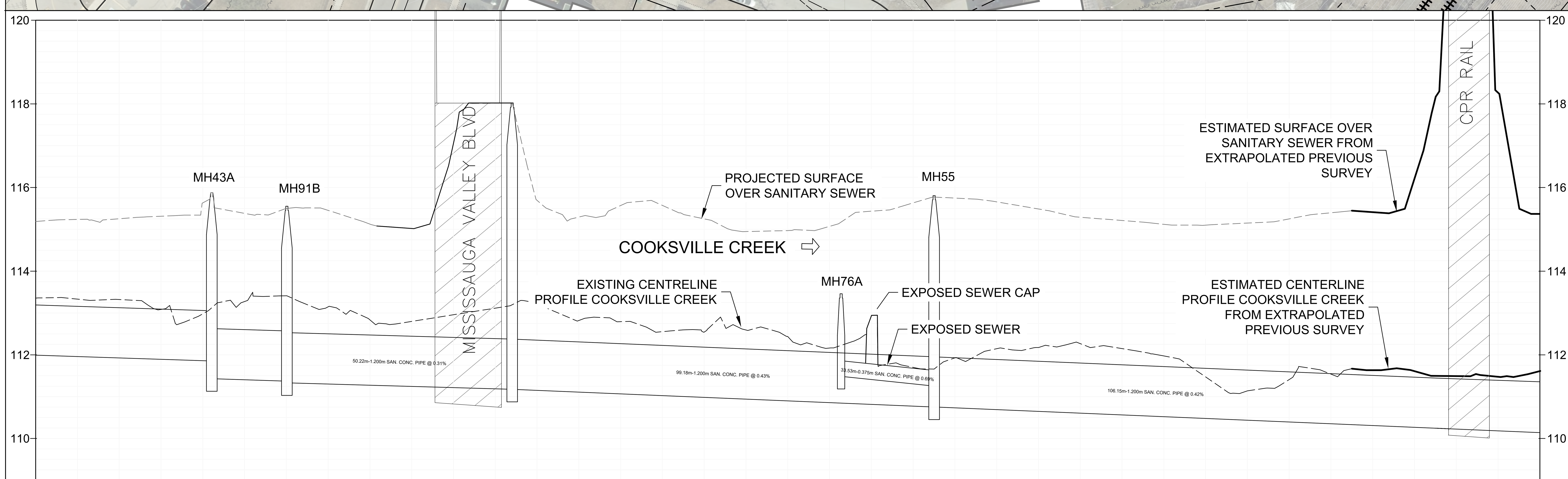
(e.g., gabions) could further degrade the quality of aquatic habitat (e.g., increased sedimentation, abandoned gabion mesh and filter cloth in channel). While Cooksville Creek, in the study area, does not currently support a fish community, the Do Nothing alternative provides no improvements for future potential habitat. Bank destabilization and continued bank erosion will result in the loss of terrestrial vegetation in impacted areas. This alternative is a static alternative and provides no opportunity to improve the degraded aquatic and terrestrial habitats within the study area.

The cost of implementing Alternative 1 is low in the short-term. There will be costs associated with maintenance and potential future emergency works in the event of substantial failure the armourstone bank protection which could impact the adjacent trail and manhole that is in close proximity to the channel bank.



LEGEND:

- MSL BOUNDARY
- PROPERTY LINE
- EXISTING FEATURES
- EXISTING ALIGNMENT
- FLOW DIRECTION
- EXISTING MAJOR CONTOUR (1.0 m INTERVAL)
- EXISTING MINOR CONTOUR (0.25 m INTERVAL)
- EXISTING EDGE OF WATER
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING FENCELINE
- EXISTING SANITARY PIPES
- EXISTING STORM PIPES
- EXISTING WATERMAIN
- EXISTING GASMAIN
- EXISTING CHANNEL ALIGNMENT



PROP. CHANNEL CL																																							
EXIST. CHANNEL CL	113.33	113.32	113.09	112.98	113.27	113.41	113.15	112.84	112.80	112.96	113.12	113.22	112.82	112.79	112.55	112.54	112.59	112.44	112.16	112.92	111.70	111.93	112.15	112.18	112.27	112.15	111.97	111.47	111.14	111.41	111.54	111.63	111.60	111.47	11
SANITARY SEWER	111.85	111.85	111.85	111.85	111.40	111.35	111.30	111.27	111.24	111.22	111.19	111.15	111.11	111.07	111.03	110.98	110.94	110.90	110.86	110.82	110.77	110.73	110.69	110.65	110.60	110.56	110.52	110.48	110.44	110.39	110.35	110.30	110.26	110.23	11
CHAINAGE	0+050	0+060	0+070	0+080	0+090	0+100	0+110	0+120	0+130	0+140	0+150	0+160	0+170	0+180	0+190	0+200	0+210	0+220	0+230	0+240	0+250	0+260	0+270	0+280	0+290	0+300	0+310	0+320	0+330	0+340	0+350	0+360	0+370	0+380	0·

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STM. SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
M.O.E.			ROGERS U/G CABLE		

REVISIONS

DATE	DETAILS	INIT.
–	–	–

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C.E.T.

DEPARTMENTAL APPROVAL

SILVIO CESARIO P.ENG.

APPROVED BY

MISSISSAUGA

PRODUCED FOR – T&W, ENGINEERING AND WORKS

COOKSVILLE CREEK

MISSISSAUGA VALLEY BLVD TO CPR

SCALE	AREA –	PROJECT No. 347151
C.A.D.D. BY K.V.	CHECKED BY KH/MP	PLAN No.
DATE DECEMBER 2022	SHEET OF #	FIGURE 9

4.2 Alternative 2: Repair and Replace/Enhance

For Alternative 2, local repair, replacement and enhancements would be undertaken to address failing bank treatments and manage hydraulic flow conditions. Implementing this alternative would re-establish erosion control protection for the trail.

Through Alternative 2, failed gabions would be replaced, where necessary. Displaced armourstones would be locally repositioned/replaced within the existing armourstone walls, and repair/replacement or protection of the concrete slabs under Mississauga Valley Boulevard would occur (e.g., since the concrete pads are in good condition, protection of the pads from undermining scour could be accomplished by placement of armourstone in front of the concrete pads and placement of rocky shoals to transition the outflanked concrete pad to the adjacent channel banks). Where no risk to property or infrastructure exists, opportunities to naturalize channel banks would be explored instead of replacing bank treatments with hard materials. Where replacement of failing erosion control measures is appropriate, then the replacement materials will consist of 'softer' treatments, where feasible (e.g., replace gabions with vegetated revetment) and incorporate vegetation where suitable. The existing footprint of engineered materials along the channel would generally be maintained.

Protection of the exposed sanitary sewer crossings would be undertaken, and where potential risks to infrastructure could occur in the future (for example, a manhole), measures would be implemented to provide future protection. Exposed concrete sewer encasements which cross the channel would be protected with permanent ramp features within the channel bed. These ramps would provide grade control and prevent future undermining; the ramps will also provide fish passage potential.

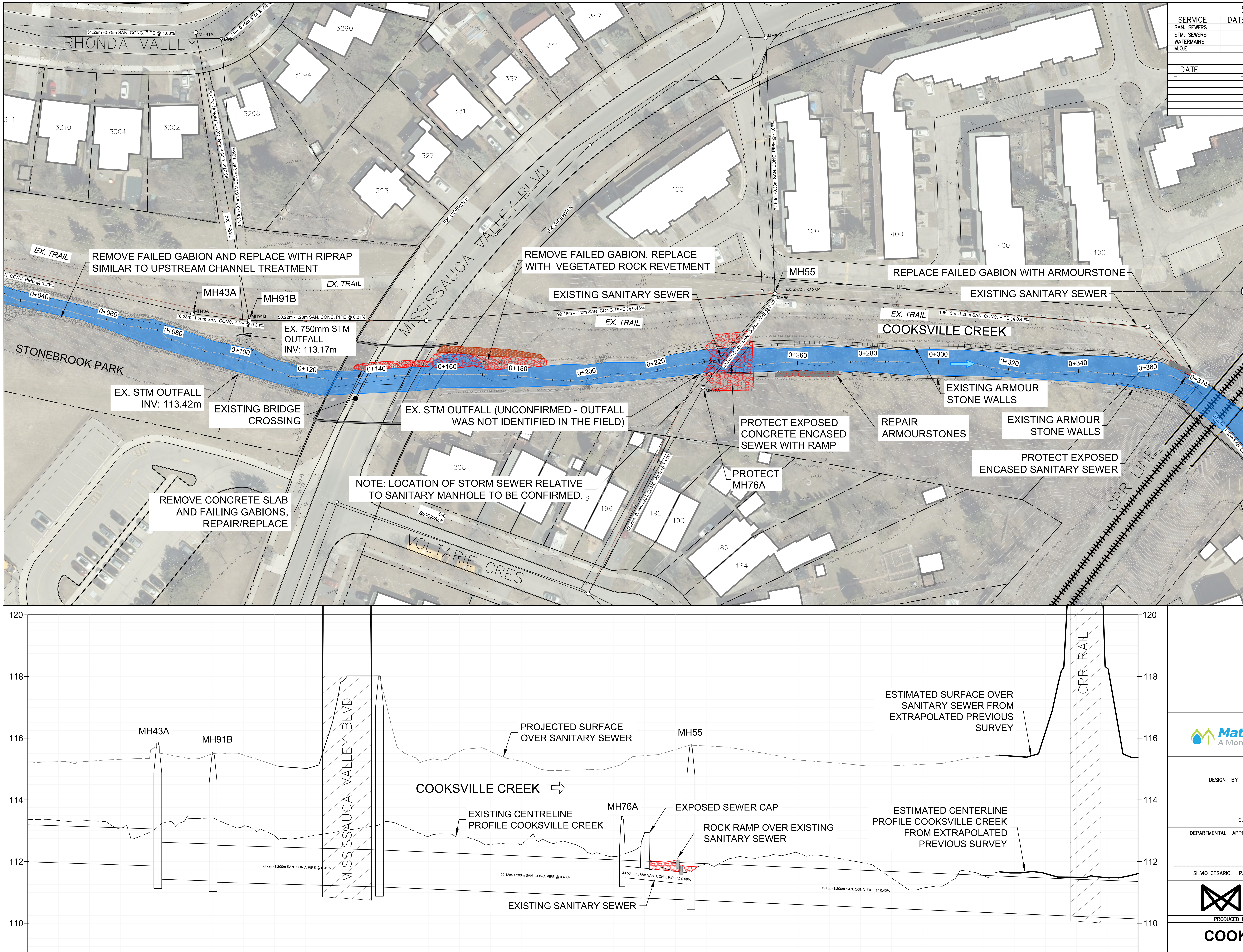
Implementation of this alternative would generally maintain the existing footprint of erosion control works. Opportunities to increase cross-sectional flow capacity would be determined to reduce hydraulic stresses and stream power on channel bed and bank materials.

Repairing and replacing failing treatments will result in some localized impact to the natural environment. Impacts to the terrestrial natural environment will occur at locations of construction access where the removal of trees and other vegetation will likely be required. However, these impacts will be temporary, as access points will be re-vegetated using native vegetation upon completion of the work. Construction access should occur within the less sensitive areas of the forested communities and impacts to riparian habitat should be kept localized to the proposed treatment. Removal of trees will avoid the breeding bird window and a cavity tree assessment should be completed prior to any tree removal to avoid impacts to potential bat maternal roosts. This alternative allows for enhancement opportunities to the terrestrial natural environment. Removed vegetation should be replaced with a diversity of native species and riparian vegetation.

Temporary impacts to the aquatic natural environment will occur but are also expected to be localized to the selected treatment areas. Minor impacts will result from temporary worksite isolation and dewatering. This will temporarily impact the benthic invertebrate community due to the reduction in

wetted habitat. Since a fish community is not currently present within the Cooksville Creek study area, impacts to fish are not anticipated. Repairing and replacing failing treatments provides limited opportunity to improve the aquatic habitat within Cooksville Creek; where opportunity exists, then this should be explored (e.g., overhanging bank, instream structures). The overall benefits to the creek system provided by this alternative are considered to outweigh the potential temporary impacts to the aquatic habitat environment. Repairing and replacing failing structures will improve bank stability and overall sorting of bed material which would result in some improvement to the habitat diversity. Riparian plantings will also provide some additional cover and refuge habitats at these localized treatments for fish. The habitat will continue to lack complexity and barriers to fish movement upstream will persist.

The cost of implementing Alternative 2 is considered to be moderate in comparison to the other alternatives. A continued need for maintenance activity, in the future, would occur.



CHAINAGE	PROP. CHANNEL CL	EXIST. CHANNEL CL	SANITARY SEWER
0+050		113.33	111.85
0+060		113.32	111.85
0+070		113.09	111.85
0+080		112.98	111.85
0+090		113.27	111.40
0+100		113.41	111.35
0+110		113.15	111.30
0+120		112.84	111.27
0+130		112.80	111.24
0+140		112.96	111.22
0+150		113.12	111.19
0+160		113.22	111.15
0+170		112.82	111.11
0+180		112.79	111.07
0+190		112.55	111.03
0+200		112.54	110.98
0+210		112.59	110.94
0+220		112.44	110.90
0+230		112.16	110.86
0+240		112.92	110.82
0+250		111.70	110.77
0+260		111.93	110.73
0+270		112.15	110.69
0+280		112.18	110.65
0+290		112.27	110.60
0+300		112.15	110.56
0+310		111.97	110.52
0+320		111.47	110.48
0+330		111.14	110.44
0+340		111.41	110.39
0+350		111.54	110.35
0+360		111.63	110.30
0+370		111.60	110.26
0+380		111.47	110.23
0+		11	11(

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STM. SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
M.O.E.			ROGERS U/G CABLE		

REVISIONS

DATE	DETAILS	INIT.
–	–	–

LEGEND:

- MSL BOUNDARY
- PROPERTY LINE
- EXISTING FEATURES
- EXISTING ALIGNMENT
- FLOW DIRECTION
- *EXISTING MAJOR CONTOUR (1.0 m INTERVAL)*
- *EXISTING MINOR CONTOUR (0.25 m INTERVAL)*
- EXISTING EDGE OF WATER
- *EXISTING TOP OF BANK*
- EXISTING BOTTOM OF BANK
- EXISTING FENCELINE
- EXISTING SANITARY PIPES
- EXISTING STORM PIPES
- EXISTING WATERMAIN
- EXISTING GASMAIN
- EXISTING CHANNEL ALIGNMENT
- PROPOSED NATURALIZATION./ TERRACING
- PROPOSED ROCK PROTECTION

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C.E.T.
DEPARTMENTAL APPROVAL
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COOKSVILLE CREEK

MISSISSAUGA VALLEY BLVD TO CPR

SCALE		AREA	–	PROJECT No. 347151
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DATE	DECEMBER 2022	SHEET	OF #	FIGURE 10

4.3 Alternative 3: Channel Modification and Realignment

For Alternative 3, channel modifications or realignment of Cooksville Creek would occur. All identified erosion issues or failing bank protection would be addressed by moving the creek away from the north bank. Relocation does not create opportunity to substantially increase depth of cover over the exposed sewers. The cross-sectional configuration would be designed to accommodate bankfull flows throughout the study area. Modification of the channel bed profile would be undertaken to conform with naturally occurring patterns of riffles and pools. Naturalization of the area would be undertaken to the extent feasible. Protection of sanitary infrastructure will be incorporated into the design.

Through detailed design, the footprint of the channel realignment, and configuration of the proposed profile and cross-section will be determined; the intent of the channel realignment is to minimize impact to the natural environment while supporting channel function, and to avoid any increase in natural hazard risk, and risk to infrastructure.

The cross-sectional configuration of Cooksville Creek could be enlarged, where feasible, to increase the flow capacity above low flow conditions (i.e., up to approximately bankfull). Modification of the channel bed profile would be undertaken to establish a sustainable pattern of riffles and pools that is in-phase with the proposed planform configuration. Where realignment is not feasible, profile enhancements could occur. The channel design would be developed based on natural channel principles and promote natural channel functions. Enhancement of the substrate gradation would occur to promote sustainable riffle forms and mitigate excess sediment transport from the study area.

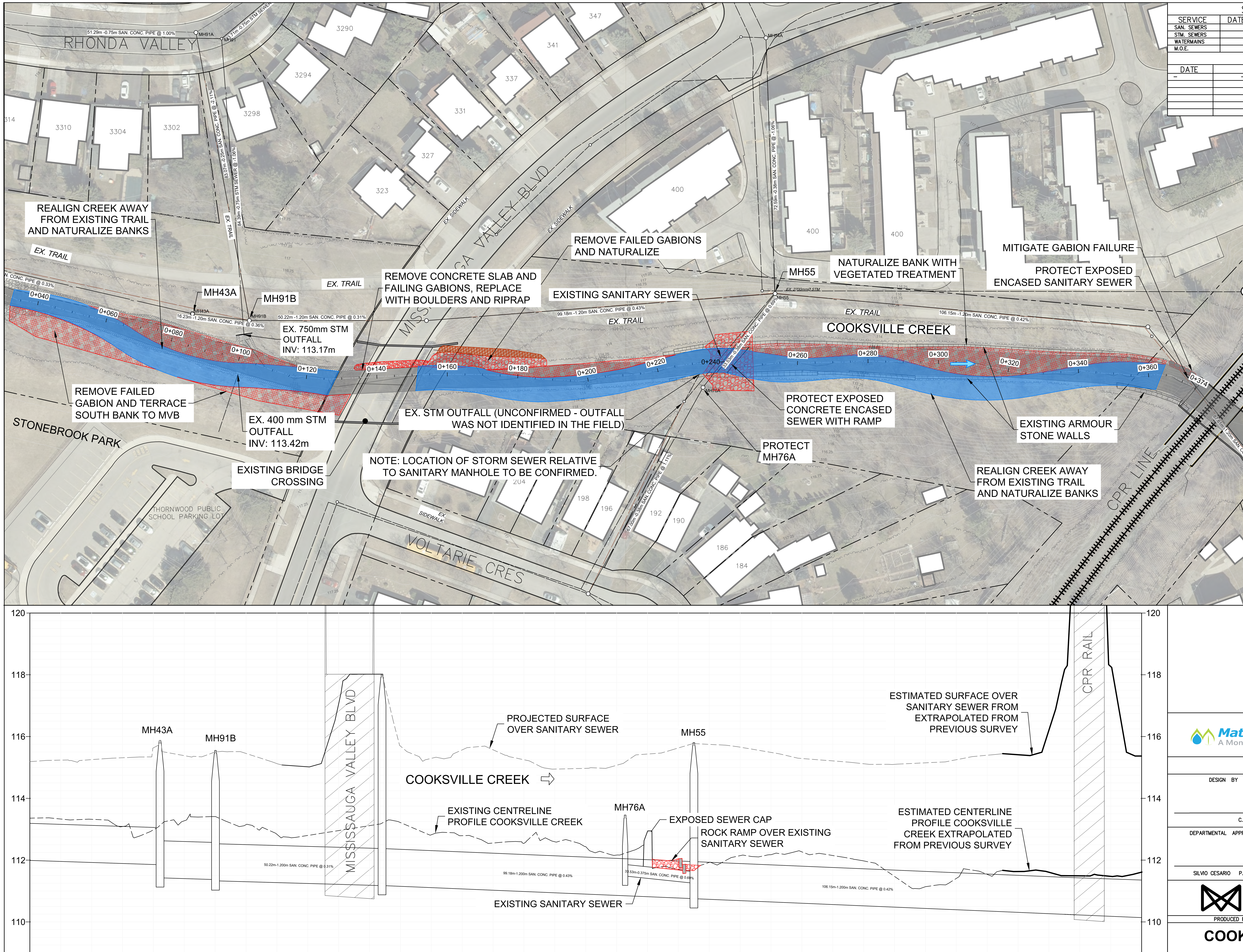
Under Mississauga Valley Boulevard, mitigation of erosion risk to the concrete pads would be the focus of this alternative, similar to Alternative 2. That is, the concrete pads are in good condition, but at risk of continual winnowing of fines from underneath the pads. Protection of the pads could be accomplished by placement of armourstone along the concrete pads and improving transition between the pads and the adjacent natural banks.

Impacts to the natural environment from this alternative are expected to be the greatest of all the proposed alternatives. Temporary impacts to the terrestrial natural environment will result at the locations of construction access, modification of erosion control works, and proposed channel alignment due to the required removal of mature trees and other vegetation. These areas can be restored once construction is complete with small trees, shrubs and native seed, but would change the forest age and community type within these localized areas. This provides an opportunity to establish new natural environment features within the existing channel corridor valley and improve the existing terrestrial natural environment by increasing diversity, and enhancing wildlife habitat.

Impacts to the aquatic natural environment will result from temporary worksite isolation and dewatering. This will temporarily impact the benthic invertebrate community due to the temporary reduction in wetted habitat. The duration of construction is expected to be longer for this alternative due to the more extensive amount of work that will be required to realign the channel. Since a fish community is not

currently present within the Cooksville Creek study area, impacts to fish are not anticipated. The overall benefits provided by this alternative outweigh the potential impacts to the aquatic environment. Channel realignment provides a hydraulically and geomorphologically stable creek configuration for long-term erosion control. In addition, it provides a more natural, sinuous channel with naturalized channel banks which improves aquatic habitat diversity and complexity. The re-creation of the riparian area will allow for significant improvements to cover and refuge habitat to occur through the planting of overhanging and dense vegetation.

The cost of implementing Alternative 3 is considered to be the highest of all alternatives.



LEGEND:

- MSL BOUNDARY
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- EXISTING ALIGNMENT
- FLOW DIRECTION
- EXISTING MAJOR CONTOUR (1.0 m INTERVAL)
- EXISTING MINOR CONTOUR (0.25 m INTERVAL)
- EXISTING EDGE OF WATER
- EXISTING TOP OF BANK
- EXISTING BOTTOM OF BANK
- EXISTING FENCELINE
- EXISTING SANITARY PIPES
- EXISTING STORM PIPES
- EXISTING WATERMAIN
- EXISTING GASMAIN
- PROPOSED REALIGNMENT
- PROPOSED NATURALIZATION./TERRACING
- PROPOSED ROCK PROTECTION

SERVICE DATA

SERVICE	DATE	INIT.	SERVICE	DATE	INIT.
SAN. SEWERS			GAS MAINS		
STM. SEWERS			BELL U/G CABLE		
WATERMAINS			HYDRO U/G CABLE		
M.O.E.			ROGERS U/G CABLE		

REVISIONS

DATE	DETAILS	INIT.
–	–	–

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COOKSVILLE CREEK

MISSISSAUGA VALLEY BLVD TO CPR

SCALE		AREA	–	PROJECT No.	347151
C.A.D.D. BY	K.V.	CHECKED BY	KH/MP	PLAN No.	
DATE	DECEMBER 2022	SHEET	OF #	FIGURE 11	

PROP. CHANNEL CL																																			
EXIST. CHANNEL CL	113.33	113.32	113.09	112.98	113.27	113.41	113.15	112.84	112.80	112.96	113.12	113.22	112.82	112.79	112.55	112.54	112.59	112.44	112.16	112.92	111.70	111.93	112.15	112.18	112.27	112.15	111.97	111.47	111.14	111.41	111.54	111.63	111.60	111.47	1'
SANITARY SEWER	111.85	111.85	111.85	111.85	111.40	111.35	111.30	111.27	111.24	111.22	111.19	111.15	111.11	111.07	111.03	110.98	110.94	110.90	110.86	110.82	110.77	110.73	110.69	110.65	110.60	110.56	110.52	110.48	110.44	110.39	110.35	110.30	110.26	110.23	1'
CHAINAGE	0+050	0+060	0+070	0+080	0+090	0+100	0+110	0+120	0+130	0+140	0+150	0+160	0+170	0+180	0+190	0+200	0+210	0+220	0+230	0+240	0+250	0+260	0+270	0+280	0+290	0+300	0+310	0+320	0+330	0+340	0+350	0+360	0+370	0+380	0

5 ALTERNATIVE EVALUATION

In order to identify a preferred alternative that best addresses the study objectives, each of the erosion control alternatives developed in Section 5 are rated against a consistent set of evaluation criteria (Table 7). The criteria include consideration for technical, economic, environmental and social factors that are defined by the MECP as part of the EA process. The alternatives are considered and evaluated in comparison to the 'Do Nothing' scenario.

5.1 Evaluation Criteria and Methodology

The erosion control alternatives need to be evaluated with a consistent methodology, the goal of which is to identify potential challenges and opportunities within the alternatives and enable comparison between alternatives. Table 7 describes the evaluation criteria A qualitative rating scale, shown in Figure 11**,** is used to assess each alternative against the evaluation criteria. Each of the criteria are weighted by their relative importance to the evaluation of erosion control alternatives, with the highest weighting being assigned to the effectiveness of the alternative (i.e., other considerations are not as relevant if the erosion control will not be effective), and to the implementation and construction costs (i.e., alternatives must consider economic realities of infrastructure management).

TABLE 7 Criteria for the Evaluation of Erosion Control Alternatives

Criteria	Relative Weighting	Description
Technical (25%)		
Erosion Control Effectiveness	25	Effectiveness of the alternative to mitigate erosion impacts, both existing and ongoing
Economic (25%)		
Construction Costs	12.5%	Relative measure of the initial costs to install/construct the proposed works
Maintenance Costs	12.5%	Relative measure of the ongoing maintenance costs in the creek following implementation
Environmental (25%)		
Construction Impacts	12.5%	The negative impact of construction activities to the surrounding natural environment
Potential for Enhancement	12.5%	The positive opportunities to enhance the aquatic and terrestrial environment
Social (25%)		
Impact to Property and Utility	12.5%	Measure of the impact to adjacent private property and use of the surrounding area
Impact to Public Safety	12.5%	Measure of the impact to public safety

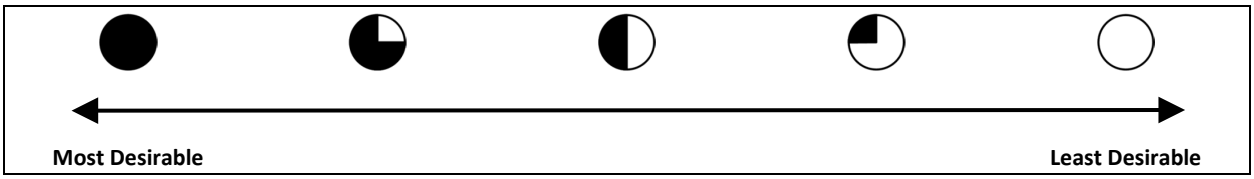

FIGURE 12 Evaluation Criteria Rating Scale

5.2 Alternatives Evaluation Matrix

The evaluations of the erosion control alternatives for each of the study reaches are shown in Table 8. Each of the criteria listed in Section 5.1 is assigned a desirability score; results are collated to yield an overall score for each alternative. A description of the rating justification for each criterion is also included on the matrix, to provide insight into the benefits and shortcomings of each alternative. In this way an informed recommendation can be made as to the preferred erosion control alternative for this project.

Table 8 Potential Alternatives Evaluation Matrix

Criteria	Description		Alternative 1: Do Nothing		Alternative 2: Repair and Replace/Enhance		Alternative 3: Channel Modification & Realignment
Technical/Engineering (25%)							
Flooding	Effectiveness of the alternative to manage or reduce flooding (i.e., effect on regional water level) or not cause negative impacts to flood hazards	○	The Do Nothing alternative does not change regional flood elevations. Flooding conditions would be unchanged from existing conditions.	○	The proposed ramp to protect the sanitary sewer has the potential for minor local impacts to low intensity frequent flood events. It is not expected to impact the Regional flood hazard. This will be confirmed at detailed design.	○	This alternative does not alter the regional flood elevation or existing flooding conditions. Increase in cross-section capacity would have minimal effect on the regional flood elevation.
Channel Processes	Effectiveness of the alternative to promote dynamic stability of channel processes and mitigate sediment impacts	○	This alternative will not alter channel conditions or processes; movement of substrate and channel bed incision is expected to continue.	◑	This alternative will not result in any changes to morphological channel properties; some management of erosive forces can be incorporated into the design. There is some potential for reconfiguration, or relocation, of erosion control measures so that they minimize interference with natural processes; this may include local re-exposure of channel banks to re-establish a natural source of sediment. Sanitary sewer protection will need to be incorporated into the design and will create backwater conditions.	◕	This alternative can enhance geomorphic form and expose natural sediment sources in the creek. Channel capacity may be increased with cross-section configuration and/or terracing. Enhancement of the channel planform would occur, creating a meandering type channel that is appropriate with energy conditions (i.e., stream power). Sanitary sewer protection will need to be incorporated into the design and will create backwater conditions; the extent of backwater will be greater than Alternative 2 given the higher pipe elevations.
Protection of Infrastructure	Effectiveness of the alternative in mitigating risk to adjacent, or underlying, infrastructure (e.g., sanitary sewer)	○	No opportunity is provided to enhance cover over sanitary sewer crossings.	◑	Enhancement of protection over the sanitary sewer crossings (2) would occur; additional protection is limited due to the low grade and elevation differential between the lateral sewer and the trunk sewer. Repair or replacement of failed gabions and armourstone in proximity to Mississauga Valley Boulevard road crossing would protect the trail.	◕	Enhancement of protection over the sanitary sewer crossings (2) would occur. No crossing would be eliminated and depth of cover over the crossings is limited due to the low grade and elevation differential between the lateral sewer and the trunk sewer. Potential cover over the sanitary sewer at 0+240 would be less than existing due to grade of the pipe in this location. Repair or replacement of failed gabions in proximity to Mississauga Valley Boulevard road crossing would protect the trail. A wider buffer between sanitary sewer and channel bank will result from the channel modifications along a portion of the study area.
Constructability	Potential to construct the project using conventional, accepted construction and engineering practices	●	There is no construction involved, therefore this alternative is the least complex to implement	◕	All elements of this alternative can be constructed using conventional and accepted construction and engineering practices.	◑	All elements of this alternative can be constructed using conventional and accepted construction and engineering practices.
Approvability	Potential for regulatory agencies to grant approval for implementation	●	No approval is needed for a Do-Nothing alternative.	◕	Upon completion of detailed design and submission of supporting materials, a typical approval process is anticipated.	◕	Upon completion of detailed design and submission of supporting materials, a typical approval process is anticipated.

Criteria	Description		Alternative 1: Do Nothing		Alternative 2: Repair and Replace/Enhance		Alternative 3: Channel Modification & Realignment
Environmental (25%)							
Terrestrial Impacts	Potential for impact to connectivity and terrestrial/wildlife (amphibian, mammal etc.) habitat due to implementation of the alternative	◕	This alternative will incur no environmental impacts as a result of construction activities; however, future failure of erosion control works could impact bankside vegetation and terrestrial habitat.	◑	This alternative will require disturbance of overbank and channel areas for construction access; however, the overall area of disturbance will be less than required for Alternative 3.	◔	Channel realignment will require extensive disturbance in the area of the proposed channel and the installation of erosion control measures. Removal of trees will be most extensive in this alternative; temporary loss in forest cover will occur.
Terrestrial Enhancement Potential	Potential for enhancement of the terrestrial environment (vegetation, habitat) due to implementation of the alternative	◔	No environmental enhancements will occur.	◑	Local terrestrial enhancements could occur at areas of repair/replacement and along construction access and staging areas.	◕	Vegetation will be re-established in the footprint of the creek alignment. Terrestrial enhancements could occur at areas of repair/replacement and along construction access and staging areas.
Aquatic Habitat Enhancement	Effectiveness of the alternative to enhance fisheries habitat resources; fish diversity, food source, and fish passage	◔	Through the continuation of erosion and undermining of bank erosion control materials, some increase in overhanging aquatic habitat will occur. No other increases to aquatic habitat would occur.	◑	Minimal changes to aquatic habitat would occur. Replacement of failed gabion erosion control measures could include materials beneficial to aquatic species. Likewise, replacement of armourstone could integrate enhancements. Remove of any instream barriers to potential upstream fish migration would occur in conjunction with sanitary sewer protection.	◕	Channel realignment provides an opportunity to improve existing aquatic habitat through the enhancement of morphological channel form (riffle, pool), substrate and hydraulic diversity (velocity), and to remove any instream barriers to potential upstream fish migration.
Rare plant species and SAR Impacts/ Enhancements (e.g., Butternut tree, etc.)	Potential for impact and/or enhancement to locally rare and SAR species	◕	In this alternative, existing erosion and channel adjustment processes will continue and lead to eventual failure of bank materials. No impacts will occur to the habitat of other potential SAR species (as indicated from records, but not observed in the study area).	◑	Any required tree removal would comply with the migratory birds protection window.	◑	Any required tree removal would comply with the migratory birds protection window.

Criteria	Description		Alternative 1: Do Nothing		Alternative 2: Repair and Replace/Enhance		Alternative 3: Channel Realignment
Social (25%)							
Impact to Property and Utility	Measure of the impact to adjacent private property (i.e., loss of property, access to property, aesthetic, basement flooding)	○	This alternative will provide no opportunity to address potential risk to private property and the sanitary sewer.	◕	Repair and Replace will provide an effective approach to protecting adjacent property and infrastructure.	◕	Channel realignment will provide the most effective long-term protection to adjacent properties and utilities.
Impact to Public Access	Measure of impact to public access (e.g., trails, recreation - picnic, fish, boat)	●	Public access to park lands will not be affected.	◕	Temporary access to park and trail may be restricted during construction activity.	◑	Temporary access to park and trail may be restricted during construction activity. The duration of restriction will be longer than for Alternative 2. Distance between watercourse and trail will increase in some areas, reducing the visual aesthetic, and direct access from the public..
Impact to Public Safety	Measure of the impact to public safety in the surrounding area resulting from the alternative	○	This alternative will provide no opportunity to address erosion risk issues to public safety for users of the area (e.g., public access to the creek)	◕	Repair and Replace is anticipated to provide an effective approach to mitigating erosion risk, public safety impacts, and does not encroach, or encroaches minimally, into existing public or private areas.	◕	Full restoration is expected to provide the most effective long-term protection to safety for the users of park and trail from the impacts of creek erosion. A loss of public property would occur where channel widening is considered to be beneficial. Where an increase in cross-sectional capacity occurs, minimal improvement to flooding conditions may occur.
Economic (25%)							
Construction Costs	Relative measure of the initial costs to install/construct the proposed works, including environmental mitigation, sediment management, well mitigation etc.)	●	No immediate construction costs will be incurred as a result of this alternative.	◕	Moderate construction costs are expected to implement repair/replacement of treatments.	◔	High construction costs are expected to implement channel realignment.
Maintenance/ Future Costs	Relative measure of the ongoing maintenance costs following implementation (sedimentation)	○	It is expected that extensive maintenance costs will be required to address erosion issues in the future if the Do Nothing alternative is selected.	◑	Repair and Replace may provide a sustainable long-term erosion control approach, requiring only moderate maintenance costs for minor repairs.	◕	Channel Realignment is expected to be a sustainable approach to erosion control in this reach, resulting in the lowest future maintenance costs and total lifecycle costs.
Overall Evaluation Score:		◔ 1.7		◑ # 2.4		◑ 2.3	

6 PUBLIC AND AGENCY CONSULTATION

The public and agency consultation requirements for a Schedule "B" project under the Municipal Class EA process include:

- Notice of Study Commencement to inform the public and applicable agencies that the Class EA is being undertaken.
- Public Information Centre (PIC) to present information and solicit feedback on the problem or opportunity
- The need for the project, the inventories of the natural, social and economic environments, and the planning and design details based on these inventories
- Notice of Study Completion to inform the public and applicable agencies that the Class EA has been completed and that the project file is available for review and comment.

This section describes the public and agency consultation undertaken for this study. Appendix E includes all consultation materials.

6.1 Public and Agency Notification

A Notice of Study Commencement was distributed to agencies and stakeholders by email on September 29, 2022.

A Notice of PIC was distributed on June 6, 2023. The PIC invitation was mailed to properties abutting the project area. The invitation also appeared on the City's project webpage and was included on the City's Events calendar.

6.2 Public Information Centre

A virtual PIC was posted on the City's website and in the Mississauga News on June 6, 2023. Notices for the PIC were posted on the website and hand delivered in a mailout to residents located adjacent to the creek. The purpose of the PIC was to outline the EA process, present background information, characterize the existing conditions of the study area, and to present the different alternatives for Cooksville Creek.

Seven completed comment forms and/or email responses were received. Comments received were primarily in regard to the natural environment, including protection of mature trees along the north channel bank, promoting native species and removal of invasive species. Additional comments were related to the adjacent pedestrian trail and maintaining or increasing access to and accessibility of the trail. Full comments received from residents after the online PIC are included in Appendix E.

6.3 Agency Consultation

A mailing list of review agencies and other stakeholders was established for this project. The Notice of Study Commencement was distributed to these contacts to describe the project and to invite feedback. A copy of the mailing list, sample letter, and agency correspondence are included in Appendix E.

Correspondence with the MECP regarding the requirements to consult with Indigenous Communities is also included in Appendix E. CVC was consulted and involved in the project as well. CVC provided input upon study commencement, a site walk and review of the EA report (see Appendix E for documentation).

6.4 First Nations Consultation

As part of the consultation process, First Nations with historical presence in the area were invited to be involved in the EA. The groups included Mississaugas of the Credit, Huron-Wendat, Six Nations, and the Haudenosaunee Development Council. Notices were provided for the commencement of the EA and the PIC.

Mississaugas of the Credit and Huron-Wendat accepted the invitation for involvement and the Stage I Archaeological Assessment was distributed for review. Both groups requested involvement in any Stage II assessments recommended, as discussed in Section 3.7.1.

7 SELECTION OF PREFERRED ALTERNATIVE

The purpose of the Class EA is to evaluate the existing technical, natural, social, and economic conditions related to the identified problem or opportunity, to develop and evaluate potential alternatives to address the problem, and to select a preferred alternative that would proceed to implementation. This section describes the results of the alternative evaluation process which includes input received from the public and describes the preferred approach for addressing identified erosion issues in the study area.

7.1 Preferred Alternative

Alternative 2 (Repair and Replace) was determined to be the preferred alternative based on results of the evaluation process outlined in Section 5. This alternative provides opportunity to re-establish erosion control measures, protect the lateral sanitary sewers, and minimize impacts to the local environment. Replacement of failing materials will focus primarily on the failed gabions. Areas or erosion concern will be addressed, where this poses a risk to the trail or property.

A conceptual design of the preferred alternative is shown in Figure 10.

The materials used to replace failed erosion control measures and/or address erosion, will be suitable for the energy and light conditions within the study area. Preference will be given to softer bioengineered measures rather than harder measures; this includes transitions or tie-ins to existing banks.

Protection of the exposed sanitary sewer will require discussion with the Region to determine acceptable strategy. The amount of cover overtop of the sewer will be limited and require consideration of implication to channel capacity. Local modifications of the cross-section may be required to offset the impact of altered elevation due to sanitary sewer protection measures.

The preferred alternative will seek to minimize environmental impacts by limiting the footprint of the works either to the area immediately adjacent to the repairs/enhancements, or to the area previously disturbed (i.e., between sanitary sewer and property lines).

The preferred alternative considers the following aspects, identified through the technical studies:

- Thalweg trajectory - Management of the flow trajectory, where relevant, can be accomplished by placing flow deflectors along the bank toe to redirect the thalweg towards the centre of the channel. This will reduce erosive potential of flows and may induce sediment deposition adjacent to the deflectors.

- Sanitary sewer protection - the proposed works will provide long-term protection of the sanitary sewer that is both adjacent, and under, Cooksville Creek. The protection measures should seek to minimize interference with channel form and processes where possible.

- Bank protection measures - where failed/failing angular stone and gabions occur along the creek banks, the following strategy is proposed:

    - Where gabions have corroded then these will be replaced with other materials.

    - Where armourstone exists, repositioning of the stone will be completed and, if feasible, reorientation of the stone will occur to simulate overhanging cover for aquatic species.

    - Where armourstones have been displaced, then these be replaced or augmented with additional stone; this includes any scour adjacent to the stone.

- Bedrock Protection - Through the proposed design, the underlying bedrock should remain covered with alluvial material, and subaqueous, similar to existing condition.

- Floodplain connectivity and channel capacity - where the estimated bankfull flows spill onto the floodplain, opportunity to modify/increase the channel width and cross-sectional area above the low flow elevation should be considered to increase in-channel water storage during frequent flows.

- Fish Habitat Enhancement - Enhancement of the aquatic environment would occur by providing for undercut banks, where feasible, through re-orientation of armourstone and placing overhanging vegetation. This will provide cover and shade to the water, which will further enhance aquatic habitat

by cooling the water temperature, providing diverse fish habitat for feeding, spawning and rearing, instream habitat features and protection.

- Terrestrial Vegetation - through the proposed restoration plan, a diversity of native plant best suited for the local habitat conditions, native tree and shrub species can be established to provide natural habitat with consideration for a future forest growth and succession of all forest levels including the ground layer, shrub layer, subcanopy and canopy layer. Plant, tree and shrub species selection will consider food sources for wildlife including; mammals, amphibians, reptiles, birds and insects. Given the recent removal of ash tree, enhancement of forest canopy can be considered in the restoration plan.

The potential impacts of the preferred alternatives are discussed in Sections 7.2 and 7.3. Additional studies that may need to be undertaken to support the detailed design process are outlined in Section 8.1.

7.2 Potential Impact to Creek Hydraulics

The intended repair/replace of the erosion control materials along Cooksville Creek from the CP rail crossing to upstream of Mississauga Valley Boulevard will not result in a reduction in channel length, nor of channel width or cross-sectional area. Therefore, no impact to flood conveyance function nor to flood elevations is expected. The proposed ramp to protect the sanitary sewer has the potential for minor local impacts to low intensity frequent flood events; this may be mitigated through local channel widening. It is not expected to impact the Regional flood hazard. During detailed design, updated cross-sections representing the proposed channel bank treatments and any modification in profile or section will be modelled. A comparison of the BOC and proposed design model will then be undertaken to demonstrate that any changes to flood elevations are within the range of tolerance by regulatory agencies. The design objective will be to cause no/minimal change in flood elevation.

7.3 Potential Impact to Hydro-Geomorphic Environment

Given that changes in channel geometry and planform will be limited, and not result in a loss of area, minimal change to instream hydraulic conditions (e.g., shear stress, stream power, velocity) are anticipated. Some changes would occur, associated with profile adjustments (e.g., ramp at the exposed sanitary sewer crossing); these would be mitigated as part of the detailed design. No increase in erosion potential is anticipated through the reach. Consideration of local channel widening to accommodate any changes in in-stream capacity/hydraulics near 0+240 m (sanitary sewer crossing) could be considered at detailed design.

7.4 Potential Impact to Natural Environment

The existing terrestrial and aquatic environments in the study area are highly modified from natural conditions. Considering the current degraded state of the natural environment, the proposed erosion

control measures are anticipated to retain similar or positive impact on existing conditions, and to provide an opportunity to enhance terrestrial and aquatic habitat conditions through naturalization efforts.

Potential impacts and benefits are summarized below:

- minor loss of riparian overbank area due construction activity and alteration in cross-section
- potential loss of trees and vegetation in the overbank areas
- potential for improved fish passage due to a ramp feature at the exposed concrete encased sanitary sewer crossing
- potential for enhanced riparian habitat through the inclusion of bioengineering methods, if feasible
- terrestrial enhancement through removal of Ash trees and native plantings in the restoration plan
- replacement planting of native species for increased habitat diversity in riparian and terrestrial habitats

In addition to the permanent or long-term impacts to the natural environment described above, there are anticipated to be short-term impacts associated with construction activities when the erosion control measures are implemented, particularly related to disturbance of the channel and overbank areas. These impacts can be mitigated through construction staging and creek bypass measures, as well as effective sedimentation and erosion control throughout the construction area. An opportunity may also exist to enhance the terrestrial and aquatic environments by shortening a stormwater pipe along Subreach 3 and diverting those flows into a vegetated channel or wetland type feature, prior to discharging into Cooksville Creek.

7.5 Potential Impact to Social Environment

Temporary impacts to the social environment will result from construction activity that will require temporary closure of the pathway. Construction equipment and pumps that bypass the flow will also cause an elevated level of noise. The daily duration of construction activity is governed by City bylaws and policies. Efforts would be made to stage the area such that path closures are phased to limit loss of access and for construction machinery to adhere with working hours and project duration. Notices advising of the construction will be posted to allow community members to plan alternative commute route and alternate recreational activities.

There are expected to be few long-term impacts resulting from the proposed erosion control works. Naturalization of the area adjacent to the channel realignment will alter the aesthetic appearance for the public.

7.6 Utilities/Infrastructure

Through the preferred alternative, it is important to maintain protection of the existing sanitary sewer infrastructure (under the creek and adjacent to the creek). Additionally, opportunities to improve/repair existing stormwater outfalls should be incorporated into the detailed design where feasible.

8 PROJECT IMPLEMENTATION

8.1 Next Steps

It is recommended that the City of Mississauga proceed with implementation of the erosion control works for the study area as detailed in the preferred alternative concept (Section 7), subject to budgetary constraints.

Detailed design is required to ensure that recommended erosion control works will be sustainable considering the flow characteristics in Cooksville Creek, to confirm the extent of channel improvements that can be undertaken, and to develop engineering drawings for tender and construction.

In preparation for detailed design, the following is recommended:

- **Tree Inventory and Cavity Tree Assessment -** Once the details of the creek restoration construction area are known, a detailed tree inventory & cavity tree assessment should be completed to assess the potential for regulated SAR bats within the proposed limits of construction. Any removal of trees with suitable cavities for SAR bats should consider the appropriate mitigation strategies.

- **Construction Access & Laydown Areas** - All areas selected for construction access routes and as laydown areas, should be confirmed and staked in the field in consultation with an ecologist prior to construction in order to avoid sensitive species and larger trees to the extant possible.

- **Stage 2 Archaeological Assessment** - A Stage 2 archaeological assessment is required for any areas anticipated to be disturbed in conjunction with the preferred alternative, as outlined in the Appendix D report.

- **Infrastructure** – confirm elevations and location of sanitary infrastructure crossings under the creek and confirm stormwater outfalls near 0+240 m. Consultation with the Region is necessary to ensure agreement on proposed methods of protection

8.2 Agency Consultation and Approvals

Consultation with CVC is recommended to receive input into technical aspects of the design, particularly as this pertains to aquatic and terrestrial habitat enhancement and future flow conditions. Through the

EA process, CVC has provided a summary of expectations for a detailed design project that should guide the design and reporting process (see Comments and responses in Appendix E).

Continued communication with local landowners and residents will facilitate the construction process. The MECP may need to be consulted once the impacts of the implementation of the detailed design as they relate to SAR are identified, if applicable. A Request for Review from the DFO will be required for any work that is to take place below the high-water mark.

The detailed design of the proposed repair or replacement of erosion control works, and supporting documentation, must be submitted for approval to CVC. The submission must include not only the design of the erosion control repair and channel realignment/modifications, but also include plans for erosion and sediment control, project staging/phasing and restoration. The submission will include a completed "Application for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses" form (pursuant to Ontario Regulation 160/06), prior to any construction activities taking place.

Once the required permits and approvals have been received, eligible contractors are recommended to be evaluated and pre-qualified on the basis of their previous creek rehabilitation and erosion control experience, with particular emphasis on in-water work experience, to help contribute to the quality and effectiveness of implementation.

8.3 Construction Mitigation Measures

Implementation of the preferred alternatives will result in local impacts to the study area. Mitigation measures should be implemented both in the design and during construction. While specific mitigation measures will be identified during detailed design, the following should be considered.

- **Erosion and Sediment Control**: Mitigation measures must be used for erosion and sediment control to prohibit sediment from entering the surrounding natural areas. The primary principles associated with sedimentation and erosion protection measures are to: (1) minimize the duration of soil exposure, (2) retain existing vegetation, where feasible, (3) encourage re-vegetation, (4) divert runoff away from exposed soils, (5) keep runoff velocities low, and (6) trap sediment as close to the source as possible.

- **Grading Techniques**: Site grading and runoff controls should be developed during final design to mitigate potential stormwater runoff impacts to the surrounding natural areas. This plan should provide for post-construction contours that minimize runoff to the natural areas.

- **Tree Removals**: Where tree removal is proposed, then all removals must be in compliance with the City of Mississauga Tree Protection and Preservation specifications. Tree removal should be completed by or overseen by a certified arborist using proper arboricultural techniques. If a new woodland edge is created during the removal of trees, the new edge should be inspected before and

after tree removal in order to analyze the reaction of newly exposed trees. This will reduce structural failure of potentially poorly adapted trees to increased winds and other external forces. Native species should be replaced, if possible, at a 3:1 ratio.

- **Riparian Vegetation Removals**: Clearing of riparian trees and/or shrubs should be minimized such that physical and biological functional attributes of the terrestrial vegetation can be maintained as they relate to aquatic ecological function.

- **Timing Restrictions for Wildlife:** Restricting construction related activities outside of sensitive periods for local or significant wildlife species can limit disturbance during life cycle stages. Construction related activities should be limited to the daylight hours (i.e., 7am to 7pm) to reduce the amount of noise disturbance to resident wildlife. Any vegetation clearing should occur outside of the breeding bird period (i.e., April 1 to August 31) as well as the bat roosting period (April 1 to October 15) to reduce impacts to breeding birds avoiding incidental take under MBCA and bats under ESA.

- **Controlled Construction Vehicle Access Construction:** Vehicle access should be limited to areas outside of the drip-line of the tree being protected and limited to less sensitive areas to prevent soil compaction and/or the initiation of soil erosion events. Construction vehicle re-fueling stations should be centralized away from vegetation communities and watercourses. Vehicle washing should be prohibited in areas adjacent to vegetation communities and watercourses. The following recommendations are provided to address these potential sources of impacts.

  - Construction vehicle access should be limited to existing roadways and construction paths, away from the identified vegetation communities when feasible.

  - For areas immediately adjacent to Cooksville Creek, periodic supervision of the construction is recommended.

  - Machinery will arrive onsite in a clean, washed condition and is to be maintained free of fluid leaks.

  - Wash, refuel and service machinery and store fuel and other materials for the machinery away from water to prevent any deleterious substance from entering the water.

- **Construction Timing (Fish):** Construction should adhere to the MNRF and DFO in-water works timing restriction for warm water systems which is March 15 to July 15 or if specified otherwise by the MNRF, DFO (DFO 2013, MNRF 2013). CVC has indicated a warmwater timing window of July 1 to March 31. All in-water works should be completed during the dry, low flow season and not during or after a significant rainfall event. The duration of in-water works should be kept to a minimum. In-water works should be completed in isolation from the main flow of the creek and a fish salvage should be completed during any worksite isolation and dewatering.

- **Restoration of Disturbed Areas:** Vegetation clearing occurring for the proposed works can be mitigated through the planting of native vegetation in any areas disturbed by construction activities. Areas disturbed should be revegetated once construction is complete through the planting of native trees, shrubs and native grasses and sedges. Milkweed should be incorporated into the plantings plans, where feasible.

- **Ecological Restoration and Habitat Compensation Plan:** Implementation of a planting plan can result in a net benefit to an ecosystem through the removal and control of non-native species and the planting of a mixture of native trees, shrubs and herbaceous species appropriate to the location. In addition, the inclusion of wildlife habitat features, where appropriate, into the plan (e.g., bird or bat boxes, perches, pits & mounds etc.) could increase the health of the overall ecosystem. An Ecological Restoration and Habitat Compensation Plan tailored to the Cooksville Creek area should be developed prior to the initiation of construction.

- **Contaminant and Spill Response Plan:** A plan should be developed, and implemented immediately in the event of a sediment release or spill of a deleterious substance and an emergency spill kit must be kept onsite. No storage of construction equipment, materials, chemicals, stockpiled resources of soil or storage of any other objects associated with site alteration is to occur within the delineated natural area, or within 30 m of Cooksville Creek. Also, maintenance of machinery during construction should occur a minimum of 30 m away from the watercourse.

- **Construction Monitoring:** is undertaken during the implementation of proposed works to ensure that methods for mitigating concerns and for environmental enhancement are performed as planned and approved, and that any problems that may arise during construction are effectively addressed. Construction activities are to be undertaken in accordance with all applicable guidelines, policies, regulations, and statutes.

8.4 Post-construction Monitoring

Post-construction monitoring of the creek remediation works is typically recommended to assess the effectiveness and environmental performance of a project. For the Cooksville Creek Erosion Control project, the following components and features would be monitored following completion of construction, as required:

- locations where erosion control works appear to be deficient, if any, through indications of erosion or channel migration

- movement of rock or other erosion control works from installed locations

- indications of sedimentation in the channel

- degree of establishment of bioengineering installations

- success of site restoration measures and riparian plantings
- algae or excessive plant growth in the channel
- description and/or photographs of any fish or other wildlife observed
- signs of vandalism or other social-based encroachments onto the creek corridor, outside of established pathways and bridges

These features should be monitored every three months for the first year following construction, and once per year following, if required. In addition, the creek remediation works should be inspected after any large flow events during the first year following construction to assess performance under high-stress conditions.

Typically, a post construction effectiveness monitoring and evaluation report is completed within one year of project completion, submitted to the project proponents and agencies or government reviewers who expressed a concern during the planning and design of the project.

9 REFERENCES

Aquafor Beech Ltd. 2011. Executive Summary (Phase 1): Cooksville Creek Watershed Study and Impact Monitoring Characterization Report. Prepared for Credit Valley Conservation Authority. March 2011.

Aquafor Beech Ltd. 2014. Development Charges Study. Prepared for the City of Mississauga.

Bunte, K. & Abt, S.R. 2001. Sampling surface and subsurface particle-size distributions in wadable gravel-and cobble-bed streams for analyses in sediment transport, hydraulics, and streambed monitoring. General Technical Report. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station

Canadian Wildlife Service (CWS). 2012. Explanation for the Core Nesting Periods Table. July 2012.

Canadian Wildlife Service (CWS). 2013. Migratory Birds Convention Act (MBCA) and Regulations. May 3, 2013. http://www.ec.gc.ca/nature/default.asp?lang=En&n=7CEBB77D-1

City of Mississauga, 1990. Cooksville Creek Erosion Study. Prepared by the Public Works Technical Services Division.

City of Mississauga. 2006. Tree Permit By-Law Number 474-05.

City of Mississauga. 2013. Natural Areas Survey Data. Data provided by Irena Rostkowska, Researcher, Information Planning, City of Mississauga. August 2016.

Cooksville Creek Erosion Control Study (Winter Associates, 1991)

Environment and Climate Change Canada (ECCC). 2023. General Nesting Periods of Migratory Birds in Canada. Modified on May 30, 2023. https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html

Fisheries and Oceans Canada (DFO). 2022. Aquatic Species at Risk Map. Accessed April 2022. https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

Dillon, M.M. Ltd. 1985. The Effect of Channelization on Cooksville Creek Flows.

Fisheries and Oceans Canada (DFO). 2013. Ontario Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat. December 27, 2013. http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/on-eng.html

Lee H. et al. 1998. Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02. 1998.

Nanson, G.C. and J.C. Croke. 1992. A genetic classification of floodplains. Geomorphology. 4: 459-486.

Ontario Breeding Bird Atlas (OBBA). 2001. Guide for Participants. Atlas Management Board, Federation of Ontario Naturalists, Don Mills.

Ontario Ministry of Natural Resources (OMNR). 2013. In-Water Works Timing Window Guidelines. March 11, 2013.

Ontario Ministry of Natural Resources and Forestry (MNRF). 2015. Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E. Regional Operations Division, Southern Region Resources Section. Peterborough, Ontario. 2015.

Parish Geomorphic Ltd. 1997. Cooksville Creek Geomorphic Assessment. Submitted to CVC, 1997.

Phillips Engineering, et al. 2003. Cooksville Creek Special Policy Area Report. Submitted to City of Mississauga.

Public Works Technical Services Division, City of Mississauga, 1990. Cooksville Creek Erosion Study.

Stanfield, L. (Ed.). 2013. Ontario Stream Assessment Protocol. Version 9.0. Fisheries Policy Section. Ontario Ministry of Natural Resources. Peterborough, Ontario. 2013.

Tinkler, K.J. and Parish, J., 1998. Recent Adjustments to the Long Profile of Cooksville Creek, an Urbanized Bedrock Channel in Mississauga, Ontario. In, Rivers Over Rock: Fluvial Process in Bedrock Channels; Tinkler, K.J. and Wohl, E, eds. American Geophysical Union.

TSH (Totten, Sims, and Hubicki) Associates, et al. 1997. Cooksville Creek Rehabilitation Study. Submitted to City of Mississauga and Credit Valley Conservation, 1997.

TSH (Totten, Sims, and Hubicki) Associates, et al. 2002. Cooksville Creek Flood Remediation Plan. Submitted to City of Mississauga and Credit Valley Conservation, 2002.

APPENDIX A
HEC-RAS Output

Existing Regulatory

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # C	Shear Char (N/m2)	Power Tota (N/m s)
2211	16993	Max WS	232.68	117.46	120.94		121.34	0.001705	3.19	142.7	98.78	0.61	44.83	38.92
2211	16936	Max WS	239.82	117.28	120.54	120.91	121.79	0.006299	5.34	75.85	149.72	1.12	134.59	206.36
2211	16896	Max WS	237.04	116.85	120.13	120.54	121.83	0.008764	5.79	42.24	23.1	1.29	165.24	822.7
2211	16891	Max WS	236.76	116.84	120.1	120.71	122.36	0.004784	6.82	42.19	23.07	1.45	84.44	401.7
2211	16882	Max WS	236.31	116.83	120.05	120.56	121.95	0.003022	6.22	40.23	21.23	1.3	65.49	307.71
2211	16869 18	Max WS	235.79	116.71	120	120.44	121.72	0.00357	5.81	40.56	21.41	1.35	61.72	358.82
2211	16853	Max WS	234.97	116.55	119.92	120.35	121.64	0.003076	5.85	41.19	21.18	1.28	60.04	309.86
2211	16850	Max WS	234.92	116.54	119.92	120.36	121.63	0.003102	5.85	41.18	21.22	1.28	60.08	310.55
2211	16845	Max WS	234.81	116.51	119.9	120.31	121.54	0.003322	5.67	41.4	21.32	1.3	58.41	331.26
2211	16844		Lat Struct											
2211	16839	Max WS	234.63	115.61	119.69	119.52	121.09	0.001321	5.3	53.1	23.25	0.87	41.94	113.98
2211	16823	Max WS	234.34	115.56	119.78		120.38	0.004268	3.66	82.62	49.26	0.61	131.56	188.12
2211	16806	Max WS	234.05	115.53	119.83		120.25	0.002689	3.06	97	46.41	0.51	85.96	123.16
2211	16787	Max WS	238.32	115.46	119.8		120.16	0.002182	2.74	105.34	50.93	0.45	72.36	94.56
2211	16767	Max WS	235.75	115.4	119.82		120.1	0.001653	2.4	114.2	47.17	0.39	57.25	75.63
2211	16754	Max WS	233.77	115.34	119.8		120.08	0.00171	2.44	112.42	65.3	0.42	56.43	73.29
2211	16738	Max WS	226.45	115.31	119.74	118.29	120.05	0.002078	2.53	99.45	43.02	0.44	66.19	100.18
2211	16734	17-Ped Bridge	Bridge											
2211	16730	Max WS	226.16	115.27	118.81		119.37	0.005019	3.36	72	32.13	0.66	123.34	323.32
2211	16719	Max WS	225.72	115.22	118.88		119.25	0.002902	2.81	91.91	44.68	0.52	80.42	136.77
2211	16707	Max WS	221.99	115.12	118.89	117.76	119.21	0.002304	2.59	96.93	42.52	0.47	68.62	111.41
2211	16704		Inl Struct											
2211	16702	Max WS	221.99	114.28	118.77		119.01	0.001457	2.2	110.82	42.71	0.37	48.66	69.85
2211	16686	Max WS	221.42	114.21	118.81		118.95	0.00091	1.83	160.19	75.99	0.3	33.26	25.1
2211	16670	Max WS	219.08	114.15	118.77		118.94	0.000983	1.94	138.12	51.35	0.31	36.39	38.88
2211	16654	Max WS	218.39	114.1	118.77		118.92	0.000897	1.87	146.24	54.62	0.3	33.03	33.28
2211	16637	Max WS	217.91	114.03	118.74		118.91	0.000946	1.89	143.08	57.42	0.3	35.17	33.4
2211	16617	Max WS	217.88	113.96	118.74		118.88	0.000803	1.78	160.91	120.68	0.28	30.66	23.74
2211	16598	Max WS	217.93	113.9	118.73		118.86	0.000757	1.76	170.76	95.47	0.28	28.96	18.51
2211	16578	Max WS	220.29	113.84	118.68		118.85	0.000433	1.94	156.5	78.71	0.31	16.53	11.33
2211	16560	Max WS	223.76	113.79	118.7		118.82	0.000306	1.73	198.66	130.12	0.27	11.99	7.74
2211	16543	Max WS	225.51	113.75	118.71		118.8	0.000407	1.5	213.1	135.26	0.23	16.38	9.82
2211	16525	Max WS	226.53	113.69	118.72		118.79	0.000416	1.38	230.08	143.13	0.21	17.13	9.38
2211	16505	Max WS	227.58	113.62	118.71		118.78	0.000403	1.34	240.1	150.13	0.21	16.27	8.95
2211	16486	Max WS	228.68	113.55	118.71		118.76	0.000336	1.25	265.13	159.7	0.19	13.42	7.15
2211	16466	Max WS	229.63	113.49	118.71		118.75	0.000317	1.22	276.19	145.67	0.19	12.57	6.58
2211	16446	Max WS	230.37	113.59	118.7		118.75	0.000185	1.39	306.65	153.01	0.22	7.44	3.43
2211	16431	Max WS	230.44	113.61	118.7		118.75	0.00015	1.24	321.09	157.67	0.19	5.93	2.64
2211	16416	Max WS	229.1	113.53	118.7		118.74	0.000132	1.18	325.02	158.51	0.18	5.35	2.26
2211	16401	Max WS	225.93	113.53	118.71		118.74	0.00009	0.98	334.31	153.17	0.15	3.64	1.55
2211	16384	Max WS	222.15	113.51	118.71		118.74	0.000103	1.1	357.85	154.83	0.16	4.49	1.63
2211	16368	Max WS	217.99	113.6	118.66		118.74	0.000224	1.64	216.4	152.94	0.24	9.92	6.28
2211	16351	Max WS	216.93	113.13	118.58	116.12	118.75	0.000414	2.07	159.46	156.5	0.3	19.69	16.57
2211	16338	16-Miss Val Bl	Bridge											
2211	16325	Max WS	216.92	113.09	117.73		118.05	0.000708	2.63	106.46	104.69	0.42	27.04	33.12
2211	16306	Max WS	218.48	112.99	117.74		118.02	0.000713	2.61	128.36	81.33	0.42	26.68	29.88
2211	16287	Max WS	224.02	113.05	117.7		118.02	0.000864	2.98	132.95	91.25	0.46	34.17	36.66
2211	16267	Max WS	226.84	113.03	117.72		117.97	0.000688	2.67	150.96	159.69	0.42	27.33	25.76
2211	16238	Max WS	229.4	112.46	117.69		117.95	0.000676	2.75	154.23	68.6	0.41	28.44	25.95
2211	16223	Max WS	232.04	112.51	117.66		117.94	0.000735	2.86	148.35	91.2	0.43	30.86	28.4
2211	16208	Max WS	234.29	112.45	117.66		117.92	0.000645	2.75	156.38	103.19	0.4	28.23	24.2
2211	16193	Max WS	235.75	112.36	117.65		117.91	0.000621	2.81	166.23	89.78	0.4	28.87	23.07
2211	16174	Max WS	236.32	112.14	117.64		117.89	0.000541	2.74	167.58	72.71	0.38	26.81	22.27
2211	16156	Max WS	236.35	112.08	117.63		117.88	0.000533	2.71	163.78	56.37	0.38	26.31	23.92
2211	16137	Max WS	237.14	112.03	117.55		117.89	0.000698	3.1	136.41	56.86	0.43	34.33	36.35
2211	16126	Max WS	240.7	112.07	117.57		117.83	0.000535	2.57	150.43	60.83	0.37	24.3	24.51
2211	16114	Max WS	240.76	111.46	117.48	115.08	117.81	0.000571	2.68	124.12	58.43	0.37	26.25	27.95
2211	16100	15-CPR	Bridge											
2211	16084	Max WS	240.77	111.47	115.36	115.58	117.07	0.005682	5.92	51.1	25.09	1.03	153.17	470.92
2211	16056	Max WS	240.77	111.44	115.02	115.83	117.6	0.010179	8.15	61.81	37.05	1.47	286.38	627.53
2211	16016	Max WS	242.82	111.41	114.63	115.11	116.41	0.008112	6.79	68.12	52.51	1.32	205.66	483.39
2211	15986	Max WS	240.76	111.38	114.7	114.77	115.61	0.004156	5.11	103.21	66.66	0.96	113.58	154.06
2211	15939	Max WS	240.76	111.31	114.66		115.31	0.003098	4.48	121.79	76.74	0.84	86.63	111.51
2211	15900	Max WS	240.77	111.04	114.72		114.98	0.001531	3.37	210.28	102.37	0.6	47.48	34.9
2211	15864	Max WS	240.76	110.6	114.71		114.89	0.000966	2.9	257.93	116.48	0.48	33.7	19.42
2211	15788	Max WS	240.76	110.29	114.66		114.81	0.00059	2.33	263.98	97.59	0.38	21.49	14.05
2211	15718	Max WS	240.77	110.21	114.64		114.77	0.000559	2.32	272.15	100.07	0.37	21.04	12.85
2211	15716		Lat Struct											
2211	15679	Max WS	239.34	110.03	114.56		114.8	0.000742	2.78	195.96	95.2	0.43	29.67	26.94

2211	15636	Max WS	235.57	109.62	114.38		114.76	0.000829	2.77	98.89	96.49	0.45	30.34	54.42
2211	15617	Max WS	241.38	109.71	113.92		114.73	0.001988	4.06	74.19	83.51	0.69	67.07	127.86
2211	15597	Max WS	238.64	109.06	114.16	111.99	114.39	0.000445	2.16	127.19	86.21	0.33	17.83	17.73
2211	15578	14-Kirwin Ave	Bridge											
2211	15562	Max WS	238.64	109	112.36		113.01	0.00237	3.59	67.72	28.27	0.71	58.29	185.02
2211	15546	Max WS	240.75	109.03	112.27	112.37	113.35	0.005063	4.64	56.72	39.57	1.01	103.5	287.02
2211	15530	Max WS	240.88	108.83	112.12	112.23	113.17	0.004994	4.74	65.11	42.62	1.01	106.49	261.69
2211	15513	Max WS	241.56	108.88	112.04	112.12	113.05	0.004425	4.6	67.25	45.78	0.96	98.77	222.28
2211	15497	Max WS	242.08	108.49	112	111.92	112.82	0.003466	4.19	74.86	45.72	0.85	80.6	173.13
2211	15478	Max WS	241.65	108.55	112.1		112.6	0.002108	3.54	104.57	52.38	0.68	55.42	91.91
2211	15459	Max WS	240.31	108.54	112.05		112.55	0.001903	3.45	112.97	68.03	0.65	51.92	64.11
2211	15440	Max WS	239.04	108.16	112.08		112.48	0.001396	3.11	118.12	57.98	0.56	41.11	53.96
2211	15423	Max WS	234.68	108.16	112.14		112.42	0.000979	2.63	132.48	53.2	0.47	29.31	39.53
2211	15405	Max WS	227.85	108.02	112.15		112.41	0.000811	2.53	130.91	46.92	0.44	26.4	35.59
2211	15388	Max WS	221.13	107.77	112.14		112.42	0.00087	2.89	133.28	43.36	0.46	32.63	39.5
2211	15370	Max WS	214.92	107.64	112.13		112.41	0.000724	2.75	133.94	42.38	0.43	28.97	32.94
2211	15351	Max WS	206.76	107.57	112.19		112.36	0.000421	2.13	160.79	49.96	0.33	17.25	15.89
2211	15332	Max WS	197.47	107.41	112.2		112.35	0.000408	2.14	174.46	65.05	0.33	17.28	11.42
2211	15313	Max WS	186.75	107.21	112.24		112.32	0.000576	1.34	157.63	43.92	0.2	25.89	21.24
2211	15294	Max WS	174	106.99	112.23		112.33	0.000212	1.63	142.13	36.25	0.24	9.72	8.7
2211	15280	Max WS	189.44	106.91	112.17		112.3	0.000279	1.65	131.07	35.27	0.25	10.6	12.78
2211	15279		Lat Struct											
2211	15265	Max WS	186.21	106.78	112.13		112.29	0.000383	1.8	112.08	36.07	0.29	13.09	17.18
2211	15250	Max WS	183.58	106.46	112.12	109.55	112.28	0.000416	1.8	103.01	36.4	0.29	13.36	23.03
2211	15204	13-Dundas St	Bridge											
2211	15140	Max WS	183.56	104.68	109.13		109.55	0.001394	2.86	64.1	16.9	0.47	36.3	103.95
2211	15139.1		Lat Struct											
2211	15139	Max WS	183.73	104.68	109.11		109.55	0.001425	2.92	62.94	15.91	0.47	37.56	109.64
2211	15138.5		Lat Struct											
2211	15138	Max WS	189.51	104.68	109.05	107.5	109.51	0.001601	3.01	62.87	17.21	0.5	40.58	122.3
2211	15135		Inl Struct											
2211	15131	Max WS	189.51	103.58	108.9		109.2	0.000795	2.42	78.43	18.55	0.38	24.45	59.07
2211	15114	Max WS	217.05	103.56	108.19		108.98	0.00263	3.94	55.12	15.3	0.66	68.6	270.15
2211	15096	Max WS	234.62	103.54	107.85	107.8	109.49	0.006673	5.68	41.3	12.25	0.99	150.01	852.18
2211	15079	Max WS	237.02	103.52	107.7		109.13	0.005362	5.31	44.68	12.84	0.91	128.18	680.05
2211	15061	Max WS	237.24	103.5	107.6	107.58	109.02	0.005985	5.29	44.84	15.57	1	131.23	694.42
2211	15044	Max WS	235.45	103.47	107.47		108.76	0.005068	5.02	46.93	16.12	0.93	116.24	578.23
2211	15026	Max WS	234.79	103.44	107.39	107.12	108.66	0.004383	5.01	47.74	16.62	0.88	111.89	492.46
2211	15010	Max WS	227.81	103.41	107.4		108.05	0.002129	3.64	68.29	22.84	0.65	57.78	171.23
2211	14994	Max WS	237.62	103.39	107.39		108.01	0.002035	3.55	71.68	23.8	0.64	55.07	164.59
2211	14978	Max WS	237.1	103.36	107.44		107.94	0.001469	3.2	77.26	25.41	0.57	43.52	112.84
2211	14962	Max WS	229.74	103.33	107.44		107.89	0.001608	3.01	79.52	29.3	0.57	40.47	107.76
2211	14946	Max WS	242.35	103.31	107.29		107.84	0.001971	3.41	82.09	29.25	0.63	51.37	138.11
2211	14930	Max WS	249.67	103.28	107.39		107.71	0.000992	2.58	101.3	32.4	0.46	28.57	64.15
2211	14913	Max WS	252.87	103.25	107.27		107.7	0.001135	3.08	103.32	31.7	0.52	38.42	75.45
2211	14895	Max WS	237.32	103.18	107.41	105.76	107.58	0.000477	1.87	146.97	92.21	0.33	14.61	16.9
2211	14878	12-King St E	Bridge											
2211	14858	Max WS	237.32	102.64	105.96		106.46	0.002964	3.59	109.26	103.76	0.73	61.56	82.04
2211	14857.9		Lat Struct											
2211	14813	Max WS	237.07	102.89	105.4	105.76	106.55	0.007824	5.35	96.07	154.41	1.23	142.77	151.61
2211	14746	Max WS	204.46	102.67	105.15		105.59	0.00454	3.62	121.77	148.33	0.92	69.39	74.84
2211	14642	Max WS	235.49	102.02	104.72	104.72	105.26	0.003838	3.68	128.62	191	0.86	68.09	65.96
2211	14592	Max WS	235.68	101.48	104.36	104.83	105.52	0.006724	5.27	92.17	142.6	1.14	134.1	131.55
2211	14533	Max WS	235.6	101.28	104.17	104.4	104.87	0.004089	4.16	117.58	165.93	0.91	83.3	56.59
2211	14491	Max WS	235.2	101.33	104.21		104.5	0.001401	2.66	187.88	240.51	0.55	32.62	15.47
2211	14443	Max WS	235.46	101.17	104.11	104	104.47	0.001998	3.03	167.69	234.5	0.64	43.12	20.42

Exisiting 100 year

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # C	Shear Char (N/m2)	Power Tota (N/m s)
2211	16993	Max WS	194.46	117.46	120.58		121.04	0.002181	3.29	108.23	95.56	0.67	50.07	43.05
2211	16936	Max WS	194.45	117.28	120.27	120.67	121.55	0.007217	5.25	56.86	131.99	1.18	135.79	198.59
2211	16896	Max WS	194.4	116.85	119.85	120.22	121.39	0.008921	5.5	36.02	20.74	1.28	153.85	763.78
2211	16891	Max WS	194.39	116.84	119.82	120.39	121.84	0.005084	6.44	35.85	21.98	1.46	78.6	366.77
2211	16882	Max WS	194.37	116.83	119.77	120.23	121.49	0.003226	5.9	34.42	20.05	1.31	61.5	286.63
2211	16869 18	Max WS	194.33	116.71	119.71	120.14	121.31	0.003759	5.6	34.72	20.2	1.36	59.07	330.64
2211	16853	Max WS	194.28	116.55	119.64	120.05	121.22	0.00326	5.61	35.34	20.02	1.29	57.13	287.79
2211	16850	Max WS	194.27	116.54	119.63	120.05	121.22	0.003292	5.6	35.31	20.02	1.29	57.24	289.32
2211	16845	Max WS	194.25	116.51	119.61	120.01	121.14	0.003515	5.47	35.5	20.16	1.32	56.15	307.23
2211	16844		Lat Struct											
2211	16839	Max WS	194.23	115.61	119.4	119.09	120.56	0.001197	4.79	46.68	21.81	0.82	35.13	90.82
2211	16823	Max WS	193.87	115.56	119.53		120.07	0.004028	3.4	70.66	46.47	0.58	115.82	155.46
2211	16806	Max WS	194.48	115.53	119.58		119.94	0.002473	2.81	85.79	44.74	0.48	73.84	97.88
2211	16787	Max WS	199.94	115.46	119.55		119.86	0.002048	2.54	92.65	49.91	0.43	63.37	76.3
2211	16767	Max WS	198.96	115.4	119.57		119.8	0.001532	2.21	102.41	45.22	0.37	49.61	61.89
2211	16754	Max WS	198.17	115.34	119.53		119.78	0.001653	2.28	99.49	47	0.4	50.48	66.21
2211	16738	Max WS	192.97	115.31	119.48	118.01	119.75	0.002017	2.36	88.57	40.47	0.42	59.3	88.26
2211	16734	17-Ped Bridge	Bridge											
2211	16730	Max WS	192.94	115.27	118.4		119	0.00617	3.45	59.02	31.24	0.72	133.5	353.33
2211	16719	Max WS	193.64	115.22	118.45		118.86	0.00385	2.91	73.35	41.05	0.59	90.99	170.5
2211	16707	Max WS	191.05	115.12	118.46	117.57	118.81	0.002951	2.66	78.89	40.56	0.52	75.71	129.88
2211	16704		Inl Struct											
2211	16702	Max WS	191.06	114.28	118.34		118.59	0.001718	2.19	92.98	40.38	0.4	50.45	75.55
2211	16686	Max WS	190.82	114.21	118.37		118.53	0.001129	1.88	127.99	68.34	0.32	36.59	29.94
2211	16670	Max WS	188.66	114.15	118.34		118.51	0.001153	1.94	116.23	49.69	0.33	37.96	40.9
2211	16654	Max WS	187.49	114.1	118.33		118.49	0.001058	1.87	122.74	53.27	0.32	34.62	34.83
2211	16637	Max WS	186.5	114.03	118.31		118.47	0.001104	1.89	118.79	54.09	0.32	36.49	35.6
2211	16617	Max WS	185.84	113.96	118.3		118.45	0.000975	1.81	130.14	99.81	0.3	33.11	24.73
2211	16598	Max WS	185.87	113.9	118.27		118.43	0.000951	1.82	132.67	81	0.31	32.31	20.64
2211	16578	Max WS	187.79	113.84	118.23		118.41	0.000493	1.92	124.21	65.24	0.32	16.75	13.24
2211	16560	Max WS	190.45	113.79	118.25		118.38	0.000355	1.72	162.42	79.21	0.29	12.4	8.15
2211	16543	Max WS	191.89	113.75	118.26		118.36	0.000508	1.55	173.24	108.51	0.25	18.29	10.49
2211	16525	Max WS	192.8	113.69	118.26		118.34	0.00053	1.44	186.9	126.89	0.23	19.54	10.22
2211	16505	Max WS	193.82	113.62	118.26		118.33	0.000523	1.42	195.87	142.36	0.23	18.86	9.94
2211	16486	Max WS	194.94	113.55	118.26		118.31	0.000437	1.32	218.59	154.94	0.22	15.57	7.96
2211	16466	Max WS	196.02	113.49	118.25		118.3	0.000416	1.29	227.95	141.94	0.21	14.72	7.41
2211	16446	Max WS	197.07	113.59	118.24		118.3	0.000241	1.47	252.59	149.17	0.24	8.63	3.85
2211	16431	Max WS	197.59	113.61	118.24		118.29	0.000203	1.33	262.71	154.62	0.22	7.13	3.07
2211	16416	Max WS	197.17	113.53	118.24		118.29	0.000177	1.27	266.46	155.64	0.21	6.41	2.63
2211	16401	Max WS	195.56	113.53	118.25		118.28	0.00012	1.04	277.49	149.04	0.17	4.33	1.81
2211	16384	Max WS	193.44	113.51	118.24		118.28	0.000136	1.18	296.7	146.11	0.19	5.35	1.9
2211	16368	Max WS	192.17	113.6	118.19		118.29	0.000294	1.75	181.88	133.92	0.27	11.7	7.31
2211	16351	Max WS	195.17	113.13	118.1	115.96	118.29	0.000521	2.18	135.24	131.76	0.33	22.39	18.95
2211	16338	16-Miss Val Bl	Bridge											
2211	16325	Max WS	195.17	113.09	117.29		117.63	0.000845	2.67	89.5	45.83	0.45	28.76	45.06
2211	16306	Max WS	195.52	112.99	117.28		117.6	0.000933	2.75	106.37	61.06	0.47	30.87	35.64
2211	16287	Max WS	196.39	113.05	117.24		117.61	0.001095	3.1	110.16	67.09	0.51	38.58	41.1
2211	16267	Max WS	196.49	113.03	117.27		117.54	0.000841	2.73	125.16	81.88	0.45	29.77	27.46
2211	16238	Max WS	196.66	112.46	117.24		117.52	0.00078	2.76	129.76	61.78	0.43	29.66	26.07
2211	16223	Max WS	197.57	112.51	117.21		117.52	0.000855	2.88	123.17	76.09	0.45	32.44	28.38
2211	16208	Max WS	198.46	112.45	117.21		117.49	0.000733	2.75	130.31	95.59	0.42	29.12	23.46
2211	16193	Max WS	199.06	112.36	117.2		117.48	0.00069	2.79	139.88	74.84	0.42	29.26	21.82
2211	16174	Max WS	199.38	112.14	117.2		117.45	0.000576	2.66	143.97	55.51	0.39	26.12	20.14
2211	16156	Max WS	199.25	112.08	117.2		117.43	0.000549	2.6	142.84	51.81	0.38	24.91	20.97
2211	16137	Max WS	199.57	112.03	117.12		117.45	0.000704	2.94	118.61	53.96	0.43	31.88	32.15
2211	16126	Max WS	196.62	112.07	117.16		117.39	0.000507	2.36	130.58	57.75	0.35	21.15	19.9
2211	16114	Max WS	196.62	111.46	117.09	114.68	117.37	0.00052	2.43	106.6	56.02	0.35	22.15	21.24
2211	16100	15-CPR	Bridge											
2211	16084	Max WS	196.62	111.47	115.04	115.11	116.46	0.005346	5.37	44	21.31	0.98	130.58	418.75
2211	16056	Max WS	196.62	111.44	114.74	115.53	117.11	0.010163	7.64	51.6	35.54	1.45	260.14	534.2
2211	16016	Max WS	196.62	111.41	114.33	114.8	115.98	0.008469	6.41	56.77	49.18	1.32	191.01	423.82
2211	15986	Max WS	196.62	111.38	114.25	114.45	115.35	0.005852	5.41	72.98	58.43	1.11	134.75	226.8
2211	15939	Max WS	196.62	111.31	114.17	114.06	114.95	0.004395	4.72	91.13	64.72	0.97	102.38	133.54
2211	15900	Max WS	196.62	111.04	114.23		114.53	0.002135	3.57	161.3	95.91	0.68	56.12	42.45
2211	15864	Max WS	196.62	110.6	114.2		114.43	0.001323	3.07	198.95	114.74	0.55	39.76	22.02
2211	15788	Max WS	196.61	110.29	114.15		114.3	0.000705	2.31	214.68	94.38	0.41	22.22	14.19
2211	15718	Max WS	196.61	110.21	114.12		114.26	0.000679	2.33	220.11	98	0.39	22.32	13.1
2211	15716		Lat Struct											
2211	15679	Max WS	196.03	110.03	114.04		114.27	0.000832	2.7	164.11	94.96	0.45	29.2	24.95

2211	15636	Max WS	194.88	109.62	113.87		114.22	0.000929	2.67	82.24	94.72	0.46	29.47	52.01
2211	15617	Max WS	196.42	109.71	113.42		114.18	0.002227	3.89	59.06	27.15	0.71	64.69	148.55
2211	15597	Max WS	196.3	109.06	113.63	111.73	113.84	0.000483	2.06	102.97	33.65	0.34	16.97	25.26
2211	15578	14-Kirwin Ave	Bridge											
2211	15562	Max WS	196.26	109	112.12		112.66	0.002195	3.25	61.23	27.63	0.67	49.17	144.82
2211	15546	Max WS	196.78	109.03	112.03	112.08	112.97	0.005103	4.31	47.36	38.84	0.99	92.82	242.32
2211	15530	Max WS	196.5	108.83	111.88	112	112.82	0.005102	4.44	54.86	41.87	1	97.09	223.23
2211	15513	Max WS	196.56	108.88	111.79	111.87	112.69	0.004489	4.3	55.93	43.53	0.95	89.51	193.77
2211	15497	Max WS	196.5	108.49	111.7	111.67	112.46	0.003737	3.99	61.32	45.02	0.87	76.35	154.99
2211	15478	Max WS	195.95	108.55	111.75		112.22	0.002335	3.41	86.34	50.95	0.7	53.58	85.45
2211	15459	Max WS	195.81	108.54	111.66		112.19	0.00234	3.47	86.26	67.09	0.7	55.03	65.56
2211	15440	Max WS	196.37	108.16	111.7		112.09	0.001584	3.03	96.48	55.45	0.59	40.87	52.85
2211	15423	Max WS	194.24	108.16	111.76		112.02	0.001075	2.53	112.4	51.97	0.49	28.29	37.02
2211	15405	Max WS	190.18	108.02	111.76		112	0.000866	2.42	113.05	46.04	0.44	25.03	32.59
2211	15388	Max WS	186.32	107.77	111.75		112.01	0.000906	2.75	116.57	42.51	0.46	30.66	35.64
2211	15370	Max WS	183.22	107.64	111.74		112	0.000756	2.63	117.42	41.23	0.43	27.42	30.4
2211	15351	Max WS	179.06	107.57	111.78		111.94	0.00046	2.08	140.62	49.05	0.34	17.04	15.45
2211	15332	Max WS	173.81	107.41	111.79		111.93	0.000422	2.04	150.2	52.6	0.33	16.23	12.78
2211	15313	Max WS	167.22	107.21	111.83		111.91	0.000656	1.34	140.21	41.61	0.21	26.86	23.01
2211	15294	Max WS	159.6	106.99	111.8		111.91	0.000248	1.65	126.94	35.64	0.25	10.33	9.58
2211	15280	Max WS	169.52	106.91	111.76		111.89	0.000309	1.65	116.42	35	0.26	10.86	12.98
2211	15279		Lat Struct											
2211	15265	Max WS	168.66	106.78	111.7		111.87	0.000465	1.86	96.36	35.78	0.31	14.45	19.36
2211	15250	Max WS	167.74	106.46	111.68	109.42	111.86	0.000506	1.85	91.2	36.39	0.31	14.68	25.95
2211	15204	13-Dundas St	Bridge											
2211	15140	Max WS	167.74	104.68	108.68		109.13	0.001682	2.97	56.53	16.9	0.52	40.12	119.05
2211	15139.1		Lat Struct											
2211	15139	Max WS	167.99	104.68	108.67		109.13	0.001681	3.01	55.89	15.89	0.51	40.9	122.94
2211	15138.5		Lat Struct											
2211	15138	Max WS	172.17	104.68	108.6	107.33	109.1	0.00194	3.12	55.13	17.12	0.56	44.9	140.21
2211	15135		Inl Struct											
2211	15131	Max WS	172.17	103.58	108.41		108.72	0.000931	2.48	69.34	18.18	0.41	26.5	65.79
2211	15114	Max WS	188.57	103.56	107.85		108.58	0.002579	3.77	50	14.68	0.65	63.98	241.32
2211	15096	Max WS	196.47	103.54	107.43	107.33	108.92	0.006491	5.4	36.39	11.4	0.96	138.01	745.03
2211	15079	Max WS	196.21	103.52	107.33		108.55	0.004967	4.9	40.04	12.44	0.87	111.64	547.14
2211	15061	Max WS	196.58	103.5	107.21	107.07	108.5	0.005697	5.02	39.15	14.01	0.96	119.8	601.47
2211	15044	Max WS	196.41	103.47	107.13		108.27	0.004939	4.73	41.51	15.12	0.91	105.76	500.39
2211	15026	Max WS	195.88	103.44	107.05		108.16	0.004202	4.65	42.42	15.35	0.85	99.11	424.31
2211	15010	Max WS	198.93	103.41	107.11		107.72	0.002187	3.49	61.82	22.84	0.66	54.77	156.76
2211	14994	Max WS	199.15	103.39	107.13		107.66	0.001872	3.24	65.6	23.8	0.61	47.06	129.21
2211	14978	Max WS	200.08	103.36	107.14		107.58	0.001459	2.99	69.63	25.41	0.56	39.21	96.47
2211	14962	Max WS	195.15	103.33	107.13		107.54	0.001692	2.87	70.4	29.3	0.58	38.32	98.17
2211	14946	Max WS	203.49	103.31	107.03		107.5	0.001863	3.14	74.6	29.25	0.61	44.81	111.28
2211	14930	Max WS	208.55	103.28	107.12		107.39	0.000917	2.36	92.56	32.4	0.44	24.47	50.25
2211	14913	Max WS	206.79	103.25	107.05		107.38	0.000943	2.69	96.41	31.7	0.47	29.94	51.88
2211	14895	Max WS	191.54	103.18	107.15	105.45	107.29	0.000421	1.66	130.68	68.84	0.31	11.85	12.08
2211	14878	12-King St E	Bridge											
2211	14858	Max WS	191.55	102.64	105.74		106.2	0.002922	3.35	92.02	101.58	0.72	55.39	65.45
2211	14857.9		Lat Struct											
2211	14813	Max WS	191.72	102.89	105.27	105.58	106.26	0.007051	4.85	80.96	133.18	1.16	120.01	117.65
2211	14746	Max WS	190.76	102.67	104.98	105.06	105.53	0.006298	3.97	102.21	133.13	1.06	86.25	100.2
2211	14642	Max WS	190.74	102.02	104.56	104.54	105.04	0.003641	3.38	108.5	155.57	0.82	59.29	53.37
2211	14592	Max WS	190.62	101.48	104.18	104.65	105.23	0.006504	4.89	73.72	102.05	1.1	119.13	128.3
2211	14533	Max WS	190.44	101.28	104.01	104.14	104.65	0.003855	3.84	94.43	136.28	0.87	72.81	52.5
2211	14491	Max WS	190.42	101.33	104.05		104.3	0.001317	2.46	154.56	198.77	0.52	28.55	12.92
2211	14443	Max WS	190.46	101.17	103.93	103.84	104.28	0.002006	2.87	130.85	193.12	0.63	39.87	19.31

BOC Regulatory

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # C	Shear Char (N/m2)	Power Tota (N/m s)
2211	16993	Max WS	232.68	117.46	120.93		121.34	0.001706	3.19	142.64	98.78	0.61	44.86	38.96
2211	16936	Max WS	239.97	117.28	120.54	120.91	121.79	0.006307	5.34	75.85	149.72	1.12	134.77	206.77
2211	16896	Max WS	237.11	116.85	120.13	120.54	121.83	0.008769	5.79	42.24	23.1	1.29	165.34	823.48
2211	16891	Max WS	236.84	116.84	120.1	120.72	122.36	0.004785	6.82	42.2	23.07	1.45	84.47	401.91
2211	16882	Max WS	236.4	116.83	120.05	120.56	121.95	0.003024	6.22	40.23	21.23	1.3	65.54	308.08
2211	16869 18	Max WS	235.82	116.71	120	120.44	121.72	0.00357	5.81	40.56	21.41	1.35	61.73	358.92
2211	16853	Max WS	235.07	116.55	119.92	120.35	121.64	0.003078	5.85	41.19	21.18	1.28	60.09	310.24
2211	16850	Max WS	235.02	116.54	119.92	120.36	121.63	0.003104	5.85	41.18	21.22	1.28	60.13	310.94
2211	16845	Max WS	234.91	116.51	119.9	120.31	121.54	0.003325	5.67	41.4	21.32	1.3	58.46	331.69
2211	16844		Lat Struct											
2211	16839	Max WS	234.74	115.61	119.69	119.53	121.09	0.001322	5.31	53.1	23.25	0.88	41.99	114.18
2211	16823	Max WS	234.24	115.56	119.78		120.38	0.004264	3.66	82.62	49.26	0.61	131.46	187.89
2211	16806	Max WS	234.2	115.53	119.83		120.25	0.002691	3.07	97.02	46.41	0.51	86.03	123.3
2211	16787	Max WS	238.47	115.46	119.8		120.16	0.002185	2.75	105.34	50.93	0.45	72.45	94.75
2211	16767	Max WS	236.25	115.4	119.82		120.1	0.001661	2.41	114.19	47.17	0.39	57.51	76.14
2211	16754	Max WS	234.29	115.34	119.8		120.08	0.001716	2.45	112.46	65.32	0.42	56.64	73.69
2211	16738	Max WS	226.54	115.31	119.74	118.29	120.05	0.002078	2.53	99.48	43.03	0.44	66.21	100.2
2211	16734	17-Ped Bridge	Bridge											
2211	16730	Max WS	226.09	115.27	118.79		119.36	0.005125	3.39	71.41	32.08	0.67	125.32	330.72
2211	16719	Max WS	225.77	115.22	118.86		119.24	0.002975	2.83	91.07	44.59	0.53	81.9	140.55
2211	16707	Max WS	222.1	115.12	118.87	117.76	119.2	0.002359	2.61	96.13	42.45	0.47	69.82	114.35
2211	16704		Inl Struct											
2211	16702	Max WS	222.1	114.28	118.76		119	0.001486	2.21	110.06	42.61	0.38	49.36	71.44
2211	16686	Max WS	221.57	114.21	118.79		118.94	0.00093	1.84	158.8	75.78	0.3	33.84	25.75
2211	16670	Max WS	219.19	114.15	118.75		118.93	0.001002	1.95	137.18	51.23	0.32	36.91	39.74
2211	16654	Max WS	218.46	114.1	118.75		118.9	0.000914	1.88	145.23	54.55	0.3	33.52	34
2211	16637	Max WS	217.95	114.03	118.73		118.89	0.000964	1.91	142.01	57.22	0.31	35.67	34.17
2211	16617	Max WS	217.89	113.96	118.72		118.86	0.00082	1.79	159.58	120.08	0.28	31.16	24.25
2211	16598	Max WS	217.94	113.9	118.71		118.84	0.000775	1.77	169.1	95.38	0.28	29.49	18.94
2211	16578	Max WS	220.33	113.84	118.66		118.84	0.000442	1.96	154.89	78.26	0.31	16.79	11.63
2211	16560	Max WS	223.83	113.79	118.68		118.8	0.000313	1.74	196.99	129.99	0.27	12.19	7.92
2211	16543	Max WS	225.58	113.75	118.69		118.78	0.000416	1.51	211.33	135.07	0.23	16.69	10.06
2211	16525	Max WS	226.61	113.69	118.7		118.77	0.000426	1.39	228.16	142.66	0.21	17.47	9.62
2211	16505	Max WS	227.68	113.62	118.69		118.76	0.000413	1.35	238.15	149.83	0.21	16.6	9.18
2211	16486	Max WS	228.83	113.55	118.69		118.74	0.000345	1.26	263.08	159.39	0.2	13.7	7.34
2211	16466	Max WS	229.82	113.41	118.69		118.74	0.000323	1.23	274.4	145.53	0.19	12.79	6.72
2211	16446	Max WS	230.59	113.39	118.68		118.73	0.000179	1.4	307.78	152.83	0.21	7.45	3.3
2211	16431	Max WS	230.74	113.39	118.68		118.73	0.000146	1.24	322.28	157.54	0.19	5.92	2.56
2211	16416	Max WS	229.48	113.3	118.68		118.72	0.000134	1.19	323.24	158.4	0.18	5.43	2.3
2211	16401	Max WS	226.41	113.32	118.69		118.72	0.000085	0.96	344.25	153	0.15	3.5	1.47
2211	16384	Max WS	222.75	113.32	118.69		118.72	0.000104	1.06	355.67	154.55	0.16	4.27	1.65
2211	16368	Max WS	218.76	113.12	118.64		118.72	0.000218	1.62	217.99	151.97	0.24	9.74	6.1
2211	16351	Max WS	217.88	112.83	118.56	116.04	118.73	0.000405	2.06	160.41	155.79	0.29	19.3	16.2
2211	16338	16-Miss Val Bl	Bridge											
2211	16325	Max WS	217.87	113.04	117.78		118	0.00099	2.1	110.98	111.05	0.35	33.45	44.16
2211	16306	Max WS	219.38	112.73	117.72		118	0.000701	2.6	128.75	80.37	0.41	26.39	29.4
2211	16287	Max WS	224.78	112.56	117.68		117.99	0.000796	2.9	135.3	90.82	0.44	32.1	33.59
2211	16267	Max WS	227.39	112.67	117.7		117.94	0.000663	2.62	152.25	154.79	0.4	26.39	24.67
2211	16238	Max WS	229.92	112.22	117.67		117.93	0.000684	2.74	153.82	68.6	0.41	28.47	26.22
2211	16223	Max WS	232.47	111.9	117.64		117.92	0.00069	2.76	150.99	91.2	0.4	28.85	26.38
2211	16208	Max WS	234.6	112.12	117.64		117.9	0.000627	2.71	157.48	102.98	0.39	27.34	23.38
2211	16193	Max WS	235.89	112.12	117.64		117.89	0.000711	2.97	172.55	89.74	0.41	32.33	26.07
2211	16174	Max WS	236.39	112.02	117.62		117.87	0.000543	2.73	167.33	72.48	0.38	26.63	22.27
2211	16156	Max WS	236.46	111.08	117.63		117.84	0.000472	2.49	170.8	56.32	0.32	22.38	20.44
2211	16137	Max WS	237.23	111.64	117.54		117.87	0.000643	3	138.83	56.76	0.41	32.12	33.26
2211	16126	Max WS	240.71	111.71	117.55		117.81	0.000515	2.53	151.66	60.71	0.36	23.53	23.49
2211	16114	Max WS	240.76	111.15	117.48	114.87	117.79	0.000514	2.6	127.02	58.41	0.35	24.42	25.14
2211	16100	15-CPR	Bridge											
2211	16084	Max WS	240.76	111.47	115.36	115.58	117.07	0.005682	5.92	51.1	25.09	1.03	153.16	470.89
2211	16056	Max WS	240.76	111.44	115.02	115.84	117.6	0.010179	8.15	61.81	37.05	1.47	286.36	627.48
2211	16016	Max WS	242.94	111.41	114.63	115.11	116.41	0.008113	6.79	68.15	52.52	1.32	205.73	483.62
2211	15986	Max WS	240.76	111.38	114.7	114.77	115.61	0.004156	5.11	103.21	66.66	0.96	113.57	154.06
2211	15939	Max WS	240.76	111.31	114.66		115.31	0.003097	4.48	121.79	76.74	0.84	86.62	111.5
2211	15900	Max WS	240.76	111.04	114.72		114.98	0.001531	3.37	210.28	102.37	0.6	47.47	34.9
2211	15864	Max WS	240.76	110.6	114.71		114.89	0.000966	2.9	257.93	116.48	0.48	33.7	19.42
2211	15788	Max WS	240.76	110.29	114.66		114.81	0.00059	2.33	263.98	97.59	0.38	21.49	14.05
2211	15718	Max WS	240.76	110.21	114.64		114.77	0.000559	2.32	272.15	100.07	0.37	21.04	12.85
2211	15716		Lat Struct											
2211	15679	Max WS	239.34	110.03	114.56		114.8	0.000742	2.78	195.96	95.2	0.43	29.67	26.94

2211	15636	Max WS	235.56	109.62	114.38		114.76	0.000829	2.77	98.89	96.49	0.45	30.34	54.42
2211	15617	Max WS	241.38	109.71	113.92		114.73	0.001988	4.06	74.19	83.51	0.69	67.07	127.85
2211	15597	Max WS	238.64	109.06	114.16	111.99	114.39	0.000445	2.16	127.19	86.21	0.33	17.83	17.73
2211	15578	14-Kirwin Ave	Bridge											
2211	15562	Max WS	238.64	109	112.36		113.01	0.00237	3.59	67.72	28.27	0.71	58.29	185.01
2211	15546	Max WS	240.65	109.03	112.27	112.37	113.35	0.005059	4.64	56.72	39.57	1.01	103.42	286.66
2211	15530	Max WS	240.73	108.83	112.12	112.23	113.17	0.00499	4.74	65.1	42.62	1.01	106.4	261.35
2211	15513	Max WS	241.35	108.88	112.04	112.12	113.04	0.004422	4.6	67.22	45.78	0.96	98.67	221.94
2211	15497	Max WS	242	108.49	112	111.92	112.82	0.003465	4.19	74.84	45.72	0.85	80.58	173.04
2211	15478	Max WS	241.65	108.55	112.1		112.6	0.002108	3.54	104.57	52.38	0.68	55.42	91.91
2211	15459	Max WS	240.37	108.54	112.05		112.55	0.001904	3.45	112.97	68.03	0.65	51.95	64.16
2211	15440	Max WS	239.12	108.16	112.08		112.48	0.001397	3.11	118.12	57.98	0.56	41.14	54.01
2211	15423	Max WS	234.69	108.16	112.14		112.42	0.000979	2.63	132.48	53.2	0.47	29.31	39.53
2211	15405	Max WS	227.89	108.02	112.15		112.41	0.000811	2.53	130.91	46.92	0.44	26.4	35.61
2211	15388	Max WS	221.16	107.77	112.14		112.42	0.00087	2.89	133.28	43.36	0.46	32.64	39.52
2211	15370	Max WS	214.94	107.64	112.13		112.41	0.000724	2.75	133.93	42.38	0.43	28.98	32.96
2211	15351	Max WS	206.81	107.57	112.19		112.36	0.000421	2.13	160.79	49.96	0.33	17.25	15.9
2211	15332	Max WS	197.48	107.41	112.2		112.35	0.000408	2.14	174.46	65.05	0.33	17.28	11.42
2211	15313	Max WS	186.73	107.21	112.24		112.32	0.000576	1.34	157.63	43.92	0.2	25.89	21.23
2211	15294	Max WS	173.98	106.99	112.23		112.33	0.000212	1.63	142.13	36.25	0.24	9.72	8.7
2211	15280	Max WS	189.44	106.91	112.17		112.3	0.000279	1.65	131.07	35.27	0.25	10.6	12.78
2211	15279		Lat Struct											
2211	15265	Max WS	186.2	106.78	112.13		112.29	0.000383	1.8	112.08	36.07	0.29	13.09	17.17
2211	15250	Max WS	183.58	106.46	112.12	109.56	112.28	0.000416	1.8	103.01	36.4	0.29	13.36	23.03
2211	15204	13-Dundas St	Bridge											
2211	15140	Max WS	183.56	104.68	109.12		109.54	0.001401	2.87	63.98	16.9	0.47	36.44	104.54
2211	15139.1		Lat Struct											
2211	15139	Max WS	183.86	104.68	109.1		109.54	0.001436	2.93	62.81	15.91	0.47	37.8	110.64
2211	15138.5		Lat Struct											
2211	15138	Max WS	189.77	104.68	109.04	107.5	109.51	0.00162	3.03	62.67	17.21	0.51	40.98	124.07
2211	15135		Inl Struct											
2211	15131	Max WS	189.61	103.58	108.89		109.19	0.000804	2.43	78.14	18.54	0.38	24.68	59.89
2211	15114	Max WS	218.46	103.56	108.18		108.98	0.002692	3.98	54.91	15.27	0.67	70.08	278.83
2211	15096	Max WS	232.98	103.54	107.84	107.78	109.47	0.006626	5.66	41.19	12.23	0.98	148.79	841.68
2211	15079	Max WS	237.75	103.52	107.69		109.14	0.005406	5.33	44.64	12.84	0.91	129.2	688.17
2211	15061	Max WS	237.9	103.5	107.59	107.58	109.03	0.006039	5.31	44.77	15.56	1	132.35	703.2
2211	15044	Max WS	235.08	103.47	107.47		108.75	0.005063	5.01	46.9	16.11	0.93	116.06	577.04
2211	15026	Max WS	233.73	103.44	107.39		108.65	0.004318	4.98	47.85	16.65	0.88	110.39	482.32
2211	15010	Max WS	222.71	103.41	107.41		108.03	0.001996	3.53	68.73	22.84	0.63	54.44	156.67
2211	14994	Max WS	235.85	103.39	107.41		108.02	0.001968	3.5	72.11	23.8	0.63	53.52	157.79
2211	14978	Max WS	237.54	103.36	107.44		107.94	0.00148	3.21	77.16	25.41	0.57	43.81	113.98
2211	14962	Max WS	232.33	103.33	107.42		107.89	0.001685	3.06	78.89	29.3	0.58	42.14	114.39
2211	14946	Max WS	243.9	103.31	107.29		107.85	0.001995	3.43	82.11	29.25	0.64	51.99	140.63
2211	14930	Max WS	249.8	103.28	107.4		107.72	0.000989	2.58	101.45	32.4	0.46	28.5	63.94
2211	14913	Max WS	251.31	103.25	107.27		107.7	0.001122	3.06	103.29	31.7	0.52	37.98	74.15
2211	14895	Max WS	236.3	103.18	107.4	105.76	107.57	0.000476	1.86	146.59	92	0.33	14.56	16.8
2211	14878	12-King St E	Bridge											
2211	14858	Max WS	235.94	102.64	105.96		106.45	0.002938	3.57	109.14	103.75	0.73	60.98	80.84
2211	14857.9		Lat Struct											
2211	14813	Max WS	236.42	102.89	105.4	105.76	106.55	0.007804	5.34	95.92	153.81	1.23	142.32	150.8
2211	14746	Max WS	235.71	102.67	105.15	105.21	105.73	0.006053	4.18	121.63	147.79	1.06	92.45	115.45
2211	14642	Max WS	235.38	102.02	104.72	104.72	105.26	0.003839	3.68	128.53	190.9	0.86	68.1	65.96
2211	14592	Max WS	235.48	101.48	104.36	104.82	105.52	0.006717	5.26	92.13	142.52	1.14	133.94	131.35
2211	14533	Max WS	235.31	101.28	104.17	104.4	104.87	0.004082	4.16	117.53	165.83	0.91	83.14	56.46
2211	14491	Max WS	235.3	101.33	104.21		104.5	0.001403	2.67	187.82	240.42	0.55	32.67	15.5
2211	14443	Max WS	235.32	101.17	104.11	104	104.47	0.001998	3.02	167.55	234.23	0.64	43.12	20.42

BOC 100 year

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # C	Shear Char (N/m2)	Power Tota (N/m s)
2211	16993	Max WS	194.46	117.46	120.58		121.04	0.002181	3.29	108.23	95.56	0.67	50.07	43.05
2211	16936	Max WS	194.45	117.28	120.27	120.67	121.55	0.007217	5.25	56.86	131.99	1.18	135.8	198.61
2211	16896	Max WS	194.42	116.85	119.85	120.22	121.39	0.008923	5.5	36.02	20.74	1.28	153.88	764.02
2211	16891	Max WS	194.42	116.84	119.82	120.39	121.84	0.005086	6.44	35.85	21.98	1.46	78.63	366.95
2211	16882	Max WS	194.36	116.83	119.77	120.23	121.49	0.003226	5.9	34.42	20.05	1.31	61.5	286.61
2211	16869 18	Max WS	194.43	116.71	119.71	120.14	121.31	0.003763	5.6	34.72	20.2	1.36	59.13	331.14
2211	16853	Max WS	194.41	116.55	119.64	120.05	121.23	0.003264	5.61	35.34	20.02	1.29	57.2	288.38
2211	16850	Max WS	194.41	116.54	119.63	120.05	121.22	0.003299	5.61	35.3	20.02	1.29	57.35	290.1
2211	16845	Max WS	194.4	116.51	119.61	120.01	121.14	0.00352	5.48	35.5	20.16	1.32	56.23	307.93
2211	16844		Lat Struct											
2211	16839	Max WS	194.18	115.61	119.4	119.09	120.55	0.001197	4.79	46.68	21.81	0.82	35.12	90.75
2211	16823	Max WS	194.02	115.56	119.53		120.07	0.004038	3.4	70.63	46.47	0.58	116.08	155.99
2211	16806	Max WS	194.62	115.53	119.58		119.94	0.002479	2.81	85.75	44.73	0.48	74	98.22
2211	16787	Max WS	199.88	115.46	119.55		119.86	0.002047	2.54	92.65	49.91	0.43	63.33	76.23
2211	16767	Max WS	198.94	115.4	119.57		119.8	0.001532	2.21	102.41	45.22	0.37	49.6	61.87
2211	16754	Max WS	198.15	115.34	119.53		119.78	0.001652	2.28	99.49	47	0.4	50.47	66.19
2211	16738	Max WS	192.96	115.31	119.48	118.01	119.75	0.002016	2.36	88.57	40.47	0.42	59.29	88.24
2211	16734	17-Ped Bridge	Bridge											
2211	16730	Max WS	192.94	115.27	118.42		119	0.006042	3.42	59.5	31.27	0.72	131.4	345.47
2211	16719	Max WS	193.6	115.22	118.46		118.87	0.003755	2.88	74.04	41.27	0.58	89.34	165.34
2211	16707	Max WS	191.01	115.12	118.47	117.57	118.82	0.002884	2.64	79.57	40.66	0.51	74.45	126.54
2211	16704		Inl Struct											
2211	16702	Max WS	191.01	114.28	118.37		118.6	0.001677	2.18	93.81	40.5	0.39	49.57	73.49
2211	16686	Max WS	190.72	114.21	118.39		118.55	0.0011	1.86	129.43	68.78	0.32	35.86	28.95
2211	16670	Max WS	188.56	114.15	118.36		118.53	0.001124	1.93	117.31	49.76	0.33	37.24	39.78
2211	16654	Max WS	187.42	114.1	118.35		118.51	0.001031	1.86	123.89	53.33	0.32	33.96	33.89
2211	16637	Max WS	186.47	114.03	118.33		118.49	0.001077	1.88	120	54.2	0.32	35.8	34.62
2211	16617	Max WS	185.83	113.96	118.32		118.47	0.000948	1.79	131.74	101.4	0.3	32.4	24.04
2211	16598	Max WS	185.88	113.9	118.3		118.45	0.000925	1.8	134.59	83.02	0.3	31.62	19.6
2211	16578	Max WS	187.8	113.84	118.26		118.43	0.00048	1.9	125.76	65.74	0.32	16.45	12.81
2211	16560	Max WS	190.47	113.79	118.27		118.4	0.000346	1.71	164.28	82.21	0.28	12.16	7.91
2211	16543	Max WS	191.88	113.75	118.29		118.38	0.000493	1.54	175.33	110.31	0.25	17.85	10.17
2211	16525	Max WS	192.78	113.69	118.29		118.37	0.000513	1.43	189.19	132.26	0.23	19.04	9.89
2211	16505	Max WS	193.8	113.62	118.28		118.35	0.000506	1.4	198.24	142.64	0.23	18.35	9.61
2211	16486	Max WS	194.9	113.55	118.28		118.34	0.000423	1.3	221.08	155.32	0.21	15.14	7.69
2211	16466	Max WS	195.96	113.41	118.28		118.33	0.000399	1.27	230.9	142.08	0.21	14.25	7.1
2211	16446	Max WS	196.99	113.39	118.27		118.32	0.000216	1.44	259.05	149.38	0.23	8.16	3.43
2211	16431	Max WS	197.5	113.39	118.27		118.32	0.000182	1.3	269.64	154.78	0.21	6.69	2.75
2211	16416	Max WS	197.08	113.3	118.27		118.31	0.000169	1.25	270.47	155.85	0.2	6.16	2.5
2211	16401	Max WS	195.44	113.32	118.27		118.3	0.000105	1	293.09	149.22	0.16	3.89	1.56
2211	16384	Max WS	193.28	113.32	118.27		118.3	0.00013	1.11	300.6	146.75	0.18	4.82	1.8
2211	16368	Max WS	191.9	113.12	118.22		118.31	0.000265	1.68	187.07	134.3	0.26	10.8	6.54
2211	16351	Max WS	194.51	112.83	118.13	115.89	118.31	0.000473	2.11	138.94	132.91	0.31	20.64	17.02
2211	16338	16-Miss Val Bl	Bridge											
2211	16325	Max WS	194.51	113.04	117.41		117.64	0.001132	2.09	95.96	57.49	0.37	34.47	57.41
2211	16306	Max WS	194.92	112.73	117.34		117.63	0.000819	2.63	110.69	66.8	0.44	27.97	31.01
2211	16287	Max WS	196.01	112.56	117.31		117.63	0.000886	2.89	116.88	70.11	0.46	32.78	32.86
2211	16267	Max WS	196.13	112.67	117.33		117.58	0.000722	2.58	131.29	89.39	0.41	26.31	23.32
2211	16238	Max WS	196.47	112.22	117.31		117.56	0.000715	2.66	134.05	61.78	0.41	27.47	23.71
2211	16223	Max WS	197.48	111.9	117.29		117.55	0.000713	2.67	130.91	76.09	0.4	27.61	23.29
2211	16208	Max WS	198.39	112.12	117.29		117.53	0.000639	2.6	136.65	96.26	0.39	25.9	20.28
2211	16193	Max WS	198.98	112.12	117.29		117.53	0.00072	2.85	151.41	76.09	0.41	30.56	22.39
2211	16174	Max WS	199.29	112.02	117.27		117.5	0.000529	2.57	148.54	56.43	0.37	24.21	18.39
2211	16156	Max WS	199.22	111.08	117.28		117.47	0.000439	2.31	154.05	52.29	0.31	19.65	16.14
2211	16137	Max WS	199.57	111.64	117.2		117.49	0.000592	2.77	124.88	54.37	0.39	27.82	26.63
2211	16126	Max WS	196.62	111.71	117.24		117.45	0.000449	2.26	136.06	58.36	0.33	19.23	17.33
2211	16114	Max WS	191.71	111.15	117.18	114.43	117.41	0.000409	2.23	113.6	56.63	0.31	18.39	16.18
2211	16100	15-CPR	Bridge											
2211	16084	Max WS	196.63	111.47	115.04	115.11	116.46	0.005346	5.37	44	21.31	0.98	130.58	418.77
2211	16056	Max WS	196.63	111.44	114.74	115.53	117.11	0.010163	7.64	51.6	35.54	1.45	260.15	534.24
2211	16016	Max WS	196.63	111.41	114.33	114.8	115.98	0.008469	6.41	56.77	49.18	1.32	191.01	423.84
2211	15986	Max WS	196.63	111.38	114.25	114.45	115.35	0.005852	5.41	72.98	58.43	1.11	134.75	226.81
2211	15939	Max WS	196.63	111.31	114.17	114.06	114.95	0.004396	4.72	91.13	64.72	0.97	102.39	133.54
2211	15900	Max WS	196.62	111.04	114.23		114.53	0.002135	3.57	161.3	95.91	0.68	56.13	42.45
2211	15864	Max WS	196.62	110.6	114.2		114.43	0.001323	3.07	198.95	114.74	0.55	39.76	22.02
2211	15788	Max WS	196.61	110.29	114.15		114.3	0.000705	2.31	214.68	94.38	0.41	22.22	14.19
2211	15718	Max WS	196.61	110.21	114.12		114.26	0.000679	2.33	220.11	98	0.39	22.32	13.11
2211	15716		Lat Struct											
2211	15679	Max WS	196.03	110.03	114.04		114.27	0.000832	2.7	164.11	94.96	0.45	29.2	24.95

2211	15636	Max WS	194.88	109.62	113.87		114.22	0.000929	2.67	82.24	94.72	0.46	29.48	52.01
2211	15617	Max WS	196.43	109.71	113.42		114.18	0.002227	3.89	59.06	27.15	0.71	64.69	148.55
2211	15597	Max WS	196.3	109.06	113.63	111.73	113.84	0.000483	2.06	102.97	33.65	0.34	16.98	25.26
2211	15578	14-Kirwin Ave	Bridge											
2211	15562	Max WS	196.29	109	112.12		112.66	0.002196	3.25	61.23	27.63	0.67	49.18	144.89
2211	15546	Max WS	196.81	109.03	112.03	112.08	112.97	0.005102	4.31	47.37	38.85	0.99	92.81	242.28
2211	15530	Max WS	196.63	108.83	111.88	112	112.82	0.005106	4.45	54.87	41.87	1	97.17	223.52
2211	15513	Max WS	196.63	108.88	111.79	111.87	112.69	0.00449	4.3	55.94	43.54	0.95	89.53	193.84
2211	15497	Max WS	196.54	108.49	111.7	111.67	112.47	0.003738	3.99	61.32	45.02	0.87	76.38	155.1
2211	15478	Max WS	195.98	108.55	111.75		112.22	0.002336	3.41	86.34	50.95	0.7	53.6	85.49
2211	15459	Max WS	195.81	108.54	111.66		112.19	0.00234	3.47	86.26	67.09	0.7	55.04	65.56
2211	15440	Max WS	196.37	108.16	111.7		112.09	0.001584	3.03	96.48	55.45	0.59	40.87	52.85
2211	15423	Max WS	194.25	108.16	111.76		112.02	0.001076	2.53	112.4	51.97	0.49	28.29	37.03
2211	15405	Max WS	190.19	108.02	111.76		112	0.000866	2.42	113.05	46.04	0.44	25.03	32.59
2211	15388	Max WS	186.33	107.77	111.75		112.01	0.000906	2.75	116.57	42.51	0.46	30.66	35.65
2211	15370	Max WS	183.23	107.64	111.74		112	0.000756	2.63	117.42	41.23	0.43	27.42	30.4
2211	15351	Max WS	179.06	107.57	111.78		111.94	0.00046	2.08	140.64	49.05	0.34	17.04	15.44
2211	15332	Max WS	173.81	107.41	111.79		111.93	0.000422	2.04	150.2	52.6	0.33	16.23	12.78
2211	15313	Max WS	167.21	107.21	111.83		111.91	0.000656	1.34	140.21	41.61	0.21	26.86	23
2211	15294	Max WS	159.62	106.99	111.8		111.91	0.000248	1.65	126.95	35.64	0.25	10.33	9.58
2211	15280	Max WS	169.52	106.91	111.76		111.89	0.000309	1.65	116.42	35	0.26	10.86	12.98
2211	15279		Lat Struct											
2211	15265	Max WS	168.66	106.78	111.7		111.87	0.000465	1.86	96.37	35.78	0.31	14.45	19.35
2211	15250	Max WS	167.74	106.46	111.68	109.42	111.86	0.000506	1.85	91.2	36.39	0.31	14.68	25.95
2211	15204	13-Dundas St	Bridge											
2211	15140	Max WS	167.74	104.68	108.69		109.13	0.001678	2.96	56.58	16.9	0.52	40.04	118.7
2211	15139.1		Lat Struct											
2211	15139	Max WS	167.99	104.68	108.67		109.13	0.001677	3	55.94	15.9	0.51	40.82	122.58
2211	15138.5		Lat Struct											
2211	15138	Max WS	172.3	104.68	108.6	107.33	109.1	0.001938	3.12	55.19	17.13	0.56	44.87	140.07
2211	15135		Inl Struct											
2211	15131	Max WS	172.3	103.58	108.41		108.73	0.000929	2.48	69.44	18.19	0.41	26.45	65.64
2211	15114	Max WS	188.93	103.56	107.86		108.58	0.002579	3.77	50.07	14.69	0.65	64.03	241.59
2211	15096	Max WS	196.77	103.54	107.44	107.33	108.92	0.00649	5.4	36.44	11.4	0.96	138.06	745.56
2211	15079	Max WS	196.58	103.52	107.33		108.56	0.004966	4.9	40.09	12.44	0.87	111.71	547.71
2211	15061	Max WS	196.71	103.5	107.22	107.07	108.5	0.005686	5.02	39.21	14.03	0.96	119.6	600
2211	15044	Max WS	196.7	103.47	107.13		108.27	0.004937	4.73	41.56	15.13	0.91	105.79	500.68
2211	15026	Max WS	196.35	103.44	107.06		108.17	0.004196	4.66	42.52	15.37	0.85	99.13	424.09
2211	15010	Max WS	197	103.41	107.12		107.71	0.002135	3.46	61.92	22.84	0.65	53.53	151.49
2211	14994	Max WS	198.53	103.39	107.14		107.66	0.001843	3.22	65.8	23.8	0.6	46.46	126.76
2211	14978	Max WS	200.36	103.36	107.18		107.61	0.001391	2.95	70.73	25.41	0.55	37.95	91.87
2211	14962	Max WS	196.18	103.33	107.12		107.54	0.001724	2.9	70.22	29.3	0.58	38.95	100.56
2211	14946	Max WS	202.06	103.31	107.05		107.5	0.001811	3.1	74.95	29.25	0.6	43.73	107.33
2211	14930	Max WS	206.39	103.28	107.13		107.39	0.000893	2.33	92.74	32.4	0.43	23.86	48.4
2211	14913	Max WS	206.04	103.25	107.05		107.38	0.000934	2.68	96.46	31.7	0.47	29.68	51.21
2211	14895	Max WS	191.95	103.18	107.16	105.45	107.29	0.000421	1.66	130.83	68.92	0.31	11.87	12.12
2211	14878	12-King St E	Bridge											
2211	14858	Max WS	191.95	102.64	105.74		106.21	0.002931	3.36	92.07	101.58	0.72	55.56	65.77
2211	14857.9		Lat Struct											
2211	14813	Max WS	191.85	102.89	105.28	105.58	106.26	0.007055	4.85	81	133.21	1.16	120.11	117.78
2211	14746	Max WS	191.02	102.67	104.98	105.06	105.53	0.006304	3.97	102.29	133.21	1.06	86.37	100.43
2211	14642	Max WS	190.89	102.02	104.56	104.54	105.04	0.003643	3.39	108.54	155.6	0.82	59.34	53.44
2211	14592	Max WS	190.67	101.48	104.18	104.65	105.23	0.006503	4.89	73.75	102.11	1.1	119.12	128.27
2211	14533	Max WS	190.56	101.28	104.01	104.14	104.65	0.003857	3.85	94.47	136.31	0.87	72.85	52.55
2211	14491	Max WS	190.45	101.33	104.05		104.3	0.001317	2.46	154.61	198.86	0.52	28.54	12.91
2211	14443	Max WS	190.51	101.17	103.94	103.85	104.28	0.002006	2.87	130.91	193.14	0.63	39.87	19.31

APPENDIX B
Geomorphic Assessment

1 INTRODUCTION

The City of Mississauga initiated a Class Environmental Assessment to identify and select alternative methods for addressing erosional concerns along Cooksville Creek from upstream of Mississauga Valley Boulevard to the CP Rail (Figure 1). Through the City of Mississauga's ongoing erosion monitoring program, this section of channel has been identified as a high priority site in need of rehabilitation, based on continued erosion and risk to adjacent property and infrastructure.

Characterization of the geomorphological conditions along the 376 m of Cooksville Creek from the CP rail crossing to Mississauga Valley Boulevard was accomplished through review of historical data, background materials, field assessments, and data analyses. The intent of the geomorphic assessment was to gain insight into channel form and functions to inform the selection and evaluation of alternatives for channel restoration. An overview of the geomorphic characterization completed for this study is provided within this technical report.

2 BACKGROUND INFORMATION AND HISTORICAL CHANGES

2.1 Study Area Overview

Cooksville Creek has been the focus of numerous studies, dating back to the early 1990s, which were aimed at documenting channel conditions and understanding channel processes within bedrock-controlled watercourses in urban settings.

The City of Mississauga initiated the Cooksville Creek Rehabilitation Study in 1997 (TSH). That study includes a comprehensive assessment of Cooksville Creek and indicates that, prior to urbanization, the creek was a meandering watercourse that was situated in a relatively thin cover of unconsolidated materials overlying the bedrock. Urban development generally proceeded upstream from Lake Ontario and, by 1977, had extended along the main branch to upstream of the west and east tributary confluence at Highway 403 (Tinkler and Parish, 1998). The current study is situated in Reach 4(d) of the TSH (1997) study.

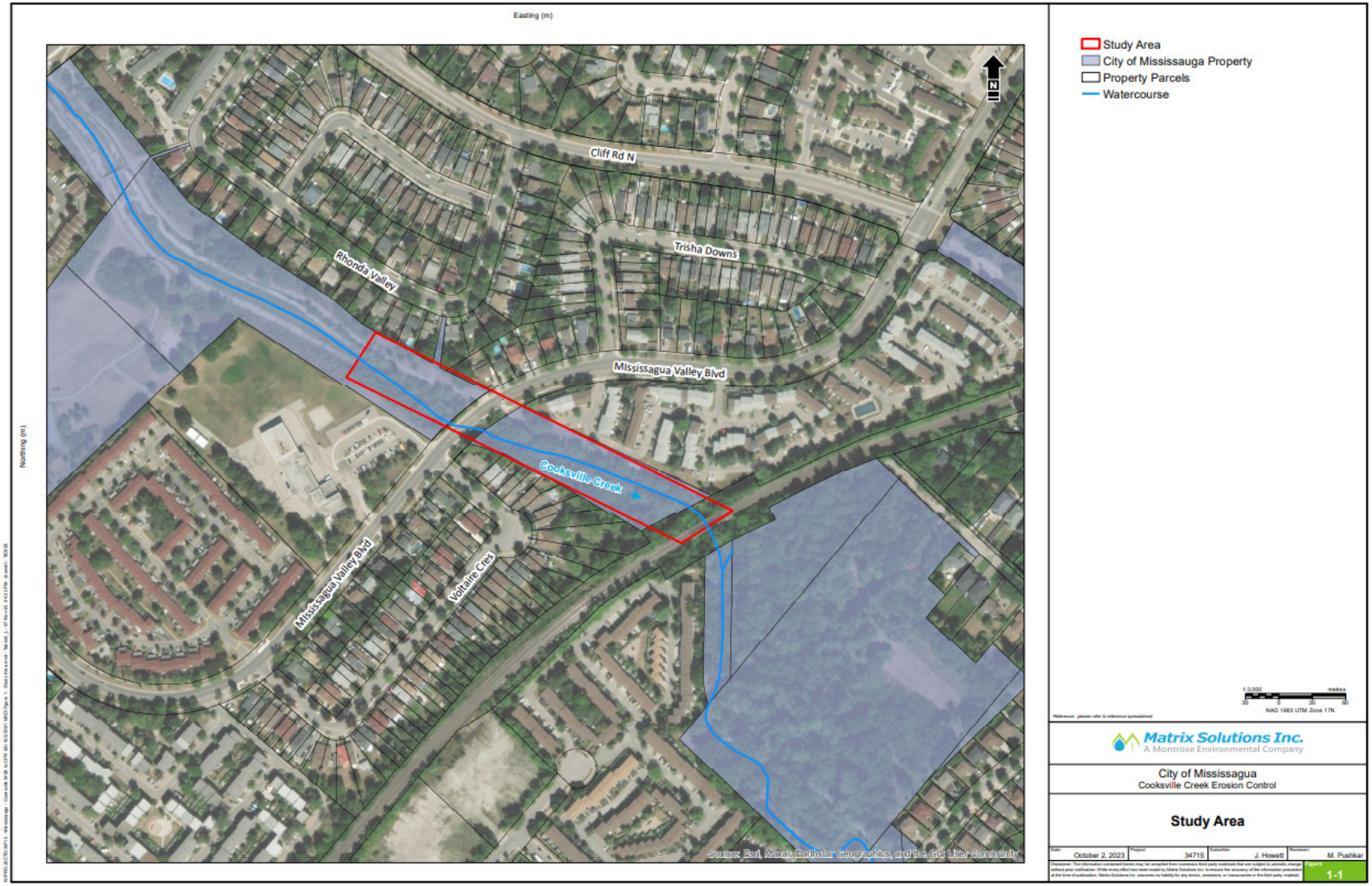

FIGURE 1 Cooksville Creek Erosion Control Study Area

The Public Works Technical Services Division of the City of Mississauga completed a detailed examination of Cooksville Creek in January and February 1990. Areas of potential erosion observed were classified as low, medium or high priority. There were no locations identified within the study area in the 1990 report.

A site description for Reach 4(d), provided in the TSH (1997), report indicated the following conditions:

- High banks along the channel create an entrenched setting;
- The channel valley displays steep banks at the CPR crossing and is channelized from this location to Central Parkway;
- Measurements of channel form were completed downstream of the current study area, in TSH (1997) Reach 4b. Approximately 200 m upstream of Kirwin Avenue the following measurements: Top of bank width = 8.2 m, top of bank average depth= 0.54 m, width/depth ratio = 15.19, low flow width = 6.3 m, low flow average depth = 0.16 m, bed materials = coarse sand and cobbles (limestone), bank materials = armourstone and sand. The cross-section was described as parabolic in shape.
- Rates of downcutting in Reach 4b were 7.1 cm/yr
- Gabion baskets were observed on the channel bed, downstream of Mississauga Valley Boulevard.
- Concrete bed and bank materials were noted at Mississauga Valley Boulevard.

TSH (1997) provided further discussion of rock bed systems including the following:

- Steep gradient, sediment starvation and quasi-horizontal well-bedded lithology of the bedrock channel results in low roughness and abundant gravitational energy for flowing water;
- The rock bed is nearly flat and smooth, and provides low resistance to flow; once sediment is entrained the channel bed provides a maximized working surface relative to weight and width of turbulent flow vectors in the stream.

Concerns that have previously been communicated to the City of Mississauga, regarding Cooksville Creek and the channel corridor, included the following:

- Development in the northern portion of the watershed was identified as a concern since this was perceived as worsening flooding and erosion conditions.
- Flooding events have been associated with loss and damage to private property (basement flooding).

2.2 Historical Conditions

A sequence of historical airphotos was obtained from the City of Mississauga (1954, 1975, 1992, and 2017). Review of aerial photography provides insight into changes that have occurred within the watershed, to the drainage network, and within the immediate study area (Error! Reference source not found.). A summary of key observations is provided in Table 1 and excerpts of the airphotos that focus on the study area are provided in Appendix A.

TABLE 1 Overview of historical changes along Cooksville Creek in proximity to the study area.

Image year	Key observations
1954	Upstream of the CPR crossing to the existing Mississauga Valley Boulevard, Cooksville Creek flows through agricultural fields, with a natural meadow present on the north bank. The channel demonstrates a low sinuosity pattern and is generally straight. Further upstream of the study area, the channel exhibits more natural meandering tendencies, suggesting in-channel works and channel realignment may have occurred through the study reach to allow for agricultural practices.
1975	Residential development has been established around the study area. Channel modifications, including straightening and armouring of the watercourse through the study reach has occurred, likely as a result of development through the area. The Mississauga Valley Boulevard crossing has been established through the study area.
2000	Development surrounding the study area resembles that of existing development conditions by 2000. Channel planform is also comparable to the current channel configuration between Mississauga Valley Boulevard and the CP Rail.
2016	Channel works (channel hardening) upstream of Mississauga Valley Boulevard is ongoing through 2016, with works completed by 2018.

Tinkler and Parish (1998) provided the following details regarding channel conditions and changes that have occurred along Reach 4 (Dundas Street to Central Parkway):

- The channel along much of Cooksville Creek was straightened between 1977 to 1990;
- From the Dundas Street crossing downstream of the project area to the upstream reach limit at Central Parkway, the channel length decreased by 212 m (i.e., ~ 11% reduction) between 1954 and 1990 (i.e., from 1928 m to 1716 m) due to channel straightening (TSH,1997). Along this length of channel, bank protection measures were placed along both banks in 1978 for a total bank length of ~ 1120 m;
- Channel width increased from 4.5 m in 1954 to 5.4 m in 1990; and
- Channel bed degradation rates were measured to be ~ 0.071 m/yr between 1978 and 1994.

Historical changes within the watershed and of the drainage network may upset the equilibrium balance of a watercourse due to urban hydro-modification and change in channel slopes (i.e., steepening due to loss of channel length). Within the Cooksville Creek watershed, much of the urban development occurred

prior to the implementation of stormwater management. The resultant change to the hydrologic regime of the watershed has resulted in a flashier hydrograph, an increase in flow magnitude and more frequent flow events in the channel (i.e., precipitation events that previously would have infiltrated into the ground are now diverted into the creek through storm sewers, raising the flows above base level more frequently than in the pre-urban condition).

A reduction in channel length due to straightening and/or removal of low order tributaries from the drainage network (i.e., elimination or piping) increases energy potential and may exacerbate hydrologic effects from urbanization (i.e., faster conveyance of water to the main branch of the channel through a storm sewer network). Specifically, when there is a reduction in channel length, the slope of the realigned channel will increase (i.e., shorter distance over the same vertical elevation drop). The increased slope contributes to an increase in energy conditions.

3 EXISTING FIELD CONDITIONS

Existing conditions and an understanding of channel functions within Cooksville Creek were established through completing field investigations and hydro-geomorphic analyses.

The geomorphic field assessment was completed on April 26, 2022 to document existing conditions, to collect field measurements, and to establish cross-section locations for the subsequent topographic survey.

The extent of the field assessment is illustrated on Error! Reference source not found.. A general description of study area conditions is provided below, followed by a discussion of field data results and analyses. Photographs illustrating reach conditions are included in the descriptions.

3.1 Site Conditions

The study area originates upstream of Mississauga Valley Boulevard where Cooksville Creek transitions from a concrete lined (bed) section of channel into a less engineered (i.e., natural bed) channel section. The downstream study reach limit occurs at the CP rail crossing. Moving upstream from the CP rail crossing, both channel banks are lined with armourstone for approximately 140 m. Locally, on the north channel bank, directly upstream of the CN rail crossing, the bank is protected by gabion baskets which have corroded/failed and lack gabion stone. Through the section of channel that has banks protected with armourstone, the height varies from 3-tiers, 2-tiers and single tiered protection. Overall, the armourstone banks were considered intact and functioning; locally, minor issues of outflanking and/or undermining were observed. Two sanitary sewer crossings occur within the study area, one crossing occurs directly upstream of the CP rail crossing, and the second crossing occurs approximately 130 m further upstream. These are evident in the channel bed profile; see Figure 2. Some areas of the west floodplain along the armourstone lined bank section were saturated, which may indicate groundwater inputs and/or flows overtopping the channel banks.

Upstream of the armourstone lined bank section, the banks of the channel are lined with gabion bank protection, with local areas of natural banks; this extends for approximately 80 m to the Mississauga Valley Boulevard crossing. The gabions were generally in poor condition, demonstrating corrosion and/or lack of gabion stone within the baskets. In areas where natural banks occurred, root control was present.

Underneath Mississauga Valley Boulevard, concrete slabs line the channel cross-section. The concrete was generally in-tact with cobble stone embedded within the concrete. At the bottom of the trapezoidal cross-section, the concrete slabs create a defined low flow channel. Gabions are present underneath the concrete slabs; the gabions are corroded and emptied of gabion stone. On the upstream west side of the bridge, scour has occurred along the channel bank.

Upstream of Mississauga Valley Boulevard, the channel exhibited natural banks for approximately 50 m. Some bank erosion was evident on the south channel bank directly upstream of Mississauga Valley Boulevard. Through the remaining 50 m of the study reach, the channel banks were protected with gabion baskets. Similar to the downstream protection, the gabions were generally in disrepair with lack of gabion stone in the baskets, outflanking and undermining of the protection present.

Overall, this length of the watercourse is characterized by structural controls that define channel cross-sections and profile configuration.

3.2 Channel Planform and Profile

The planform configuration of Cooksville Creek is relatively straight through the study area. The straight planform is associated with the historical channel modifications and hardening of the channel banks.

The channel bed profile was surveyed along the thalweg of the study area for the purpose of the geomorphic assessment. The thalweg typically meanders within the channel and thus the length of the thalweg profile is longer than the reach. The thalweg profile provides additional detail of channel bed configuration and controls and is therefore appropriate for the geomorphic assessment. Figure 2 clearly reveals that there is variability in the channel bed profile with respect to bed morphology, slope trends, and the presence of grade control structures (infrastructure protection). The study reach is characterized by a pool-riffle sequence with notable deep pools, having residual depth from downstream to upstream of 0.66 m (near the CP Rail) , 0.62 m (downstream of the exposed concrete encased sanitary sewer), 0.50 m (upstream of Mississauga Valley Boulevard) and 0.65 m (near upstream limit of study area) A long pool (~ 80 m) was present upstream of the weir grade control structure located between the CP rail crossing and Mississauga Valley Boulevard.

The overall gradient of the reach, from upstream of Mississauga Valley Boulevard to the CP Rail is 0.59%. Slope units were defined, as demonstrated in Figure 2.

3.3 Cross-Sections and Substrate

As part of the geomorphic channel assessment, nine (9) cross-sections were surveyed and assessed (Figure 2). Since the channel has been previously modified and is lined by gabions and/or armourstone along much of its length, the geomorphic characterization of channel form was limited to the defined/constructed form. Table 2 provides an overview of channel dimensions based on the surveyed cross-sections. Overall, the cross-sections appeared symmetrical, which was expected given the historical alteration of channel form and engineered banks.

Substrate materials were measured using the Wolman (1954) pebble count technique. The substrate was primarily that of coarse gravel to small cobbles in riffles.

TABLE 2 Overview of Field Site Measurements

	Minimum	Maximum	Average
Average grade (%)		0.59	
Section length (m)	22.87	39.90	32.66
Bankfull Width (m)	7.16	13.38	10.11
Max. Bankfull Depth (m)	0.88	2.09	1.50
Avg Bankfull Depth (m)	0.68	1.71	1.06
Bankfull Channel Area (m^2)	5.71	21.17	10.88
Width: Depth ratio (m/m)	6.78	15.96	10.21
Channel Perimeter (m)	8.79	17.10	12.61
Hydraulic radius (m)	0.46	1.24	0.85
Substrate (mm) D5 D10 D16 D25 D35 D50 D65 D75 D84 D90 D95	 5 10 10 20 25 50 80 100 120 150 150		

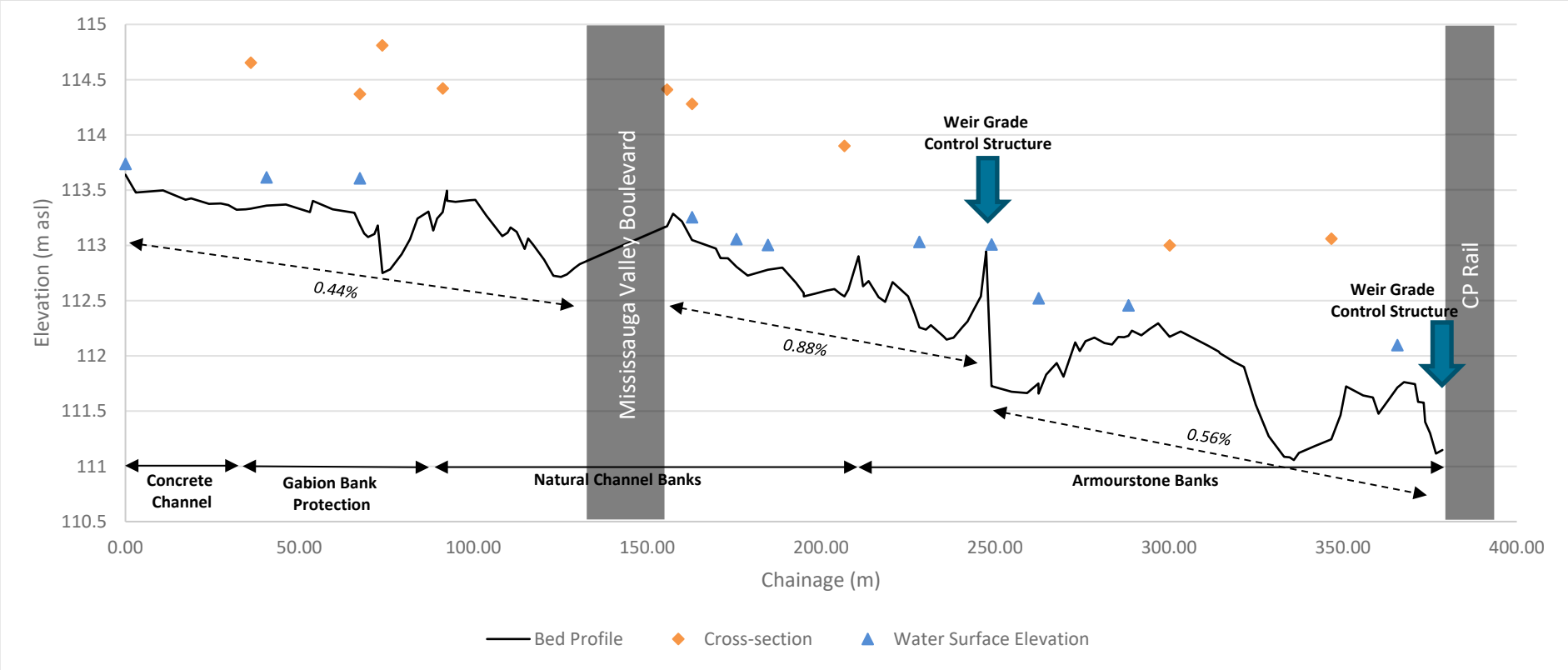

FIGURE 2 Channel bed profile with cross-section locations and average bed gradients.

3.4 Hydrogeomorphic Conditions

The updated hydraulic model of the study area was used as a basis for the hydro-geomorphic assessment. Since the intent of the analyses was to examine existing hydraulic conditions, the existing (rather than future) flows were used for the assessment. Results of the assessment are summarized in Table 3 and discussed below.

3.4.1 Channel Capacity

The flow events that are contained in the cross-sections, and those that begin to access the floodplain, were examined in the HEC-RAS model. Results (Table 3) indicated that the cross-sections were generally unable to contain the estimated bankfull flow (< 60% of the 2-year event) in the downstream portions of the study area (i..e., larger than bankfull events spill onto the floodplain). Capacity of the channel increases in the upstream direction, with the 2-year event contained within the cross-section. Based on the channel capacity results, all flows greater than the 2-year event spill onto the adjacent floodplain throughout the study area.

3.4.2 Floodplain Connectivity

The connectivity of the channel to the floodplain determines whether flood flow energy remains largely focused within the channel cross-section, or becomes dissipated on the floodplain. That is, while the analyses of channel capacity indicated that the estimated 'bankfull' flows (i.e., ~ 60% of the 2-year flow) were generally associated with the top of bank channel capacity, the configuration of the floodplain adjacent to the banks determines how far flood waters extend into the floodplain. The assessment of floodplain connectivity thus provides insight into which flow events tend to remain within the channel cross-section and those which flow events spill onto the floodplain. Examining channel and floodplain interactions is especially relevant in urban systems where an increase in water depth and energy conditions within the creek can increase erosive conditions beyond a threshold of tolerance.

Entrenchment ratio, as defined by Rosgen (1994) is the ratio of the flood width at twice the bankfull depth (~ equivalent to the 50-year flood event) to the estimated bankfull width (60% 2-year flood event). Rosgen (1994) suggests that when the ratio is < 1.1, then flows are 'entrenched' and remain within the cross-section; ratios 1.2 – 1.4 indicate moderate entrenchment, and ratios larger than 1.4 indicate partial entrenchment. Review of Table 3 reveals that the entrenchment ratio was above 1.4 through the study area. Overall, the study area is considered to be partially entrenched.

3.4.3 Stream Power, Shear Stress, and Sediment Entrainment Potential

A summary of the hydraulic conditions associated with the estimated bankfull (60% of the 2 year) flows are provided in Table 3. Review of the table indicates that the flow energy (i.e., stream power) of the estimated bankfull flow are moderate to relatively high with values ranging from 8.78W/m^2 to 406.99 W/m^2. The stream power values are within the naturally occurring range associated with meandering to braided type channels as per established stream power classifications (Brookes (1988), Nanson and Croke (1992)).

The shear stresses exerted on the channel bed demonstrate similar trends as the stream power.

The grain sizes that are, theoretically, entrainable during estimated bankfull flows are smaller than 0.08 m throughout the entire study area (Table 3). This size corresponds to the D65 of the measured substrate gradation (Table 2), suggesting that the D50 of the substrate gradation may be mobile during larger flows. Analyses of sediment entrainment potential were extended to the full range of existing flow events represented in the HEC RAS model; review of the results indicated that similar to bankfull flows, stone smaller than the D50 could be entrained.

TABLE 3 Hydraulic Parameters and Potential Sediment Mobility During 60% of the 2-year Flow Event.

HEC Stn	Flow Event Capacity of Section	60% of 2-theseyear flow	Velocity (m/s)	Froude	Stream Power (W/m^2)	Estimated Stream Type	Shear stress (N/m^2)	Grain Entrainable (m)	Grain Transportable (m)	Entrenchment Ratio
16525	2 year	39.12	1.11	0.29	17.4	Meandering	15.74	0.02	0.04	5.36
16446	2 year	39.12	1.98	0.55	106.37	Braided	53.84	0.07	0.15	10.27
16401	60% 2 year	39.12	2.58	0.67	153.51	Braided	59.39	0.08	0.27	10.27
16351	< 60% 2 year	39.12	2.03	0.52	126.86	Braided	62.41	0.09	0.16	5.51
Mississauga Valley Boulevard										
16325	60% 2 year	39.12	2.02	0.54	120.52	Braided	59.77	0.08	0.16	1.40
16248	60% 2 year	39.12	2.84	0.73	131.73	Braided	46.34	0.06	0.33	6.17
16238	60% 2 year	39.12	2.07	0.5	49.35	Meandering	23.88	0.03	0.17	5.83
16193	< 60% 2 year	39.12	2.52	0.59	83.4	Braided	33.07	0.05	0.25	3.67
16137	< 60% 2 year	39.66	1.46	0.29	14.98	Meandering	10.22	0.01	0.08	2.50
16114	60% 2 year	39.66	1.21	0.26	8.78	Meandering	7.25	0.01	0.05	2.10
CPR Bridge										
16084	< 60% 2 year	39.66	1.59	0.35	20.41	Meandering	12.85	0.02	0.09	2.19
16056	< 60% 2 year	39.66	3.62	0.95	261.98	Braided	72.31	0.10	0.56	3.72
16016	< 60% 2 year	39.66	4.03	1.29	406.99	Braided	101.1	0.14	0.70	2.63

3.5 Geomorphic Processes

Geomorphic understanding of Cooksville Creek through the study area was gained through completing a review of background documents, a field investigation, and data analyses. A summary of geomorphic processes that affect channel stability and erosion is provided in this section.

The profile of all watercourses tends to exhibit a concave up configuration and is adjusted (or works to adjust) to a downstream base level control point. Base level control points are elevation points along the channel, and typically occur at the mouth. The elevation of this point either does not change, or changes very gradually (e.g., lower lake levels over time). Through the study area, two grade control features are present in the form of sanitary sewer crossings. The concrete encased sanitary sewer crossings create backwater conditions and reduce the local energy grade; deposition of sediment was observed in the pools.

Unlike other portions of Cooksville Creek, the interbedded siltstone/limestone and shale bedrock of the Georgian Bay Formation was not exposed within the study area. The presence of alluvial cover reduces the rate of bedrock exposure; cover was relatively consistent along the length of channel through the study area. In shale bedrock watercourses, knickpoints tend to occur which gradually regress in an upstream direction. While this is observed along other reaches of Cooksville Creek, within the current the study area, no well-defined bedrock knickpoints were present. Given the alluvial cover, protection from some erosion is provided, this reduces the rate of channel bed incision.

The historical changes in channel length and flows that accompanied urban development have altered the flow regime and channel processes of Cooksville Creek. TSH has indicated that low flows have decreased by 30% due to urbanization and peak flows have increased by 10%. Review of the potential channel capacity through the study area indicates that the estimated bankfull flows typically fill the capacity of the bankfull channel, with local areas where the estimated bankfull flow is able to spill onto the adjacent floodplain.

Review of the HEC-RAS data and associated analyses indicated that moderate to high energy conditions occur throughout the study area, with local areas of lower energy. When the stream power conditions were compared to stream type classifications (e.g. Nanson and Croke, 1988), then it was evident that through most of the study area, the naturally stream type was a meandering or braided type channel (Table 3). Areas where energy conditions indicate a braided type channel may indicate areas of higher energy through what would naturally be considered a meandering type watercourse. The planform of Cooksville Creek, between the CP rail and upstream of Mississauga Valley Boulevard, is relatively straight. Meandering of the thalweg and formation of alternate bars within the channel may be anticipated. At areas of thalweg contact with the channel banks, erosion may be expected to occur, in the long term, compromising the condition of erosion control measures.

3.6 Recommendations

Through the review of background materials and the geomorphic assessment completed for the study area, several recommendations have been identified for consideration when developing alternative solutions. A summary of general and specific considerations for enhancement of existing conditions is provided in Table 4.

TABLE 4 Key Issues Affecting the Study Area Along Cooksville Creek

Key Issue	Description
Bedrock	The study area is underlain by interbedded dolomitic siltstone, limestone and shale. Bedrock was protected by an accumulation of alluvium in the study area. Gradual lowering/downcutting of bedrock in the study area could lead to the exposure of bedrock on the channel bed and undermining of erosion control measures (i.e., gabion baskets and armourstone banks).
Channel form and function	The form and function of Cooksville Creek have been altered and constrained. This includes a loss of sediment supply, loss of diversity in cross-section, planform, and profile. Hydraulic conditions increase the potential of substrate entrainment. Re-establishment of channel form and function, in support of aquatic habitat creation, and flow management is recommended. Opportunities exist to enhance the morphological form and function of the study area. Given the narrow channel corridor, where establishing a meandering planform is not feasible, management of the low-flow is recommended to provide longer term protection of the erosion control measures.

4 SUMMARY

A geomorphological assessment was completed for the section of Cooksville Creek that extends ~ 376 m from upstream of Mississauga Valley Boulevard to the CP Rail. The intent of the assessment was to document existing conditions and to gain an understanding of channel functions and processes within the study area. The geomorphic assessment included a review of background materials, a review of historical aerial imagery, field investigations, and data analyses.

Cooksville Creek, including the study area, has been the focus of various studies, dating back to the 1990s. Background information provides a context and understanding of existing conditions. Key controls on the configuration of Cooksville Creek included armouring of the channel banks (armourstone, gabion baskets), infrastructure within the channel corridor including sanitary sewer crossings beneath the channel, and the urban influence of the surrounding landscape.

Key factors that affect morphological form and function, and those which contribute to the failure of erosion control materials within the study area were identified. This included age of materials (e.g., gabions near the end of their design life), and undersized channel crossings (i.e., smaller than bankfull

flows spill onto the floodplain) and contribute to overtopping scour. Results from analyses indicated that the channel cross-section is generally undersized, enabling flows less than the estimated bankfull flow to spill onto the floodplain. Considerations for enhancement of existing conditions were recommended. Exposure of the sanitary sewer between the CP Rail and Mississauga Valley Boulevard has contributed to scour pool formation.

APPENDIX C
Natural Environment

DRAFT

Matrix Solutions Inc.
A Montrose Environmental Company

COOKSVILLE CREEK EROSION CONTROL PROJECT ENVIRONMENTAL ASSESSMENT MISSISSAUGA VALLEY BOULEVARD TO THE CANADIAN PACIFIC RAIL CROSSING

NATURAL HERITAGE ASESSMENT

Prepared for:
CITY OF MISSISSAUGA

Prepared by:
MATRIX SOLUTIONS INC., A MONTROSE ENVIRONMENTAL COMPANY

Version 0.1
December 2023
Guelph, Ontario

Unit 7B, 650 Woodlawn Rd. W
Guelph, ON, Canada N1K 1B8
T 519.772.3777 F 226.314.1908
www.matrix-solutions.com

COOKSVILLE CREEK EROSION CONTROL PROJECT ENVIRONMENTAL ASSESSMENT MISSISSAUGA VALLEY BOULEVARD TO THE CANADIAN PACIFIC RAIL CROSSING NATURAL HERITAGE ASSESSMENT

Prepared for City of Mississauga, December 2023

Emily Ottens, B.Sc., M.BEMA
Ecologist

reviewed by
Kierian Keele, B.Sc.
Ecologist

CONTRIBUTORS

Name	Job Title	Role
Emily Ottens, B.Sc., M.BEMA	Ecologist	Primary author
Kelsey Reich	Environmental Technologist	Co-author
Kierian Keele, B.Sc.	Ecologist	Reviewer

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IN-TEXT TABLES

APPENDICES

1 INTRODUCTION

1.1 Natural Environment

The City of Mississauga (the City) retained Matrix Solutions Inc., a Montrose Environmental company to complete an erosion control Municipal Class Environmental Assessment (EA) for Cooksville Creek for the reach located upstream of Mississauga Boulevard (approximately 100 m) and downstream to the Canadian Pacific (CP) rail crossing. The subject lands (approximately 1.66 ha in size) include this section of Cooksville Creek, and the study area encompasses the subject lands plus 120 m of adjacent lands (Figure 1).

Matrix reviewed available background information to enable an understanding of the natural heritage features and species that are known to and or have the potential to occur within the study area. Requests for information were sent to the Ontario Ministry of Natural Resources and Forestry (MNRF), the Ministry of the Environment, Conservation and Parks (MECP), and Credit Valley Conservation (CVC). Background wildlife species records were compiled using the Natural Heritage Information Centre (NHIC; MNRF 2022a), Ontario Breeding Bird Atlas (OBBA; OBBA 2001), Ontario GeoHub Aquatic Resource Maps (MNRF 2022b), eBird (Cornell Lab of Ornithology 2022), Ontario Butterfly Atlas (OBA; TEA 2022a), Ontario Moth Atlas (OMA; TEA 2022b), Ontario Reptile and Amphibian Atlas (ORAA; Ontario Nature 2022), iNaturalist (iNaturalist Network 2022a), Aquatic Species at Risk Map (DFO 2022), Ontario Mammals (iNaturalist Network 2022b), and Canada Important Bird Areas (IBA; Bird Studies Canada 2022). The following additional resources were used to compile background wildlife and plant species records: 2021 Natural Areas Survey (NAS) for Site CV12 (City of Mississauga 2021a) and Site MY3 (City of Mississauga 2021b). Fisheries and Oceans Canada (DFO) listed no known aquatic species at risk (SAR) or critical habitat. Aerial photography and available mapping was compiled and reviewed.

- Study Area (Center: 611542 E, 4827191 N)
- Study Area (120m Buffer)
- Regulation Limit (Credit Valley Conservation)
- Significant Natural Area and Natural Green Space (City of Mississauga)
- Special Management Area (City of Mississauga)
- Watercourse (Credit Valley Conservation)
- Road
- Railway

1:2,000 metres
20 0 20 40
NAD 1983 UTM Zone 17N

Matrix Solutions Inc.
A Montrose Environmental Company

The Corporation of the City of Mississauga
Cooksville Creek: Mississauga Valley Blvd to CPR

Study Area

Date:	Project:	Submitter:	Reviewer:
December 2023	34715	E. Ottens	K. Keele

Figure 1

1.2 Summary of Background Information

1.2.1 Significant Species Screening

A screening exercise was completed to identify provincially designated SAR and species of conservation concern (SCC) that can potentially exist in the study area and within 10 km. The screening was carried out by comparing the preferred habitats of SAR and SCC identified as having records in the vicinity of the study area from the various wildlife atlases.

SAR are those listed on the Species at Risk in Ontario (SARO) list (MNRF 2022c). These include species identified by the Committee on the Status of Species at Risk in Ontario (COSSARO) as provincially endangered (END), threatened (THR), or special concern (SC). Species listed by COSSARO as END or THR are protected by the *Endangered Species Act* (ESA), which includes protection of their habitat, and are referred to as regulated SAR. Species considered SC are included in the definition of SCC, which include:

- species designated provincially as SC
- species assigned a conservation status (S-rank) of S1 to S3 or SH by the NHIC
- species that are designated federally as THR or END by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC) but not provincially by COSSARO
    - If these species are listed under Schedule 1 of the federal *Species at Risk Act* (SARA), they are protected by the federal SARA but not provincially by the ESA.

Full SAR/SCC screening results are provided in Appendix A. SCC are discussed further within the context of significant wildlife habitat (SWH) in Appendix B.

1.2.2 Significant Wildlife Habitat Screening

A screening exercise was completed to confirm or identify potential (i.e., “candidate”) SWH that may occur within the study area. SWH is protected under the Ontario *Provincial Policy Statement, 2020* (MMAH 2020) and is described in the provincial *Significant Wildlife Habitat Technical Guide* (SWHTG; MNR 2000) as comprising four major categories of habitat:

- seasonal concentration areas
- rare vegetation communities and specialized wildlife habitat
- habitats of SCC
- animal movement corridors

Specific criteria defining SWH for Ecoregion 7E, in which the subject property is located, are described in the *Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E* (MNRF 2015). Individual SWH types within these four broad categories were assessed as either not present, candidate, or confirmed for the study area, based on comparison of criteria against information obtained from relevant background documents and original field surveys. Detailed results of the SWH screening are provided in Appendix B.

1.2.3 Agency Consultation

Requests for information were sent to the MECP, MNRF (Aurora District), and CVC on March 1, 2023, to request available natural heritage information, SAR records, relevant wildlife records, and any other potential constraint information for the study area. No responses from CVC or MECP have been received yet. MNRF provided a Natural Heritage Information Request Guide and had no further comments on the information request at that time. Agency correspondence letters are provided in Appendix C.

1.3 Methodology

Information on the terrestrial and aquatic environment existing conditions within the study area was gathered from a combination of secondary source research, field investigations, and agency consultation.

1.3.1 Available Secondary Source Information Collection and Review

Available secondary sources of information were collected and reviewed to determine existing natural environment conditions within the study area. The sources reviewed are outlines in Table 1.

TABLE 1 Reviewed Sources for Existing Natural Environment Conditions

Source	Information Reviewed
Ontario Ministry of Natural Resources and Forestry	• species at risk • natural heritage features data layers from Land Information Ontario
Fisheries and Oceans Canada	• Aquatic Species at Risk Map
Natural Heritage Information Centre	• Data records for study area
Ontario Breeding Bird Atlas	• Species records for study area
Ontario Reptile and Amphibian Atlas	• Species records for study area
Ontario Butterfly Atlas	• Species records for study area
Ontario Moth Atlas	• Species records for study area
Important Bird Areas	• Data records for study area
eBird	• Species records for study area
iNaturalist	• Species records for study area • Ontario Mammal records for study area
2021 Natural Areas Update: Site MY3	• Data records for study area
2021 Natural Areas Update: Site CV12	• Data records for study area

1.3.2 Field Investigation Methodology

Matrix staff conducted various site investigations during 2022 to identify aquatic and terrestrial habitats and features present within the study area. Incidental wildlife observations were collected during all site visits. Investigations were conducted in the spring and summer of 2022. Dates and locations of specific surveys are shown in Table 2.

TABLE 2 Field Survey Summary

Field Investigation	Protocol	Date	Observer
Aquatic Habitat Assessment	Modified Ontario Stream Assessment Protocol (Stanfield 2013)	November 25, 2022	K. Keele, K. Reich
Ecological Land Classification	Lee et. al (2008) and Lee et. al (1998)	June 3, 2022 and July 1, 2022	K. Keele
Vascular Flora and Fauna Inventory	Systematic search by Ecological Land Classification polygon	June 3, 2022	K. Keele, E. Lupton
Breeding Bird Surveys	OBBA (2001)	June 3, 2022 and July 1, 2022	K. Keele
Incidental Species	N/A	all site visits	K. Keele, E. Lupton, K. Reich

1.3.2.1 Aquatic Habitat Assessment

A detailed aquatic habitat assessment was conducted on November 25, 2022, to characterize aquatic features in the study area. The entire 360 m reach of Cooksville Creek from 100 m upstream of Mississauga Valley Boulevard to the CP rail bridge was assessed and detailed notes and photographs were recorded.

The following information was documented during the aquatic habitat assessment:

- substrate type and composition
- riparian and aquatic vegetation
- potential fish habitat or presence of fish
- water temperature
- flow conditions
- adjacent lands (vegetation community type, riparian habitat, canopy cover, land use, etc.)
- channel morphology
- instream habitat and cover

The creek was divided into three assessment reaches based on similar aquatic habitat and channel morphology. It should be noted these reaches are identical as defined in the geomorphic assessment completed by Matrix in 2022. Assessment reaches are shown on Figure 2. No fish community assessment was undertaken as part of this project.

Easting (m)

611300 611400 611500 611600 611700 611800

Northing (m)

4827400 4827300 4827200 4827100 4827000

Acala Crescent
Cliff Road North
Trisha Downs
Rhonda Valley
Mississauga Valley Boulevard
Cooksville Creek
Voltaire Crescent

BB5
BB4
BB3
BB2
BB1

Reach 3
Reach 2
Reach 1

N

bing

- Study Area (Center: 611542 E, 4827191 N)
- Study Area (120m Buffer)
- Regulation Limit (Credit Valley Conservation)
- Watercourse (Credit Valley Conservation)
- Aquatic Reach
- Reach Break
- Flow Direction
- Road
- Railway
- Breeding Bird Location

1:2,000 metres
20 0 20 40
NAD 1983 UTM Zone 17N

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The Corporation of the City of Mississauga
Cooksville Creek: Mississauga Valley Blvd to CPR

Aquatic Habitat and Breeding Bird Survey Locations

Date:	Project:	Submitter:	Reviewer:
December 2023	34715	E. Ottens	K. Keele

Figure 2

I:\City\Mississauga\34715\Figures\And\Tables\ECL\2023\Report\HabitatAssessment\Figure-3-Aquatic_Habitat_and_Breeding_Bird_Survey_Locations.mxd - Tabloid_L - 13-Dec-23, 12:42 PM - sylam - TID005

Water Quality

Water quality and flow monitoring measurements were performed at the downstream and upstream sections of the study area on November 25, 2022. Water quality was monitored using a Pro Multiparameter Water Quality Meter, manufactured by YSI Inc., which measures pH, conductivity, dissolved oxygen, oxidation reduction potential, turbidity, temperature, salinity, and total dissolved solids. Results of the water quality monitoring are presented in Table 3.

TABLE 3 Water Quality Parameters

Parameters	Reach 1	Reach 2	Reach 3
pH	6.55	8.17	8.51
Conductivity (µS/cm)	only SPC µS/cm taken, which was 4,696	2,677	2,627
Dissolved Oxygen (mg/L)	4.2	3.6	3.3
Temperature (°C)	5.8	6.6	7.2
Oxygen-reduction Potential (mV)	0.1	-83.3	-97.4

Fish Community

No fish community assessment was performed along Cooksville Creek during this study, as previous records of fish within Cooksville Creek in proximity to the study area was identified as minimal due to multiple barriers to fish passage both upstream and downstream of the project limits. CVC provided records of this fish community.

1.3.2.2 Terrestrial Field Assessment

Ecological Land Classification

Vegetation communities were characterized and mapped using the Ecological Land Classification (ELC) systems for southern Ontario (Lee 2008, 1998) during two site visits on June 3 and July 1, 2022. Existing ELC data for Sites MY3 and CV12 from the NAS (City of Mississauga 2021a, City of Mississauga 2021b) data was confirmed and updated. Details of the vegetation communities were recorded including species composition, dominance, and uncommon species or features. The vegetation inventory was compiled and refined by incidental observations recorded throughout all site visits. ELC communities are shown on Figure 3.

Easting (m)

611300 611400 611500 611600 611700 611800

Northing (m)

4827400 4827300 4827200 4827100 4827000

Acala Crescent
Cliff Road
Trisha Downs
Rhonda Valley
Mississauga Valley Boulevard
Cooksville Creek
Voltaire Crescent

Parkland
CUT/CUM
Parkland
FOD7
CVR-1
FOD7
Parkland
CVR-1
FOD5
FOD7-2
CVR-1

N

- Study Area (Center: 611542 E, 4827191 N)
- Study Area (120m Buffer)
- Watercourse (Credit Valley Conservation)
- Road
- Railway

Ecological Land Classification

- CUT/CUM: Cultural Thicket/Cultural Meadow
- CVR-1: Residential Low Density
- FOD5: Dry-Fresh Sugar Maple Deciduous Forest
- FOD7: Fresh-Moist Lowland Deciduous Forest
- FOD7-2: Fresh-Moist Ash Lowland Deciduous Forest
- Parkland

1:2,000 metres
20 0 20 40
NAD 1983 UTM Zone 17N

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Cooksville Creek: Mississauga Valley Blvd to CPR

Ecological Land Classification

Date:	Project:	Submitter:	Reviewer:
December 2023	34715	E. Ottens	K. Keele

Figure 3

Vascular Flora and Fauna Inventories

The vascular flora inventories were conducted in conjunction with the ELC on June 3 and July 1, 2022. Each ELC community was systematically searched and documented. All elements were observed to species level unless a lack of distinguishing features for the flora was present.

Breeding Bird Surveys

Two breeding bird surveys were conducted on June 3 and July 1, 2022, and data was recorded using the OBBA protocols (OBBA 2001). Five stations were selected in the study area and at each station a 10-minute point count was conducted for both visual and audible documentation of species presence including the highest level of breeding evidence exhibited for each species recorded. Incidental observations were also recorded during travel between stations, and during all other field surveys onsite for the duration of the project. The point count locations are shown on Figure 2. Breeding bird results can be found in Appendix G.

Incidental Species Observations

Incidental species observations were recorded during all site visits for all wildlife (mammals, birds, reptiles, amphibians, insects). This included direct observations of individuals and signs of wildlife presence (i.e., tracks, scat, dens, nests, etc.).

1.4 Existing Conditions

1.4.1 Aquatic Habitat Assessment

Cooksville Creek is a large watercourse in the Greater Toronto Area and located within Mississauga, Ontario. Within the study area the creek is a single channel, but two branches converge into one 1 km upstream of the study area. The creek flows approximately north to south and eventually drains into Lake Ontario near RK McMillan Park, approximately 5.8 km downstream of the study area. Cooksville Creek is classified as poor, warm/cool water habitat that supports a limited fish community in the lower watershed near Lake Ontario (Aquafor Beech 2011). The section of creek located in the study area is believed to support a very small fish population due to barriers to fish passage being present upstream and downstream of the site. Matrix did not preform a fish community assessment as part of this study.

Within the study area, Cooksville Creek meanders through conservation land and alongside a low residential neighbourhood and Thornwood Public School, beginning upstream at Stonebrook Park. Most of the watercourse has been channelized using concrete, armourstone, and gabion baskets. Portions of these measures are failing and erosion to the channel banks is occurring both around the protection measures and the natural banks. The adjacent land use is residential neighbourhoods on both the upstream and downstream ends, with parkland on the upstream end (Stonebrook Park).

During the aquatic survey on November 25, 2022, the water temperatures within the creek ranged between 5.8 and 7.2°C. No groundwater inputs or evidence of groundwater inputs were observed. The assessment reaches are shown on Figure 3.

1.4.1.1 Reach 1

Reach 1 (creek) is located directly between the north-east side of the CP railway and southwest side of Mississauga Valley Boulevard. This reach is approximately 198 m in length and consists of a shallow, riffle, pool, riffle sequence. This reach contains armourstone on both banks and is generally in good condition; however, there are a few areas of failed armourstone sections exposed. Scouring was observed behind the left armourstone bank. Jute mat was occasionally observed upstream on the banks of the creek. Bank stability was observed to be moderately unstable to unstable. The first 1.5 to 10 m of the left and rights banks are deciduous forest and over 10 m of the left and right banks are residential. Emergent, rooted floating, submergent, and free-floating macrophytes were absent. Floating algae was absent; however, attached algae was abundant and filaments and slimes/crusts were present. he substrate throughout this reach is angular cobble, intermittent gravel, and a fine layer of silt. Many exposed rocks were observed within the channel and a thalweg was observed generally on the left side of the creek. The existing structure contains a concrete weir downstream, with a water depth of approximately 36 cm upstream and 38 cm downstream. There is another concrete weir upstream, with a water depth of approximately 28 cm. The water was flowing clear at the time of assessment with a wetted with of approximately 6.56 to 7.08 m, and the water level appeared higher than normal. Woody debris and detritus were observed within the creek. Occasional garbage within Reach 1 and salt from off the adjacent pedestrian pathway were observed. No minnows were observed in at the time of assessment, but crayfish were observed.

1.4.1.2 Reach 2

Reach 2 begins on the north-west side of Mississauga Valley Boulevard and extends approximately 98 m to the edge of the deciduous forest section, with a pedestrian pathway in close proximity. This reach is a very uniform channel with a 4 m wide concrete base on the bottom of the creek. Two outfalls are located across from each other, and the smell of sewage was noted during the time of assessment. Shoreline cover is approximately 60 to 90% and canopy cover is approximately 50% to 75%. The first 1.5 to 10 m of the left and right banks are scrubland and over 10 m of the left and right banks abut residential uses. Minor undercutting and exposed roots on the banks are present, with approximately 14 to 20 cm of undercut. Occasional areas of scouring were noted on the left bank. No aquatic macrophytes were observed. Attached algae and slimes/crusts were abundant and filaments are present. The substrate throughout this reach is angular cobble, and intermittent gravel. Reach 2 has a water depth between 16.5 and 61 cm. The water was flowing clear at the time of assessment with a wetted with of approximately 6.30 to 6.60 m. A small log jam and piles of wood is located on the edge of the creek.

1.4.1.3 Reach 3

Reach 3 (creek) is located upstream of Reach 2 and extends approximately 103 m, consisting of occasional riffles. A 4 m wide concrete base on the bottom of the creek was observed and the left and right banks appear stable. The first 1.5 to 10 m of the left and right banks are scrubland and over 10 m of the left and right banks abut residential uses. Canopy cover is approximately 0% to 24% and vegetated shore cover is approximately 30% to 60%. Native plantings are located along the shoreline, and it appears as if the whole area was recently restored. Emergent vegetation such as cattail species (*Typha sp.*) and soft-stemmed bulrush (*Schoenoplectus tabernaemontani*) are present along the shore; however, no other aquatic macrophytes or algae were observed. Substrate in this reach consists of angular cobble and silt. The water was flowing clear at the time of assessment, with a wetted with of approximately 4.5 m. Detritus was observed within the creek and no minnows were observed at the time of assessment.

1.4.2 Terrestrial Ecology Assessment

1.4.2.1 Vegetation Communities and Vascular Flora

A vegetation inventory and ELC was conducted over the course of multiple field visits and built upon by using the provided NAS data (City of Mississauga 2021a, City of Mississauga 2021b). ELC mapping was prepared following *Ecological Land Classification for Southern Ontario: First Approximation and Its Classification* (Lee et al. 1998) and *Southern Ontario Ecological Land Classification* (Lee 2008). ELC communities can be found on Figure 2. Two site visits were conducted to complete and assessment of the landform and vegetation present onsite. Soil sampling was not conducted during ELC assessments due to the highly disturbed nature of the study area in which the vegetation communities were located.

Five ELC community classes are represented within the study area and include forest, parkland, residential, meadow and thicket. Characteristics of each of the identified community types are provided in the following paragraphs. Detailed vegetation inventories resulted in a total of 158 species of vascular flora being identified onsite. Overall, 52% of species were native and 47% of species were exotic. The vegetation inventory is presented in Appendix D.

Cultural Urban Thicket/Cultural Urban Meadow (CUT/CUM)

This community comprises cultural thicket and cultural meadow is located at the north-west extend of the study area, on either side of Cooksville Creek. The shrub layer on the south side of Cooksville Creek comprises many planted species, including grey dogwood (*Cornus racemosa*), nannyberry (*Viburnum lentago*), and red-osier dogwood (*Cornus sericea*). Other shrubs observed include multifloral rose (*Rosa multiflora*), common buckthorn (*Rhamnus cathartica*), riverbank grape (*Vitis riparia*), and European cranberry bush (*Viburnum opulus*). A variety of cultural meadow species are found in the herbaceous layer, but dominant species include reed canary grass (*Phalaris arundinacea*), goldenrod species (*Solidago sp.*), and wild carrot (*Daucus carota*). The canopy layer makes up less than 25% of this community. Canopy species both natural and planted present are Manitoba maple (*Acer negundo*),

American basswood (*Tilia americana*), red maple (*Acer rubrum*), eastern white cedar (*Thuja occidentalis*), Siberian elm (*Ulmus pumila*), and bur oak (*Quercus macrocarpa*). A pedestrian pathway is present within this community.

Sugar Maple Deciduous Forest Ecosite (FOD5)

This forest community is located on the south-east side of the CP railway and the canopy is dominated by sugar maple and red oak covering 60% of the community. The shrub layer is composed of white ash (*Fraxinus americana*), ironwood (*Ostrya virginiana*), and to a lesser extent American basswood and black cherry (*Prunus serotina*). The understory is dominated by choke cherry (*Prunus virginiana*) and common buckthorn, and this layer composes 60% of the vegetative community. The ground layer is composed of blue stemmed goldenrod (*Solidago caesia*), garlic mustard (*Alliaria petiolata*), zig-zag goldenrod (*Solidago flexicaulis*) and large leaved aster (*Eurybia macrophylla*). Introduced periwinkle species (*Vinca sp.*) and European swallow-wort (*Vincetoxicum rossicum*) are starting to establish within this unit. Old foundation stone and concrete structures, informal walking trails and fire pits are present within this unit. This information was pulled from background resources, as the FOD5 community was not visited during Matrix field investigations.

Fresh-Moist Lowland Deciduous Forest Ecosite (FOD 7)

This forested community is in two areas, south-east of the CUT/CUM community and south of Mississauga Valley Boulevard. Canopy species include black walnut, crack willow (*Salix fragilis*), Manitoba maple, Siberian elm, white oak (*Quercus alba*) and bur oak. Shrub species included honeysuckle species (*Tatarian sp.*), chokecherry, sweet cherry (*Prunus avium*), common buckthorn, staghorn sumac (*Rhus typhina*), red-osier dogwood, and alternate-leaved dogwood (*Cornus alternifolia*). The herbaceous layer consisted of garlic mustard, green ash, buckthorn species (*Rhamnus sp.*), water parsnip (*Sium suave*), ox-eye daisy (*Leucanthemum vulgare*), Jerusalem artichoke (*Helianthus tuberosus*), garden yellow rocket (*Barbarea vulgaris*). A pedestrian pathway falls within the community. Evidence of clearing was noted in this community, with large amounts of cut and downed woody debris. The FOD7 community within the subject lands is 1.21 ha in size.

Fresh-Moist Ash Lowland Deciduous Forest (FOD 7-2)

This ash lowland forest is located on the southeast side of the railway, adjacent to the FOD5 and surrounded by other forest communities. Canopy cover composes 45% of the community and includes trees 10 to 25 m in height, dominated by black walnut (*Juglans nigra*) and green ash (*Fraxinus pennsylvanica*). Large hybrid willow (*willow sp.*) are scattered along the banks. Recent snag removals within the community by the City has opened up the canopy, allowing light to ground layer. The subcanopy is dominated by green ash, Manitoba maple, and black walnut. Manitoba maple and willow are abundant within the understory. The ground layer is dominated by garlic mustard, yellow avens (*Geum aleppicum*), enchanter's nightshade (*Circaea canadensis*), false nettle (*Boehmeria cylindrica*) and fowl manna grass (*Glyceria striata*). Invasive species are present throughout the community in pockets,

which include goutweed (*Aegopodium podagraria*) and periwinkle species. This information was pulled from background resources, as the FOD5 community was not visited during Matrix field investigations.

Residential Low Density (CVR_1)

This community comprises predominantly single residential dwellings and Thornwood Public School. The landscape consists of manicured grass with sporadic trees, shrubs, and groundcover. Most of the species observed is non-native. Informal walking trails and roads are present within this community. The CVR-1 community within the subject lands is 0.16 ha in size.

Parkland

Two areas of parkland are located within the study area. The first area is located on Thornwood Public School property, south of Cooksville Creek. The second area is located north of the CUT/CUM community and the FOD7. The first area is manicured lawn and dominated by red fescue (*Festuca rubra*). The second area is also manicured lawn, with scattered shrubs and trees, some of them planted. Shrub species include red-osier dogwood, alternate-leaved dogwood, staghorn sumac, hawthorn species (*Crataegus sp*.), and sand cherry (*Prunus pumila var. pumila*) (planted). Canopy species include white spruce (*Picea glauca*), red pine (*Pinus resinosa*), silver maple (*Acer saccharinum*), blue spruce (*Picea pungens*), Manitoba maple, trembling aspen (*Populus tremuloides*), American basswood, Siberian elm, eastern hemlock (*Tsuga canadensis*), and little leaf linden (*Tilia cordata*). The parkland community within the subject lands is 0.25 ha in size.

Three regionally and/or locally rare species were observed within the parkland, red pine (planted), great lakes sand cherry (*Prunus pumila var. pumila*) (a release, not naturally established), and a planted northern mountain-ash (*Sorbus decora*). Four regionally and/or locally species were observed within the FOD7community: a planted hobblebush (*Viburnum lantanoides*), cleavers (*Galium aparine*), planted ninebark (*Physocarpus opulifolius),* and great lakes sand cherry. Three regionally and/or locally rare species were observed within the CUT/CUM1 community: great lakes sand cherry, northern mountain-ash, and cleavers. No vegetation SAR were observed within the study area. One S3 species, great lakes sand cherry was observed within the study area; however, this was a planted specimen, not naturally established.

1.4.2.2 Wildlife Communities

Wildlife observations were collected during each site visit in addition to the breeding bird and aquatic habitat assessment. Incidental faunal species observations are included in the species tables found in Appendices E to I. The results of these investigations are detailed in the following subsections.

Amphibians and Reptiles

No amphibian and reptile specific surveys were conducted during field investigations; however, the following resources were reviewed: NHIC, iNaturalist, ORAA, and the 2021 NAS reports for site CV12 and MY3. Incidental species observations were recorded at each site visit. NHIC has one record of a milksnake

(*Lampropeltis Triangulum*) within the study area (1 km × 1 km square). The data obtained for ORAA includes 26 species that have been observed in the proximity of the study area (10 km × 10 km square), with some data over 30 years old. Five species records were obtained from iNaturalist, as potentially falling with within the study area (filtered to verifiable and research-grade results) one record was obtained from the 2021 NAS report for Site CC12.

A list of all amphibian and reptile species known from the background data collection is provided in Appendix E. Based on the SAR and SCC screening (Appendix A), the following two SAR and three SCC amphibian and reptile species were identified as having potential to occur within the study area based on existing records in the vicinity of the study. No habitat in the study area is considered suitable for SAR/SCC herpetofauna species. Matrix did not observe any reptiles or amphibians during field investigations.

- Reptile:
  - snapping turtle (*Chelydra serpentine*)
  - northern map turtle (*Graptemys geographica*)
  - Blanding's turtle (*Emydoidea blandingii*)
  - eastern musk turtle (*Sternotherus odoratus*)
- Amphibian:
  - Jefferson salamander (*Ambystoma jeffersonianum*)

Bird Species

Breeding bird surveys were conducted on June 3 and July 1, 2022. Thirty-three species were detected during breeding bird surveys and eight species were detected during incidental observations. A list of species detected along with evidence of breeding is provided as Appendix G. A search of NHIC (1 km × 1 km square) resulted in one SAR bird species, Henslow's sparrow (*Ammodramus henslowii*; END). The data obtained from OBBA includes 102 species that have been observed in proximity of the study area (10 km × 10 km square). Results from eBird and iNaturalist identified 136 and 64 bird species, respectively, as potentially occurring within the study area. The NAS reports for Sites MY3 and CV12 identified 17 bird species records. A list of all bird species known from the background data collection and those observed during field surveys is provided in Appendix F.

Based on the SAR and SCC screening in Appendix A, six SAR and nine SCC bird species were identified as having the potential to occur within the study area based on existing records in the vicinity and presence of appropriate habitat onsite:

- Bank swallow (*Riparia riparia*)
- Bobolink (*Dolichonyx oryzivorus*)
- Chimney swift (*Chaetura pelagica*)

- Eastern meadowlark (*Sturnella magna*)
- Henslow's sparrow (*Ammodramus henslowii)*
- Least bittern (*Ixobrychus exilis)*
- Bald eagle (*Haliaeetus leucocephalus*)
- Barn Swallow (*Hirundo rustica*)
- Canada warbler (*Cardellina canadensis*)
- Common nighthawk (*Chordeiles minor*)
- Eastern wood-pewee (*Contopus virens*)
- Olive-sided flycatcher (*Contopus cooperi*)
- Peregrine falcon (*Falco peregrinus*)
- Rusty blackbird (*Euphagus carolinus*)
- Wood thrush (*Hylocichla mustelina*)

One SCC bird species was observed within the study area, the eastern wood-pewee, during incidental wildlife surveys. OBBA and eBird records have confirmed the eastern wood-pewee as potentially occurring within the study area; however, this species was not detected during the breeding bird surveys. No other SAR or SCC bird species were founding during the breeding bird surveys.

Mammal

Mammal-specific field surveys were not conducted as part of the project; however, incidental observations were recorded. During field investigations, eastern grey squirrel (*Sciurus carolinensis*) and eastern cottontail (*Sylvilagus floridanus*) were observed.

According to Ontario Mammals, 40 mammal species ranges fall within the study area and iNaturalist records show 9 mammal species as potentially occurring within the study area.

Background information and SAR/SCC screening identified that potential habitat for four SAR mammals may be present within the study area:

- Eastern small-footed myotis (*Myotis leibii*)
- Little brown myotis (*Myotis lucifugus*)
- Northern myotis (*Myotis septentrionalis*)
- Tri-colored myotis (*Perimyotis subflavus*)

No federally or provincially significant mammal species were observed during the field surveys of the study area. Refer to Appendix H for a full list of mammals known from and observed within the study area.

Insect Species

Within a 10 × 10 km atlas square from the Ontario Moth Atlas and Ontario Butterfly Atlas that overlap the study area, 83 butterfly and 23 moth species are known to occur, respectively. This includes one regulated

SAR, mottled duskywing (*Erynnis martialis*; END), and one SCC, monarch (*Danaus plexippus*; SC). iNaturalist identified 65 insect species as potentially occurring within the study area. Matrix did not observe rither of these species during the field studies. One insect species was observed during Matrix field investigations, cabbage white (*Pieris rapae*). No habitat for mottle duskywing was identified, but candidate monarch habitat is present. Refer to Appendix I for a full list of butterfly species reported from within the study area.

Species at Risk

Incidental observations, including SAR encountered, were collected during field investigations and are detailed in Appendix A.

2 OPPORTUNITIES AND CONSTRAIN ANALYSIS

This section analyzes the significance and sensitivity of natural features to determine opportunities and constraints for creek restoration opportunities. Natural features that are sensitive to disturbance are identified based on rare or significant features or the functions/processes and/or policies prohibiting development or alteration within them.

2.1 Watercourses and Fish Habitat

Cooksville Creek is a warm water system which support minimally diverse fish community near the mouth of the creek and Lake Ontario. No electrofishing was completed, but an aquatic habitat assessment was performed. Background records and previous knowledge of the site outlined by CVC indicated there is very minimal fish community present within the portion of Cooksville Creek due to fish barriers present throughout the watercourse. Cooksville Creek is connected to fish-bearing waters and is considered fish habitat by MNRF and DFO. As such, a DFO request for review will be completed for the proposed channel works and MNRF will be consulted for timing windows and fish permits. In addition, development and site alteration within watercourses and their associated fish habitat are prohibited unless permitted by the CVC.

The study area has riffles, pools, bank overhangs and cobble present, which is considered potential fish habitat; however, overall, the portion of Cooksville Creek within the study area provides poor-quality fish habitat. Past intervention with the creek has created features such as concrete barriers and concrete channel lining which restrict fish passage. Wood debris and cover are sporadic and not abundant. Failing erosion protection measures (concrete weirs and armourstone, for example) also impose poor fish habitat. Overall, the system has sporadic but limited in-stream vegetation, little diversity of habitat, uniform and poorly sorted substrate, little cover for fish species and poor water quality.

The current system would benefit from habitat enhancement designed to improve fish habitat, naturalize the stream corridor, and provide flood and erosion protection. This alteration would have a positive effect within the study area and contribute to improvement for the watershed. To improve fish habitat, addition

of in-stream cover such as woody debris and aquatic vegetation would provide enhancement. As well, creation riffle/run/pool features, removal of fish barriers and a more naturalized channel alignment would enhance conditions. Riparian plantings would help stabilize the banks of the creek and provide shade and cover for fish.

2.2 Significant Woodlands

The Cooksville Creek study area is part of the City of Mississauga Green System which comprises the Natural Heritage System, Urban Forests, Natural Hazard Lands and Parks and Open Spaces (City of Mississauga, 2015). The City of Mississauga Official Plan (City of Mississauga 2023) identifies the study area as a Significant Natural Area, which is part of the greater Natural Heritage System, including natural areas (e.g., meadows, fish and wildlife habitats), woodlands, wetlands, and valley and watercourse corridors. The Mississauga Official Plan defines Significant Natural Areas as areas that meet one or more of the following criteria (City of Mississauga 2023):

- provincially or regional significant Life Science Areas of Natural and Scientific Interest (ANSI)
- environmentally sensitive or significant areas
- habitat of threatened species or endangered species
- fish habitat
- SWH
- significant woodlands
- significant wetlands
- significant valleylands

The Mississauga Official Plan defines significant woodlands as those that meet one or more of the following criteria (City of Mississauga 2023):

- woodlands, excluding cultural savannahs, greater than or equal to 4 ha
- woodlands, excluding cultural woodlands and cultural savannahs, greater than or equal to 2 ha and less than 4 ha
- any woodland greater than 0.5 ha that supports old growth trees (greater than or equal to 100 years old)
- supports a significant linkage function as determined through an environmental impact study approved by the City in consultation with the appropriate conservation authority
- is located within 100 m of another Significant Natural Area supporting a significant ecological relationship between the two features
- is located within 30 m of a watercourse or significant wetland
- supports significant species or communities

The FOD7 within the subject lands is 1.21 ha in size; however, it is connected to the FOD5, FOD7, and FOD7-2 communities within the study area and the railway line is not wide enough to cause fragmentation between the forested areas. The woodlands within the Cooksville Creek study area are within 30 m of a watercourse (Cooksville Creek), greater than 4 ha, and support significant species; therefore, they are considered significant. Construction activity and site alteration within or adjacent to a Significant Natural Area would be permitted unless all reasonable alternatives have been considered and any negative impacts have been minimized. Any negative impact that cannot be avoided would need to be mitigated through restoration and enhancement to the greatest extent possible.

2.3 Residential Woodlands

Mississauga's Natural Heritage System also includes Residential Woodlands, which are areas, generally in older residential area, with large lots that have mature trees forming a contiguous canopy and minimal native understorey. Lands within Residential Woodlands are subject to Site Plan Control. Site alteration for lands within a Residential Woodland will have a regard for protecting, enhancing, restoring, and expanding the existing tree canopy and understorey. Character area policies may identify additional requirements to protect Residential Woodlands.

2.4 Special Management Area

Special Management Areas are adjacent to or near Significant Natural Areas or Natural Green Spaces and will be managed or restored to enhance the Significant Natural Area or Natural Green Space. Site alteration is not permitted within or adjacent to these areas unless it is demonstrated that there will be no negative impact to the natural heritage features and their ecological functions and opportunities for protection, restoration, enhancement, and expansion have been identified.

2.5 Habitat for Threatened and Endangered Species

2.5.1 Eastern Small-footed Myotis, Little Brown Myotis, Northern Myotis, and Tri-coloured Bat

Eastern small-footed myotis roost in a variety of habitats including under rocks, buildings, under bridges, caves or hollow trees and change roosting locations every day (MNRF 2017). Little brown myotis establish maternity roosts in tree cavities and under loose or exfoliating bark, especially in wooded areas near water and forage over water and in open areas between forest and water (MNRF 2017). Northern myotis roost in tree crevices, hollows and under bark of live and dead trees located in a forest gap and switch roosts frequently (MNRF 2017). Tri-coloured bats establish maternity roosts within live and dead foliage within or below the canopy. Oak is the preferred roost trees species, but maples can also be used (MNRF 2017). The forested sections of the study area have the potential to provide suitable habitat for the provincially endangered eastern small-footed myotis (*Myotis leibii*), little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), and the tri-coloured bat (*Perimytosis subflavus*). Potential alternative

implementation impacts will need to consider trees which are identified with suitable cavities for SAR bats. A cavity tree assessment is recommended, followed by an acoustic survey following MNRF protocol if suitable roosting habitat is found.

2.6 Habitat for Special Concern Species

2.6.1 Eastern Wood-Pewee (Special Concern)

Eastern wood-pewee live in the mid canopy layer of forest clearings and edges of deciduous and mixed forests, being most abundant in intermediate-age mature forest stands with little understory (MNRF 2022c). Eastern wood-pewee is listed as SC both provincially and federally. This species was confirmed within the forested section of the study area, during incidental wildlife surveys. Calls heard were indicative of breeding bird evidence. Construction activities should take place outside of the April 1 to August 31, in accordance with the *Migratory Birds Convention Act*.

2.6.2 Monarch (Special Concern)

Monarchs are found in open or disturbed habitats such as roadsides, fields, wetlands, prairies, and open forests (MNRF 2022c). Caterpillars are confined to meadows and open areas where milkweed grows and monarch are commonly found in alvars, tallgrass prairies, and cultural meadow where milkweed is present (MNRF 2022c). Suitable habitat may exist within the CUT/CUM ecosite within the study area. Matrix observed common milkweed during field investigations in this community.

2.7 Significant Wildlife Habitat

Two categories for candidate SWH were met during the SWH screening:

- bat maternity colonies
- SC and rare wildlife species

The full SWH screening can be found in Appendix B.

2.7.1 Bat Maternity Colonies

The forested communities within the study area have the potential to provide suitable habitat for the provincially endangered eastern small-footed myotis (*Myotis leibii*), little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), and the tri-coloured bat (*Perimytosis subflavus*). Many bat species are known to have high fidelity to their hibernacula and maternity roost sites, and it is not uncommon for bats to return to the same roost tree or groups of trees in successive years (MNRF 2017). Maternity roosts vary by species, but generally include leaf clusters of maple and oak trees, large snags, under loose tree bark and in tree hollows/cavities, buildings and under bridges (MNRF 2017). Guidelines for identifying candidate significant bat maternity colonies are outlined by the MNRF in the

document, *Survey Protocol for Species at Risk Bats within Treed Habitats Little Brown Myotis, Northern Myotis & Tri-Coloured Bat. Guelph District. April 2017* (MNRF 2017). The wooded habitats within the study area classified as FOD5, FOD7, and FOD7-2, may provide suitable habitat for bat maternal roosts, although no specific assessments were completed as part of this study. A cavity tree assessment should be conducted within the treed areas that may be impacted by the preferred alternative following MNRF protocols. Correspondence with MECP should be conducted to determine if acoustic surveys are required.

2.7.2 Special Concern and Rare Wildlife Species

Candidate SWH for monarch and confirmed SWH for eastern wood-pewee was identified within the study area. More detailed information regarding these species can be found in Section 2.4.

2.8 Implication of Design Alternatives

2.8.1 Alternative 1: Do Nothing

In Alternative 1, do nothing, no action is taken to address identified erosion issues. This alternative will result in no immediate impacts through site alteration to the natural environment. Existing erosion and failure of channel elements would continue, thus negatively impacting the terrestrial and aquatic environment over time. The aquatic environment will continue to be classified as poor and not support fish communities as barriers to fish movement are present and do not allow connection of fish passage throughout the entire Cooksville Creek. Erosion to the banks and bank destabilization will result in loss of terrestrial habitat and vegetation.

2.8.2 Alternative 2: Repair and Replace/Enhance

Alternative 2 includes local repair, replacement, and enhancements that would be undertaken to address failing bank treatments and manage hydraulic flow conditions. Localized enhancement to the repaired areas of the creek will provide benefit to the local natural environment. Installation of these treatments will temporarily cause an impact through temporary disturbance of access routes, removal of trees and vegetation, and other disruptions. Construction access should occur in less sensitive habitat, and orientation of access routes should be designed to limit disturbance to trees and vegetation. Impacts to riparian habitat should be kept localized to the proposed treatment. Removal of vegetation should occur outside of breeding bird windows, and a cavity tree assessment should be performed prior to any removal to avoid impacts to bat habitat. All removed vegetation should be restored with native species able to provide enhancement to slope/bank structure in riparian habitat.

The aquatic environment will see temporary impacts due to localized treatments. This work will impact benthic communities by reduction of wetted habitat when worksite isolation or dewatering occurs. No impacts are anticipated to fish as there is no reported fish community present within Cooksville Creek. The enhancement benefits will outweigh the temporary impacts to the aquatic environment and provide an overall net benefit. Improvement of bank stability and overall sorting of bed material would result in

enhancement of habitat diversity. Restoration plantings using native species will provide additional structure and bank stability.

2.8.3 Alternative 3: Channel Modification and Realignment

Channel modifications or realignment of Cooksville Creek to address failing treatments is proposed for Alternative 3. Identified erosion issues or failing bank protection would be addressed by moving Cooksville Creek away from the eastern bank. The installation of these treatments would temporarily impact the localized sites and access routes through the removal of trees and vegetation. Increasing the cross-sectional area of the creek to increase flow capacity would impacts impose on the terrestrial environment. Removal of vegetation should avoid breeding bird timing windows and a cavity tree assessment should be performed prior to any removals to avoid impacts to bat habitat. Using native plant species, enhancement of native vegetation cover and vegetative community biodiversity outweighs the vegetation disturbance and removals.

Impacts to the aquatic environment will be localized. Benthic communities will be impacted by removal of wetted habitat. No fish communities will be impacted. Riparian banks and vegetation will be removed and replaced with native plantings and the banks stabilized. This will improve aquatic habitat diversity. The recreation of the riparian vegetation will allow for significant improvements to cover and refuge habitat to occur through the planting of overhanging and dense vegetation.

2.9 Natural Features Protection Measures

2.9.1 Prior to and During Construction

Natural features protection is an important part of the design and undertaking of the site construction. Limiting impacts to the defined work area and minimizing disturbed footprint should be considered where possible. It is recommended that heavy-duty erosion and sediment control (ESC) and a tree protection zone (TPZ) be installed to clearly delineate the limits of work and to protect the surrounding natural features and significant woodlands. Inspection of the TPZ and ESC should be done at regular intervals and after a rainfall. Any deficiencies would be repaired.

Removal of vegetation must adhere to the *Migratory Birds Convention Act*, which protects migratory birds, their eggs, and nests from being harmed or destroyed during the breeding bird window. The study area is within zone C3 of the map of nesting zones in Canada (ECCC 2023) and within a forest habitat. The core breeding period is April 20 to August 10. All clearing and grubbing should be undertaken outside of this window. If clearing is required during this period, a qualified avian biologist can undertake nest searches of “simple” habitats, such as hedgerows, trees, and construction features.

Construction should adhere to MNRF and DFO in-water working timing restrictions for a warm water system, which is March 31 to July 1 or if specified otherwise by MNRF, DFO ,and CVC (DFO 2013, MNR 2013). All in-water works should be completed during low flows and not during or after a significant

rainfall. The duration of in-water works should be kept to a minimum. In water works should be isolated from the main flow of the creek and a fish salvage should be completed during any worksite isolation and dewatering. A contaminant and spill response plan should be developed and implemented immediately in the event of a sediment release or spill of deleterious substances and an emergency spill kit must be kept onsite. No storage of construction equipment, materials, chemicals, stockpiled resources of soil or storage of any other objects associated with site alteration is to occur within the delineated work area or within 30 m of Cooksville Creek. Also, maintenance of machinery during construction should occur a minimum of 30 m away from the watercourse.

An opportunity exists to remove invasive and non-native plant species and establish native vegetation community. Similarly, removal of dead or emerald ash borer infested ash trees that may be posing a hazard to the public is recommended, including replacement with native tree species.

2.9.2 Post Construction

Tree removals will be required for the proposed undertakings including access routes. Tree removals should be completed by or overseen by a certified arborist following proper arboriculture techniques. The removals should be following the Tree Permit By-Law Number 474-05 (City of Mississauga 2006). If new woodland edge is created during the removal of trees, the new edge should be inspected before and after tree removal by a certified arborist. This will be undertaken to assess the trees condition and analyze the reaction of the newly exposed trees to environmental conditions including winds and external forces.

All disturbed areas as part of construction works require re-vegetation through seeding, and tree and shrub planting using native seed and plants to enhance the natural environment and prevent erosion. Cover crop will be seeded on all areas as soon as feasible to establish vegetation on all bare soils. Post-construction monitoring of erosion and sediment controls should be performed on monthly intervals or after major rain even

3 REFERENCES

Aquafor Beech Ltd. (Aquafor Beech). 2011. “Executive Summary (Phase 1): Cooksville Creek Watershed Study and Impact Monitoring, Characterization Report.” Draft prepared for Credit Valley Conservation (CVC). Guelph, Ontario. March 2011.

Bird Studies Canada. 2022. *Important Bird Areas of Canada*. Accessed April 2022. https://www.ibacanada.com/mapviewer.jsp?lang=EN

City of Mississauga. 2023. *Mississauga Official Plan*. Mississauga, Ontario. March 3, 2023. https://www.mississauga.ca/projects-and-strategies/strategies-and-plans/mississauga-official-plan/

City of Mississauga. 2021a. *City of Mississauga Natural Areas Study (2021) Natural Areas Fact Sheet - Site CV12*. Mississauga, Ontario. 2021.

City of Mississauga. 2021b. *City of Mississauga Natural Areas Study (2021) Natural Areas Fact Sheet - Site MY3*. Mississauga, Ontario. 2021.

City of Mississauga. 2006. *Tree Permit By-law Number 474-05*. Mississauaga, Ontario. January 1, 2006. https://www.mississauga.ca/file/COM/TREE_PERMIT.PDF

Cornell Lab of Ornithology. 2022. *eBird*. Accessed April 2022. https://ebird.org/home

Environment and Climate Change Canada (ECCC). 2023. *General Nesting Periods of Migratory Birds in Canada*. Modified on May 30, 2023. https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html

Fisheries and Oceans Canada (DFO). 2022. *Aquatic Species at Risk Map*. Accessed April 2022. https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html

Fisheries and Oceans Canada (DFO). 2013. *Ontario Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat*. Modified December 27, 2013. http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/on-eng.html

iNaturalist Network. 2022a. *iNaturalist*. Accessed April 2022. https://www.inaturalist.org/

iNaturalist Network. 2022b. *iNaturalist - Ontario Mammals*. Accessed April 2022. https://www.inaturalist.org/guides/1327?view=card

Lee H. 2008. *Southern Ontario Ecological Land Classification*. Prepared for Ontario Ministry of Natural Resources. May 2008.

Lee H. et al. 1998. *Ecological Land Classification for Southern Ontario: First Approximation and Its Application*. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02. 1998.

Ontario Breeding Bird Atlas (OBBA). 2001. *Ontario Breeding Bird Atlas Guide for Participants*. Bird Studies Canada, Environment Canada, Federation of Ontario Naturalists, Ministry of Natural Resources, Ontario Field Ornithologists. March 2001.

Ontario Ministry of Municipal Affairs and Housing (MMAH). 2020. *Provincial Policy Statement, 2020*. Issued under Section 3 of the Planning Act. Queen's Printer for Ontario, 2020. Toronto, Ontario. May 1, 2020.

Ontario Ministry of Natural Resources and Forestry (MNRF). 2022a. *Make a Map: Natural Heritage Areas*. Mapping application. Accessed April 2022. https://www.lioapplications.lrc.gov.on.ca/Natural_Heritage/index.html?viewer=Natural_Heritage.Natural_Heritage&locale=en-CA

Ontario Ministry of Natural Resources and Forestry (MNRF). 2022b. *Ontario GeoHub*. Accessed April 2022. 2022. https://geohub.lio.gov.on.ca/

Ontario Ministry of Natural Resources and Forestry (MNRF). 2022c. *Species at Risk in Ontario List*. Accessed April 2022. http://www.ontario.ca/environment-and-energy/species-risk-ontario-list

Ontario Ministry of Natural Resources and Forestry (MNRF). 2017. *Survey Protocol for Species at Risk Bats within Treed Habitats Little Brown Myotis, Northern Myotis & Tri-Coloured Bat*. Guelph District. April 2017.

Ontario Ministry of Natural Resources and Forestry (MNRF). 2015. *Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E*. Regional Operations Division, Southern Region Resources Section. Peterborough, Ontario. 2015.

Ontario Ministry of Natural Resources (MNR). 2013. *In-water Work Timing Window Guidelines*. March 11, 2013. 2013. https://dr6j45jk9xcmk.cloudfront.net/documents/2579/stdprod-109170.pdf

Ontario Ministry of Natural Resources (MNR). 2000. *Significant Wildlife Habitat Technical Guide*. Fish and Wildlife Branch, Wildlife Section, Science Development and Transfer Branch, Southcentral Sciences Section. October 2000. 2000.

Ontario Nature. 2022. *Ontario Reptile and Amphibian Atlas*. Accessed April 2022. 2022. https://www.ontarioinsects.org/herp/

Stanfield, L. (Ed.). 2013. *Ontario Stream Assessment Protocol*. Version 9.0. Fisheries Policy Section. Ontario Ministry of Natural Resources. Peterborough, Ontario. 2013.

Toronto Entomologists' Association (TEA). 2022a. *Ontario Butterfly Atlas*. Accessed April 2022. 2022. http://www.ontarioinsects.org/atlas_online.htm

Toronto Entomologists' Association (TEA). 2022b. *Ontario Moth Atlas*. Accessed April 2022. 2022. https://www.ontarioinsects.org/moth/

APPENDIX A
Species at Risk Screening

TABLE A1 Species At Risk

Taxonomy	Species	ESA Status	SARA Status	COSEWIC Status	Preferred Habitat[1, 2]	Known Species Range [1, 2]	Source Identifying Species Record	Probability of Occurrence within Study Area	Conclusions/ Recommendations
Avian	Henslow's Sparrow *Centronyx henslowii*	END	END Schedule 1	END	- Open fields with tall grasses, flowering plants, and scattered shrubs; abandoned farm fields, pastures, and wet meadows. - Prefers undisturbed, extensive, dense, tall grasslands. - Avoids grazed, harvested, burned fields, or those crowded with trees and shrubs. **- TPO, CUM, and MAM that are a minimum of 30 ha in size with vegetation over 30 cm in height, a thick thatch layer, and absence of woody vegetation** .	- From Windsor northeast to Ottawa Valley/Montreal area.	NHIC	Low This species was not observed during Matrix breeding bird surveys. No suitable habitat exists within the study area.	Nothing further.
Flora	Butternut *Juglans cinerea*	END	END Schedule 1	END	- Deciduous forests with moist, well-drained soil of pH 5.5 to 8; commonly found along streams. - Often grows alone in sunny openings and near forest edges. **- FOD and mature hedgerows** .	- South of Pembroke to Port Elgin.	iNaturalist	Low Although FOD communities exist within the study area, no Butternut was observd during Matrix field observations.	Nothing further.
Flora	Red Mulberry *Morus rubra*	END	END Schedule 1	END	- Moist forest habitats including slopes and ravines. **- FOD6, FOD7, FOD8, and FOD9**.	- Pickering, Oshawa, Toronto, Windsor, Walpole Island, Pelee Island, Rondeau, Leamington, Fort Erie, Mt. Brydges, Hamilton to Niagara Falls.	iNaturalist	Low Although FOD7 communities exist within the study area, no Red Mulberry was observed during Matrix field observations.	Nothing further.
Herpetofaunas	Jefferson Salamander *Ambystoma jeffersonianum*	END	END Schedule 1	END	- Mature deciduous or mixed upland forest containing, or adjacent to, breeding ponds. - Terrestrial habitat must include small mammal burrows or rock fissures for over-wintering below the frost line. - Breeding ponds are normally ephemeral or vernal woodland pools that dry in late summer. **- FOD where permanent or temporary ponds or pools are present** .	- Most commonly found within the Niagara Escarpment and Carolinian forest regions.	ORAA	Low Although FOD communities exist within the study area, no terrestrial habitat features or breeding ponds were observed during Matrix field investigations.	Nothing further.
Invertebrates	Mottled Duskywing (Great Lakes Plains population) *Erynnis martialis*	END	No Status	END	- Requires New Jersey Tea or Narrow-Leaved New Jersey Tea to lay eggs. - Typically dry habitats such as open barrens and alvars with sparse vegetation and well-drained soils. - May include oak or pine woodland, roadsides, riverbanks, shady hillsides, and tallgrass prairies.	- Oakville, Burlington, Alderville, Camp Borden, Marmora, Niagara,F104 Ottawa, Stirling and the Pinery Provincial Park.	Ontario Butterfly Atlas	Low No suitable habitat exists within the study area.	Nothing further.
Mammals	Eastern Small-footed Myotis (Eastern Small-footed Bat) *Myotis leibii*	END	N/A	N/A	- Summer habitat includes rock outcrops, in buildings, under bridges, or in caves, mines or hollow trees. - Roosting locations are typically changed every night. - Winter hibernation occurs in caves or mines, typically drier and colder than sites selected by other bats.	- South of Georgian Bay to Lake Erie and east to the Pembroke area, the Bruce Peninsula, the Espanola area, and Lake Superior Provincial Park.	Ontario Mammals	Candidate Suitable habitat may exist in the forested communities within the study area.	Likely to require a cavity tree assessment, followed by an acoustic survey following MNRF protocol if suitable roosting habitat is found.
Mammals	Little Brown Myotis (Little Brown Bat) *Myotis lucifugus*	END	END Schedule 1	END	- Large-diameter trees, attics, abandoned buildings, and barns often used for summer colonies. - Foraging occurs over water, along waterways, and forest edges, while open areas such as clearcuts or fields are typically avoided. - Hibernacula used in winter include mines and caves that are humid and remain above freezing.	- All across Ontario; concentrated in southern Ontario.	Ontario Mammals	Candidate Suitable habitat may exist in the forested communities within the study area.	Likely to require a cavity tree assessment, followed by an acoustic survey following MNRF protocol if suitable roosting habitat is found.
Mammals	Northern Myotis (Northern Long-eared Bat) *Myotis septentrionalis*	END	END Schedule 1	END	- Typically within the boreal forest, under loose bark or in the cavities of trees. - Foraging occurs over water, along waterways, and forest edges, while open areas such as clearcuts or fields are typically avoided. - Overwintering occurs in cold and humid sites such as caves or mines. **- FOC, FOM, FOD, SWC, SWM, and SWD where suitable roosting (i.e. cavity trees and trees with loose bark) habitat is available**.	- Forested areas in southern Ontario, to the north shore of Lake Superior and occasionally as far north as Moosonee, and west to Lake Nipigon.	Ontario Mammals	Candidate Suitable habitat may exist in the forested communities within the study area.	Likely to require a cavity tree assessment, followed by an acoustic survey following MNRF protocol if suitable roosting habitat is found.
Mammals	Tri-colored Bat *Perimyotis subflavus*	END	END Schedule 1	END	- Day roost and maternity colonies are formed in older forests with large-diameter trees, barns, or other structures. - Foraging occurs over water or along streams in a forest. - Winter hibernacula include caves and mines.	- Southern Ontario north to Sudbury.	Ontario Mammals	Candidate Suitable habitat may exist in the forested communities within the study area.	Likely to require a cavity tree assessment, followed by an acoustic survey following MNRF protocol if suitable roosting habitat is found.
Avian	Bank Swallow *Riparia riparia*	THR	THR Schedule 1	THR	- Requires vertical faces in sand or silt deposits; river and lake banks, active/inactive sand and gravel pits, road cuts, soil stockpiles. - Breeding sites are located close to aerial foraging areas such as grasslands, meadows, pastures, and cropland. - Large wetlands used for nocturnal roost sites during post-breeding, migration and wintering periods.	- Common across southern Ontario, especially along Lake Erie and Lake Ontario shorelines and the Saugeen River. - Sparse populations scattered across northern Ontario.	OBBA	Low This species was not observed during Matrix breeding bird surveys.	Nothing further.
Avian	Bobolink *Dolichonyx oryzivorus*	THR	THR Schedule 1	SC	- Hayfields, pastures, wet prairie, graminoid peatlands, abandoned farm fields dominated by tall grasses, no-till cropland, small-grain fields, restored surface mining sites. - Small nests are often built on the ground in dense grasses. - Typically not abundant in short-grass prairie, alfalfa, or in row crop monocultures (corn, soybean, wheat). **- TPO, TPS, CUM1**.	- Southern Ontario north to James Bay.	OBBA, eBird	Low This species was not observed during Matrix breeding bird surveys.	Nothing further.
Avian	Chimney Swift *Chaetura pelagica*	THR	THR Schedule 1	THR	- Historically included hollow trees. - More commonly found in and around urban settlements, including chimneys and other manmade structures. - Typically close to water. **- TPO, CUM1, MAM, MAS, OAO, SAS1, SAM1, SAF1 adjacent to suitable nesting habitat** .	- Southern Ontario north to Timmins.	OBBA, eBird, MY3 (NAS 2021), CV12 (NAS 2021)	Low This species was not observed during Matrix breeding bird surveys.	Nothing further.
Avian	Eastern Meadowlark *Sturnella magna*	THR	THR Schedule 1	THR	- Moderately tall grasslands; prairies, savannahs, pastures and hayfields, alfalfa fields, weedy borders of croplands, roadsides, orchards, airports, overgrown fields. - Small trees, shrubs, or fence posts used as elevated song perches. **- TPO, TPS, CUM1, CUS, and MAM2**.	- Southern Ontario north to Timmins, as well as Lake of the Woods area.	OBBA	Low This species was not observed during Matrix breeding bird surveys.	Nothing further.
Avian	Least Bittern *Ixobrychus exilis*	THR	THR Schedule 1	THR	- Marshes with emergent vegetation surrounded by open water; prefers cattail marshes with a mix of open pools and channels. - Nests are built above marsh water in stands of dense vegetation. **- MAS2-1, MAS3-1, SA and OAO** .	- From Collingwood to Kingston as well as small pockets near Cornwall.	eBird	Low This species was not observed during Matrix breeding bird surveys. No suitable habitat exists within the study area.	Nothing further.
Herpetofaunas	Blanding's Turtle (Great Lakes / St. Lawrence population) *Emydoidea blandingii*	THR	THR Schedule 1	END	- Shallow, nutrient-rich habitats; typically large wetlands and shallow lakes with lots of water plants. - Nesting occurs in sand, organic soil, gravel, cobblestone, and soil-filled crevices of rock outcrops. - Overwintering occurs in pools about 1 metre in depth. **- SWT2, SWT3, SWD, SWM, MAS2, SAS1, SAM1, where open water is present** .	- Southern Ontario north to Sudbury, with isolated reports as far north as Timmins.	ORAA	Low No suitable habitat exists within the study area.	Nothing further.

TOTAL	**15**
Herpetofaunas	**2**
Avian	**6**
Aquatics	**0**
Invertebrates	**1**
Flora	**2**
Mammals	**4**

ESA Status	
END	**9**
THR	**6**
TOTAL SAR	**15**

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APPENDIX B
Significant Wildlife Habitat Screening

TABLE B1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
Waterfowl Stopover and Staging Areas (Terrestrial) Rationale: Habitat important for migrating waterfowl.	American Black Duck Blue-winged Teal Gadwall Green-winged Teal Northern Shoveler Tundra Swan American Wigeon Northern Pintail	CUM1 CUT1 • Plus evidence of annual spring flooding from melt water or run-off within these Ecosites. • Fields with seasonal flooding and waste grain in the Long Point, Rondeau, Pt. Pelee, Lake St. Clair, Grand Bend areas may be important for Tundra Swans.	• Fields with sheet water during Spring (mid March to May). • Field flooding during spring melt and run-off provides important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available [cxlviii]. Information Sources: • Reports and other information available from Conservation Authorities • Sites documented through waterfowl planning processes (eg. EHJV implementation plan). • Field Naturalists Clubs. • Ducks Unlimited Canada . • Natural Heritage Information Center (NHIC) Waterfowl Concentration Area. • Anecdotal information from the landowners, adjacent landowners or local naturalist clubs may be good information in determining occurrence.	• Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" [ccxi]. • Any mixed aggregations of 100Ⓔ or more individuals required. • SWH MIST [cxlix] Index #7 provides development effects and mitigation measures. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). • The flooded Field Ecosite habitat plus a 100 – 300 m radius, dependant on local site conditions and adjacent land use is the significant wildlife habitat [cxlviii].	Although a small area of CUT/CUM exists within the study area, sheet water is not likely during the spring. **Not SWH.**
Waterfowl Stopover and Staging Areas (Aquatic) Rationale: Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district.	Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed Duck Surf Scoter White-winged Scoter Black Scoter Ring-necked duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback Ruddy Duck	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	• Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify. • These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water). Information Sources: • Environment Canada • Naturalist clubs often are aware of staging / stopover areas. • OMNRF Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging. • Sites documented through waterfowl planning processes (eg. EHJV implementation plan). • Ducks Unlimited projects. • Element occurrence specification by Nature Serve: http://www.natureserve.org • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area.	Studies carried out and verified presence of: • Aggregations of 100Ⓔ or more of listed species for 7 daysⒺ, results in > 700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH [cxlix]. • The combined area of the ELC Ecosites and a 100 m radius area is the SWH [cxlviii]. • Wetland area and shorelines associated with sites identified within the SWHTG [cxlviii] Appendix K [cxlix] are significant wildlife habitat. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" [ccxi]. • Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). • SWH MIST cxlix Index #7 provides development effects and mitigation measures.	No corresponding ELC communities present within the study area. **SWH type not present.**
Shorebird Migratory	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit	BBO1 BBO2 BBS1 BBS2	• Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats.	Studies confirming: • Presence of 3 or more of listed species and > 1000Ⓔ shorebird use days during spring or fall migration period (shorebird use days are the accumulated	No corresponding ELC communities present within the study area.

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
Stopover Area Rationale: High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	Black-bellied Plover American Golden Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel Ruddy Turnstone Sanderling Dunlin	BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	• Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. • Sewage treatment ponds and storm water ponds do not qualify as a SWH. Information Sources: • Western hemisphere shorebird reserve network. • Canadian Wildlife Service (CWS) Ontario Shorebird Survey. • Bird Studies Canada. • Ontario Nature. • Local birders and naturalist clubs. • Natural Heritage Information Centre (NHIC) Shorebird Migratory Concentration Area.	number of shorebirds counted per day over the course of the fall or spring migration period). • Whimbrel stop briefly (< 24 hrs) during spring migration, any site with > 100[E] Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC Shoreline Ecosites plus a 100 m radius area [cxlviii]. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" [ccxi]. • SWH MIST [cxlix] Index #8 provides development effects and mitigation measures.	**SWH type not present.**
Raptor Wintering Area Rationale: Sites used by multiple species, a high number of individuals and used annually are most significant.	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl **Special Concern:** Short-eared Owl Bald Eagle	Hawks / Owls: Combination of ELC Community Series; need to have present one Community Series from each land class Forest: FOD, FOM, FOC. Upland: CUM, CUT, CUS, CUW. Bald Eagle: Forest community Series: FOD, FOM, FOC, SWD, SWM or SWC on shoreline areas adjacent to large rivers or lakes with open water (hunting area).	• The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. • Raptor wintering (hawk / owl) sites need to be > 20 ha [cxlviii, cxlix] with a combination of forest and upland. [xvi, xvii, xviii, xix, xx, xxi]. • Least disturbed sites, idle / fallow or lightly grazed field / meadow (> 15 ha) with adjacent woodlands [cxlix]. • Field area of the habitat is to be wind swept with limited snow depth or accumulation. • Eagle sites have open water and large trees and snags available for roosting [cxlix]. Information Sources: • OMNRF Ecologist or Biologist. • Naturalist clubs. • Natural Heritage Information Centre (NHIC) Raptor Winter Concentration Area. • Data from Bird Studies Canada. • Results of Christmas Bird Counts. • Reports and other information available from Conservation Authorities.	Studies confirm the use of these habitats by: • One or more Short-eared Owls or; One of more Bald Eagles or; At least10 individuals and two of the listed hawk / owl species[E]. • To be significant a site must be used regularly (3 in 5 years) [cxlix] for a minimum of 20 days by the above number of birds[E]. • The habitat area for an Eagle winter site is the Shoreline Forest Ecosites directly adjacent to the prime hunting area[E]. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" [ccxi]. • SWH MIST [cxlix] Index #10 and #11 provides development effects and mitigation measures.	Although a combination of FOD7 and CUT/CUM communities exist within the study area, the area does not meet the size requirements (>20 ha) for hawk and owl wintering. Although an FOD7 and FOD7-7 exist within the study area, Cooksville Creek would likely not be large enough to support Bald Eagle wintering. **Not SWH.**
Bat Hibernacula Rationale: Bat hibernacula	Big Brown Bat Tri-coloured Bat	Bat Hibernacula may be found in these Ecosites: CCR1 CCR2 CCA1	• Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. • Active mine sites should not be considered as SWH. • The locations of bat hibernacula are relatively poorly known.	• All sites with confirmed hibernating bats are SWH [E]. • The area includes 200 m radius around the entrance of the hibernaculum [cxlviii, ccvii, E] for most development types and 1000 m for wind farms [ccv]. • Studies are to be conducted during the peak swarming period (Aug. – Sept.).	No corresponding ELC communities present within the study area. No hibernacula observed during Matrix field observations.

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
are rare habitats in all Ontario landscapes		CCA2 (Note: buildings are not considered to be SWH)	Information Sources • OMNRF for possible locations and contact for local experts. • Natural Heritage Information Centre (NHIC) Bat Hibernaculum. • Ministry of Northern Development and Mines for location of mine shafts. • Clubs that explore caves (eg. Sierra Club). • University Biology Departments with bat experts.	Surveys should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects" [ccv]. • SWH MIST [cxlix] Index #1 provides development effects and mitigation measures.	**SWH type not present.**
Bat Maternity Colonies Rationale: Known locations of forested bat maternity colonies are extremely rare in all Ontario landscapes.	Big Brown Bat Silver-haired Bat	Maternity colonies considered SWH are found in forested Ecosites. All ELC Ecosites in ELC Community Series: FOD FOM SWD SWM	• Maternity colonies can be found in tree cavities, vegetation and often in buildings [xxii, xxv, xxvi, xxvii, xxxi] (buildings are not considered to be SWH). • Maternity roosts are not found in caves and mines in Ontario [xxii]. • Maternity colonies located in Mature deciduous or mixed forest stands [ccix, ccx, ccv] with > 10 / ha large diameter (> 25 cm dbh) wildlife trees [ccvii]. • Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3 [ccxiv] or class 1 or 2 [ccxii]. • Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags / ha are preferred [ccx, lxiv]. Information Sources: • OMNRF for possible locations and contact for local experts. • University Biology Departments with bat experts.	• Maternity Colonies with confirmed use by; • > 10 Big Brown Bats[Ⓔ] • > 5 Adult Female Silver haired Bats[Ⓔ]. • The area of the habitat includes the entire woodland or a forest stand ELC Ecosite or an Ecoelement containing the maternity colonies[Ⓔ]. • Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects" [ccv]. • SWH MIST [cxlix] Index #12 provides development effects and mitigation measures.	Wooded areas within the study area have the potential for bat roosting trees to be present. Targeted bat surveys were not completed within the study area during Matrix field investigations. A bat cavity tree assessment should be completed prior to removal of any trees. **Candidate SWH.**
Turtle Wintering Areas Rationale: Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	Midland Painted Turtle **Special Concern:** Northern Map Turtle Snapping Turtle	Snapping and Midland Painted Turtles; ELC Community Classes; SW, MA, OA and SA, ELC Community Series; FEO and BOO Northern Map Turtle; Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat	• For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen [cix, cx, cxi, cxii]. • Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH. Information Sources: • EIS studies carried out by Conservation Authorities. • Field Naturalists Clubs. • OMNRF Ecologist or Biologist. • Natural Heritage Information Centre (NHIC).	• Presence of 5 over-wintering Midland Painted Turtles is significant[Ⓔ]. • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant[Ⓔ]. • The mapped ELC Ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep water pool where the turtles are over wintering is the SWH. • Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept. – Oct.) or spring (Mar– May) [cvii]. Congregation of turtles is more common where wintering areas are limited and therefore significant [cix, cx, cxi, cxii]. • SWH MIST [cxlix] Index #28 provides development effects and mitigation measures for turtle wintering habitat.	Although Cooksville Creek exists within the study area, it does not provide adequate depth or substrates for turtle overwintering. **Not SWH.**
Reptile Hibernaculum Rationale: Generally sites are the only known sites in	**Snakes:** Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brown snake Smooth Green Snake	For all snakes, habitat may be found in any Ecosite other than very wet ones. Talus, Rock Barren, Crevice, Cave, and Alvar sites may be directly related to	• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural or naturalized locations. The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line [xliv, l, li, lii, cxii].	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr / May) and Fall (Sept / Oct) [Ⓔ].	No reptile hibernaculum or rock crevices observed during Matrix field investigations. **SWH type not present.**

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
the area. Sites with the highest number of individuals are most significant.	Northern Ring-necked Snake **<u>Special Concern</u>:** Milk snake Eastern Ribbonsnake	these habitats. Observations or congregations of snakes on sunny warm days in the spring or fall is a good indicator.	• Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. <u>Information Sources</u>: • In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells). • Reports and other information available from Conservation Authorities. • Field Naturalist Clubs. • University herpetologists. • Natural Heritage Information Centre (NHIC).	• <u>Note</u>: If there are Special Concern Species present, then site is SWH. • <u>Note</u>: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population (e.g. strong hibernation site fidelity). Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30 m radius area is the SWH©. • SWH MIST [cxlix] Index #13 provides development effects and mitigation measures for snake hibernacula.	
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff) <u>Rationale</u>: Historical use and number of colony nests make this habitat signif-icant. An iden-tified colony can be impor-tant to local populations. All swallow population are declining in Ontario.	Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles Cliff faces, bridge abutments, silos, barns. Habitat found in the following Ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed / permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed / permitted Mineral Aggregate Operation. <u>Information Sources</u>: • Reports and other information available from Conservation Authorities. • Ontario Breeding Bird Atlas. • Bird Studies Canada; NatureCounts http://www.birdscanada.org/birdmon/ • Field Naturalist Clubs.	Studies confirming: • Presence of 1 or more nesting sites with 8 [cxlix] or more cliff swallow pairs and / or rough-winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50 m radius habitat area from the peripheral nests [ccvii]. • Field surveys to observe and count swallow nests are to be completed during the breeding season. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” [ccxi]. • SWH MIST [cxlix] Index #4 provides development effects and mitigation measures.	Although a CUT/CUM exists within the study area, no nests were observed during Matrix field observations or breeding bird surveys. **SWH type not present.**
Colonially-Nesting Bird Breeding Habitat (Trees and Shrubs) <u>Rationale:</u> Large colonies are important to local bird population, typically sites are only known colony in area and	Great Blue Heron Black-crowned Night Heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15 m from ground, near the top of the tree. <u>Information Sources:</u> • Ontario Breeding Bird Atlas ccv, colonial nest records. • Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNRF). • Natural Heritage Information Centre (NHIC) Mixed Wader Nesting Colony. • Aerial photographs can help identify large heronries. • Reports and other information available from Conservation Authorities. • MNRF District Offices.	Studies confirming: • Presence of 2© or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300 m radius or extent of the Forest Ecosite containing the colony or any island < 15.0 ha with a colony is the SWH [cc, ccvii]. • Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and / or eggshells. • SWH MIST [cxlix] Index #5 provides development effects and mitigation measures.	No corresponding ELC communities present within the study area. **SWH type not present.**

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
are used annually.			• Field Naturalist Clubs.		
Colonially-Nesting Bird Breeding Habitat (Ground) Rationale: Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1;50,000 NTS map). Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird). MAM1 – 6 MAS1 – 3 CUM CUT CUS	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. • Brewers Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands. Information Sources: • Ontario Breeding Bird Atlas, rare / colonial species records. • Canadian Wildlife Service. • Reports and other information available from Conservation Authorities. • Natural Heritage Information Centre (NHIC) Colonial Waterbird Nesting Area. • MNRF District Offices. • Field Naturalist Clubs.	Studies confirming: • Presence of > 25 active nests for Herring Gulls or Ring-billed Gulls, > 5 active nests for Common Tern or > 2 active nests for Caspian Tern(E). • Presence of 5 or more pairs for Brewer's Blackbird(E). • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant(E). • The edge of the colony and a minimum 150m radius area of habitat, or the extent of the ELC Ecosites containing the colony or any island < 3.0 ha with a colony is the SWH [cc, ccvii]. • Studies would be done during May / June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" [ccxi] • SWH MIST [cxlix] Index #6 provides development effects and mitigation measures.	No islands or peninsulas observed during Matrix field observations. **SWH type not present.**
Migratory Butterfly Stopover Areas Rationale: Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	Painted Lady Red Admiral **Special Concern**: Monarch	Combination of ELC Community Series; need to have present one Community Series from each landclass: Field: CUM CUT CUS Forest: FOC FOD FOM CUP Anecdotally, a candidate site for butterfly stopover will have a history of butterflies being observed.	• A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Erie or Lake Ontario [cxlix]. • The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south [xxxii, xxxiii, xxxiv, xxxv, xxxvi]. • The habitat should not be disturbed, fields / meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat [cxlviii, cxlix]. • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes [xxxvii, xxxviii, xxxix, xl, xli]. Information Sources: • MNRF District Offices. • Natural Heritage Information Centre (NHIC). • Agriculture Canada in Ottawa may have list of butterfly experts. • Field Naturalist Clubs. • Toronto Entomologists Association. • Conservation Authorities.	Studies confirm: • The presence of Monarch Use Days (MUD) during fall migration (Aug / Oct) [xliii]. MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500 / day [xxxvii], significant variation can occur between years and multiple years of sampling should occur [xl, xlii]. • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD. • MUD of > 5000 or > 3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant(E). • SWH MIST [cxlix] Index #16 provides development effects and mitigation measures.	Study area is not within 5 km of Lake Ontario or Lake Erie. **SWH type not present.**
Landbird Migratory Stopover Rationale: Sites with a high diversity	All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.ec.gc.ca/na	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC	• Woodlots > 5 ha(E) in size and within 5 km [iv, v, vi, vii, viii, ix, x, xi, xii, xiii, xiv, xv] of Lake Erie and Lake Ontario. If woodlands are rare in an area of shoreline, woodland fragments 2 – 5 ha can be considered for this habitat(E). • If multiple woodlands are located along the shoreline those Woodlands < 2 km from Lake Erie and Lake Ontario are more significant [cxlix].	Studies confirm: • Use of the habitat by > 200 birds / day and with > 35 spp with at least 10 bird spp. recorded on at least 5 different survey dates(E). This abundance and diversity of migrant bird species is considered above average and significant.	Study area is not within 5 km of Lake Ontario or Lake Erie. **SWH type not present.**

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
of species as well as high numbers are most significant.	ture/ default.asp?lang=En&n=421B7A9D-1 All migrant raptors species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors).	SWM SWD	• Sites have a variety of habitats; forest, grassland and wetland complexes [cxlix]. • The largest sites are more significant [cxlix]. • Woodlots and forest fragments are important habitats to migrating birds [ccxviii], these features located along the shore and located within 5 km of Lake Erie and Lake Ontario are Candidate SWH [cxlviii]. <u>Information Sources</u>: • Bird Studies Canada. • Ontario Nature. • Local birders and field naturalist clubs. • Ontario Important Bird Areas (IBA) Program.	• Studies should be completed during spring (Mar to May) and fall (Aug to Oct) migration using standardized assessment techniques. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” [ccxi]. • SWH MIST [cxlix] Index #9 provides development effects and mitigation measures.	
Deer Winter Congregation Areas <u>Rationale</u>: Deer movement during winter in the southern areas of EcoRegion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions [cxlviii].	White-tailed Deer	All Forested Ecosites with these ELC Community Series; FOC FOM FOD SWC SWM SWD Conifer plantations much smaller than 50 ha may also be used.	• Woodlots > 100 ha in size or if large woodlots are rare in a planning area woodlots > 50 ha [E]. • Deer movement during winter in the southern areas of EcoRegion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands [cxlviii]. • Large woodlots > 100ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer / ha [ccxxiv]. • Woodlots with high densities of deer due to artificial feeding are not significant[E]. <u>Information Sources:</u> • MNRF District Offices. • LIO/NRVIS.	Studies confirm: • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF [cxlviii]. • Use of the woodlot by white-tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRF [E]. • Studies should be completed during winter (Jan / Feb) when > 20 cm of snow is on the ground using aerial survey techniques [ccxxiv], ground or road surveys or a pellet count deer density survey [ccxxv]. • SWH MIST [cxlix] Index #2 provides development effects and mitigation measures.	Although FOD7 communities exist within the study area, they do not meet the size requirements (>50 or >100 ha) for a Deer winter Congregation Area. **Not SWH.**

TABLE B2 Rare Vegetation Communities

Rare Vegetation Community	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes	Habitat Description	Detailed Information and Sources	Defining Criteria	Assessment Details
Cliffs and Talus Slopes Rationale: Cliffs and Talus Slopes are extremely rare habitats in Ontario.	Any ELC Ecosite within Community Series: TAO CLO TAS CLS TAT CLT	A Cliff is vertical to near vertical bedrock > 3 m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris.	Most cliff and talus slopes occur along the Niagara Escarpment. Information Sources: • The Niagara Escarpment Commission has detailed information on location of these habitats. • OMNRF Districts. • Natural Heritage Information Centre (NHIC) has location information available on their website. • Field Naturalist Clubs. • Conservation Authorities.	• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes [lxxviii]. • SWH MIST [cxlix] Index #21 provides development effects and mitigation measures.	No corresponding ELC communities present within the study area. **SWH type not present.**
Sand Barren Rationale: Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry.	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always < or equals to 60%.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered, but less than 60%.	• A sand barren area > 0.5 ha in size[E]. Information Sources: • OMNRF Districts. • Natural Heritage Information Centre (NHIC) has location information available on their website. • Field Naturalist Clubs. • Conservation Authorities.	• Confirm any ELC Vegetation Type for Sand Barrens [lxxviii]. • Site must not be dominated by exotic or introduced species (< 50% vegetative cover are exotic sp.)[E]. • SWH MIST [cxlix] Index #20 provides development effects and mitigation measures.	No corresponding ELC communities present within the study area. **SWH type not present.**
Alvar Rationale: Alvars are extremely rare habitats in EcoRegion 7E.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 Five Alvar Indicator Species: 1) *Carex crawei* 2) *Panicum philadelphicum* 3) *Eleocharis compressa* 4) *Scutellaria parvula* 5) *Trichostema brachiatum*	An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plants. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover [lxxviii].	• An Alvar site > 0.5 ha in size [lxxv]. Alvar is particularly rare in EcoRegion 7E where the only known sites are found in the western islands of Lake Erie [cxcix]. Information Sources: • Alvars of Ontario (2000). • Federation of Ontario Naturalists [lxxvi]. • Ontario Nature – Conserving Great Lakes Alvars [ccviii]. • Natural Heritage Information Centre (NHIC) has location information available on their website. • OMNRF Staff. • Field Naturalist Clubs. • Conservation Authorities.	• Field studies that identify four of the five [E] **Alvar Indicator Species** [lxxv, cxlix] at a Candidate Alvar site is Significant. • Site must not be dominated by exotic or introduced species (< 50% vegetative cover are exotic sp.). • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses [lxxv]. • SWH MIST [cxlix] Index #17 provides development effects and mitigation measures.	No corresponding ELC communities present within the study area. **SWH type not present.**

Rare Vegetation Community	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes	Habitat Description	Detailed Information and Sources	Defining Criteria	Assessment Details
	These indicator species are very specific to Alvars within EcoRegion 7E Ⓔ [cxlix].				
Old Growth Forest Rationale: Due to historic logging practices and land clearance for agriculture, old growth forest is rare in EcoRegion 7E.	Forest Community Series: FOD FOC FOM SWD SWC SWM	Old Growth forests are characterized by heavy mortality or turnover of overstorey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris.	• Woodland area is > 0.5 ha Ⓔ. Information Sources: • OMNRF Forest Resource Inventory mapping. • OMNRF Districts. • Field Naturalist Clubs. • Conservation Authorities. • Sustainable Forestry Licence (SFL) companies will possibly know locations through field operations. • Municipal forestry departments.	Field Studies will determine: • If dominant trees species of the are > 140 years old, then the area containing these trees is Significant Wildlife Habitat [cxlviii]. • The forested area containing the old growth characteristics will have experienced no recognizable forestry activities [cxlviii] (cut stumps will not be present). • The area of Forest Ecosites combined or an Ecoelement within an Ecosite that contain the old growth characteristics is the SWH. • Determine ELC vegetation types for the forest area containing the old growth characteristics [lxxviii]. • SWH MIST [cxlix] Index #23 provides development effects and mitigation measures.	Although FOD communities exist within the study area, they do not meet the requirements of an Old Growth Forest. **SWH type not present.**
Savannah Rationale: Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60% [lxxix, lxxx, lxxxi, lxxxii, lxxxiii]. In EcoRegion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario).	• No minimum size to site Ⓔ. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. Information Sources: • Natural Heritage Information Centre (NHIC) has location data available on their website. • OMNRF Districts. • Field Naturalists Clubs. • Conservation Authorities.	• Field studies confirm one or more of the Savannah indicator species listed in [cxlix] Appendix N should be present Ⓔ. Note: Savannah plant spp. list from EcoRegion 7E should be used [cxlviii]. • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (< 50% vegetation cover are exotic sp.). • SWH MIST [cxlix] Index #18 provides development effects and mitigation measures.	No corresponding ELC communities present within the study area. **SWH type not present.**
Tallgrass Prairie Rationale: Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover [lxxix, lxxx, lxxxi, lxxxii, lxxxiii]. In EcoRegion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario).	• No minimum size to site Ⓔ. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. Information Sources: • OMNRF Districts. • Natural Heritage Information Centre (NHIC) has location information available on their website. • Field Naturalists Clubs. • Conservation Authorities.	• Field studies confirm one or more of the Prairie indicator species listed in [cxlix] Appendix N should be present Ⓔ. Note: Prairie plant spp. list from EcoRegion 7E should be used [cxlviii]. • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (< 50% vegetative cover are exotic sp.). • SWH MIST [cxlix] Index #19 provides development effects and mitigation measures.	No corresponding ELC communities present within the study area. **SWH type not present.**
Other Rare Vegetation Communities Rationale:	Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix	Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	• ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in appendix M [cxlviii]. • The OMNRF/NHIC will have up to date listing for rare vegetation communities.	• Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG [cxlviii]. • Area of the ELC Vegetation Type polygon is the SWH.	No rare vegetation communities were observed within the study area.

Rare Vegetation Community	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes	Habitat Description	Detailed Information and Sources	Defining Criteria	Assessment Details
Plant communities that often contain rare species which depend on the habitat for survival.	M of the SWHTG [cxlviii]. Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.		Information Sources: • Natural Heritage Information Centre (NHIC) has location information available on their website. • OMNRF Districts. • Field Naturalists Clubs. • Conservation Authorities.	• SWH MIST [cxlix] Index #37 provides development effects and mitigation measures.	**No SWH.**

TABLE B3 Specialized Habitats of Wildlife considered SWH

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
Waterfowl Nesting Area Rationale: Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 **Note: includes adjacency to Provincially Significant Wetlands**	• A waterfowl nesting area extends 120 m [cxlix] from a wetland (> 0.5 ha) or a wetland (> 0.5 ha) and any small wetlands (0.5 ha) within 120m or a cluster of 3 or more small (< 0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur [cxlix]. • Upland areas should be at least 120 m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (40cm dbh) in woodlands for cavity nest sites. Information Sources: • Ducks Unlimited staff may know the locations of particularly productive nesting sites. • OMNRF Wetland Evaluations for indication of significant waterfowl nesting habitat. • Reports and other information available from Conservation Authorities.	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding Mallards[Ⓔ], or; • Presence of 10 or more nesting pairs for listed species including Mallards[Ⓔ]. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" [ccxi]. • A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m [cxlviii] from the wetland and will provide enough habitat for waterfowl to successfully nest. • SWH MIST [cxlix] Index #25 provides development effects and mitigation measures.	No corresponding ELC communities present within the study area. **SWH type not present.**
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat Rationale: Nest sites are fairly uncommon in EcoRegion 7E and are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	Osprey **Special Concern:** Bald Eagle	ELC Forest Community Series: FOD FOM FOC SWD SWM SWC Directly adjacent to riparian areas – rivers, lakes, ponds and wetlands.	• Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. • Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms). Information Sources: • Natural Heritage Information Centre (NHIC) compiles all known nesting sites for Bald Eagles in Ontario. • MNRF values information (LIO/NRVIS) will list known nesting locations. Note: data from NRVIS is provided as a point and does not represent all the habitat. • Nature Counts, Ontario Nest Records Scheme data. • OMNRF District. • Check the Ontario Breeding Bird Atlas [ccv] or Rare Breeding Birds in Ontario for species documented. • Reports and other information available from Conservation Authorities. • Field Naturalists Clubs.	Studies confirm the use of these nests by: • One or more active Osprey or Bald Eagle nests in an area [cxlviii]. • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH [ccvii], maintaining undisturbed shorelines with large trees within this area is important [cxlviii]. • For a Bald Eagle the active nest and a 400 - 800 m radius around the nest is the SWH [cvi, ccvii]. Area of the habitat from 400 - 800m is dependant on site lines from the nest to the development and inclusion of perching and foraging habitat [cvi]. • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for equal or > 3 years or suspected of not being used for > 5 years before being considered not significant [ccvii]. • Observational studies to determine nest site use, perching sites and foraging areas need to be done from early March to mid August.	No evidence of Bald Eagle or Osprey Nests or sightings were observed during breeding bird survey or other Matrix field investigations. An FOD7 community is located along Cooksville Creek. **Not SWH.**

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
				• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" [ccxi]. • SWH MIST [cxlix] Index #26 provides development effects and mitigation measures.	
Woodland Raptor Nesting Habitat Rationale: Nests sites for these species are rarely identified; these area sensitive habitats are often used annually by these species.	Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk	May be found in all forested ELC Ecosites. May also be found in SWC, SWM,SWD and CUP3	• All natural or conifer plantation woodland/forest stands > 30 ha with > 4 ha of interior habitat [lxxxviii, lxxxix, xc, xci, xciii, xciv, xcv, xcvi, cxxxiii]. Interior habitat determined with a 200 m buffer [cxlviii]. • Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small off-shore islands. • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest. Information Sources: • OMNRF Districts. • Check the Ontario Breeding Bird Atlas [ccv] or Rare Breeding Birds in Ontario for species documented. • Check data from Bird Studies Canada. • Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of 1 or more active nests from species list is considered significant [cxlviii]. • Red-shouldered Hawk and Northern Goshawk – A 400 m radius around the nest or 28 ha area of habitat is the SWH [ccvii] (the 28 ha habitat area would be applied where optimal habitat is irregularly shaped around the nest). • Barred Owl – A 200 m radius around the nest is the SWH [ccvii]. • Broad-winged Hawk and Coopers Hawk – A 100 m radius around the nest is the SWH [ccvii]. • Sharp-Shinned Hawk – A 50 m radius around the nest is the SWH [ccvii]. • Conduct field investigations from early March to end of May. The use of call broadcasts can help in locating territorial (courting / nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • SWH MIST [cxlix] Index #27 provides development effects and mitigation measures.	Forest habitat found within the study area, but not large enough (< 30 ha) to support Woodland Raptor Nesting. No raptor or nests of the outlined species were observed during breeding bird survey or other Matrix field investigations. **Not SWH**.
Turtle Nesting Areas Rationale: These habitats are rare and when identified will often be the only breeding site for local populations for turtles.	Midland Painted Turtle **Special Concern:** Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (< 100 m) [cxlviii] or within the following ELC Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons, or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes and rivers are most frequently used. Information Sources: • Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels). • Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may help to find potential nesting habitat for them. • Natural Heritage Information Centre (NHIC). • Field Naturalist Clubs.	Studies confirm: • Presence of 5 or more nesting Midland Painted Turtles[E]. • One or more Northern Map Turtles or Snapping Turtle nesting is a SWH[E]. • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30 – 100 m around the nesting area dependant on slope, riparian vegetation and adjacent land use in the SWH [cxlviii]. • Travel routes from wetland to nesting area are to be considered within the SWH as part of the 30 – 100 m area of habitat [cxlix]. • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • SWH MIST [cxlix] Index #28 provides development effects and mitigation measures for turtle nesting habitat.	No corresponding ELC communities present within the study area. Cooksville Creek does not have the appropriate depth and substrate for turtle nesting. **SWH type not present.**
Seeps and Springs Rationale: Seeps/Springs are typical of headwater areas and are often at	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps / Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within	Any forested area (with < 25 % meadow / field / pasture) within headwaters of a stream or river system [cxvii, cxlix]. • Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species [cxix, cxx, cxxi, cxxii, cxiii, cxiv].	Field Studies confirm: • Presence of a site with 2 or more[E] seeps / springs should be considered SWH. • The area of an ELC Forest Ecosite or an Ecoelement within Ecosite containing the seeps / springs is the SWH. The	No seeps or springs observed in the study area during field investigations.

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
the source of coldwater streams.		the headwater areas of a stream could have seeps / springs.	Information Sources: • Topographical Map. • Thermography. • Hydrological surveys conducted by Conservation Authorities and MOE. • Field Naturalists Clubs and landowners. • Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped.	protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat [cxlviii]. • SWH MIST [cxlix] Index #30 provides development effects and mitigation measures.	**SWH type not present.**
Amphibian Breeding Habitat (Woodland) Rationale: These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations.	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or shortest distance from forest habitat are more significant because they are more likely to be used due to educed risk to migrating amphibians.	• Presence of a wetland, pond or woodland pool (including vernal pools) > 500 m^2 (about 25 m diameter) [ccvii] within or adjacent (within 120 m) to a woodland (no minimum size) [clxxxii, lxiii, lxv, lxvi, lxvii, lxviii, lxix, lxx]. Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat [cxlviii]. Information Sources: • Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records. • Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. • OMNRF Districts and wetland evaluations. • Field Naturalist Clubs. • Canadian Wildlife Service Amphibian Road Call Survey. • Ontario Vernal Pool Association: http://www.ontariovernalpools.org	Studies confirm: • Presence of breeding population of 1 or more of the listed newt / salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) [lxxi] or 2 or more of the listed frog species with Call Level Codes of 3Ⓔ. • A combination of observational study and call count surveys [cviii] will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the woodland / wetlands. • The habitat is the wetland area plus a 230 m radius of woodland area [lxiii, lxv, lxvi, lxvii, lxviii, lxix, lxx, lxxi]. If a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. • SWH MIST [cxlix] Index #14 provides development effects and mitigation measures.	No wetlands, ponds, or woodland pools observed within or adjacent to the wooded areas within the study area. **SWH type not present.**
Amphibian Breeding Habitat (Wetland) Rationale: Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within Central Ontario landscapes.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	ELC Community Classes SW, MA, FE, BO, OA and SA. Typically these Wetland Ecosites will be isolated (> 120 m) from Woodland Ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bull Frog) maybe adjacent to woodlands.	• Wetlands > 500 m^2 (about 25 m diameter) [ccvii], supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats [clxxxii]. • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. • Bullfrogs require permanent water bodies with abundant emergent vegetation. Information Sources: • Ontario Herpetofaunal Summary Atlas (or other similar atlases). • Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count. • OMNRF Districts and wetland evaluations. • Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of breeding population of 1 or more of the listed newt / salamander species or 2 or more of the listed frog / toad species with at least 20 individuals (adults or eggs masses) [lxxi] or 2 or more of the listed frog/toad species with Call Level Codes of 3Ⓔ. or; Wetland with confirmed breeding Bullfrogs are significantⒺ. • The ELC Ecosite Wetland area and the shoreline are the SWH. • A combination of observational study and call count surveys [cviii] will be required during the spring (March - June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule.	No wetlands present within the study area. **SWH type not present.**

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
				• SWH MIST [cxlix] Index #15 provides development effects and mitigation measure	
Woodland Area-Sensitive Bird Breeding Habitat Rationale: Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler, Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager, Winter Wren Pileated Woodpecker **Special Concern**: Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (> 60 yrs old) forest stands or woodlots > 30 ha [cv, cxxxi, cxxxii, cxxxiii, cxxxiv, cxxxv, cxxxvi, cxxxvii, cxxxviii, cxxxix, cxl, cxli, cxlii, cxliii, cxliv, cxlv, cxlvi, cl, cli, clii, cliii, cliv, clv, clvi, clvii, clviii, clix]. • Interior forest habitat is at least 200 m from forest edge habitat [clxiv]. Information Sources: • Local birder clubs. • Canadian Wildlife Service (CWS) for the location of forest bird monitoring. • Bird Studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to determine what forests were of greatest value to interior species. • Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species Ⓔ. • Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH Ⓔ. • Conduct field investigations in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” [ccxi]. • SWH MIST [cxlix] Index #34 provides development effects and mitigation measures.	Forested habitat is present within the study area; however, it is not large enough (< 30 ha) to support Woodland Area Sensitive Breeding Birds. **Not SWH.**

TABLE B4 Habitats of Species of Conservation Concern considered SWH

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
Marsh Breeding Bird Habitat Rationale: Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	American Bittern Virginia Rail Sora Common Moorhen American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Green Heron Trumpeter Swan **Special Concern:** Black Tern Yellow Rail	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 For Green Heron: All SW, MA and CUM1 sites.	• Nesting occurs in wetlands. • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present [cxxiv]. • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it many be found in upland shrubs or forest a considerable distance from water. Information Source: • OMNRF District and wetland evaluations. • Field Naturalists Clubs. • Natural Heritage Information Centre (NHIC) Records. • Reports and other information available from Conservation Authorities. • Ontario Breeding Bird Atlas.	Studies confirm: • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren **or** breeding by any combination of 4 or more of the listed species [E]. • Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH [E]. • Area of the ELC Ecosite is the SWH. • Breeding surveys should be done May / June when these species are actively nesting in wetland habitats. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” [ccxi]. • SWH MIST [cxlix] Index #35 provides development effects and mitigation measures.	No corresponding ELC communities present within the study area. **SWH type not present.**
Open Country Bird Breeding Habitat Rationale: This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow **Special Concern:** Short-eared Owl	CUM1 CUM2	• Large grassland areas (includes natural and cultural fields and meadows > 30 ha [clx, clxi, clxiii, clxiv, clxv, clxvi, clxvii, clxviii, clxix]. • Grassland not Class 1 or 2 agricultural lands, and not being actively used for farming (e.g. no row cropping or intensive hay or livestock pasturing in the last 5 years) [E]. • Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. • The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species. Information Sources: • Agricultural land classification maps, Ministry of Agriculture. • Local Bird Clubs. • Ontario Breeding Bird Atlas. • EIS Reports and other information available from Conservation Authorities.	Field Studies confirm: • Presence of nesting or breeding of 2 or more of the listed species [E]. • A field with 1 or more breeding Short-eared Owls is to be considered SWH. • The area of SWH is the contiguous ELC Ecosite field areas. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” [ccxi]. • SWH MIST [cxlix] Index #32 provides development effects and mitigation measures.	Although a CUT/CUM exists within the study area, it does not meet the size requirements (> 30 ha) for Open Country Bird Breeding habitat. **Not SWH.**
Shrub / Early Successional Bird Breeding Habitat Rationale: This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records.	Indicator Spp: Brown Thrasher Clay-coloured Sparrow Common Spp: Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of Shrub Ecosites can be complexed into a larger habitat for some bird species.	• Large field areas succeeding to shrub and thicket habitats > 10 ha [clxiv] in size. • Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (e.g. no row-cropping, haying or live-stock pasturing in the last 5 years) [E]. • Shrub thicket habitats (> 10 ha) are most likely to support and sustain a diversity of these species [clxxiii]. • Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands. Information Sources: • Agricultural land classifications maps, Ministry of Agriculture. • Local Bird Clubs. • Ontario Breeding Bird Atlas. • Reports and other information available from Conservation Authorities.	Field Studies confirm: • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species [E]. • A habitat with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as SWH [E]. • The area of the SWH is the contiguous ELC Ecosite field / thicket area. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” [ccxi]. • SWH MIST [cxlix] Index #33 provides development effects and mitigation measures.	Although a CUT/CUM exists within the study area, it does not meet the size requirement (> 10 ha) for Shrub/Early Successional Bird Breeding Habitat. **Not SWH.**
Terrestrial Crayfish	Chimney or Digger Crayfish	MAM1 MAM2	• Wet meadow and edges of shallow marshes (no minimum size) should be surveyed for terrestrial crayfish.	Studies Confirm:	No corresponding ELC communities present

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
Rationale: Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare [cxcii].	(*Fallicambarus fodiens*) Devil Crayfish or Meadow Crayfish (*Cambarus diogenes*)	MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM CUM1 with inclusions of above Meadow Marsh Ecosites can be used by terrestrial crayfish.	• Constructs burrows in marshes, mudflats, meadows, the ground cannot be too moist. Can often be found far from water. • Both species are semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed. Information Sources: • Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998.	• Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable meadow marsh, swamp or moist terrestrial sites [cci]. • Area of ELC Ecosite or an Ecoelement area of meadow marsh or swamp within the larger Ecosite area is the SWH. • Surveys should be done in April to August in temporary or permanent water. Note the presence of burrows or chimneys are often the only indicator of presence, observance or collection of individuals in very difficult [cci]. • SWH MIST [cxlix] Index #36 provides development effects and mitigation measures.	within the study area**.** Crayfish were observed within the creek and no burrows were found during Matrix field investigations. **SWH type not present.**
Special Concern and Rare Wildlife Species Rationale: These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre (NHIC).	All plant and animal element occurrences (EO) within a 1 or 10 km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy.	• When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or Provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites [lxxviii]. Information Sources: • Natural Heritage Information Centre (NHIC) will have Special Concern and Provincially Rare (S1-S3, SH) species list with element occurrences data. • NHIC Website "Get Information" – http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas. • Expert advice should be sought as many of the rare spp. have little information available about their requirements.	Studies Confirm : • Assessment / inventory of the site for the identified Special Concern or rare species needs to be completed during the time of the year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs to be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat for foraging habitat. • SWH MIST [cxlix] Index #37 provides development effects and mitigation measures.	**Candidate SOCC:** • Monarch (*Danaus plexippus*) **Confirmed SOCC:** • Eastern Wood-pewee (*Contopus virens*) See wildlife and vegetation lists for any provincially rare species.

TABLE B5 Animal Movement Corridors

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
Amphibian Movement Corridors Rationale: Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	Corridors may be found in all Ecosites associated with water. Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1.	• Movement corridors between breeding habitat and summer habitat [clxxiv, clxxv, clxxvi, clxxvii, clxxviii, clxxix, clxxx, clxxxi]. • Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat –Wetland) of this Schedule [E]. Information Sources: • MNRF District Office. • Natural Heritage Information Centre (NHIC). • Reports and other information available from Conservation Authorities. • Field Naturalist Clubs.	• Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites. • Corridors should consist of native vegetation, with several layers of vegetation. Corridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant [cxlix]. • Corridors should have at least 15 m of vegetation on both sides of waterway [cxlix] or be up to 200 m [cxlix] wide of woodland habitat and with gaps < 20 m [cxlix]. • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat [cxlix]. • SWH MIST [cxlix] Index #40 provides development effects and mitigation measures	No Amphibian Breeding Habitat from Table 1.2.2. **SWH type not present.**

TABLE B6 Significant Wildlife Habitat Exceptions for EcoDistricts within EcoRegion 7E

EcoDistrict	Wildlife Habitat and Species	Candidate SWH			Confirmed SWH	Study Area
		Ecosite	Habitat Description	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
7E-2	**Bat Migratory Stopover Area** Rationale: Stopover areas for long distance migrant bats are important during fall migration. Hoary Bat Eastern Red Bat Silver-haired Bat	No specific ELC types.		• Long distance migratory bats typically migrate during late summer and early fall from summer breeding habitats throughout Ontario to southern wintering areas. Their annual fall migration may concentrate these species of bats at stopover areas. • This is the only known bat migratory stopover habitats based on current information. Information Sources: • OMNRF for possible locations and contact for local experts. • University of Waterloo, Biology Department.	• Long Point (42°35'N, 80°30'E, to 42°33'N, 80°03'E) has been identified as a significant stop-over habitat for fall migrating Silver-haired Bats, due to significant increases in abundance, activity and feeding that was documented during fall migration [ccxv]. • The confirmation criteria and habitat areas for this SWH are still being determined. • SWH MIST [cxlix] Index #38 provides development effects and mitigation measures	Study area is not located within Ecodistrict 7E-2. **SWH type not present.**

DRAFT

APPENDIX C
Agency Consultation

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

March 6, 2023 Matrix 34715-522

CREDIT VALLEY CONSERVATION
1255 Old Derry Road
Mississauga, ON L5N 6R4

Subject: Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design

To Whom It May Concern:

1 INTRODUCTION

On behalf of City of Mississauga, Matrix Solutions Inc. is submitting a request for information regarding fish records, thermal regime, timing windows, wetland mapping and/or evaluation, data records for Locally Significant Features or Significant Wildlife Habitat, Species at Risk and Local Species Rankings (should it be available).

Any other possible site constraint information would be greatly appreciated. The information will be used to inform the background review for the project involving the preparation of a natural environment screening for the Cooksville Creek Mississauga Valley Boulevard to CP Rail Erosion Control EA and Detailed Design.

2 PROJECT DESCRIPTION

The City of Mississauga is undertaking an Erosion Control Municipal Class Environmental Assessment (EA) for Cooksville Creek for the reach located upstream of Mississauga Valley Boulevard extending to the CP Rail. The study area originates upstream of Mississauga Valley Boulevard (approximately 100m) and continues downstream to the CP Rail crossing. The reach joining Mississauga Valley Blvd. to the CP rail represents approximately 360m of channel which would essentially complete the Cooksville Creek restoration from Robert Spec downstream to Lakeshore Road. Cooksville Creek as a whole, has been significantly modified (straightened) through the reach to accommodate development, and corresponding development needs (sanitary infrastructure).

3 BACKGROUND INFORMATION

Upon review of the Mississauga Natural Area Surveys, Natural Heritage Information Centre, Fisheries and Oceans Canada, Ontario Breeding Bird Atlas, the Ontario Reptile and Amphibian Atlas records, Land Information Ontario Aquatic Resource Area Mapping, eBird, Ontario Butterfly Atlas, iNaturalist, Ontario Mammals, and Canadian Important Bird Areas the following features and species were identified as potentially occurring in the vicinity of the study area (Table 1).

Table 1. Species List

Common Name	Scientific Name	SRank	ESA Status	COSEWIC Status
Mammals				
Eastern Small-footed Bat	*Myotis leibii*	S2/S3	END	N/A
Little Brown Bat	*Myotis lucifugus*	S4	END	END
Northern Long-eared Bat	*Myotis septentrionalis*	S3	END	END
Tri-colored Bat	*Perimyotis subflavus*	S3	END	END
Reptiles				
Blanding's Turtle	*Emydoidea blandingii*	S3	THR	END
Jefferson Salamander	*Ambystoma jeffersonianum*	S2	END	END
Eastern Musk Turtle (Stinkpot)	*Sternotherus odoratus*	S3	SC	SC
Northern Map Turtle	*Graptemys geographica*	S3	SC	SC
Snapping Turtle	*Chelydra serpentina*	S3	SC	SC
Birds				
Barn Swallow	*Hirundo rustica*	S4B	SC	-
Bank Swallow	*Riparia riparia*	S4B	THR	THR
Bobolink	*Dolichonyx oryzivorus*	S4B	THR	THR
Chimney Swift	*Chaetura pelagica*	S4B/S4N	THR	THR
Eastern Meadowlark	*Sturnella magna*	S4B	THR	THR
Henslow's Sparrow	*Centronyx henslowii*	SHB	END	END
Least Bittern	*Ixobrychus exilis*	S4B	THR	THR
Bald Eagle	Haliaeetus leucocephalus	S2N/S4B	SC	Not at Risk
Canada Warbler	Cardellina canadensis	S4B	SC	THR
Common Nighthawk	Chordeiles minor	S4B	SC	SC
Eastern Wood-pewee	Contopus virens	S4B	SC	SC
Olive-sided Flycatcher	Contopus cooperi	S4B	SC	SC
Peregrine Falcon	Falco peregrinus	S3B	SC	Not at Risk
Rusty Blackbird	Euphagus carolinus	S4B	SC	SC
Wood Thrush	Hylocichla mustelina	S4B	SC	THR
Vegetation				
Butternut	*Juglans cinerea*	S2?	END	END
Red Mulberry	*Morus rubra*	S2	END	END
Invertebrates				
Mottled Duskywing	*Erynnis martialis*	S2	END	END
Monarch	*Danaus plexippus*	S2N, S4B	SC	END

Please contact the undersigned should you require additional information of the above.

Yours truly,

MATRIX SOLUTIONS INC.

Emily Ottens (Hon) B.Sc., M.BEMA
Ecologist

EO/vc
Attachments

Emily Ottens

From: Emily Ottens
Sent: March 6, 2023 12:38 PM
To: Bhatt, Stuti
Cc: Kierian Keele; Emily Ottens
Subject: RE: [External] FW: 34715-522; Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design
Attachments: Cooksville Creek Study Area.PNG

Hi Stuti,

Below is the information you requested. Additional details surrounding the scope of the project are also found on the request letter.

Project Name: Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design
Proponent: City of Mississauga
User: Matrix Solutions Inc.
Intended Use and Publications: The information will be used to inform the background review for the project involving the preparation of a natural environment screening (EA)

Attached is a screenshot of our study area and study area plus 120 m buffer (purple lines).

Thanks,

Emily Ottens, H.B.Sc., M.BEMA
Ecologist, Eastern Natural Sciences

MATRIX SOLUTIONS INC.
Environment & Engineering
Unit 7B, 650 Woodlawn Rd. W, Guelph, ON, N1K 1B8
D 226.314.1923 **C** 226 821 4808
www.matrix-solutions.com

From: Bhatt, Stuti <stuti.bhatt@cvc.ca>
Sent: March 6, 2023 10:53 AM
To: Emily Ottens <EOttens@matrix-solutions.com>
Cc: Kierian Keele <kkeele@matrix-solutions.com>
Subject: RE: [External] FW: 34715-522; Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design

Hi Emily,

Thank you for your email. Please provide the following information along with a map of your interest area so I can proceed with a data sharing agreement. If possible, please also send a shapefile of the interest area*.

- Project name:
- Proponent:
- User:
- Intended use and publications:

Please feel free to get in touch if you have any questions.

Best regards,

Stuti Bhatt
Planning Technician, Planning and Development Services | Credit Valley Conservation
905-670-1615 ext 350 | M: 437-221-3614
stuti.bhatt@cvc.ca | cvc.ca

Credit Valley Conservation

From: Emily Ottens <EOttens@matrix-solutions.com>
Sent: Monday, March 6, 2023 10:25 AM
To: Wilson, Christine <Christine.Wilson@cvc.ca>
Cc: Kierian Keele <kkeele@matrix-solutions.com>
Subject: [External] FW: 34715-522; Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design

Hi Christine,

I received a bounce-back email that Charlotte is not longer with CVC and was given your email regarding inquiries. Attached please find an information request for our Cooksville Creek project.

Thank you,

Emily Ottens, H.B.Sc., M.BEMA
Ecologist, Eastern Natural Sciences

MATRIX SOLUTIONS INC.
Environment & Engineering
Unit 7B, 650 Woodlawn Rd. W, Guelph, ON, N1K 1B8

D 226.314.1923 **C** 226 821 4808
www.matrix-solutions.com

From: Emily Ottens <EOttens@matrix-solutions.com>
Sent: March 6, 2023 10:23 AM
To: charlotte.cox@cvc.ca
Cc: iftekhar.ahmad@cvc.ca; Emily Ottens <EOttens@matrix-solutions.com>; Kierian Keele <kkeele@matrix-solutions.com>
Subject: 34715-522; Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design

Hello,

Attached please find an information request for the Cooksville Creek EA project (34715-522). Please reach out if you require any additional information regarding the project.

Thank you,

Emily Ottens, H.B.Sc., M.BEMA
Ecologist, Eastern Natural Sciences

MATRIX SOLUTIONS INC.
Environment & Engineering
Unit 7B, 650 Woodlawn Rd. W, Guelph, ON, N1K 1B8
D 226.314.1923 **C** 226 821 4808
www.matrix-solutions.com

March 1, 2023 Matrix 34715-522

MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS

Subject: Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design

To Whom It May Concern:

1 INTRODUCTION

On behalf of City of Mississauga, Matrix Solutions Inc. is submitting a request for information regarding fish records, Significant Wildlife Habitat and Species at Risk (should it be available). Any other possible site constraint information would be greatly appreciated. The information will be used to inform the background review for the project involving the preparation of a natural environment screening for the Cooksville Creek Mississauga Valley Boulevard to CP Rail Erosion Control EA and Detailed Design.

2 PROJECT DESCRIPTION

The City of Mississauga is undertaking an Erosion Control Municipal Class Environmental Assessment (EA) for Cooksville Creek for the reach located upstream of Mississauga Valley Boulevard extending to the CP Rail. The study area originates upstream of Mississauga Valley Boulevard (approximately 100m) and continues downstream to the CP Rail crossing. The reach joining Mississauga Valley Blvd. to the CP rail represents approximately 360m of channel which would essentially complete the Cooksville Creek restoration from Robert Spec downstream to Lakeshore Road. Cooksville Creek as a whole, has been significantly modified (straightened) through the reach to accommodate development, and corresponding development needs (sanitary infrastructure).

3 BACKGROUND INFORMATION

Upon review of the Mississauga Natural Area Surveys, Natural Heritage Information Centre, Fisheries and Oceans Canada, Ontario Breeding Bird Atlas, the Ontario Reptile and Amphibian Atlas records, Land Information Ontario Aquatic Resource Area Mapping, eBird, Ontario Butterfly Atlas, iNaturalist, Ontario Mammals, and Canadian Important Bird Areas the following features and species were identified as potentially occurring in the vicinity of the study area (Table 1).

Table 1. Species List

Common Name	Scientific Name	SRank	ESA Status	COSEWIC Status
Mammals				
Eastern Small-footed Bat	*Myotis leibii*	S2/S3	END	N/A
Little Brown Bat	*Myotis lucifugus*	S4	END	END
Northern Long-eared Bat	*Myotis septentrionalis*	S3	END	END
Tri-colored Bat	*Perimyotis subflavus*	S3	END	END
Reptiles				
Blanding's Turtle	*Emydoidea blandingii*	S3	THR	END
Jefferson Salamander	*Ambystoma jeffersonianum*	S2	END	END
Eastern Musk Turtle (Stinkpot)	*Sternotherus odoratus*	S3	SC	SC
Northern Map Turtle	*Graptemys geographica*	S3	SC	SC
Snapping Turtle	*Chelydra serpentina*	S3	SC	SC
Birds				
Barn Swallow	*Hirundo rustica*	S4B	SC	-
Bank Swallow	*Riparia riparia*	S4B	THR	THR
Bobolink	*Dolichonyx oryzivorus*	S4B	THR	THR
Chimney Swift	*Chaetura pelagica*	S4B/S4N	THR	THR
Eastern Meadowlark	*Sturnella magna*	S4B	THR	THR
Henslow's Sparrow	*Centronyx henslowii*	SHB	END	END
Least Bittern	*Ixobrychus exilis*	S4B	THR	THR
Bald Eagle	Haliaeetus leucocephalus	S2N/S4B	SC	Not at Risk
Canada Warbler	Cardellina canadensis	S4B	SC	THR
Common Nighthawk	Chordeiles minor	S4B	SC	SC
Eastern Wood-pewee	Contopus virens	S4B	SC	SC
Olive-sided Flycatcher	Contopus cooperi	S4B	SC	SC
Peregrine Falcon	Falco peregrinus	S3B	SC	Not at Risk
Rusty Blackbird	Euphagus carolinus	S4B	SC	SC
Wood Thrush	Hylocichla mustelina	S4B	SC	THR
Vegetation				
Butternut	*Juglans cinerea*	S2?	END	END
Red Mulberry	*Morus rubra*	S2	END	END
Invertebrates				
Mottled Duskywing	*Erynnis martialis*	S2	END	END
Monarch	*Danaus plexippus*	S2N, S4B	SC	END

Please contact the undersigned should you require additional information of the above.

Yours truly,

MATRIX SOLUTIONS INC.

Emily Ottens (Hon) B.Sc., M.BEMA
Ecologist

EO/vc
Attachments

DRAFT

Emily Ottens

From: Emily Ottens
Sent: March 1, 2023 12:46 PM
To: SAROntario@ontario.ca
Cc: Kierian Keele
Subject: 34715-522; Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design
Attachments: 34715-522 MECP Info Request 2023-03-01.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hello,

Attached please find an information request for the Cooksville Creek EA project (34715-522). Please reach out if you require any additional information.

Thank you.

Emily Ottens, H.B.Sc., M.BEMA
Ecologist, Eastern Natural Sciences

MATRIX SOLUTIONS INC.
Environment & Engineering
Unit 7B, 650 Woodlawn Rd. W, Guelph, ON, N1K 1B8
D 226.314.1923 **C** 226 821 4808
www.matrix-solutions.com

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

March 1, 2023 Matrix 34715-522

MINISTRY OF NORTHERN DEVELOPMENT, MINES, NATURAL RESOURCES AND FORESTRY
50 Bloomington Rd.
Aurora, Ontario
L4G 0L8

Subject: Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design

To Whom It May Concern:

1 INTRODUCTION

On behalf of City of Mississauga, Matrix Solutions Inc. is submitting a request for information regarding fish records, thermal regime, timing windows, wetland mapping and/or evaluation, data records for Locally Significant Features or Significant Wildlife Habitat and Species at Risk (should it be available).

Any other possible site constraint information would be greatly appreciated. The information will be used to inform the background review for the project involving the preparation of a natural environment screening for the Cooksville Creek Mississauga Valley Boulevard to CP Rail Erosion Control EA and Detailed Design.

2 PROJECT DESCRIPTION

The City of Mississauga is undertaking an Erosion Control Municipal Class Environmental Assessment (EA) for Cooksville Creek for the reach located upstream of Mississauga Valley Boulevard extending to the CP Rail. The study area originates upstream of Mississauga Valley Boulevard (approximately 100m) and continues downstream to the CP Rail crossing. The reach joining Mississauga Valley Blvd. to the CP rail represents approximately 360m of channel which would essentially complete the Cooksville Creek restoration from Robert Spec downstream to Lakeshore Road. Cooksville Creek as a whole, has been significantly modified (straightened) through the reach to accommodate development, and corresponding development needs (sanitary infrastructure).

3 BACKGROUND INFORMATION

Upon review of the Mississauga Natural Area Surveys, Natural Heritage Information Centre, Fisheries and Oceans Canada, Ontario Breeding Bird Atlas, the Ontario Reptile and Amphibian Atlas records, Land Information Ontario Aquatic Resource Area Mapping, eBird, Ontario Butterfly Atlas, iNaturalist, Ontario Mammals, and Canadian Important Bird Areas the following features and species were identified as potentially occurring in the vicinity of the study area (Table 1).

Table 1. Species List

Common Name	Scientific Name	SRank	ESA Status	COSEWIC Status
Mammals				
Eastern Small-footed Bat	*Myotis leibii*	S2/S3	END	N/A
Little Brown Bat	*Myotis lucifugus*	S4	END	END
Northern Long-eared Bat	*Myotis septentrionalis*	S3	END	END
Tri-colored Bat	*Perimyotis subflavus*	S3	END	END
Reptiles				
Blanding's Turtle	*Emydoidea blandingii*	S3	THR	END
Jefferson Salamander	*Ambystoma jeffersonianum*	S2	END	END
Eastern Musk Turtle (Stinkpot)	*Sternotherus odoratus*	S3	SC	SC
Northern Map Turtle	*Graptemys geographica*	S3	SC	SC
Snapping Turtle	*Chelydra serpentina*	S3	SC	SC
Birds				
Barn Swallow	*Hirundo rustica*	S4B	SC	-
Bank Swallow	*Riparia riparia*	S4B	THR	THR
Bobolink	*Dolichonyx oryzivorus*	S4B	THR	THR
Chimney Swift	*Chaetura pelagica*	S4B/S4N	THR	THR
Eastern Meadowlark	*Sturnella magna*	S4B	THR	THR
Henslow's Sparrow	*Centronyx henslowii*	SHB	END	END
Least Bittern	*Ixobrychus exilis*	S4B	THR	THR
Bald Eagle	Haliaeetus leucocephalus	S2N/S4B	SC	Not at Risk
Canada Warbler	Cardellina canadensis	S4B	SC	THR
Common Nighthawk	Chordeiles minor	S4B	SC	SC
Eastern Wood-pewee	Contopus virens	S4B	SC	SC
Olive-sided Flycatcher	Contopus cooperi	S4B	SC	SC
Peregrine Falcon	Falco peregrinus	S3B	SC	Not at Risk
Rusty Blackbird	Euphagus carolinus	S4B	SC	SC
Wood Thrush	Hylocichla mustelina	S4B	SC	THR
Vegetation				
Butternut	*Juglans cinerea*	S2?	END	END
Red Mulberry	*Morus rubra*	SE	END	END
Invertebrates				
Mottled Duskywing	*Erynnis martialis*	S2	END	END
Monarch	*Danaus plexippus*	S2N, S4B	SC	END

Please contact the undersigned should you require additional information of the above.

Yours truly,

MATRIX SOLUTIONS INC.

Emily Ottens (Hon) B.Sc., M.BEMA
Ecologist

EO/vc
Attachments

Emily Ottens

From: Scientific Collection Permits Aurora (MNRF) <scp.aurora@ontario.ca>
Sent: March 2, 2023 12:19 PM
To: Emily Ottens
Cc: Kierian Keele; Varga, Steve (MNRF)
Subject: [External] RE: 34715-522; Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design
Attachments: NHGuide_MNRF_2019-04-01.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Good Afternoon Emily,

Thank you for your request for information on natural heritage information. In order to provide the most efficient service possible, the attached Natural Heritage Information Request Guide has been developed to assist you with accessing natural heritage data and values from convenient online sources.

MNRF has no further comment on your information request at the present time. Once specific works are proposed, boundaries are known and potential impacts to specific features are identified, you may contact our office to request more detailed information. If you are looking for wetland and/or ANSI evaluations/field notes or fish dot files to help inform initial planning processes at a broader level, please send a request to our office for the specific features you are interested in so that we can provide the applicable information. All natural heritage inquiries should be sent to scp.aurora@ontario.ca.

While MNRF is the provincial lead for setting timing window guidelines in the province, we do not issue timing windows for projects where we do not have a review and approval role under our own legislation (e.g. FWCA, PLA, LRIA, etc.). The agency(ies) responsible for the review and approval of the proposed works are responsible for setting the appropriate timing windows and will do so while taking into consideration MNRF's guidelines. Where fish rescues are required, MNRF may issue a Licence to Collect Fish for Scientific Purposes, however, this timing window applies only to fish handling and not to in-water works. Please see the Ministry's timing window guidelines for in-water works here. If you are in consultations with the Department of Fisheries and Oceans and/or the local conservation authority regarding working outside of the timing window guidelines and the applicable agency is looking for MNRF guidance, please have the appropriate staff member from the respective agency(ies) contact our office directly at scp.aurora@ontario.ca.

The Ministry no longer has carriage of the Endangered Species Act. For species at risk information, please contact the Ministry of Environment, Conservation and Parks at SAROntario@ontario.ca.

It remains the proponent's responsibility to complete a preliminary screening for each project, to obtain available information from multiple sources, to conduct any necessary field studies, and to consider any potential environmental impacts that may result from an activity. We wish to emphasize the need for the proponents to complete screenings prior to contacting the Ministry or other agencies for more detailed technical information and advice.

The Ministry continues to work on updating data housed by Lands Information Ontario and the Natural Heritage Information Centre, and ensuring this information is accessible through online resources.

Data housed by LIO and NHIC will assist in scoping the necessary field assessments for an area if development or site alteration is proposed. This information is not meant to replace the responsibility of the proponent to undertake species and / or habitat surveys. Surveys or additional site level assessment are often required to confirm presence or absence

of natural heritage features and values. Environmental consulting firms have the professional and technical expertise to assess sites for natural heritage features and can gauge the potential for such features to exist.

Absence or lack of information for a given geographic area does not necessarily mean the absence of natural heritage features. Many areas in Ontario have never been surveyed and new plant and animal species records are still being discovered for many localities. In addition, new species may be listed and new natural heritage features may be defined over time. For these reasons, the Ministry cannot provide a definitive statement on the presence, absence or condition of natural heritage features in all parts of Ontario.

Thank you for your inquiry,

Ashley Chlebak
Integrated Resource Management Specialist
Aurora District | Regional Operations Division
Ministry of Natural Resources and Forestry
289-380-2062 ashley.chlebak@ontario.ca

Ontario

As part of providing accessible customer service, please let me know if you have any accommodation needs or require communication supports or alternate formats.

From: Emily Ottens <EOttens@matrix-solutions.com>
Sent: March 1, 2023 12:45 PM
To: Scientific Collection Permits Aurora (MNRF) <scp.aurora@ontario.ca>
Cc: Kierian Keele <kkeele@matrix-solutions.com>
Subject: 34715-522; Information Request – Cooksville Creek Mississauga Valley Boulevard to CP Rail, Erosion Control EA and Detailed Design

Hello,

Attached please find an information request for the Cooksville Creek EA project (34715-522). Please reach out if you require any additional information.

Thank you.

Emily Ottens, H.B.Sc., M.BEMA
Ecologist, Eastern Natural Sciences

MATRIX SOLUTIONS INC.
Environment & Engineering
Unit 7B, 650 Woodlawn Rd. W, Guelph, ON, N1K 1B8
D 226.314.1923 **C** 226 821 4808
www.matrix-solutions.com

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

DRAFT

APPENDIX D
Vegetation Inventory

TABLE D1 Vegetation Summary

Common Name	Botanical Name	Coefficient of Conservatism	Wetness Index	Weediness Index	Invasive Species Ontario	Provincial Rank	ESA Status	COSEWIC Status (2016-08-19)	SARA Status (2016-08-19)	Global Rank	Regional Status 7E - Carolkinian Zone - 2017 (Oldham 2017)	Local Status CVC and Peel Region (CVC 2002)	All Species	iNaturalist	NHIC	MY3 (NAS 2021)	CV12 (NAS 2021)	Study Area	CUT/CUM	Parkland	FOD7
CONIFERS	**GYMNOSPERMS**												x			o	o	x	o	o	o
Cedar Family	**Cupressaceae**												x				o	x	o	o	
Eastern White Cedar	*Thuja occidentalis*	4	-3			S5				G5	C		x					x	x	x	
Pine Family	**Pinaceae**												x			o	o	x	o	o	o
Tamarack	*Larix laricina*	7	-3			S5				G5	U		x					x		x	
Norway Spruce	*Picea abies*		5	-1		SNA				G5	IX		x				x				
White Spruce	*Picea glauca*	6	3			S5				G5	U		x					x		x	
Blue Spruce	*Picea pungens*		3			SNA				G5	IR		x					x	x	x	
Red Pine	*Pinus resinosa*	8	3			S5				G5	R	R	x					x		x	
Eastern White Pine	*Pinus strobus*	4	3			S5				G5	C		x					x	x	x	
Eastern Hemlock	*Tsuga canadensis*	7	3			S5				G5	C		x					x		x	
DICOTS	**DICOTYLEDONS**												x	o		o	o	x	o	o	o
Maple Family	**Aceraceae**												x			o	o	x	o	o	o
Manitoba Maple	*Acer negundo*	0	0		1	S5				G5	C		x			x	x	x	x	x	x
Norway Maple	*Acer platanoides*		5	-3	2	SNA				GNR	IU		x			x	x	x	x	x	x
Red Maple	*Acer rubrum*	4	0			S5				G5	C		x					x	x		
Silver Maple	*Acer saccharinum*	5	-3			S5				G5	C		x					x		x	x
Sugar Maple	*Acer saccharum*	4	3			S5				G5	C		x				x	x	x		
Freeman's Maple	*Acer X freemanii*	6	-5			SNA				GNA	hyb		x			x	x				
Sumac or Cashew Family	**Anacardiaceae**												x			o	o	x	o	o	o
Eastern Poison-ivy	*Toxicodendron radicans ssp.*	5	-1			S5				G5	C		x					x			x
Staghorn Sumac	*Rhus typhina*	1	3			S5				G5	C		x			x		x		x	x
Carrot or Parsley Family	**Apiaceae**												x			o	o	x	o	o	o
Bishop's Goutweed	*Aegopodium podagraria*		0	-3	1	SNA				GNR	IU		x				x	x		x	x
Garden Chervil	*Anthriscus cerefolium*					SNA				GNR	IH		x					x			x
Wild Carrot	*Daucus carota*		5	-2		SNA				GNR	IC		x			x		x	x	x	
Water Parsnip	*Sium suave*	4	-5		3	S5				G5	C		x					x			x
Erect Hedge-parsley	*Torilis japonica*		3	-3		SNA				GNR	IX		x			x	x				
Ginseng Family	**Araliaceae**												x				o	x	o	o	o
English Ivy	*Hedera helix*										IR		x					x		x	
Milkweed Family	**Asclepiadaceae**												x				o	x	o	o	o
Common Milkweed	*Asclepias syriaca*	0	5			S5				G5	C		x					x	x		
European Swallow-wort	*Vincetoxicum rossicum*		5	-3	1	SNA				GNR	IX		x					x	x		x
Composite or Aster Family	**Asteraceae**												x	o		o	o	x	o	o	o
Common Ragweed	*Ambrosia artemisiifolia*	0	3			S5				G5	C		x					x	x		x
Common Burdock	*Arctium minus*		3	-2		SNA				GNR	IC		x				x	x	x	x	x
Large-leaved Aster	*Eurybia macrophylla*	5	5			S5				G5	C		x				x				
Devil's Beggar-ticks	*Bidens frondosa*	3	-3			S5				G5	C		x				x				
Ox-eye Daisy	*Leucanthemum vulgare*		5	-1		SNA				GNR	IC		x					x	x	x	x
Canada Thistle	*Cirsium arvense*		3	-1	1	SNA				GNR	IC		x					x	x		
Bull Thistle	*Cirsium vulgare*		3	-1		SNA				GNR	IC		x					x	x	x	
Philadelphia Fleabane	*Erigeron philadelphicus*	1	-3			S5				G5	C		x					x	x		x
Jerusalem Artichoke	*Helianthus tuberosus*	1	0	-2		SU				G5	X		x					x			x
Elecampane	*Inula helenium*		3	-2	4	SNA				GNR	IU		x					x	x		
Disc Mayweed	*Matricaria discoidea*		3			SNA				G5	IC		x					x			x
Goldenrod Species	*Solidago sp.*												x					x	x		x
Wreath Goldenrod	*Solidago caesia*	5	3			S5				G5	C		x				x				
Canada Goldenrod	*Solidago canadensis var.*	1	3			S5				G5	C		x			x	x	x	x	x	
Common Tansy	*Tanacetum vulgare*		5	-1		SNA				GNR	IX		x					x	x		
Common Dandelion	*Taraxacum officinale*		3	-2		SNA				G5	IC		x					x	x	x	x
Coltsfoot	*Tussilago farfara*		3	-2		SNA				GNR	IC		x					x	x		x
Touch-me-not Family	**Balsaminaceae**												x				o	x			o
Jewelweed	*Impatiens capensis*	4	-3			S5				G5	C		x				x				
Barberry Family	**Berberidaceae**												x				o	x	o	o	o
Japanese Barberry	*Berberis thunbergii*		4	-3	3	SNA				GNR	IX		x					x			x
Birch Family	**Betulaceae**												x				o	x	o	o	o
Paper Birch	*Betula papyrifera*	2	2			S5				G5	C		x					x	x		
European White Birch	*Betula pubescens ssp.*					SNA				GNRTNR			x					x		x	x
Ironwood	*Ostrya virginiana*	4	4			S5				G5	C		x				x				
Borage Family	**Boraginaceae**												x				o	x	o	o	o
Viper's Bugloss	*Echium vulgare*		5	-2		SNA				GNR	IC		x					x	x		
True Forget-me-not	*Myosotis scorpioides*		-5	-1	4	SNA				G5	IX		x					x	x		x
Mustard Family	**Brassicaceae**												x	o		o	o	x	o	o	o
Garlic Mustard	*Alliaria petiolata*		0	-3	1	SNA				GNR	IC		x				x	x	x	x	x
Garden Yellowrocket	*Barbarea vulgaris*		0	-1	3	SNA				GNR	IC		x					x	x		x
Dame's Rocket	*Hesperis matronalis*		5	-3	1	SNA				G4G5	IC		x					x	x		x
Bellflower Family	**Lobelia**												x				o	x	o	o	o
Creeping Bellflower	*Campanula rapunculoides*		5	-2	4	SNA				GNR	IU		x					x		x	
Honeysuckle Family	**Caprifoliaceae**												x			o	o	x	o	o	o
Honeysuckle species	*Lonicera sp.*												x					x			x

Common Name	Botanical Name	Coefficient of Conservatism	Wetness Index	Weediness Index	Invasive Species Ontario	Provincial Rank	ESA Status	COSEWIC Status (2016-08-19)	SARA Status (2016-08-19)	Global Rank	Regional Status 7E - Carolkinian Zone - 2017 (Oldham 2017)	Local Status CVC and Peel Region (CVC 2002)	All Species	iNaturalist	NHIC	MY3 (NAS 2021)	CV12 (NAS 2021)	Study Area	CUT/CUM	Parkland	FOD7
Tartarian Honeysuckle	*Lonicera tatarica*		3	-3	1	SNA				GNR	IC		x				x	x	x		x
American Black Elderberry	*Sambucus nigra ssp. canadensis*	5	-2			S5				G5T5	C		x					x		x	
Hobblebush	*Viburnum lantanoides*	8	0			S5				G5	R	R	x					x			x
Nannyberry	*Viburnum lentago*	4	-1			S5				G5	C		x					x	x		
European Cranberrybush	*Viburnum opulus*		0	-1		SNA				G5			x					x	x		
Pink Family	**Caryophyllaceae**												x	o		o	o	x	o	o	o
Bouncing-bet	*Saponaria officinalis*		3	-3	3	SNA				GNR	IC		x					x			x
Staff-tree Family	**Celastraceae**												x					x	o	o	o
Winged Spindle Tree	*Euonymus alatus*		5	-1	3	SNA				GNR	IR		x					x			x
Morning-glory Family	**Convolvulaceae**												x				o	x	o	o	o
Field Bindweed	*Convolvulus arvensis*		5	-1	3	SNA				GNR	IC		x					x	x	x	
Dogwood Family	**Cornaceae**												x				o	x	o	o	o
Alternate-leaved Dogwood	*Cornus alternifolia*	6	5			S5				G5	C		x					x		x	x
Gray Dogwood	*Cornus racemosa*	2	-2			S5				G5	C		x					x	x		
Red-osier Dogwood	*Cornus sericea*	2	-3			S5				G5	C		x					x	x	x	x
Stonecrop Family	**Crassulaceae**												x				o	x	o	o	o
Goldmoss Stonecrop	*Sedum acre*		5	-3	2	SNA				GNR	IX		x					x			x
Teasel Family	**Dipsacaceae**												x				o	x	o	o	o
Fuller's Teasel	*Dipsacus fullonum*		5	-1	3	SNA				GNR	IC		x					x	x	x	
Oleaster Family	**Elaeagnaceae**												x				o	x	o	o	o
Russian Olive	*Elaeagnus angustifolia*		4	-1	3	SNA				GNR	IU		x					x	x		
Pea Family	**Fabaceae**												x	o		o	o	x	o	o	o
Black Medick	*Medicago lupulina*		1	-1	4	SNA				GNR	IC		x					x		x	x
Black Locust	*Robinia pseudoacacia*		4	-3	2	SNA				G5	IC		x				x	x	x		
Alsike Clover	*Trifolium hybridum*		1	-1		SNA				GNR	IC		x					x			x
Red Clover	*Trifolium pratense*		2	-2	4	SNA				GNR	IC		x					x	x		
Cow Vetch	*Vicia cracca*		5	-1	2	SNA				GNR	IX		x					x	x		x
Beech Family	**Fagaceae**												x	o		o	o	x	o	o	o
White Oak	*Quercus alba*	6	3			S5				G5	C		x					x			x
Bur Oak	*Quercus macrocarpa*	5	1			S5				G5	C		x					x	x		x
Red Oak	*Quercus rubra*	6	3			S5				G5	C		x				x	x			x
Geranium Family	**Geraniaceae**												x	o		o	o	x	o	o	o
Spotted Geranium	*Geranium maculatum*	6	3			S5				G5	C		x					x	x	x	x
Herb-robert	*Geranium robertianum*		5	-2		S5				G5	C		x					x	x	x	x
Currant Family	**Grossulariaceae**												x	o		o	o	x	o	o	o
Red Currant	*Ribes rubrum*		5	-2		SNA				G4G5	IX		x					x	x		
Water-leaf Family	**Hydrophyllaceae**												x			o	o	x	o	o	o
Virginia Water-leaf	*Hydrophyllum virginianum*	6	-2			S5				G5	C		x					x			x
Walnut Family	**Juglandaceae**												x	o		o	o	x	o	o	o
Black Walnut	*Juglans nigra*	5	3			S4?				G5	C		x			x	x	x			x
Mint Family	**Lamiaceae**												x	o		o	o	x	o	o	o
Ground Ivy	*Glechoma hederacea*		5	-2	4	SNA				GNR	IC		x				x	x		x	x
Loosestrife Family	**Lythraceae**												x	o			o	x	o	o	o
Purple Loosestrife	*Lythrum salicaria*		-5	-3	1	SNA				G5	IC		x					x	x		
Mulberry Family	**Moraceae**												x	o			o	x	o	o	o
White Mulberry	*Morus alba*		0	-3	1	SNA				GNR	IC		x					x	x	x	x
Red Mulberry	*Morus rubra*	10	1			S2		END	END	G5	R		x	x							
Olive Family	**Oleaceae**												x				o	x	o	o	o
Ash species	*Fraxinus sp.*												x				x				
White Ash	*Fraxinus americana*	4	3			S4				G5	C		x					x			x
European Ash	*Fraxinus excelsior*				4	SNA				GNR	IR		x					x			x
Green Ash	*Fraxinus pennsylvanica*	3	-3			S4				G5	C		x					x	x	x	x
European Privet	*Ligustrum vulgare*		1	-2	4	SNA				GNR	IX		x				x				
Plantain Family	**Plantaginaceae**												x			o	o	x	o	o	o
English Plantain	*Plantago lanceolata*		0	-1		SNA				G5	IC		x					x	x	x	x
Smartweed Family	**Polygonaceae**												x			o	o	x	o	o	o
Curlytop Smartweed	*Persicaria lapathifolia*	2	-4			S5				G5	C		x					x	x		
Lady's-thumb	*Persicaria maculosa*		-3	-1		SNA				G3G5	IC		x					x	x		
Curly-leaf Dock	*Rumex crispus*		-1	-2		SNA				GNR	IC		x					x	x		
Buttercup Family	**Ranunculaceae**												x			o	o	x	o	o	o
Tall Buttercup	*Ranunculus acris*		-2	-2		SNA				G5	IC		x					x	x	x	x
Buckthorn Family	**Rhamnaceae**												x			o	o	x	o		o
Common Buckthorn	*Rhamnus cathartica*		3	-3	1	SNA				GNR	IC		x			x	x	x	x		x
Rose Family	**Rosaceae**												x			o	o	x	o	o	o
Tall Hairy Agrimony	*Agrimonia gryposepala*	2	2			S5				G5	C		x					x			x
Downy Serviceberry	*Amelanchier arborea*	5	3			S5				G5	C		x					x	x		
Smooth Serviceberry	*Amelanchier laevis*	5	5			S5				G5	C		x					x	x		
Common Goat's-beard	*Aruncus dioicus*		3	-1		SNA				G5			x					x	x	x	x
Hawthorn species (planted)	*Crataegus sp.*	4	5										x					x		x	
Yellow Avens	*Geum aleppicum*	2	-1			S5				G5	C		x				x	x	x	x	x
Wood Avens	*Geum urbanum*		5	-1		SNA				G5	IX		x					x	x	x	
Apple species	*Malus sp.*												x					x			x

Common Name	Botanical Name	Coefficient of Conservatism	Wetness Index	Weediness Index	Invasive Species Ontario	Provincial Rank	ESA Status	COSEWIC Status (2016-08-19)	SARA Status (2016-08-19)	Global Rank	Regional Status 7E - Carolkinian Zone - 2017 (Oldham 2017)	Local Status CVC and Peel Region (CVC 2002)	All Species	iNaturalist	NHIC	MY3 (NAS 2021)	CV12 (NAS 2021)	Study Area	CUT/CUM	Parkland	FOD7
Common Apple	*Malus pumila*		5	-1		SNA				G5	IC		x					x			x
Ninebark	*Physocarpus opulifolius*	5	-2			S5				G5	U	R	x					x			x
Sweet Cherry	*Prunus avium*		5	-2	4	SNA				GNR	IR		x					x			x
Great Lakes Sand Cherry	*Prunus pumila var. pumila*	10	5			S3				G5T4	R		x					x	x	x	x
Black Cherry	*Prunus serotina*	3	3			S5				G5	C		x				x	x	x		
Choke Cherry	*Prunus virginiana*	2	1			S5				G5	C		x				x	x	x		x
Smooth Rose	*Rosa blanda*	3	3			S5				G5	C		x					x	x		
Multiflora Rose	*Rosa multiflora*		3	-3	1	SNA				GNR	IC		x				x	x	x	x	x
Common Blackberry	*Rubus allegheniensis*	2	2			S5				G5	C		x					x	x		
American Red Raspberry	*Rubus idaeus*	0	-2			SNA				G5			x					x			x
Black Raspberry	*Rubus occidentalis*	2	5			S5				G5	C		x				x				
Northern Mountain-ash	*Sorbus decora*	8	3			S5				G5	R		x					x	x	x	
Madder Family	**Rubiaceae**												x			o	o	x	o	o	o
Cleavers	*Galium aparine*	4	3			S5				G5	C	R	x					x	x		x
Willow Family	**Salicaceae**												x			o	o	x	o	o	o
White Poplar	*Populus alba*		5	-3	2	SNA				G5	IU		x					x	x	x	
Balsam Poplar	*Populus balsamifera*	4	-3			S5				G5	U		x					x	x		
Eastern Cottonwood	*Populus deltoides ssp. deltoides*	4	-1			S5				G5T5	C		x					x			x
Trembling Aspen	*Populus tremuloides*	2	0			S5				G5	C		x					x	x	x	x
Willow species	*Salix sp.*												x				x				
Bebb's Willow	*Salix bebbiana*	4	-4			S5				G5	C		x					x	x		
Crack Willow	*Salix fragilis*		-1	-3	3	SE				GNR	IC		x			x		x			x
Sandbar Willow	*Salix interior*										C		x					x	x	x	
Eastern crack Willow	*Salix euxina*												x					x	x	x	
Hybrid Crack Willow	*Salix X rubens*		-4	-3		hyb				HYB	hyb		x				x	x		x	
Weeping Willow	*Salix X sepulcralis*					hyb				GNA	hyb		x					x			x
Figwort Family	**Scrophulariaceae**												x			o	o	x	o	o	o
Common Mullein	*Verbascum thapsus*		5	-2		SNA				GNR	IC		x					x	x		
Nightshade Family	**Solanaceae**												x			o	o	x	o	o	o
Bittersweet Nightshade	*Solanum dulcamara*		0	-2	3	SNA				GNR	IC		x					x	x		
Linden Family	**Tiliaceae**												x				o	x	o	o	o
American Basswood	*Tilia americana*	4	3			S5				G5	C		x				x	x	x	x	x
Little Leaf Linden	*Tilia cordata*				4	SNA				GNR	IR		x					x		x	
Elm Family	**Ulmaceae**												x				o	x	o	o	o
American Elm	*Ulmus americana*	3	-2			S5				G5	C		x				x	x	x	x	
Siberian Elm	*Ulmus pumila*		5	-1	2	SNA				GNR	IX		x					x	x	x	x
Nettle Family	**Urticaceae**												x				o	x	o	o	o
Stinging Nettle	*Urtica dioica ssp. dioica*		-1	-1	3	SNA				G5T5?	IR		x					x			x
Violet Family	**Violaceae**												x			o	o	x	o	o	o
Violet sp.	*Viola sp.*												x					x			x
Sand Violet	*Viola sororia var. affinis*	6	-3			S4?				G5	U		x					x	x		
Canadian White Violet	*Viola canadensis*	6	5			S5				G5	U		x					x	x		
Grape Family	**Vitaceae**												x				o	x	o	o	o
Virginia Creeper	*Parthenocissus quinquefolia*	6	1			S4?				G5	U		x				x	x		x	x
Riverbank Grape	*Vitis riparia*	0	-2			S5				G5	C		x				x	x	x		x
MONOCOTS	**MONOCOTYLEDONS**												x			o	o	x	o	o	o
Asparagus Family	**Asparagaceae**												x					x		o	o
Hosta species	*Hosta sp.*												x					x	x	x	
Sedge Family	**Cyperaceae**												x			o	o	x	o	o	o
Sedge species	*Carex sp.*												x					x			x
Awl-fruited Sedge	*Carex stipata*	3	-5			S5				G5	C		x					x			x
Soft-stem Bulrush	*Schoenoplectus tabernaemontani*	5	-5			S5				G5	C		x			x		x			x
Lily Family	**Liliaceae**												x			o	o	x	o	o	o
Large False Solomon's Seal	*Maianthemum racemosum*	4	3			S5				G5	C		x				x				
Starry False Solomon's Seal	*Maianthemum stellatum*	6	1			S5				G5	C		x					x			x
Grass Family	**Poaceae**												x			o		x	o	o	o
Smooth Brome	*Bromus inermis*		5	-3	4	SNA				G5TNR	IC		x					x		x	x
Crabgrass species	*Digitaria sp.*		3	-1		SNA				GNR	IC		x					x	x		
Red Fescue	*Festuca rubra*										IC		x					x		x	
Reed Canary Grass	*Phalaris arundinacea*	0	-4			S5				G5	C		x			x		x	x		x
Timothy	*Phleum pratense*		3	-1		SNA				GNR	IC		x					x			x
Common Reed	*Phragmites australis*	0	-4		1	SNA				G5T5			x			x					
Kentucky Blue Grass	*Poa pratensis ssp. pratensis*	0	1		2	S5				G5T	IC		x					x			x
Cattail Family	**Typhaceae**												x					x	o		o
Narrow-leaved Cattail	*Typha angustifolia*	3	-5			SNA				G5	IC		x					x	x		x

TABLE D2 Floristic Summary and Assessment

		Study Area		CUT/CUM		Parkland		FOD7	
Species Diversity									
Total Species:		**122**		**78**		**47**		**72**	
Native Species:		64	52.46%	37	47.44%	23	48.94%	37	51.39%
Exotic Species		58	47.54%	41	52.56%	24	51.06%	35	48.61%
Total Taxa in Region (List Region, Source)		10000		10000		10000		10000	
% Regional Taxa Recorded		1.22%		0.78%		0.47%		0.72%	
Regionally Significant Species		8		5		3		4	
S1-S3 Species		1		1		1		1	
S4 Species		2		1		1		2	
S5 Species		55		34		20		30	
Co-efficient of Conservatism and Floral Quality Index									
Co-efficient of Conservatism (CC) (average)		**3.83**		**3.24**		**4.52**		**3.57**	
CC 0 to 3	*lowest sensitivity*	26	40.63%	20	54.05%	8	34.78%	17	45.95%
CC 4 to 6	*moderate sensitivity*	32	50.00%	15	40.54%	10	43.48%	18	48.65%
CC 7 to 8	*high sensitivity*	5	7.81%	1	2.70%	4	17.39%	1	2.70%
CC 9 to 10	*highest sensitivity*	1	1.56%	1	2.70%	1	4.35%	1	2.70%
Presence of Weedy & Invasive Species									
mean weediness		**-1.91**		**-1.85**		**-1.96**		**-2.03**	
weediness = -1	*low potential invasiveness*	23	39.66%	17	41.46%	9	37.50%	13	37.14%
weediness = -2	*moderate potential invasiveness*	17	29.31%	13	31.71%	7	29.17%	8	22.86%
weediness = -3	*high potential invasiveness*	18	31.03%	11	26.83%	8	33.33%	14	40.00%
Presence of Wetland Species									
average wetness value		**1.45**		**1.59**		**2.00**		**1.24**	
upland		29	23.77%	20	25.64%	15	31.91%	15	20.83%
facultative upland		41	33.61%	28	35.90%	15	31.91%	21	29.17%
facultative		26	21.31%	14	17.95%	9	19.15%	21	29.17%
facultative wetland		21	17.21%	14	17.95%	9	19.15%	10	13.89%
obligate wetland		6	4.92%	3	3.85%	0	0.00%	5	6.94%

APPENDIX E
Amphibians and Reptiles

TABLE E1 Reptile and Amphibian Species

Species		Conservation Rank				Source					
Scientific Name	Common Name	Provincial (S-RANK)	Provincial (ESA)	National (COSEWIC)	National (SARA)	NHIC	ORAA	iNaturalist	MY3 (NAS 2021)	CV12 (NAS 2021)	Matrix Observations
Cryptodeira	Turtles										
Chelydra serpentina	Snapping Turtle	S3	SC	SC	SC		x				
Chrysemys picta marginata	Midland Painted Turtle	S4					x				
Emydoidea blandingii	Blanding's Turtle	S3	THR	END	THR		x				
Graptemys geographica	Northern Map Turtle	S3	SC	SC	SC		x				
Sternotherus odoratus	Eastern Musk Turtle	S3	SC	SC	SC		x				
Trachemys scripta elegans	Red-eared Slider	SNA					x				
Squamata	Snakes										
Diadophis punctatus	Ring-necked Snake	S4					x				
Lampropeltis triangulum	Milksnake	S4		SC	SC	x	x	x			
Nerodia sipedon sipedon	Northern Watersnake	S5					x				
Opheodrys vernalis	Smooth Greensnake	S4					x				
Storeria dekayi	DeKay's Brownsnake	S5					x	x			
Storeria occipitomaculata	Red-bellied snake	S5					x				
Thamnophis sirtalis sirtalis	Eastern Gartersnake	S5					x			x	
Caudata	Salamanders										
Ambystoma jeffersonianum	Jefferson Salamander	S2	END	END	END		x				
Ambystoma maculatum	Spotted Salamander	S4					x	x			
Necturus maculosus	Mudpuppy	S4					x				
Notophthalmus viridescens viridescens	Red-spotted Newt	S5					x				
Plethodon cinereus	Eastern Red-backed Salamander	S5					x	x			
Anura	Frogs and Toads										
Anaxyrus americanus	American Toad	S5					x	x			
Hyla versicolor	Gray Treefrog	S5					x				
Lithobates catesbeianus	American Bullfrog	S4					x				
Lithobates clamitans	Green Frog	S5					x				
Lithobates palustris	Pickerel Frog	S4					x				
Lithobates pipiens	Northern Leopard Frog	S5					x				
Lithobates sylvaticus	Wood Frog	S5					x				
Pseudacris crucifer	Spring Peeper	S5					x				
Total:						1	26	5	0	1	0

Legend

SRANK

S1 Critically Imperiled
S2 Imperiled
S3 Vulnerable
S4 Apparently Secure
S5 Secure
SU Unrankable
SNA Unranked
SX Presumed Extirpated
SH Possibly Extirpated
S#? Rank Uncertain

COSEWIC

NAR Not at Risk
SC Special Concern
THR Threatened
END Endangered
EXT Extinct
EXP Extirpated
DD Data Deficient

COSSARO

NAR Not at Risk
SC Special Concern
THR Threatened
END Endangered
EXP Extirpated
DD Data Deficient

SARA Schedule

Schedule 1 Officially protected under SARA
Schedule 2 Threatened/Endangered; may be reassessed for consideration for inclusion to Schedule 1
Schedule 3 Special concern; may be reassessed for consideration for inclusion to Schedule 1

ESA

SC Special Concern
THR Threatened
END Endangered
EXT Extinct
EXP Extirpated

APPENDIX F
Birds

TABLE F1 Bird Species

Species		Conservation Rank				Source							
Scientific Name	Common Name	Provincial (S-RANK)	Provincial (ESA)	National (COSEWIC)	National (SARA)	NHIC	OBBA	eBird	iNaturalist	MY3 (NAS 2021)	CV12 (NAS 2021)	Breeding Bird	Matrix Field Observations
Accipitridae	**Hawks, Kites, Eagles & Allies**												
Accipiter cooperii	Cooper's Hawk	S4					x	x	x				
Accipiter striatus	Sharp-shinned Hawk	S5					x	x					
Buteo jamaicensis	Red-tailed Hawk	S5					x	x	x				
Circus cyaneus	Northern Harrier	S4B					x						
Haliaeetus leucocephalus	Bald Eagle	S2N/S4B	SC					x	x				
Alaudidae	**Larks**												
Eremophila alpestris	Horned Lark	S5B					x						
Alcedinidae	**Kingfishers**												
Megaceryle alcyon	Belted Kingfisher	S4B/S5B					x	x					
Apodidae	**Swifts**												
Chaetura pelagica	Chimney Swift	S4B/S4N	THR	THR	THR		x	x		x	x		
Anatidae	**Ducks, Geese & Swans**												
Aix sponsa	Wood Duck	S5					x						
Anas acuta	Northern Pintail	S5						x	x				
Anas discors	Blue-winged Teal	S4					x	x					
Anas platyrhynchos	Mallard	S5					x	x	x	x	x	x	x
Anas rubripes	American Black Duck	S4					x	x	x				
Anas strepera	Gadwall	S4					x						
Branta canadensis	Canada Goose	S5					x	x	x				
Cygnus olor	Mute Swan	SNA					x	x					
Lophodytes cucullatus	Hooded Merganser	S5B, S5N					x						
Branta bernicla	Brant	S4N							x				
Ardeidae	**Herons and Bitterns**												
Ardea herodias	Great Blue Heron	S4						x					
Butorides virescens	Green Heron	S4B					x	x					
Ixobrychus exilis	Least Bittern	S4B	THR	THR	THR			x					
Nycticorax nycticorax	Black-crowned Night-heron	S3B,S3N						x					
Bombycillidae	**Waxwings**												
Bombycilla cedrorum	Cedar Waxwing	S5B					x	x	x			x	
Caprimulgidae	**Nightjars**												
Chordeiles minor	Common Nighthawk	S4B	SC	SC	THR		x						
Cardinalidae	**Cardinals, Grosbeaks & Allies**												
Cardinalis cardinalis	Northern Cardinal	S5					x	x	x		x	x	x
Passerina cyanea	Indigo Bunting	S4B					x	x					
Pheucticus ludovicianus	Rose-breasted Grosbeak	S4B					x	x	x				
Piranga olivacea	Scarlet Tanager	S4B					x	x					
Piranga rubra	Summer Tanager	SNA						x					
Cathartidae	**Vultures**												
Cathartes aura	Turkey Vulture	S5B					x	x	x				
Certhiidae	**Creepers**												
Certhia americana	Brown Creeper	S5B						x	x				
Charadriidae	**Plovers**												
Charadrius vociferus	Killdeer	S5B/S5N					x	x	x			x	
Columbidae	**Pigeons & Doves**												
Columba livia	Rock Pigeon	SNA					x	x	x				
Zenaida macroura	Mourning Dove	S5					x	x	x			x	
Corvidae	**Crows & Jays**												
Corvus brachyrhynchos	American Crow	S5B/S4N					x	x	x			x	
Corvus corax	Common Raven	S5						x					
Cyanpcitta cristata	Blue Jay	S5					x	x	x			x	
Cuculidae	**Cuckoo & Anis**												
Coccyzus americanus	Yellow-billed Cuckoo	S4B					x	x					
Coccyzus erythropthalmus	Black-billed Cuckoo	S5B					x	x					
Emberizidae	**New World Sparrows & Allies**												
Ammodramus henslowii	Henslow's Sparrow	SHB	END	END	END	x							
Junco hyemalis	Dark-eyed Junco	S5B						x	x				
Melospiza georgiana	Swamp Sparrow	S5B					x	x					
Melospiza lincolnii	Lincoln's Sparrow	S5B						x					
Melospiza melodia	Song Sparrow	S5B/S4N					x	x	x			x	

Species		Conservation Rank				Source							
Scientific Name	Common Name	Provincial (S-RANK)	Provincial (ESA)	National (COSEWIC)	National (SARA)	NHIC	OBBA	eBird	iNaturalist	MY3 (NAS 2021)	CV12 (NAS 2021)	Breeding Bird	Matrix Field Observations
Passerculus sandwichensis	Savannah Sparrow	S4B					x						
Passerella iliaca	Fox Sparrow	S4B						x					
Pipilo erythrophthalmus	Eastern Towhee	S4B					x	x					
Spizella arborea	American Tree Sparrow	S4B						x					
Spizella pallida	Clay-colored Sparrow	S4B						x				x	
Spizella passerina	Chipping Sparrow	S5B/S4N					x	x	x			x	
Zonotrichia albicollis	White-throated Sparrow	S5B					x	x	x				
Zonotrichia leucophrys	White-crowned Sparrow	S4B						x	x			x	
Spizella pusilla	Field Sparrow	S4B					x	x				x	
Falconidae	**Carcaras & Falcons**												
Falco columbarius	Merlin	S5B						x	x				
Falco peregrinus	Peregrine Falcon	S3B	SC				x	x					
Falco sparverius	American Kestrel	S4					x	x					
Fringillidae	**Finches & Allies**												
Acanthis flammea	Common Redpoll	S4B						x	x				
Haemorhous mexicanus	House Finch	SNA					x	x	x			x	
Haemorhous purpureus	Purple Finch	S4B						x	x				
Spinus pinus	Pine Siskin	S4B						x					
Spinus tritis	American Goldfinch	S5B/S4N					x	x	x	x		x	
Gaviidae	**Loons**												
Gavia immer	Common Loon	S5B,S5N						x					
Hirundinidae	**Swallows**												
Hirundo rustica	Barn Swallow	S4B	SC	SC			x	x					
Petrochelidon pyrrhonota	Cliff Swallow	S4B					x						
Progne subis	Purple Martin	S3/S4B					x	x	x				
Riparia riparia	Bank Swallow	S4B	THR	THR	THR		x						
Stelgidopteryx serripennis	Northern Rough-winged Swallow	S4B					x	x					
Tachycineta bicolor	Tree Swallow	S4B					x	x				x	
Icteridae	**New World Blackbird**												
Agelaius phoeniceus	Red-winged Blackbird	S4/S5					x	x	x	x		x	x
Dolichonyx oryzivorus	Bobolink	S4B	THR	SC			x	x					
Euphagus carolinus	Rusty Blackbird	S4B	SC	SC	SC			x					
Icterus galbula	Baltimore Oriole	S4B					x	x	x			x	
Icterus spurius	Orchard Oriole	S4B					x	x					
Molothrus ater	Brown-headed Cowbird	S4B					x	x	x				
Quiscalus quiscula	Common Grackle	S5B/S4N					x	x	x	x		x	
Sturnella magna	Eastern Meadowlark	S4B	THR	THR	THR		x						
Laridae	**Gulls, Terns & Skimmers**												
Larus argentatus	Herring Gull	S5B,S5N						x					
Larus delawarensis	Ring-billed Gull	S5B/S4N					x	x	x			x	
Mimidae	**Mockingbirds, Thrashers & Allies**												
Dumetella carolinsis	Gray Catbird	S4B					x	x	x		x	x	x
Mimus polyglottos	Northern Mockingbird	S4					x	x	x				
Toxostoma rufum	Brown Thrasher	S4B					x	x					
Paridae	**Chickadees and Titmice**												
Poecile atricapillus	Black-capped Chickadee	S5					x	x	x		x	x	
Baeolophus bicolor	Tufted Titmouse	S4					x					x	
Parulidae	**Wood Warblers**												
Cardellina canadensis	Canada Warbler	S4B	SC	THR	SC			x					
Cardellina pusilla	Wilson's Warbler	S4B						x					
Geothlypis philadelphia	Mourning Warbler	S4B					x	x					
Geothylupis trichas	Common Yellowthroat	S5B					x	x					
Mniotilta varia	Black-and-white Warbler	S5B						x	x				
Oreothlypis celata	Orange-crowned Warbler	S4B						x					
Oreothlypis peregrina	Tennessee Warbler	S5B						x					
Oreothlypis ruficapilla	Nashville Warbler	S5B					x	x	x				
Parkesia noveboracensis	Northern Waterthrush	S5B					x	x					
Seiurus aurocapilla	Ovenbird	S4B						x	x				
Setophaga americana	Northern Parula	S4B						x					
Setophaga caerulescens	Black-throated Blue Warbler	S5B						x	x				
Setophaga castanea	Bay-breasted Warbler	S5B						x	x				
Setophaga citrina	Hooded Warbler	S4B						x					

Species		Conservation Rank				Source							
Scientific Name	Common Name	Provincial (S-RANK)	Provincial (ESA)	National (COSEWIC)	National (SARA)	NHIC	OBBA	eBird	iNaturalist	MY3 (NAS 2021)	CV12 (NAS 2021)	Breeding Bird	Matrix Field Observations
Setophaga coronata	Yellow Rumped Warbler	S5B						x					
Setophaga discolor	Prairie Warbler	S3B						x					
Setophaga dominica	Yellow-throated Warbler	SNA							x				
Setophaga fusca	Blackburnian Warbler	S5B						x					
Setophaga magnolia	Magnolia Warbler	S5B						x					
Setophaga pensylvanica	Chestnut-sided warbler	S5B					x	x					
Setophaga petechai	Yellow Warbler	S5B					x	x				x	
Setophaga pinus	Pine Warbler	S5B					x	x					
Setophaga ruticilla	American Redstart	S5B					x	x	x				
Setophaga striata	Blackpoll Warbler	S4B						x					
Setophaga tigrina	Cape May Warbler	S5B						x					
Setophaga virens	Black-throated Green Warbler	S5B						x					
Vermivora cyanoptera	Blue-winged Warbler	S4B						x					
Passeridae	**Sparrows**												
Passer domesticus	House Sparrow	SNA					x	x	x	x		x	x
Phalacrocoracidae	**Cormorants**												
Phalacrocorax auritus	Double-crested Cormorant	S5B						x					
Phasianidae	**Patridges, Grouse, Turkeys**												
Phasianus colchicus	Ring-necked Pheasant	SNA					x						
Picidae	**Woodpeckers**												
Colaptes auratus	Northern Flicker	S4B					x	x	x			x	
Dryocopus pileatus	Pileated Woodpecker	S5					x						
Leuconotopicus villosus	Hairy Woodpecker	S5					x	x	x		x		
Melanerpes carolinus	Red-bellied Woodpecker	S4					x	x	x				
Picoides pubescens	Downy Woodpecker	S5					x	x	x			x	
Sphyrapicus varius	Yellow-bellied Sapsucker	S5B					x	x	x				
Podicipedidae	**Grebes**												
Podiceps grisegena	Red-necked Grebe	S3B/S4N					x						
Polioptilidae	**Gnatcatchers**												
Polioptila caerulea	Blue-gray Gnatcatcher	S4B					x	x					
Rallidae	**Railes, Gallinules & Coots**												
Porzana carolina	Sora	S4B					x		x				
Rallus limicola	Virginia Rail	S5B					x						
Regulidae	**Kinglets**												
Regulus calendula	Ruby-crowned Kinglet	S4B						x	x				
Regulus satrapa	Golden-crowned Kinglet	S5B						x	x				
Scolopacidae	**Sandpipers, Phalaropes &Allies**												
Actitis macularius	Spotted Sandpiper	S5					x	x	x				
Scolopax minor	American Woodcock	S4B					x						
Sittidae	**Nutchatches**												
Sitta canadensis	Red-breasted Nuthatch	S5					x	x	x		x		
Sitta carolinensis	White-breasted Nuthatch	S5					x	x	x			x	
Stercorariidae	**Skuas**												
Bubo virginianus	Great Horned Owl	S5					x						
Megascops asio	Screech Owl	S4					x	x					
Strix varia	Barred Owl	S5						x					
Sturnidae	**Starlings**												
Sturnus vulgaris	European Starling	SNA					x	x	x			x	
Trochillidae	**Hummingbirds**												
Archilochus colubris	Ruby-throated Hummingbird	S5B					x	x					
Troglodytidae	**Wrens**												
Thyrothorus ludovicianus	Carolina Wren	S4					x	x			x		
Troglodytes aedon	House Wren	S5B					x	x					
Troglodytes hiemalis	Winter Wren	S5B						x	x				
Turdidae	**Thrushes**												
Catharus fuscescens	Veery	S4B					x	x					
Catharus guttatus	Hermit Thrush	S5B						x	x				
Catharus minimus	Gray-cheeked Thrush	S4B						x					
Catharus ustulatus	Swainson's Thrush	S4B						x	x				
Hylocichla mustelina	Wood Thrush	S4B	SC	THR	THR		x	x					

Species		Conservation Rank				Source							
Scientific Name	Common Name	Provincial (S-RANK)	Provincial (ESA)	National (COSEWIC)	National (SARA)	NHIC	OBBA	eBird	iNaturalist	MY3 (NAS 2021)	CV12 (NAS 2021)	Breeding Bird	Matrix Field Observations
Turdus migratorius	American Robin	S5B					x	x	x	x		x	x
Tyrannidae	**Tyrant Flycatchers**												
Contopus cooperi	Olive-sided Flycatcher	S4B	SC	SC	THR			x	x				
Contopus virens	Eastern Wood-pewee	S4B	SC	SC	SC		x	x					x
Empidonax alnorum	Alder Flycatcher	S5B					x	x					
Empidonax flaviventris	Yellow-bellied Flycatcher	S5B						x					
Empidonax minimus	Least Flycatcher	S4B					x	x			x		
Empidonax traillii	Willow Flycatcher	S5B					x	x				x	
Myiarchus crinitus	Great Crested Flycatcher	S4B					x	x				x	
Sayornis phoebe	Eastern Phoebe	S5B/S4N					x	x					
Tyrannus tyrannus	Eastern Kingbird	S4B					x	x		x			
Vireonidae	**Vireos**												
Vireo gilvus	Warbling Vireo	S5B					x	x	x			x	
Vireo olivaceus	Red-eyed Vireo	S5B					x	x				x	x
Vireo solitarius	Blue-headed Vireo	S5B						x	x				
Vireo flavifrons	Yellow-throated Vireo	S4B						x					
Vireo philadelphicus	Philadelphia Vireo	S5B						x					
Total:						1	102	136	64	8	9	33	8

Legend

SRANK
- S1 Critically Imperiled
- S2 Imperiled
- S3 Vulnerable
- S4 Apparently Secure
- S5 Secure
- SU Unrankable
- SNA Unranked
- SX Presumed Extirpated
- SH Possibly Extirpated
- S#? Rank Uncertain

COSEWIC
- NAR Not at Risk
- SC Special Concern
- THR Threatened
- END Endangered
- EXT Extinct
- EXP Extirpated
- DD Data Deficient

COSSARO
- NAR Not at Risk
- SC Special Concern
- THR Threatened
- END Endangered
- EXP Extirpated
- DD Data Deficient

SARA Schedule
- Schedule 1 Officially protected under SARA
- Schedule 2 Threatened/Endangered; may be reassessed for consideration for inclusion to Schedule 1
- Schedule 3 Special concern; may be reassessed for consideration for inclusion to Schedule 1

ESA
- SC Special Concern
- THR Threatened
- END Endangered
- EXT Extinct
- EXP Extirpated

APPENDIX G
Breeding Birds

Breeding Bird Survey - June 3, 2022

BREEDING BIRD SURVEY			OB	PO	PB	CONF	#	Notes
Station 1	Northern Cardinal	*Cardinalis cardinalis*		S			1	calling
June 3, 2022	Baltimore Oriole	*Icterus galbula*			P		2	calling, visual, male and female
7:45 - 7:55 am	Red-winged Blackbird	*Agelaius phoeniceus*		H			8	
	Downy Woodpecker	*Picoides pubescens*		H			1	calling, moving tree to tree
	House Sparrow	*Passer domesticus*			P		5	calling, near houses
	American Robin	*Turdus migratorius*		H			3	
	Blue Jay	*Cyanpcitta cristata*		H			2	calling, visual, foraging
	Ring-billed Gull	*Larus delawarensis*		X			1	flyover
	Mourning Dove	*Zenaida macroura*		H			3	
	American Goldfinch	*Spinus tritis*			P		4	flying, male and female
	Great Crested Flycatcher	*Myiarchus crinitus*		H			1	
Station 2	Northern Flicker	*Colaptes auratus*		S			3	calling
June 3, 2022	Northern Cardinal	*Cardinalis cardinalis*		S			2	calling
7:57 - 8:07 am	Willow Flycatcher	*Empidonax traillii*		S			1	calling
	European Starling	*Strunus vulgaris*				CF	10	flying, food in mouth
	House Sparrow	*Passer domesticus*			P		8+	near houses
	Baltimore Oriole	*Icterus galbula*		S			1	calling, flying, male
	Warbling Vireo	*Vireo gilvus*		S			2	calling
	White-breasted Nuthatch	*Sitta carolinensis*		H			1	flying
	American Robin	*Turdus migratorius*		H			1	calling
Station 3	Baltimore Oriole	*Icterus galbula*		S			2	calling
June 3, 2022	Red-winged Blackbird	*Agelaius phoeniceus*			P		13+	12+ calling, 1 female foraging
8:07-8:17 am	House Sparrow	*Passer domesticus*			N		1	flying, calling, nest material
	Northern Cardinal	*Cardinalis cardinalis*		S			1	calling
	American Robin	*Turdus migratorius*		H			3	foraging
	Mallard	*Anas platyrhynchos*		H			1	female, in creek
	American Crow	*Corvus brachyrhynchos*		H			1	calling
Station 4	Killdeer	*Charadrius vociferus*		S			3	calling
June 3, 2022	Common Grackle	*Quiscalus quiscula*		H			2	visual
8:20 - 8:30 am	Downy Woodpecker	*Picoides pubescens*		S			1	calling
	Red-winged Blackbird	*Agelaius phoeniceus*			A		20+	calling, visual, male and female, males fighting
	Field Sparrow	*Spizella pusilla*		H			1	
	Red-eyed Vireo	*Vireo olivaceus*		S			1	calling
	Northern Cardinal	*Cardinalis cardinalis*		S			1	calling
	European Starling	*Strunus vulgaris*		H			5+	flying
	American Robin	*Turdus migratorius*				CF	1	food in mouth
	Mourning Dove	*Zenaida macroura*			P		2	visual, a pair
	Ring-billed Gull	*Larus delawarensis*		H			1	
	Downy Woodpecker	*Picoides pubescens*			A		1	calling, disturbed
Station 5	Red-winged Blackbird	*Agelaius phoeniceus*				NY	20	male and female, fighting, nesting
June 3, 2022	Killdeer	*Charadrius vociferus*		S			1	flying, calling
8:30 - 8:40 am	Baltimore Oriole	*Icterus galbula*		H			1	male foraging
	Mallard	*Anas platyrhynchos*		H			1	male, sitting
	Great Crested Flycatcher	*Myiarchus crinitus*		S			1	calling
	American Goldfinch	*Spinus tritis*			P		2	flying, visual, a pair
	Common Grackle	*Quiscalus quiscula*		H			4	
	House Sparrow	*Passer domesticus*		H			8+	near houses
	Yellow Warbler	*Setophaga petechai*		S			2	calling
	Mourning Dove	*Zenaida macroura*		H			8	flying
	Tree Swallow	*Tachycineta bicolor*		H			1	flying
	European Starling	*Strunus vulgaris*			V		6	flying, nesting in a tree

CODE

Observed

X *Species observed in its breeding season (no evidence of breeding).*

Possible Breeding

H *Species observed in its breeding season in suitable habitat*

S *Singing male present, or its breeding call heard, in its breeding season in suitable nesting habitat*

Probable Breeding

P *Pair observed in their breeding season in suitable nesting habitat*

T *Permanent territory presumed through registration of territorial song on at least 2 days a week or more apart, at the same place*

D *Courtship on display between a male and a female or 2 males, including courtship, feeding or copulation*

V *Visiting probable nest*

A *Agitated behaviour or anxiety calls of an adult*

B *Brood patch on adult female or cloacal protuberance on adult male*

N *nest-building or excavation of nest hole*

Confirmed Breeding

DD *Distraction display or injury feigning*

NU *Used nest or egg shell found (occupied or laid within the period of study*

FY *Recently fledged young or downy young, including young incapable of sustained flight*

AE *Adults leaving or entering nest site in circumstances indicating occupied nest*

FS *Adult carrying faecal sac*

CF *Adult carrying food for young*

NE *Nest containing eggs*

NY *Nest with young seen or heard*

Breeding Bird Survey - June 3, 2022

BREEDING BIRD SURVEY			OB	PO	PB	CONF	#	Notes
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	Downy Woodpecker	*Picoides pubescens*		H			1	calling, moving tree to tree
	House Sparrow	*Passer domesticus*			P		5	calling, near houses
	American Robin	*Turdus migratorius*		H			3	
	Blue Jay	*Cyanpcitta cristata*		H			2	calling, visual, foraging
	Ring-billed Gull	*Larus delawarensis*		X			1	flyover
	Mourning Dove	*Zenaida macroura*		H			3	
	American Goldfinch	*Spinus tritis*			P		4	flying, male and female
	Great Crested Flycatcher	*Myiarchus crinitus*		H			1	
Station 2	Northern Flicker	*Colaptes auratus*		S			3	calling
June 3, 2022	Northern Cardinal	*Cardinalis cardinalis*		S			2	calling
7:57 - 8:07 am	Willow Flycatcher	*Empidonax traillii*		S			1	calling
	European Starling	*Strunus vulgaris*				CF	10	flying, food in mouth
	House Sparrow	*Passer domesticus*			P		8+	near houses
	Baltimore Oriole	*Icterus galbula*		S			1	calling, flying, male
	Warbling Vireo	*Vireo gilvus*		S			2	calling
	White-breasted Nuthatch	*Sitta carolinensis*		H			1	flying
	American Robin	*Turdus migratorius*		H			1	calling
Station 3	Baltimore Oriole	*Icterus galbula*		S			2	calling
June 3, 2022	Red-winged Blackbird	*Agelaius phoeniceus*			P		13+	12+ calling, 1 female foraging
8:07-8:17 am	House Sparrow	*Passer domesticus*			N		1	flying, calling, nest material
	Northern Cardinal	*Cardinalis cardinalis*		S			1	calling
	American Robin	*Turdus migratorius*		H			3	foraging
	Mallard	*Anas platyrhynchos*		H			1	female, in creek
	American Crow	*Corvus brachyrhynchos*		H			1	calling
Station 4	Killdeer	*Charadrius vociferus*		S			3	calling
June 3, 2022	Common Grackle	*Quiscalus quiscula*		H			2	visual
8:20 - 8:30 am	Downy Woodpecker	*Picoides pubescens*		S			1	calling
	Red-winged Blackbird	*Agelaius phoeniceus*			A		20+	calling, visual, male and female, males fighting
	Field Sparrow	*Spizella pusilla*		H			1	
	Red-eyed Vireo	*Vireo olivaceus*		S			1	calling
	Northern Cardinal	*Cardinalis cardinalis*		S			1	calling
	European Starling	*Strunus vulgaris*		H			5+	flying
	American Robin	*Turdus migratorius*				CF	1	food in mouth
	Mourning Dove	*Zenaida macroura*			P		2	visual, a pair
	Ring-billed Gull	*Larus delawarensis*		H			1	
	Downy Woodpecker	*Picoides pubescens*			A		1	calling, disturbed
Station 5	Red-winged Blackbird	*Agelaius phoeniceus*				NY	20	male and female, fighting, nesting
June 3, 2022	Killdeer	*Charadrius vociferus*		S			1	flying, calling
8:30 - 8:40 am	Baltimore Oriole	*Icterus galbula*		H			1	male foraging
	Mallard	*Anas platyrhynchos*		H			1	male, sitting
	Great Crested Flycatcher	*Myiarchus crinitus*		S			1	calling
	American Goldfinch	*Spinus tritis*			P		2	flying, visual, a pair
	Common Grackle	*Quiscalus quiscula*		H			4	
	House Sparrow	*Passer domesticus*		H			8+	near houses
	Yellow Warbler	*Setophaga petechai*		S			2	calling
	Mourning Dove	*Zenaida macroura*		H			8	flying
	Tree Swallow	*Tachycineta bicolor*		H			1	flying
	European Starling	*Strunus vulgaris*			V		6	flying, nesting in a tree

CODE

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N *nest-building or excavation of nest hole*

Confirmed Breeding

DD *Distraction display or injury feigning*

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FY *Recently fledged young or downy young, including young incapable of sustained flight*

AE *Adults leaving or entering nest site in circumstances indicating occupied nest*

FS *Adult carrying faecal sac*

CF *Adult carrying food for young*

NE *Nest containing eggs*

NY *Nest with young seen or heard*

APPENDIX H
Mammals

TABLE H1 Mammal Species

Species Name		Conservation Ranking				Source					
Scientific Name	Common Name	S-Rank	ESA	COSEWIC	SARA	NHIC	Ontario Mammals	iNaturalist	MY3 (NAS 2021)	CV12 (NAS 2021)	Matrix Field Observations
Artiodactyla	**Deer and Bison**										
Odocoileus virginianus	White-tailed Deer	S5					x				
Carnivora	**Carnivores**										
Canis latrans	Coyote	S5					x	x			
Lontra canadensis	North American River Otter	S5					x				
Martes americana	American Marten	S5					x				
Mephitis mephitis	Striped Skunk	S5					x	x			
Mustela frenata	Long-tailed Weasel	S4					x				
Mustela nivalis	Least Weasel	SU					x				
Neovison vison	American Mink	S4					x	x			
Procyon lotor	Northern Raccoon	S5					x				
Vulpes vulpes	Red Fox	S5					x				
Chiroptera	**Bats**										
Eptesicus fuscus	Big Brown Bat	S4					x				
Lasionycteris noctivagans	Silver-haired Bat	S4					x				
Lasiurus borealis	Red Bat	S4					x				
Lasiurus cinereus	Hoary Bat	S4					x				
Myotis leibii	Eastern Small-footed Myotis	S2/S3	END				x				
Myotis lucifugus	Little Brown Myotis	S4	END	END	END		x				
Myotis septentrionalis	Northern Myotis	S3	END	END	END		x				
Perimyotis subflavus	Tricolored Bat	S3	END	END	END		x				
Lagomorphia	**Rabbits and Hares**										
Sylvilagus floridanus	Eastern Cottontail	S5					x	x			x
Lepus americanus	Snowshoe Hare	S5					x				
Rodentia	**Rodents**										
Castor canadensis	Beaver	S5					x	x			
Erethizon dorsatum	Porcupine	S5					x				
Glaucomys volans	Southern Flying Squirrel	S4					x				
Marmota monax	Woodchuck	S5					x				
Microtus pennsylvanicus	Meadow Vole	S5					x	x			
Mus musculus	House Mouse	SNA					x				
Myodes gapperi	Southern Red-backed Vole	S5					x				
Napaeozapus insignis	Woodland Jumping Mouse	S5					x				
Ondatra zibethicus	Muskrat	S5					x	x			
Peromyscus leucopus	White-footed Mouse	S5					x				
Peromyscus maniculatus	Deer Mouse	S5					x				
Sciurus carolinensis	Grey Squirrel	S5					x				x
Synaptomys cooperi	Southern Bog Lemming	S4					x				
Tamias striatus	Eastern Chipmunk	S5					x	x			
Tamiasciurus hudsonicus	Red Squirrel	S5					x	x			
Zapus hudsonius	Meadow Jumping Mouse	S5					x				
Soricomorpha											
Blarina brevicauda	Northern Short-tailed Shrew	S5					x				
Condylura cristata	Star-nosed Mole	S5					x				
Sorex cinereus	Masked Shrew	S5					x				
Sorex hoyi	Pygmy Shrew	S4					x				

Legend

SRANK	
S1	Critically Imperiled
S2	Imperiled
S3	Vulnerable
S4	Apparently Secure
S5	Secure
SU	Unrankable
SNA	Unranked
SX	Presumed Extirpated
SH	Possibly Extirpated
S#?	Rank Uncertain

COSEWIC	
NAR	Not at Risk
SC	Special Concern
THR	Threatened
END	Endangered
EXT	Extinct
EXP	Extirpated
DD	Data Deficient

COSSARO	
NAR	Not at Risk
SC	Special Concern
THR	Threatened
END	Endangered
EXP	Extirpated
DD	Data Deficient

SARA Schedule	
Schedule 1	Officially protected under SARA
Schedule 2	Threatened/Endangered; may be reassessed for consideration for inclusion to Schedule 1
Schedule 3	Special concern; may be reassessed for consideration for inclusion to Schedule 1

ESA	
SC	Special Concern
THR	Threatened
END	Endangered
EXT	Extinct
EXP	Extirpated

APPENDIX I
Insects

TABLE I1 Insect Species

Species Name		Conservation Ranking				Source						
Scientific Name	Common Name	S-Rank	ESA	COSEWIC	SARA	NHIC	Ontario Butterfly Atlas	iNaturalist	Ontario Moth Atlas	MY3 (NAS 2021)	CV12 (NAS 2021)	Matrix Field Observations
Coleoptera	**Beetles**											
Ancistronycha bilineata	Soldier Beetle	SNR						x				
Ancistronycha dentigera	Soldier Beetle	SNR						x				
Ancistronycha neglecta	Soldier Beetle	SNR						x				
Cantharis curtisi	Soldier Beetle	SNR						x				
Cantharis rotundicollis	Soldier Beetle	SNR						x				
Cantharis rufa	Soldier Beetle	SNA						x				
Cantharis tuberculata	Soldier Beetle	SNR						x				
Chauliognathus pensylvanicus	Soldier Beetle	SNR						x				
Dichelotarsus simplex	Soldier Beetle	SNR						x				
Malthinus occipitalis	Soldier Beetle	SNR						x				
Malthodes fragilis	Soldier Beetle	SNR						x				
*Malthodes mediocciden*s	Soldier Beetle	SNR						x				
Malthodes parvulus	Soldier Beetle	SNR						x				
Malthodes similis	Soldier Beetle	SNR						x				
Podabrus brevicollis	Soldier Beetle	SNR						x				
Podabrus diadema	Soldier Beetle	SNR						x				
Podabrus extremus	Soldier Beetle	SNR						x				
Podabrus flavicollis	Soldier Beetle	SNR						x				
Podabrus frater	Soldier Beetle	SNR						x				
Podabrus frosti	Soldier Beetle	SNR						x				
Podabrus heteronychus	Soldier Beetle	SNR						x				
Podabrus intrusus	Soldier Beetle	SNR						x				
Podabrus laevicollis	Soldier Beetle	SNR						x				
Podabrus modestus	Soldier Beetle	SNR						x				
Podabrus nothoides	Soldier Beetle	SNR						x				
Podabrus planulus	Soldier Beetle	SNR						x				
Podabrus protensus	Soldier Beetle	SNR						x				
Podabrus puberulus	Soldier Beetle	SNR						x				
Podabrus punctulatus	Soldier Beetle	SNR						x				
Podabrus rugosulus	Soldier Beetle	SNR						x				
Podabrus tomentosus	Soldier Beetle	SNR						x				
Podabrus tricostatus	Soldier Beetle	SNR						x				
Polemius laticornis	Soldier Beetle	SNR						x				
Rhagonycha costipennis	Soldier Beetle	SNR						x				
Rhagonycha excavata	Soldier Beetle	SNR						x				
Rhagonycha fraxini	Soldier Beetle	SNR						x				
Rhagonycha imbecillis	Soldier Beetle	SNR						x				
Rhagonycha luteicollis	Soldier Beetle	SNR						x				
Rhagonycha mollis	Soldier Beetle	SNR						x				
Rhagonycha oriflava	Soldier Beetle	SNR						x				
Rhagonycha recta	Soldier Beetle	SNR						x				
Rhagonycha septentrionis	Soldier Beetle	SNR						x				
Rhagonycha sylvatica	Soldier Beetle	SNR						x				
Rhagonycha vilis	Soldier Beetle	SNR						x				
Rhaxonycha bilobata	Soldier Beetle	SNR						x				
Rhaxonycha carolina	Soldier Beetle	SNR						x				
Silis percomis	Soldier Beetle	SNR						x				
Trypherus frisoni	Soldier Beetle	SNR						x				
Hymenoptera	**Sawflies, Wasps, Bees, and Ants**											
Bombus impatiens	Common Eastern Bumble Bee	S5						x				
Camponotus pennsylvanicus	Eastern Black Carpenter Ant	S5						x				
Lepidoptera	**Butterflies**											
Amphion floridensis	Nessus Sphinx	S4					x		x			

Species Name		Conservation Ranking				Source						
Ancyloxypha numitor	Least Skipper	S5					x					
Antheraea polyphemus	Polyphemus Moth	S5					x	x	x			
Asterocampa celtis	Hackberry Emperor	S3					x					
Atalopedes campestris	Sachem	SNA					x					
Boloria bellona	Meadow Fritillary	S5					x					
Catocala minuta	Little Underwing	SNR					x		x			
Catocala parta	Mother Underwing	S5					x		x			
Catocala piatrix	The Penitent	S4					x		x			
Celastrina neglecta	Summer Azure	S5					x					
Cercyonis pegala	Common Wood-Nymph	S5					x					
Chlosyne nycteis	Silvery Checkerspot	S5					x					
Cisseps fulvicollis	Yellow-collared Scape Moth	SNR					x		x			
Coenonympha tullia	Common Ringlet	S5					x					
Colias eurytheme	Orange Sulphur	S5					x					
Colias philodice	Clouded Sulphur	S5					x	x				
Ctenucha virginica	Virginia Ctenucha Moth	S5					x		x			
Cupido comyntas	Eastern Tailed Blue	S5					x					
Danaus plexippus	Monarch	S2N,S4B	SC	END	SC		x	x				
Darapsa myron	Hog Sphinx	SU					x		x			
Epargyreus clarus	Silver-spotted Skipper	S4					x					
Erynnis baptisiae	Wild Indigo Duskywing	S4					x	x				
Erynnis lucilius	Columbine Duskywing	S4					x					
Erynnis martialis	Mottled Duskywing	S2	END	END			x					
Estigmene acrea	Salt Marsh Moth	S5					x		x			
Euchaetes egle	Milkweed Tussock Moth	S4?					x		x			
Eumorpha pandorus	Pandorus Sphinx	S4					x		x			
Euphyes dion	Dion Skipper	S4					x					
Euphyes vestris	Dun Skipper	S5					x					
Feniseca tarquinius	Harvester	S4					x					
Glaucopsyche lygdamus	Silvery Blue	S5					x					
Haematopis grataria	Chickweed Geometer	SNR						x				
Halysidota tessellaris	Banded Tussock Moth	S5					x		x			
Haploa confusa	Confused Haploa	S5					x		x			
Hemaris diffinis	Snowberry Clearwing Moth	S4S5					x		x			
Hyalophora cecropia	Cecropia Moth	S5					x		x			
Hylephila phyleus	Fiery Skipper	SNA					x					
Junonia coenia	Common Buckeye	SNA					x					
Leptotes marina	Marine Blue	SNA					x					
Lethe anthedon	Northern Pearly-Eye	S5					x					
Lethe eurydice	Eyed Brown	S5					x					
Limenitis archippus	Viceroy	S5					x					
Limenitis arthemis arthemis	White Admiral	S5					x					
Limenitis arthemis astyanax	Red-spotted Purple	S5					x					
Lophocampa caryae	Hickory Tussock Moth	SNR					x		x			
Lophocampa maculata	Spotted Tussock Moth	S4					x		x			
Megisto cymela	Little Wood-Satyr	S5					x					
Nymphalis antiopa	Mourning Cloak	S5					x	x				
Nymphalis l-album	Compton Tortoiseshell	S5					x	x				
Paonias excaecata	Blinded Sphinx	S5					x		x			
Papilio cresphontes	Giant Swallowtail	S4					x					
Papilio glaucus	Eastern Tiger Swallowtail	S5					x					
Papilio polyxenes	Black Swallowtail	S5					x					
Phoebis sennae	Cloudless Sulphur	SNA					x					
Pholisora catullus	Common Sootywing	S4					x	x				
Phyciodes cocyta	Northern Crescent	S5					x					
Phyciodes tharos	Pearl Crescent	S4					x					
Pieris rapae	Cabbage White	SNA					x	x				x
Poanes hobomok	Hobomok Skipper	S5					x					

Species Name		Conservation Ranking				Source						
Poanes viator	Broad-winged Skipper	S4					x					
Polites origenes	Crossline Skipper	S4					x					
Polites peckius	Peck's Skipper	S5					x	x				
Polites themistocles	Tawny-edged Skipper	S5					x					
Polygonia comma	Eastern Comma	S5					x					
Polygonia interrogationis	Question Mark	S5					x					
Pontia protodice	Checkered White	SNA					x					
Pyrisitia lisa	Little Yellow	SNA					x					
Pyrrharctia isabella	Isabella Tiger Moth	S5					x	x	x			
Satyrium acadica	Acadian Hairstreak	S4					x					
Satyrium calanus	Banded Hairstreak	S4					x					
Satyrium caryaevorus	Hickory Hairstreak	S4					x					
Satyrium edwardsii	Edwards' Hairstreak	S4					x					
Satyrium liparops	Striped Hairstreak	S5					x					
Speyeria atlantis	Atlantis Fritillary	S5					x					
Sphecodina abbottii	Abbott's Sphinx	S4					x		x			
Spilosoma virginica	Virginian Tiger Moth	S5					x		x			
Thorybes pylades	Northern Cloudywing	S5					x					
Thymelicus lineola	European Skipper	SNA					x					
Tolype velleda	Large Tolype	SNR					x		x			
Vanessa atalanta	Red Admiral	S5					x					
Vanessa cardui	Painted Lady	S5					x					
Vanessa virginiensis	American Lady	S5					x					
Wallengrenia egeremet	Northern Broken-Dash	S5					x					
Odonata	**Damselflies and Dragonflies**											
Anax junius	Green Darner	S5						x				
Plathemis lydia	Common Whitetail	S5						x				
Sympetrum vicinum	Autumn Meadowhawk	S5						x				
Orthoptera	**related insects**											
Gryllus pennsylvanicus	Fall Field Cricket	S5						x				
TOTAL:						0	83	65	23	0	0	1

Legend

SRANK	
S1	Critically Imperiled
S2	Imperiled
S3	Vulnerable
S4	Apparently Secure
S5	Secure
SU	Unrankable
SNA	Unranked
SX	Presumed Extirpated
SH	Possibly Extirpated
S#?	Rank Uncertain

COSEWIC	
NAR	Not at Risk
SC	Special Concern
THR	Threatened
END	Endangered
EXT	Extinct
EXP	Extirpated
DD	Data Deficient

COSSARO	
NAR	Not at Risk
SC	Special Concern
THR	Threatened
END	Endangered
EXP	Extirpated
DD	Data Deficient

SARA Schedule	
Schedule 1	Officially protected under SARA
Schedule 2	Threatened/Endangered; may be reassessed for consideration for inclusion to Schedule 1
Schedule 3	Special concern; may be reassessed for consideration for inclusion to Schedule 1

ESA	
SC	Special Concern
THR	Threatened
END	Endangered
EXT	Extinct
EXP	Extirpated

APPENDIX D
Archaeological Investigation

Stage 1 Archaeological Assessment
Municipal Class Environmental Assessment
Cooksville Creek Erosion Control Project
Part of Lot 14, Concession 1 NDS
Former Geographic Township of Toronto
Now the City of Mississauga
Regional Municipality of Peel, Ontario

Original Report

Submitted to:
Ministry of Citizenship and Multiculturalism

Prepared for:
Mariette Pushkar
Matrix Solutions, Inc.
171 Victoria Street North
Kitchener, ON N2H 5C5
www.matrix-solutions.com

Prepared by:
TMHC Inc.
1108 Dundas Street, Unit 105
London, ON N5W 3A7
519-641-7222
tmhc.ca

Licensee:	Sherri Pearce, MA, P316
PIF No:	P316-0499-2022
Project No:	2022-065
Dated:	February 7, 2023

EXECUTIVE SUMMARY

A Stage 1 archaeological assessment was conducted for a Municipal Class Environmental Assessment (MCEA) for the Cooksville Creek Erosion Control Project – upstream of Mississauga Valley Boulevard to Canadian Pacific (CP) Rail – in the City of Mississauga, Ontario. The Project Area is roughly 1.74 ha (4.30 ac) in size and is located within part of Lot 14, Concession 1 North of Dundas Street (NDS) in the Geographic Township of Toronto, Now the City of Mississauga, Regional Municipality of Peel, Ontario. The Project Area is focused around a 360 m segment of Cooksville Creek, stretching 100 m upstream of Mississauga Valley Boulevard southeast to the CP Rail line. The overall Project Area includes treed green space, the Cooksville Creek Trail system, Mississauga Valley Boulevard and associated bridge, and a CP Rail line bridge. In 2022 TMHC Inc. (TMHC) was contracted by Mariette Pushkar of Ecosystem Recovery Inc. (ERI) (recently merged with Matrix Solutions, Inc. [Matrix]), to conduct the assessment on behalf of the Corporation of the City of Mississauga. The assessment was conducted in accordance with the provisions of the *Environmental Assessment Act* (EA), the *Provincial Policy Statement* (PPS), and the Corporation of the City of Mississauga's *Consulting Services for Cooksville Creek Erosion Control Program*. The purpose of the assessment was to determine whether there was potential for the discovery of archaeological resources present within the Project Area.

The Stage 1 background study included a review of current land use, historic and modern maps, past settlement history for the area and a consideration of topographic and physiographic features, soils and drainage. It also involved a review of previously registered archaeological resources within 1 km of the Project Area and previous archaeological assessments within 50 m. The background study indicated that the Project Area had potential for the recovery of archaeological resources due to the proximity (i.e., within 300 m) of features that signal archaeological potential, namely:

- the proximity to primary water sources (Cooksville Creek);
- features indicating past water sources (Glacial Lake Iroquois Beach); and,
- mapped 19th-century transportation routes (Credit Valley Railway).

As the Project Area was in proximity to features that signal archaeological potential, a Stage 1 property inspection was conducted to evaluate the current conditions of the Project Area and its integrity. The Stage 1 property inspection visually confirmed that the majority of the Project Area contains areas of previous disturbance (paved roads, sidewalks, pathways, and bridges) (0.46 ha; 26.4%). It also determined that portions were sloped (0.73 ha; 42.0%) and low and wet (0.36 ha; 20.7%). However, portions of the Project Area that are grassed and treed are not obviously disturbed and retain archaeological potential (0.19 ha; 10.9%) and would require Stage 2 assessment.

Based on the Stage 1 background research and property inspection, the following recommendations are made:

- The grassed and treed areas within the Project Area, as shown on Map 10 (0.19 ha; 10.9%), are not obviously disturbed, retain archaeological potential and are recommended for Stage 2 assessment. As these lands are non-ploughable, the Stage 2 assessment should consist of a standard test pit survey at a 5 m transect interval, in keeping with provincial standards.
- Portions of the Project Area have been previously disturbed (0.46 ha; 26.4%) and are considered to no longer retain archaeological potential. These areas have been photo documented and no further assessment work is recommended.

- The areas of slope (0.73 ha; 42.0%) and low and wet areas (0.36 ha; 20.7%) within the Project Area are considered not to retain archaeological potential. These areas have been photo documented and no further assessment work is recommended.

Our recommendations are subject to the conditions laid out in Section 7.0 of this report and to the MCM's review and acceptance of this report into the provincial registry.

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PROJECT PERSONNEL

Project Manager	Sherri Pearce, MA (P316)
Project Administrator	Victoria Scott, MA, MLis
	Kellie Theaker, CHRP
Health and Safety Coordinator	Wendi Jakob, C.Tech, CAPM
	Andrew Turner, BA (R1042)
Fieldwork Coordination	Johnathan Freeman, MA (P274)
	David Gostick, BA
Field Director(s)	Johnathan Freeman, MA (P274)
GIS Mapping	David Gostick, BA
Report Writer	Katherine Bishop, PhD (R407)
Researcher	Katherine Bishop, PhD (R407)
Senior Review	Matthew Beaudoin, PhD (P324)

ACKNOWLEDGEMENTS

Wolfgang Wolter	Senior Project Manager, Matrix Solutions, Inc.
Mariette Pushkar	Senior Fluvial Geomorphologist, Matrix Solutions Inc.

TERRITORIAL ACKNOWLEDGEMENT

The Project Area is located within the treaty lands of the Mississauga of the Credit First Nation on lands connected with the Head of the Lake Purchase, Treaty No. 14, and on the traditional lands of the Anishinaabek (Ah-nish-in-a-bek), Haudenosaunee (Ho-den-no-show-nee), and the Huron-Wendat Nation. This land continues to be home to diverse Indigenous peoples (e.g., First Nations, Métis, and Inuit) whom we recognize as contemporary stewards of the land and vital contributors of our society.

ABOUT TMHC

Established in 2003 with a head office in London, Ontario, TMHC Inc. (TMHC) provides a broad range of archaeological assessment, heritage planning and interpretation, cemetery, and community consultation services throughout the Province of Ontario. We specialize in providing heritage solutions that suit the past and present for a range of clients and intended audiences, while meeting the demands of the regulatory environment. Over the past two decades, TMHC has grown to become one of the largest privately-owned heritage consulting firms in Ontario and is today the largest predominately woman-owned CRM business in Canada.

Since 2004, TMHC has held retainers with Infrastructure Ontario, Hydro One, the Ministry of Transportation, Metrolinx, the City of Hamilton, and Niagara Parks Commission. In 2013, TMHC earned the Ontario Archaeological Society's award for Excellence in Cultural Resource Management. Our seasoned expertise and practical approach have allowed us to manage a wide variety of large, complex, and highly sensitive projects to successful completion. Through this work, we have gained corporate experience in helping our clients work through difficult issues to achieve resolution.

TMHC is skilled at meeting established deadlines and budgets, maintaining a healthy and safe work environment, and carrying out quality heritage activities to ensure that all projects are completed diligently and safely. Additionally, we have developed long-standing relationships of trust with Indigenous and descendent communities across Ontario and a good understanding of community interests and concerns in heritage matters, which assists in successful project completion.

TMHC is a Living Wage certified employer with the Ontario Living Wage Network and a member of the Canadian Federation for Independent Business.

KEY STAFF BIOS

Matthew Beaudoin, PhD., Principal, Manager – Archaeological Assessments

Matthew Beaudoin received a Ph.D. in Anthropology from Western University in 2013 and became a Principal at TMHC in 2019. During his archaeological career, Matthew has conducted extensive field research and artifact analysis on Indigenous and Settler sites from Labrador and Ontario. In addition, Matthew has also conducted ethnographic projects in Labrador. Since joining TMHC in 2008, Matthew has been involved with several notable projects, such as the Imperial Oil's Waterdown to Finch Project, the Camp Ipperwash Project, and the Scugog Island Natural Gas Pipeline Project. Matthew is an active member of the Canadian Archaeological Association, the Ontario Archaeological Association, the Ontario Historical Society, the World Archaeology Congress, the Council for Northeastern Historical Archaeology, the Society for American Archaeology, and the Society for Historical Archaeology.

Sherri Pearce, MA, Project Manager

Sherri Pearce received a BA (Hon.) in Anthropology specializing in archaeology and First Nations studies from the University of Western Ontario in 2006 and she went on to complete a MA in Anthropology at the same institution in 2008. Since receiving her Professional License in 2009 Sherri has supervised over 500 archaeological assessments. Ms. Pearce is an active member of the Ontario Archaeological Society and the Council for Northeast Historical Archaeology.

STATEMENT OF QUALIFICATIONS AND LIMITATIONS

The attached Report (the "Report") has been prepared by TMHC Inc. (TMHC) for the benefit of the Client (the "Client") in accordance with the agreement between TMHC and the Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report (collectively, the "Information"):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations");
- represents TMHC's professional judgment in light of the Limitation and industry standards for the preparation of similar reports;
- may be based on information provided to TMHC which has not been independently verified;
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context; and
- was prepared for the specific purposes described in the Report and the Agreement.

TMHC shall be entitled to rely upon the accuracy and completeness of information that was provided to it and has no obligation to update such information. TMHC accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

TMHC agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but TMHC makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

Except (1) as agreed to in writing by TMHC and Client; (2) as required by-law; or (3) to the extent used by governmental reviewing agencies for the purpose of obtaining permits or approvals, the Report and the Information may be used and relied upon only by Client.

TMHC accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information ("improper use of the Report"), except to the extent those parties have obtained the prior written consent of TMHC to use and rely upon the Report and the Information. Any injury, loss or damages arising from improper use of the Report shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of the Report and any use of the Report is subject to the terms hereof.

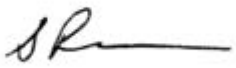
QUALITY INFORMATION

Report prepared by:

Katherine Bishop, PhD (R407)

Report Writer and Staff Archaeologist

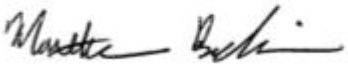
Licensee:



Sherri Pearce, MA (P316)

Project Manager

Report reviewed by:



Matthew Beaudoin, PhD (P324)

Principal/Manager of Archaeological Assessment

1 PROJECT CONTEXT

1.1 Development Context

1.1.1 Introduction

A Stage 1 archaeological assessment was conducted for a Municipal Class Environmental Assessment (MCEA) for the Cooksville Creek Erosion Control Project – upstream of Mississauga Valley Boulevard to Canadian Pacific (CP) Rail – in the City of Mississauga, Ontario. The Project Area is roughly 1.74 ha (4.30 ac) in size and is located within part of Lot 14, Concession 1 North of Dundas Street (NDS) in the Geographic Township of Toronto, Now the City of Mississauga, Regional Municipality of Peel, Ontario. The Project Area is focused around a 360 m segment of Cooksville Creek, stretching 100 m upstream of Mississauga Valley Boulevard southeast to the CP Rail line. The overall Project Area includes treed green space, the Cooksville Creek Trail system, Mississauga Valley Boulevard and associated bridge, and a CP Rail line bridge. In 2022 TMHC Inc. (TMHC) was contracted by Ecosystem Recovery Inc. (ERI) (recently merged with Matrix Solutions, Inc. [Matrix]), to conduct the assessment on behalf of the Corporation of the City of Mississauga. The assessment was conducted in accordance with the provisions of the *Environmental Assessment Act* (EA), the *Provincial Policy Statement* (PPS), and the Corporation of the City of Mississauga's *Consulting Services for Cooksville Creek Erosion Control Program*. The purpose of the assessment was to determine whether there was potential for the discovery of archaeological resources present within the Project Area.

All archaeological assessment activities were performed under the professional archaeological license of Sherri Pearce, MA (P316) and in accordance with the *Standards and Guidelines for Consultant Archaeologists* (MTC 2011, "Standards and Guidelines"). Permission to enter the property and carry out all required archaeological activities, including photo-documentation, was given by Mariette Pushkar of Matrix.

1.1.2 Purpose and Legislative Context

The *Ontario Heritage Act* (R.S.O. 1990) makes provisions for the protection and conservation of heritage resources in the Province of Ontario. Heritage concerns are recognized as a matter of provincial interest in Section 2.6.2 of the *Provincial Policy Statement* (PPS 2020) which states:

> *development* and *site alteration* shall not be permitted on lands containing *archaeological resources* or *areas of archaeological potential* unless *significant archaeological resources* have been *conserved*.

In the PPS, the term conserved means:

> the identification, protection, management and use of *built heritage resources, cultural heritage landscapes* and *archaeological resources* in a manner that ensures their cultural heritage value or interest is retained. This may be achieved by the implementation of recommendations set out in a conservation plan, archaeological assessment and/or heritage impact assessment that has been approved, accepted or adopted by the relevant planning authority and/or decision-maker. Mitigative measures and/or alternative development approaches can be included in these plans and assessments.

The *Environmental Assessment Act* (EA) provides for the protection and conservation of the environment. In this case, the environment is widely defined to cover "cultural heritage" resources. Section 5(3)(c) of the Act stipulates that heritage resources to be affected by a proposed undertaking be identified during the environmental screening process. Within the EA process, the purpose of a Stage 1 background study is to determine if there are known cultural resources within the proposed Project Area, or potential for such resources to exist. Subsequently, it can act as a planning tool by identifying areas of concern that, where possible, could be avoided to minimize environmental impact. It is also used to determine the need for a Stage 2 field assessment involving the search for archaeological sites.

The planning for this project is following the scope of work set out by the Corporation of the City of Mississauga's *Consulting Services for Cooksville Creek Erosion Control Program: Upstream of Mississauga Valley Blvd. to CP Rail*. The Project Area is focused around the 360 m stretch of Cooksville Creek between an area 100 m upstream of Mississauga Valley Blvd to the CP Rail line. This section of Cooksville Creek was identified as a site of high priority in need of rehabilitation because of continued erosion (Corporation of the City of Mississauga 2022:1). In an effort to preserve existing public property and infrastructure, erosion control measures were initiated, which stipulate that a complete Stage 1 Archaeological Assessment is required to assess the archaeological potential for the site (Corporation of the City of Mississauga 2022:7).

2 STAGE 1 BACKGROUND REVIEW

2.1 Research Methods and Sources

A Stage 1 overview and background study was conducted to gather information about known and potential cultural heritage resources within the Project Area. According to the *Standards and Guidelines*, a Stage 1 background study must include a review of:

- an up-to-date listing of sites from the Ministry of Citizenship and Multiculturalism's (MCM) PastPortal for 1 km around the property;
- reports of previous archaeological fieldwork within a radius of 50 m around the property;
- topographic maps at 1:10,000 (recent and historical) or the most detailed scale available;
- historical settlement maps (e.g., historical atlas, survey);
- archaeological management plans or other archaeological potential mapping when available; and,
- commemorative plaques or monuments on or near the property.

For this project, the following activities were carried out to satisfy or exceed the above requirements:

- a database search was completed through MCM's PastPortal system that compiled a list of registered archaeological sites within 1 km of the Project Area (completed May 5, 2022);
- a review of known prior archaeological reports for the property and adjacent lands;
- Ontario Base Mapping (1:10,000) was reviewed through ArcGIS and mapping layers under the Open Government Licence – Canada and the Open Government Licence- Ontario;
- detailed mapping provided by the client was also reviewed; and,
- a series of historic maps and photographs was reviewed related to the post-1800 land settlement.

There are no applicable archaeological management plans for the area.

Additional sources of information were also consulted, including modern aerial photographs, local history accounts, soils data provided by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), physiographic data provided by the Ontario Ministry of Northern Development and Mines, and detailed topographic data provided by Land Information Ontario.

When compiled, background information was used to create a summary of the characteristics of the Project Area, in an effort to evaluate its archaeological potential. The Province of Ontario (MTC 2011; Section 1.3.1) has defined the criteria that identify archaeological potential as:

- previously identified archaeological sites;
- water sources;
    - primary water sources (e.g., lakes, rivers, streams, creeks);
    - secondary water sources (e.g., intermittent streams and creeks, springs, marshes, swamps);
    - features indicating past water sources (e.g., glacial lake shorelines, relic river or stream channels, shorelines of drained lakes or marshes, cobble beaches);
    - accessible or inaccessible shorelines (e.g., high bluffs, sandbars stretching into a marsh);
- elevated topography (e.g., eskers, drumlins, large knolls, plateau);
- pockets of well-drained sandy soils;

- distinctive land formations that might have been special or spiritual places (e.g., waterfalls, rock outcrops, caverns, mounds, promontories and their bases);
- resource areas, including:
    - food or medicinal plants (e.g., migratory routes, spawning areas, prairies);
    - scarce raw materials (e.g., quartz, copper, ochre, or chert outcrops);
    - early Settler industry (e.g., fur trade, logging, prospecting, mining);
- areas of early 19th-century settlement, including:
    - early military locations;
    - pioneer settlement (e.g., homesteads, isolated cabins, farmstead complexes);
    - wharf or dock complexes;
    - pioneer churches;
    - early cemeteries;
- early transportation routes (e.g., trails, passes, roads, railways, portage routes);
- a property listed on a municipal register, designated under the *Ontario Heritage Act*, or that is a federal, provincial, or municipal historic landmark or site; and,
- a property that local histories or informants have identified with possible archaeological sites, historical event, activities, or occupations.

In Southern Ontario (south of the Canadian Shield), any lands within 300 m of any of the features listed above are considered to have potential for the discovery of archaeological resources.

Typically, a Stage 1 assessment will determine potential for Indigenous and 19th-century period sites independently. This is due to the fact that lifeways varied considerably during these eras, so the criteria used to evaluate potential for each type of site also varies.

It should be noted that some factors can also negate the potential for discovery of intact archaeological deposits. The *Standards and Guidelines* (MTC 2011; Section 1.3.2) indicates that archaeological potential can be removed in instances where land has been subject to extensive and deep land alterations that have severely damaged the integrity of any archaeological resources. Major disturbances indicating removal of archaeological potential include, but are not limited to:

- quarrying;
- major landscaping involving grading below topsoil;
- building footprints; and,
- sewage and infrastructure development.

Some activities (agricultural cultivation, surface landscaping, installation of gravel trails, etc.) may result in minor alterations to the surface topsoil but do not necessarily affect or remove archaeological potential. It is not uncommon for archaeological sites, including structural foundations, subsurface features and burials, to be found intact beneath major surface features like roadways and parking lots. Archaeological potential is, therefore, not removed in cases where there is a chance of deeply buried deposits, as in a developed or urban context or floodplain where modern features or alluvial soils can effectively cap and preserve archaeological resources.

2.2 Project Context: Archaeological Context

2.2.1 Project Area: Overview and Physical Setting

The Project Area is located in the central portion of the City of Mississauga, east of Hurontario Street and north of Dundas Street, in the suburb of Mississauga Valley; it focuses on a 360 m stretch of Cooksville Creek beginning 100 m upstream of Mississauga Valley Boulevard, flowing southeast and ending at the CP Rail line (Maps 1-2). The overall Project Area is roughly 1.74 ha (4.30 ac) in size and contains grassed and treed areas associated with Stonebrook Park, a portion of the paved Cooksville Creek Trail system, the CP Rail line bridge, and a portion of Mississauga Valley Boulevard and associated bridge.

The Project Area falls within the South Slope physiographic region, as defined by Chapman and Putnam (1984:172-174; Map 3). The South Slope is the southern slope of the Oak Ridges Moraine and extends from the Niagara Escarpment in the west to the Trent River in the east. The South Slope meets the Moraine at heights of approximately 300 metres above sea level and descends southward towards Lake Ontario. The South Slope predominantly consists of shallow shale and till plains. More specifically, the Project Area falls within a drumlinized till plain, just north of a Glacial Lake Iroquois Beach.

The Project Area contains three different soil types (Map 4). The northern portion contains Fox Sand, which is well drained and occurs on smooth, gently sloping topography (Hoffman and Richards 1953:48). It is low in organic matter content and is prone to erosion by wind and water. The soils in the central portion of the Project Area are classed as Bottom Land; these are low lying soils occurring along streams and creeks that are subject to flooding (Hoffman and Richards 1953:63). The orientation of the Bottom Land soils within the Project Area are consistent with the orientation of the creek as depicted on historic mapping (Map 5 and 6) and prior to it being channelized sometime during the 20th century. The third soil type, in the southern portion, is Cooksville Clay Loam. Cooksville Clay Loam imperfectly drains, includes portions of shale bedrock that is prone to drought, and the topography is often smooth to gently sloping (Hoffman and Richards 1953:58).

Cooksville Creek originates from a storm sewer system in commercial lands along Matheson Boulevard, east of McLaughlin Road, roughly 5.5 km northwest of the Project Area. Open channel flow begins at Matheson Boulevard and flows south, ultimately draining into Lake Ontario, roughly 5.1 km southeast of the Project Area. Due to its winding nature, Cooksville Creek is over 16 km long. The Project Area centres on an open channel of the creek (Maps 1-2) that has been artificially fortified with multi-tiers of armourstone and gabion baskets.

2.2.2 Summary of Registered or Known Archaeological Sites

According to PastPortal (accessed May 5, 2022) there is one registered archaeological site within 1 km of the Project Area (Table 1). However, further review of the site location has demonstrated that the site is roughly 1.3 km to the northwest. AjGv-18, or Cherry Hill, is listed in PastPortal as a post-contact village site with a Mississauga affiliation. In reviewing the site record, AjGv-18 is actually a 3 to 6 ac property containing a house that has been preserved by the Peel County Historical Society. It also goes on to state that the site was tested by the Ontario Archaeological Society (OAS) in 1971. The Cherry Hill House is a two-and-a-half story clapboard residence constructed in ca. 1822, with an earlier course-cut stone wing constructed ca. 1811; the site was designated a Heritage Property in 1978 (Canada's Historic Places 2022).

Table 1: Registered Archaeological Sites within 1 km of the Project Area

Borden Number	Site Name	Time Period	Affinity	Site Type	Status
AjGv-18	Cherry Hill	Post-Contact	Mississauga	Village	

2.2.3 Summary of Past Archaeological Investigations within 50 m

During the course of this study no record was found of any archaeological investigations within 50 m of the Project Area. However, it should be noted that the MCM currently does not provide an inventory of archaeological assessments to assist in this determination.

2.2.4 Dates of Archaeological Fieldwork

The Stage 1 property inspection was conducted on May 9, 2022, in sunny and warm weather conditions under the direction of Johnathan Freeman, MA (P274) (Table 2).

Table 2: Dates of Fieldwork, Weather Conditions and Field Director

Dates of Fieldwork	Weather Conditions	Field Director
May 9, 2022	Sunny and warm	J. Freeman, MA (P274)

2.3 Project Context: Historical Context

2.3.1 Indigenous Settlement in the Mississauga Area

There is archaeological evidence of Indigenous settlement in the region since the time of glacial retreat some 12,000 years ago through to the modern era. Our knowledge of past Indigenous land use in the area is incomplete due primarily to a lack of archaeological investigations of many areas prior to urban development. However, using existing data and regional syntheses, it is possible to propose a generalized model of Indigenous settlement in the area. The general themes, time periods and cultural traditions of Indigenous settlement, based on archaeological evidence, are provided below and in Table 3.

Table 3: Chronology of Indigenous Settlement in the Mississauga Area

Period	Time Range	Diagnostic Features	Archaeological Complexes
Early Paleo	9000-8400 BCE	fluted projectile points	Gainey, Barnes, Crowfield
Late Paleo	8400-8000 BCE	non-fluted and lanceolate points	Holcombe, Hi-Lo, Lanceolate
Early Archaic	8000-6000 BCE	serrated, notched, bifurcate base points	Nettling, Bifurcate Base Horizon
Middle Archaic	6000-2500 BCE	stemmed, side & corner notched points	Brewerton, Otter Creek, Stanly/Neville
Late Archaic	2000-1800 BCE	narrow points	Lamoka
Late Archaic	1800-1500 BCE	broad points	Genesee, Adder Orchard, Perkiomen
Late Archaic	1500-1100 BCE	small points	Crawford Knoll
Terminal Archaic	1100-950 BCE	first true cemeteries	Hind
Early Woodland	950-400 BCE	expanding stemmed points, Vinette pottery	Meadowood
Middle Woodland	400 BCE-500 CE	dentate, pseudo-scallop pottery	Saugeen
Transitional Woodland	500-900 CE	first corn, cord-wrapped stick pottery	Princess Point
Late Woodland	900-1300 CE	first villages, corn horticulture, longhouses	
Late Woodland	1300-1400 CE	large villages and houses	
Late Woodland	1400-1650 CE	tribal emergence, territoriality	Attawandaron/Wendat/Petun
Contact Period - Indigenous	1700 CE-present	treaties, mixture of Indigenous & Settler items	Haudenosaunee/Six Nations/Mississauga/Tutelos
Contact Period - Settler	1796 CE-present	industrial goods, homesteads	pioneer life, municipal settlement

2.3.1.1 Paleo Period

The first human populations to inhabit the region around Peel County arrived between 12,000 and 10,000 years ago, coincident with the end of the last period of glaciation. Climate and environmental conditions were significantly different than they are today; local environs would not have been welcoming to anything but short-term settlement. Termed Paleoindians by archaeologists, Ontario's Indigenous peoples would have crossed the landscape in small groups (i.e., bands or family units) searching for food, particularly migratory game species. In this area, caribou may have provided the staple of the Paleo period diet, supplemented by wild plants, small game, birds and fish.

Given the low density of populations on the landscape at this time and their mobile nature, Paleo period sites are small and ephemeral. They are sometimes identified by the presence of fluted projectile points manufactured on high quality raw materials, including Onondaga chert from the Niagara Escarpment and Fossil Hill chert from Blue Mountains. Paleo period sites have commonly been found in association with relic glacial lakeshores throughout Ontario.

2.3.1.2 Archaic Period

Settlement and subsistence patterns changed significantly during the Archaic period as both the landscape and ecosystem adjusted to the retreat of the glaciers. Building on earlier patterns, early Archaic period populations continued the mobile lifestyle of their predecessors. Through time and with the development of more resource rich local environments, these groups gradually reduced the size of the territories they exploited on a regular basis. A seasonal pattern of warm season riverine or lakeshore settlements and interior cold weather occupations has been documented in the archaeological record.

Since the large cold weather mammal species that formed the basis of the Paleo period subsistence pattern became extinct or moved northward with the onset of warmer climate conditions, Archaic period populations had a more varied diet, exploiting a range of plant, bird, mammal, and fish species. Reliance on specific food resources like fish, deer and nuts becomes more pronounced through time and the presence of more hospitable environments and resource abundance led to the expansion of band and family sizes. In the archaeological record, this is evident in the presence of larger sites and aggregation camps, where several families or bands would come together in times of plenty. The change to more preferable environmental circumstances led to a rise in population density. As a result, Archaic sites are more plentiful than those from the earlier period. Artifacts typical of these occupations include a variety of stemmed and notched projectile points, chipped stone scrapers, ground stone tools (e.g., celts, adzes) and ornaments (e.g., bannerstones, gorgets), bifaces or tool blanks, animal bone (where and when preserved) and waste flakes, a by-product of the tool making process.

2.3.1.3 Early, Middle and Transitional Woodland Periods

Significant changes in cultural and environmental patterns are witnessed in the Woodland period (c. 950 BCE-1700 CE). By this time, the coniferous forests of earlier times were replaced by stands of mixed and deciduous species. Occupations became increasingly more substantial in this period, culminating in major semi-permanent villages by 1,000 years ago. Archaeologically, the most significant changes by Woodland times are the appearance of artifacts manufactured from modeled clay and the construction of house structures. The Woodland period is often defined by the occurrence of pottery, storage facilities and residential areas similar to those that define the incipient agricultural or Neolithic period in Europe.

Early and Middle Woodland period peoples are also known for a well-developed burial complex and ground stone tool industry. Unique Early Woodland period ground stone items include pop-eyed birdstones and gorgets. In addition, there is evidence of the development of widespread trading with groups throughout the northeast. The recovery of marine shells from the Lake Superior area indicates that exchanges of exotic materials and finished items from distant places were commonplace.

2.3.1.4 Late Woodland Period

Beginning circa 1000 CE, the archaeological record documents the emergence of more substantial, semi-permanent settlements and the adoption of corn horticulture. These developments are most often associated with Iroquoian-speaking populations, the ancestors of the Wendat (Huron), Tionontati (Petun) and Attawandaron (Neutral) nations who were known to have resided in the province at the time of the arrival of the first European explorers and missionaries. Iroquoian villages incorporated a number of longhouses, multi-family dwellings that contained several families related through the female line. Pre-contact sites may be identified by a predominance of well-made pottery decorated with various simple and geometric motifs, triangular projectile points, clay pipes and ground stone artifacts. Sites post-dating European contact are recognized through the appearance of various items of European manufacture. The latter include materials acquired by trade (e.g., glass beads, copper/brass kettles, iron axes, knives, and other metal implements) in addition to the personal items of European visitors and Jesuit missionaries (e.g., finger rings, stoneware, rosaries, and glassware).

2.3.1.5 Post-Contact Period

When European explorers and missionaries arrived in Ontario in the 17th century, the Iroquoian nations who had formerly inhabited the north shore of Lake Ontario watersheds had left the area, with the Wendat migrating north to the Lake Simcoe environs. By 1650, many Wendat had fled due to the onset of epidemic disease and increasing raids by Five Nations Iroquois groups who had established an increasing presence along Lake Ontario. At the same time, Algonquian-speaking populations were utilizing the watershed for hunting and trapping, and by the 17th century, the Algonquin-speaking Mississaugas began moving southward into the area. It was the Mississaugas who had settled the area north of Lake Ontario by the time the British arrived in the late 18th century. The Europeans identified the Mississaugas as the Mississaugas of the Credit. The Mississaugas were an Ojibwa people, and by the early 1700s had migrated south and settled in the area around the Etobicoke Creek, Credit River and Burlington Bay. “Mississauga” translates as meaning “River of the North of Many Mouths”. European settlement became more intense, causing inland movement of the Mississaugas for harvesting purposes. Land surrenders to the British Colonial government and the Six Nations began.

2.3.2 Treaty History

The Project Area is encompassed by the Head of the Lake Purchase Treaty No. 14, which was signed September 5, 1806, between the British Crown and the Mississaugas of the Credit.

Following the Toronto Purchase agreement (Treaty No. 13), the Mississaugas of the Credit were asked to sell lands immediately west of the Treaty No. 13 lands that they had previously ceded. A provisional agreement was reached with the Crown on August 2, 1805, in which the Mississaugas ceded 70,784 acres of land; the lands to be ceded were bound by the Toronto Purchase of 1787 in the east, the Brant Tract Treaty in the west, and a northern boundary that ran six miles back from the shoreline of Lake Ontario. In return for the land, the Mississaugas were to receive £1000 of trade goods and the sole right of fisheries at 12 and 16 Mile Creeks along with the possession of each creek's flats. In addition, the Mississaugas also reserved the sole right of fishing at the Credit River and were to retain a 1-mile strip of land on each of its banks (Wybenga 2017).

2.3.3 Municipal Settlement

Historically the Project Area falls within part of Lot 14, Concession 1 NDS, in the Geographic Township of Toronto, Peel County, Ontario. A brief discussion of 19th-century settlement and land use in the township is provided below in an effort to identify features signaling archaeological potential.

2.3.3.1 Peel County

Formerly part of the York County in the Home or Nassau District, Peel County was created following the termination of the district system in 1852. Initially comprised of Caledon, Chinguacousy, Albion, Toronto Gore, and Toronto Townships, the County remained as such until 1973 when the Region of Peel was established. With the establishment of the Region of Peel, portions of the former county's townships were dissolved, creating the Municipalities of Brampton, Caledon, and Mississauga. The creation of these aforementioned municipalities changed the township boundaries within the old Peel County as follows: Caledon is comprised of Caledon Township as well as the north part of Albion and Chinguacousy Townships; Mississauga is comprised of Toronto Township and the southern tip of Toronto Gore Township; and Brampton is comprised of the southern part of Chinguacousy Township and part of Toronto Gore Township.

2.3.3.2 Toronto Township

The Project Area is located in the southern part of Toronto Township. Toronto Township is situated in the southeast of the County of Peel and contained 64,777 acres of assessed land by 1877 (Walker & Miles 1877). Toronto Township was first formed as part of York County in 1805, when officials from York (now Toronto) purchased 74,000 acres of land from the Mississaugas (Heritage Mississauga 2018c). This is now referred to as the "Mississauga Purchase" or "First Purchase" (Heritage Mississauga 2018c). This "First Purchase" was surveyed in 1806 ("Old Survey") and was followed by immediate settlement (Lynch 1874). In 1818, Treaty 19 (known as "Second Purchase") gave the British Crown over 600,000 further acres of land, which includes most of today's Region of Peel (Heritage Mississauga 2018c). Consent for any settler to fish along the Credit River had to be provided by the Mississaugas (Pope 1877:60). The first settler was Colonel Thomas Ingersoll. In 1808, the whole population of Toronto Township consisted of seven families. The "New Survey" of this region was conducted in 1819 and opened the area for settlement, dividing it into the townships of Toronto, Chinguacousy, Caledon, Albion, and Toronto Gore (Lynch 1874: 117; Heritage Mississauga 2018c). In the "New Survey," Toronto Township was sometimes labeled as the "North Toronto Township" for clarity, and was further divided into east and west by Hurontario Street (now Centre Road); concessions are specified and

labelled accordingly as "East of Hurontario Street" (EHS) and "West of Hurontario Street" (WHS). The greater part of the New Survey was granted to a colony of Irish from the City of New York, which brought a fluctuation of settlers into Toronto Township, and at which time most of the Indigenous reserve land had been sold as they moved to areas along the Saugeen River (Pope 1877:60).

The Town of Mississauga was created in 1968 and incorporated as a city in 1974 through the amalgamation of the Town of Mississauga and villages of Port Credit and Streetsville, and portions of the townships of Toronto Gore and Trafalgar.

2.3.3.3 Cooksville

The Project Area is located roughly 500 m north of the historic village of Cooksville. Cooksville, originally known as "Harrisville", became a hub of commercial activity in the early township, as it was centered on the intersection of Dundas Street and Hurontario Street (locally known as Centre Road) (Heritage Mississauga 2018b). Although the village was not incorporated until 1836, the town developed early and included mail delivery between York and Niagara (ca. 1820), a licensed inn (ca. 1829), a general store (ca. 1852), and an administrative centre for surrounding townships in the form of the first purpose-built Town Hall (ca. 1874) (Heritage Mississauga 2018a, 2018b). The Cooksville Town Hall served for many years as the centre for civic, commercial, and educational interests in Toronto Township (Heritage Mississauga 2018b). Cooksville was also home to the first commercial winery in Canada (Clair House Winery or Chateaux Claire) and participated in a well-known agricultural fair (Heritage Mississauga 2018b). Cooksville joined with other villages of Toronto Township in 1968 to form the Town of Mississauga. (Heritage Mississauga 2018b).

Cooksville Creek was an important feature of historic Cooksville, and residents often built their homes around the winding creek. On Lot 15, roughly 600 m west of the Project Area, prominent farmer John Charters Price built his family home along the western side of the creek just north of Dundas Street in 1853 (Heritage Mississauga 2018a; Map 6). He built a second family home on the east side of the Creek in 1909 (Heritage Mississauga 2018b).

2.3.4 Nineteenth Century Land Use and Historic Map Review

Historically the Project Area falls within part of Lot 14, Concession 1 NDS, Toronto Township, Peel County, Ontario. A review of relevant and available historic maps was undertaken to establish former land use within the Project Area.

No structures are depicted within or near the Project Area on the 1859 Tremaine map (Map 5). The lot is associated with John Hector as of this date. The Town of Cooksville is depicted on the map, with the town centre located some distance southwest of the Project Area. Hurontario Street and Dundas Street East are depicted as open at this time; although, each of these thoroughfares is at least 600 m from the Project Area. Cooksville Creek is shown flowing through the Project Area at this time; although, the orientation of the creek does not follow its present-day alignment (Map 1). As noted earlier in Section 2.2.1 of the report, and as depicted on the soils map (Map 4), the Bottom Lands shown on the soils map roughly correspond to the orientation of the creek shown on the 1859 and the 1877 maps.

Again, no structures are shown within or near the Project Area on the 1877 map (Map 6). As of this date, Lot 14 has been divided into an east and west half. The west half of Lot 14 is associated with Gardner, whereas the east half is associated with Asa Walterhouse. In 1877, Gardner's property has three outlined town blocks fronting on Dundas Street East, roughly 550 m southeast of the Project Area (Map 6). Similarly, Asa

Walterhouse's property has one outlined town block fronting on Dundas Street East; it is roughly 500 m southeast of the Project Area. It is unclear whether these town blocks were used for commercial or residential use, or if they are left vacant in 1877; all four blocks fall within the easternmost section of historic town of Cooksville (Map 6).

The Credit Valley Railway (CVR; now CP Rail) line is depicted as open in 1877 and bisects the southern edge of the Project Area (Map 6). The CVR was constructed as a connection between Toronto and Orangeville by way of Streetsville and the Credit River Valley, and the first train passed through there in 1874 (Boles 2021). In 1884 the CVR was purchased by the CP Rail company as a means of facilitating traffic from the western Great Lakes to the eastern seaboard (Boles 2021).

2.3.5 Twentieth Century Land Use and Historic Map Review

Aerial photos (City of Toronto Orthophotography 1966; Hunting Survey Corporation 1954) are available for the area from the 20th century and were reviewed to provide insights into more recent changes to the Project Area. A 1954 aerial photograph (Map 7) shows that Cooksville Creek more closely follows its modern alignment; although, still differs somewhat. The general area surrounding the creek is characterized as rural, with some development shown south of the rail line; the areas east and west of the creek appear to be orchards. The CP Rail line follows the same alignment as shown on the 1877 (Map 6).

By 1965, the general area has largely remained rural and the orchards to the east and west of the creek are still present (Map 8). The creek now follows its modern alignment and it appears that the lands immediately adjacent the creek were being subject to stripping or some other form of land disturbance, most likely related to the channelization. The CP Rail line remains the same.

Reference to a 1976 aerial photo shows that, within the short span of 11 years, considerable development had taken place and the general area is now characterized as residential (Map 9). All modern development features are visible as of this date, including the presence of Mississauga Valley Boulevard and associated bridge, and the Cooksville Creek Trail system. The CP Rail line and its associated bridge are also still visible.

2.3.6 Review of Heritage Properties

There are no designated heritage properties or plaques within 50 m of the Project Area.

The closest historic designated property (Stewart House, ca. 1894) is located roughly 750 m southeast of the Project Area (Heritage Mississauga 208a). The closest heritage area is a park named for John Charters Price, located near his original family homestead roughly 600 m southwest of the Project Area (Heritage Mississauga 2018b).

3 STAGE 1 PROPERTY INSPECTION

As the Project Area was in proximity to features that signal archaeological potential, a Stage 1 property inspection was conducted to evaluate the current conditions within the Project Area and its integrity. The Stage 1 property inspection was undertaken in good weather and lighting conditions. No conditions were encountered that would hinder the property inspection or the identification of features of archaeological potential. The property boundaries were determined in the field based on proponent mapping, aerial images, landscape features, and property fencing.

The Project Area is roughly 1.74 ha (4.30 ac) in size and includes treed green space, the Cooksville Creek Trail system, Mississauga Valley Boulevard and associated bridge, and a CP Rail line bridge (Map 10). Cooksville Creek is an open channel that runs northwest-southeast through the centre of the Project Area. Mississauga Valley Boulevard crosses over Cooksville Creek, bisecting the Project Area.

The portion of the Project Area northwest of Mississauga Valley Boulevard contains grassed and treed areas that do not appear to be obviously disturbed (Images 1 and 2). In this portion, north of the creek, is a section of the paved Cooksville Creek Trail system (Image 3). This trail system crosses over Mississauga Valley Boulevard and extends southward beyond the CP Rail line. Along either side of the creek are steeply sloped areas (Images 3 and 12). On the northern bank of the creek is a disturbed area related to a large concrete drain (Image 9). Mississauga Valley Boulevard is a two-lane paved road with a curb and sidewalk that widens by the trail entrances either side of the road (Image 4). Image 5 shows infrastructure disturbance related to the Mississauga Valley Boulevard bridge.

The portion of the Project Area southeast of Mississauga Valley Boulevard is largely characterized by steeply sloped areas (Images 8, 10, and 11). Other than the paved trail, disturbance was also noted relating to the CP Rail bridge infrastructure and support installation on both sides of the bank crossing (Images 6 and 7). Image 6 also shows that sewer infrastructure is present in the Project Area adjacent the paved trail.

The results of the Stage 1 assessment, as well as the location and orientation of all photographs appearing in this report, are presented on Map 10. Map 11 presents the results on proponent mapping, and Map 12 is an unaltered proponent map.

3.1 Documentary Records

All records are currently being stored at the TMHC corporate office located at 1108 Dundas Street, Unit 105, London, ON, N5W 3A7. Table 4 provides an inventory of the documentary records generated during this project.

Table 4: Documentary Records

Dates of Fieldwork	Field Notes	Field Maps	Digital Images
May 9, 2022	Digital and hard copies	Digital and hard copies	24 Images

4 ANALYSIS AND CONCLUSIONS

As noted in Section 2.1, the Province of Ontario has identified numerous factors that signal the potential of a property to contain archaeological resources. Based on the archaeological and historical context reviewed above, the Project Area is in proximity (i.e., within 300 m) to features that signal archaeological potential, namely:

- the proximity to primary water sources (Cooksville Creek);
- features indicating past water sources (Glacial Lake Iroquois Beach); and,
- mapped 19th-century transportation routes (Credit Valley Railway).

A Stage 1 property inspection visually confirmed that the majority of the Project Area contains areas of previous disturbance (paved roads, sidewalks, pathways, and bridges) (0.46 ha; 26.4%). It also determined that portions were sloped (0.73 ha; 42.0%) and low and wet (0.36 ha; 20.7%). However, portions of the Project Area that are grassed and treed are not obviously disturbed and retain archaeological potential (0.19 ha; 10.9%) and would require Stage 2 assessment. It should be noted that the areas that are recommended for test pit survey were likely impacted by historical stripping activities in the 1960s; however, this would need to be ground truthed to confirm.

5 RECOMMENDATIONS

Based on the Stage 1 background research and property inspection, the following recommendations are made:

- The grassed and treed areas within the Project Area, as shown on Map 10 (0.19 ha; 10.9%), are not obviously disturbed, retain archaeological potential and are recommended for Stage 2 assessment. As these lands are non-ploughable, the Stage 2 assessment should consist of a standard test pit survey at a 5 m transect interval, in keeping with provincial standards.
- Portions of the Project Area have been previously disturbed (0.46 ha; 26.4%) and are considered to no longer retain archaeological potential. These areas have been photo documented and no further assessment work is recommended.
- The areas of slope (0.73 ha; 42.0%) and low and wet areas (0.36 ha; 20.7%) within the Project Area are considered not to retain archaeological potential. These areas have been photo documented and no further assessment work is recommended.

Our recommendations are subject to the conditions laid out in Section 7.0 of this report and to the MCM's review and acceptance of this report into the provincial registry.

6 SUMMARY

A Stage 1 archaeological assessment was conducted for a MCEA for the Cooksville Creek Erosion Control Project – upstream of Mississauga Valley Boulevard to CP Rail – in the City of Mississauga, Ontario. The Project Area is roughly 1.74 ha (4.30 ac) in size and is located within part of Lot 14, Concession 1 North of Dundas Street (NDS) in the Geographic Township of Toronto, Peel County, Ontario. The background research indicated that the Project Area was in proximity to features signalling archaeological potential and a Stage 1 property inspection was undertaken. The Stage 1 property inspection determined that portions of the Project Area were previously disturbed (0.46 ha; 26.4%), sloped (0.73 ha; 42.0%), or low and wet (0.36 ha; 20.7%), and no longer retained archaeological potential, while the grassed and treed areas (0.19 ha; 10.9%) were not obviously disturbed, retain archaeological potential, and are recommended for Stage 2 assessment.

7 ADVICE ON COMPLIANCE WITH LEGISLATION

This report is submitted to the MCM as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the Project Area of a development proposal have been addressed to the satisfaction of the MCM, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

It is an offence under Sections 48 and 69 of the Ontario Heritage Act for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the Ontario Heritage Act.

Should previously undocumented (i.e., unknown or deeply buried) archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48(1) of the *Ontario Heritage Act.*

The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner and Crystal Forrest, A/Registrar of Burial Sites, Ontario Ministry of Government and Consumer Services. Her telephone number is 416-212-7499 and e-mail address is Crystal.Forrest@ontario.ca.

8 BIBLIOGRAPHY

Boles, D.

2021 *Credit Valley Railway*. Toronto Railway Historical Association (TRHA) Blog. Website Link. Last Accessed May 12, 2022.

Canada's Historic Places

2022 Cherry Hill House. Website Link. Last Accessed: May 12, 2022.

Chapman L.J. and D.F. Putnam

1984 *The Physiography of Southern Ontario*. Third Edition. Ontario Ministry of Natural Resources: Ontario.

2007 Physiography of Southern Ontario, *Ontario Geological Survey, Ministry of Northern Development and Mines*, Miscellaneous Release-Data 228.

City of Toronto Orthophotography

1966 Aerial Photos – 1966. Website Link. Last Accessed May 11, 2022.

1975 Aerial Photos – 1975. Website Link. Last Accessed May 11, 2022.

The Corporation of the City of Mississauga

2022 *Consulting Services for Cooksville Creek Erosion Control Project: Upstream of Mississauga Valley Blvd to CP Rail*. Internal Document.

Government of Ontario

1990 *Environmental Assessment Act, R.S.O. 1990*. (c. E.18). Queen's Printer for Ontario. Website Link. Last Accessed April 7, 2022.

2002 *Funeral, Burial and Cremation Services Act, 2002, S.O. 2002*. (c. 33). Queen's Printer for Ontario. Website Link. Last Accessed April 7, 2022.

Heritage Mississauga

2018a *Cooksville Heritage Tours.* Website Link. Last Accessed May 12, 2022.

2018b *Cooksville's History*. Website Link. Last Accessed May 12, 2022.

2018c *Mississauga's History*. Website Link. Last Accessed August 17, 2021.

Hoffman, D.W. and N.R. Richards

1953 *Soil Survey of Peel County*. Report No. 18 of the Ontario Soil Survey. Experimental Farms Service, Canada Department of Agriculture and the Ontario Agricultural College.

Hunting Survey Corporation Ltd.

1954 Aerial Photos – 1954. Website Link. Last Accessed May 11, 2022.

Lynch, J.

1874 *Directory of the Country of Peel 1873-4*. Brampton: Brampton Progress Chromatic Printing House.

Microsoft

2019 Computer generated building footprints for Canada, *Microsoft Open Source*. Website Link. Last Accessed Nov 3, 2021.

Ministry of Tourism and Culture (MTC; now Ministry of Citizenship and Multiculturalism)

2011 Standards and Guidelines for Consultant Archaeologists. Toronto.

2022 Ontario's PastPortal Online Database. Accessed: July 7, 2021.

Ontario Geological Survey

2010 Surficial Geology of Southern Ontario. *Ontario Geological Survey, Ministry of Northern Development, Mines and Forestry*, Miscellaneous Release-Data 128-REV.

Ontario Ministry of Municipal Affairs and Housing (OMMAH)

2020 *Provincial Policy Statement, 2020*. Queen's Printer for Ontario. Website Link. Last Accessed: April 7, 2022.

OpenStreetMap

2021 Geofabrik Extract. Website Link. Last Accessed December 10, 2021.

Pope, J.H.

1877 *Illustrated Historical Atlas of the County of Peel*. Toronto: Walker & Miles. Reprint, Port Elgin: Cummings Atlas Reprints, 1971.

Tremaine, G.

1859 *Illustrated Historical Map of the County of Peel, Canada West*. G.R. & G.M. Tremaine, Toronto.

Walker & Miles

1877 *Illustrated Historical Atlas of the County of Peel, Ont*. Walker & Miles, Toronto.

Wybenga, Darin

2017 Head of the Lake, Treaty No. 14 (1806). Mississaugas of the Credit First Nation. Website Link. Last Accessed May 17, 2022.

9 IMAGES

Image 1: Grassed Area North of Cooksville Creek Trail

Looking Southeast

Image 2: Treed Area South of Cooksville Creek

Looking Southeast

Image 3: Paved Trail

Looking Southeast

Image 4: Mississauga Valley Boulevard and Trail Entrance

Looking Southwest

Image 5: Disturbance Under Mississauga Valley Boulevard Bridge

Looking Northwest

Image 6: Paved Trail, Sewer Infrastructure, and CP Rail Bridge

Looking South

Image 7: Disturbed Area – CP Rail Bridge

Looking Northwest

Image 8: Cooksville Creek, Existing Armourstone, and Sloped Areas

Looking Northwest

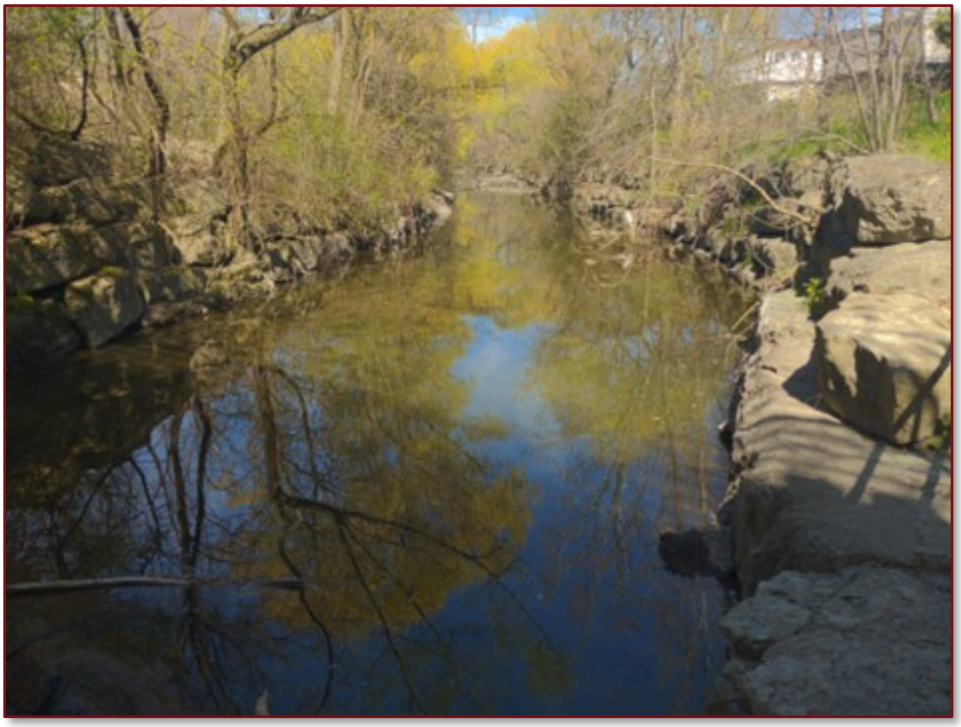


Image 9: Concrete Drain Disturbance

Looking East

Image 10: Sloped Area North of Cooksville Creek Trail

Looking Southeast

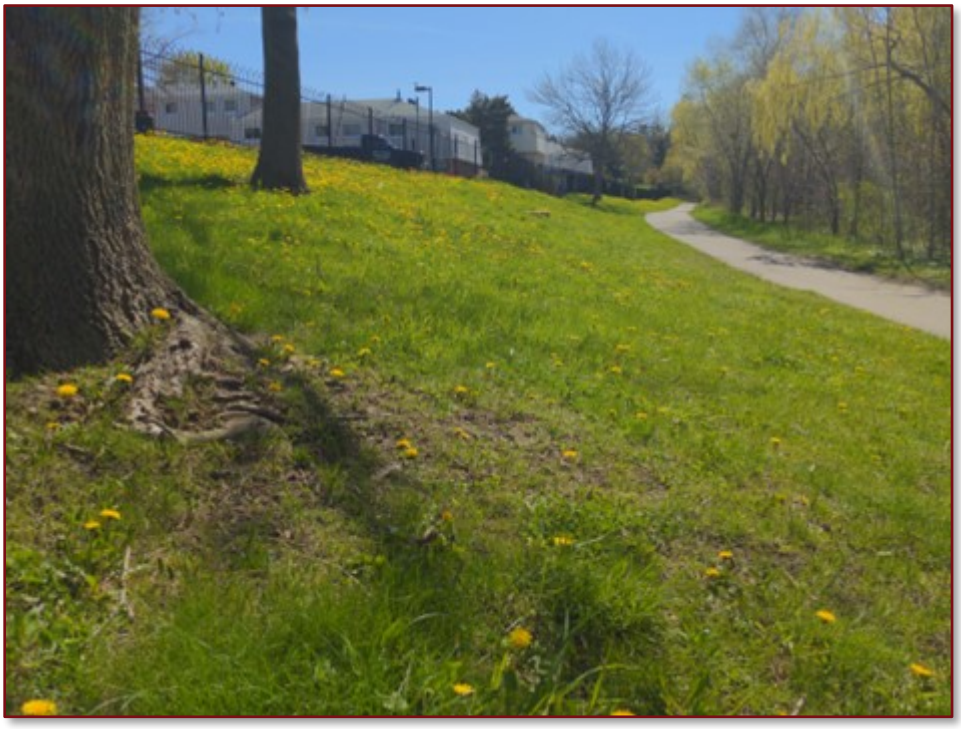


Image 11: Sloped Area North of CP Rail Bridge

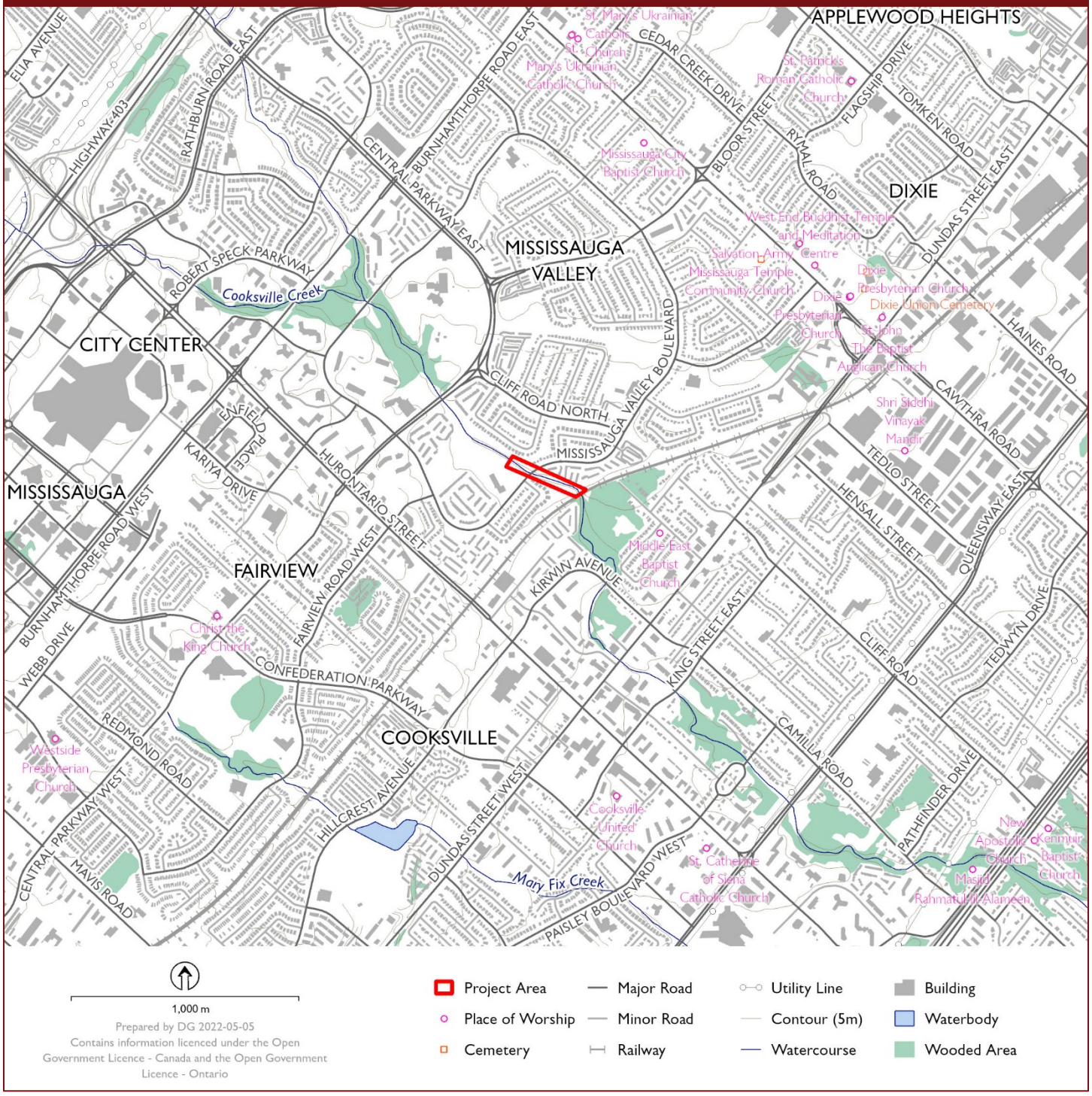
Looking Northwest

Image 12: Sloped Area North of Mississauga Valley Boulevard

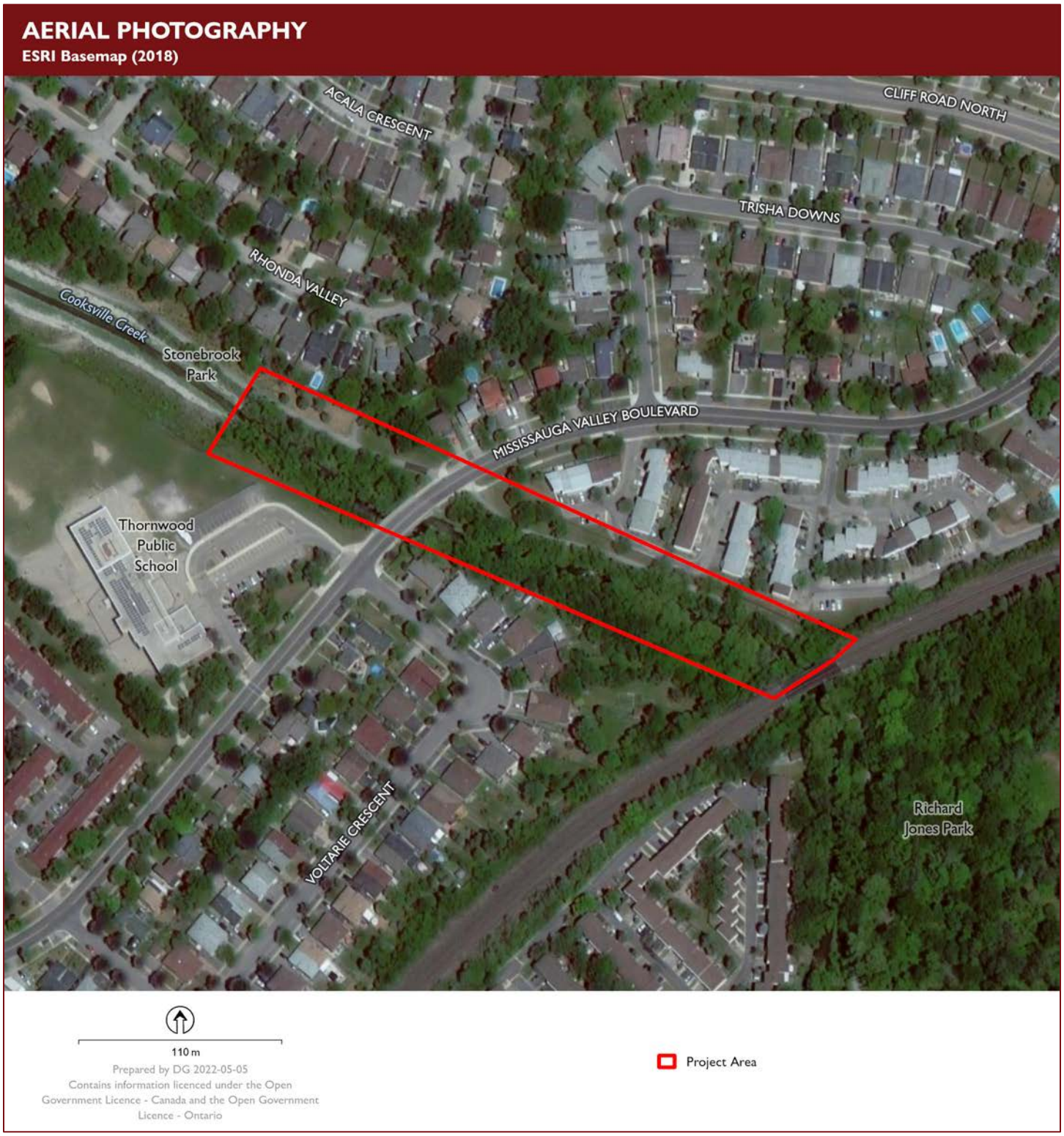
Looking Northwest

10 MAPS

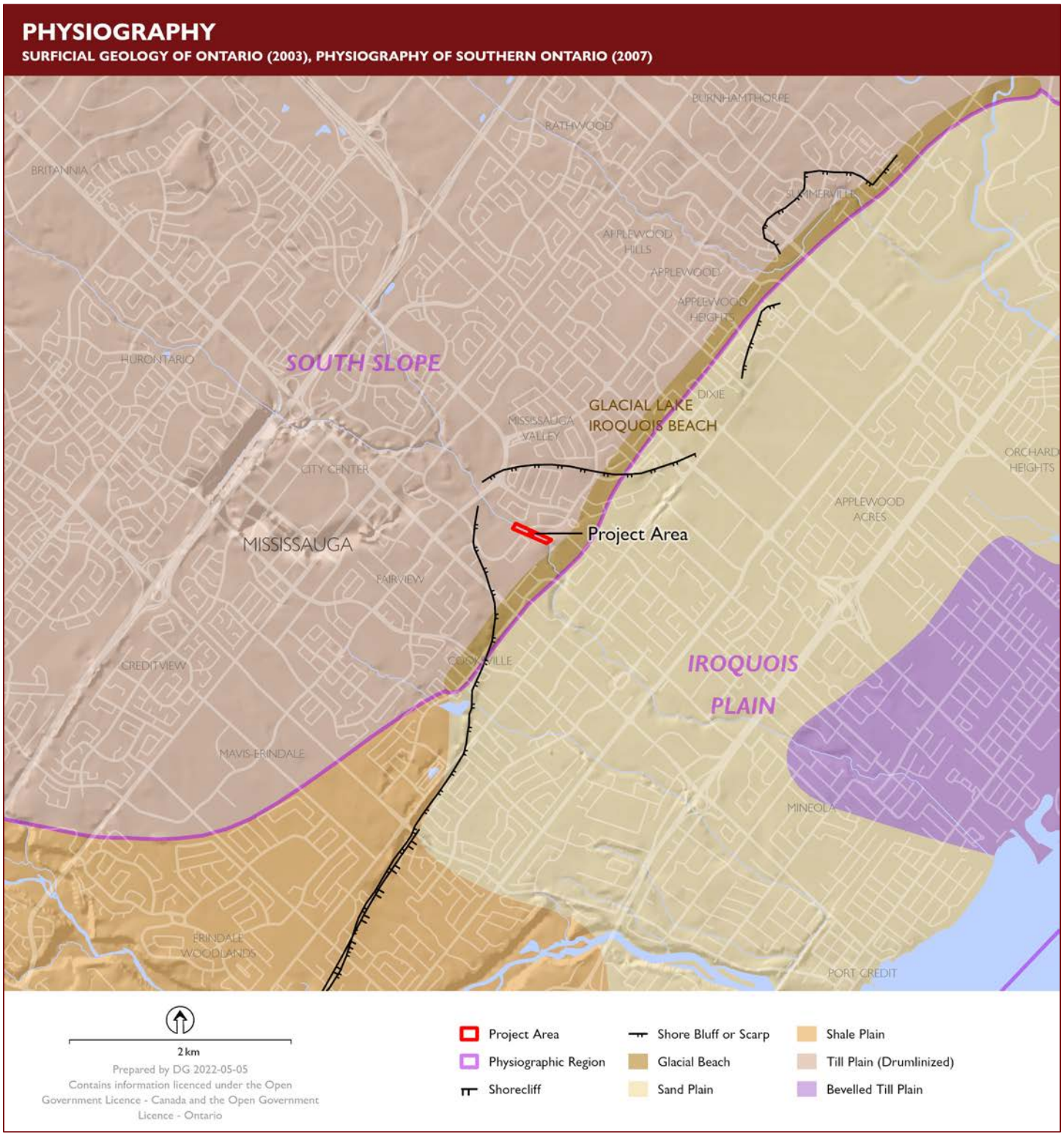
PROJECT LOCATION



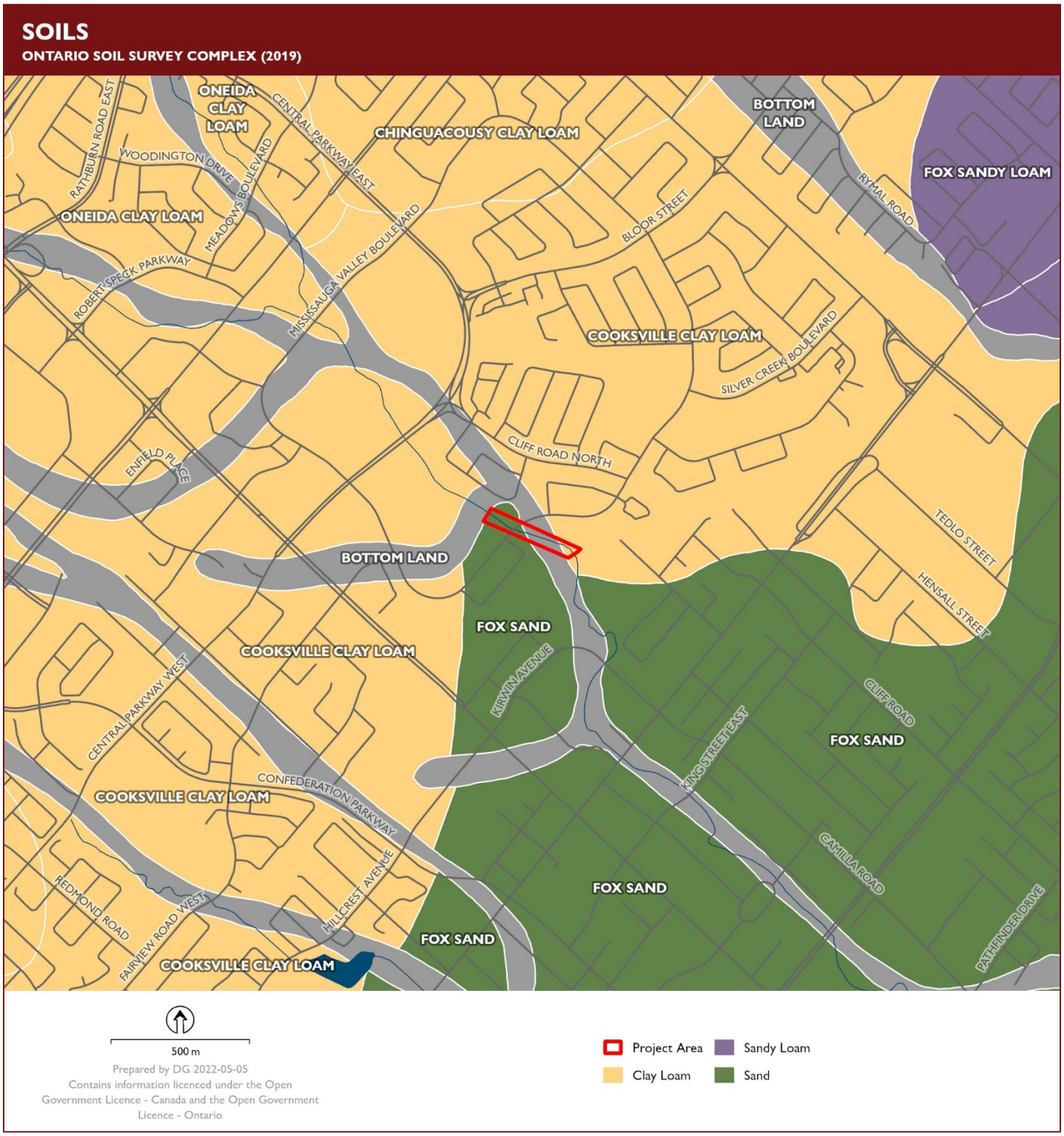
Map 1: Location of the Project Area in the City of Mississauga, ON



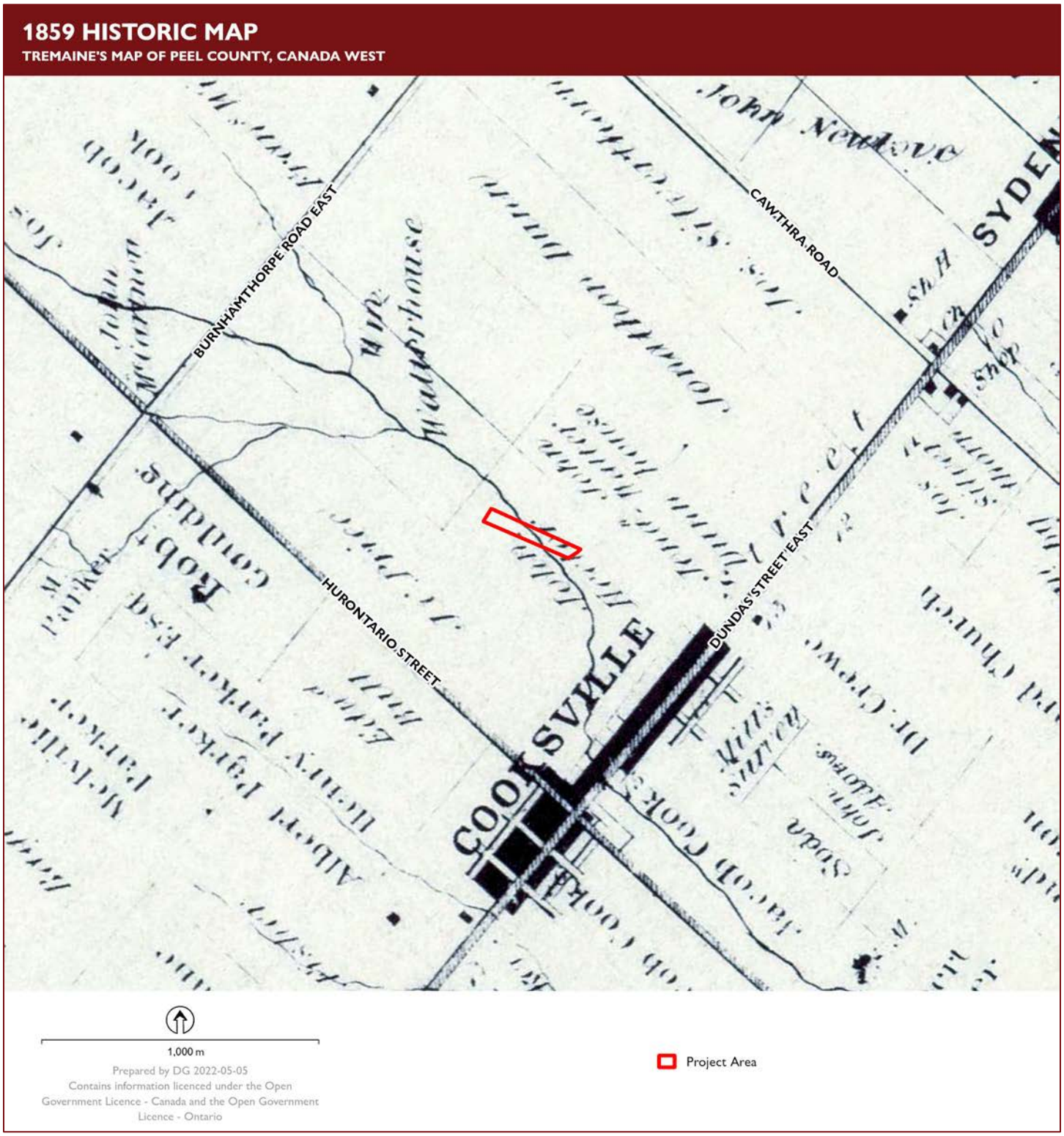
Map 2: Aerial Photograph Showing the Location of the Project Area



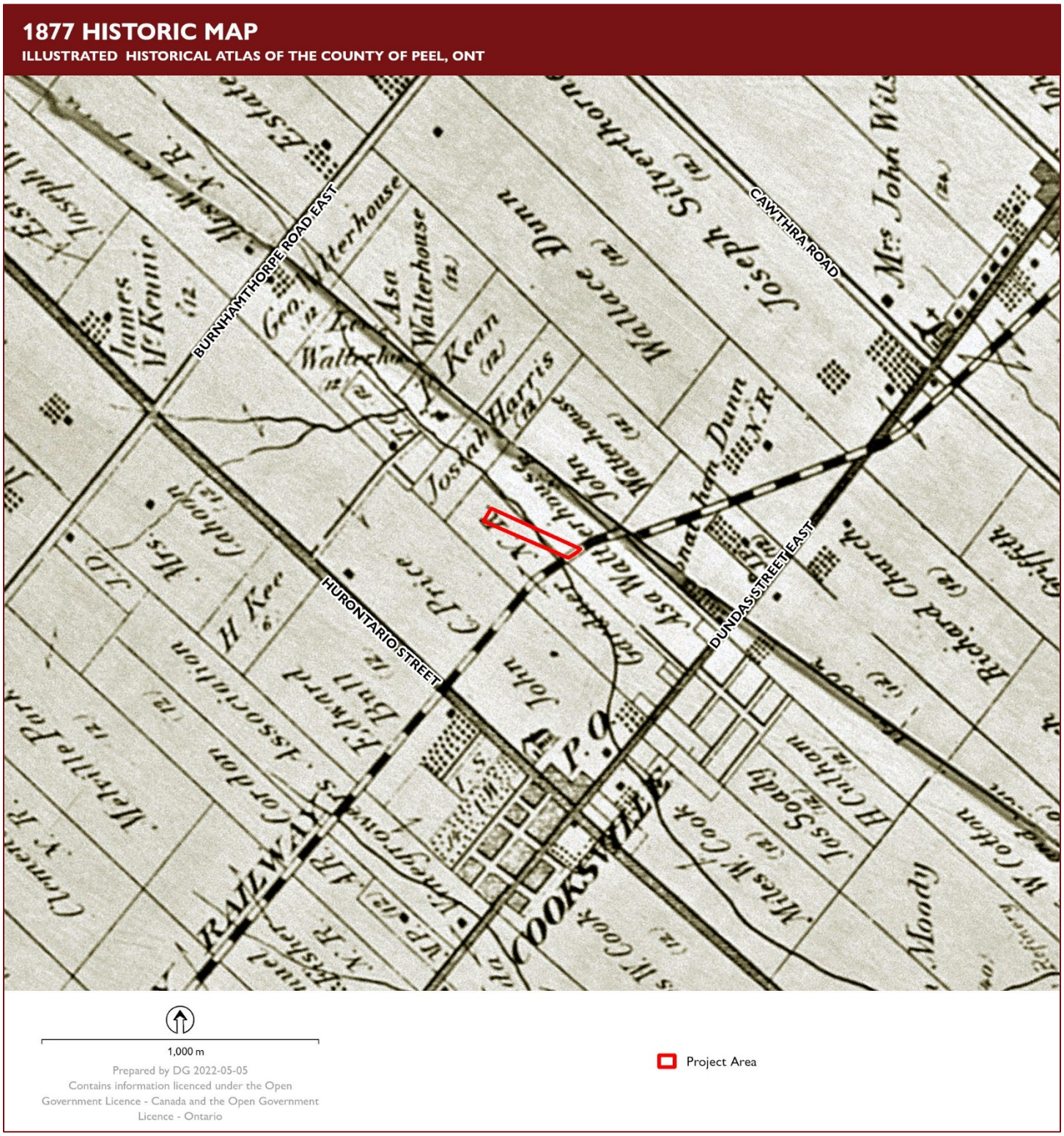
Map 3: Physiography Within the Vicinity of the Project Area



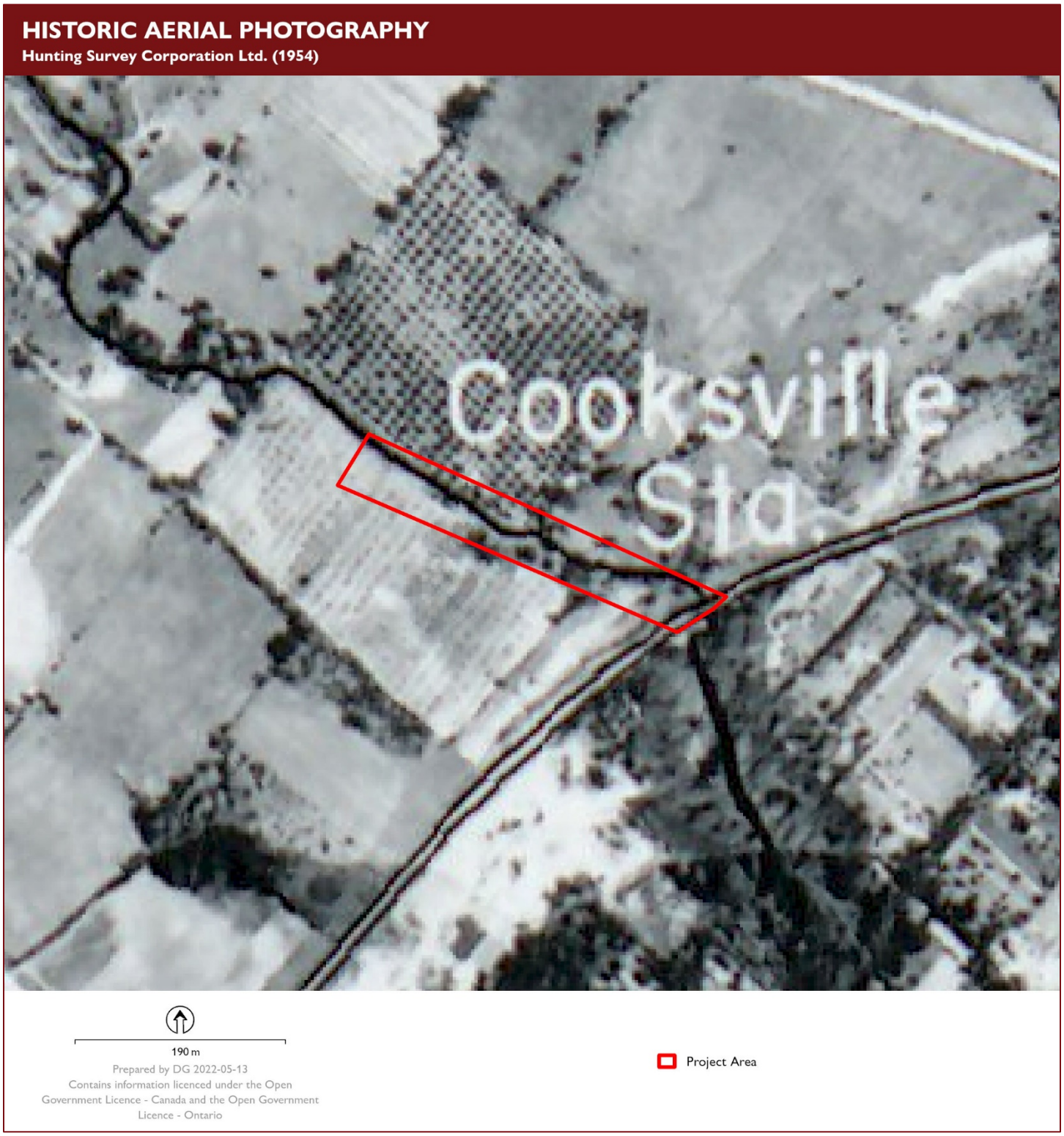
Map 4: Soils Within the Vicinity of the Project Area



Map 5: Location of the Project Area Shown on the 1859 Tremaine Map



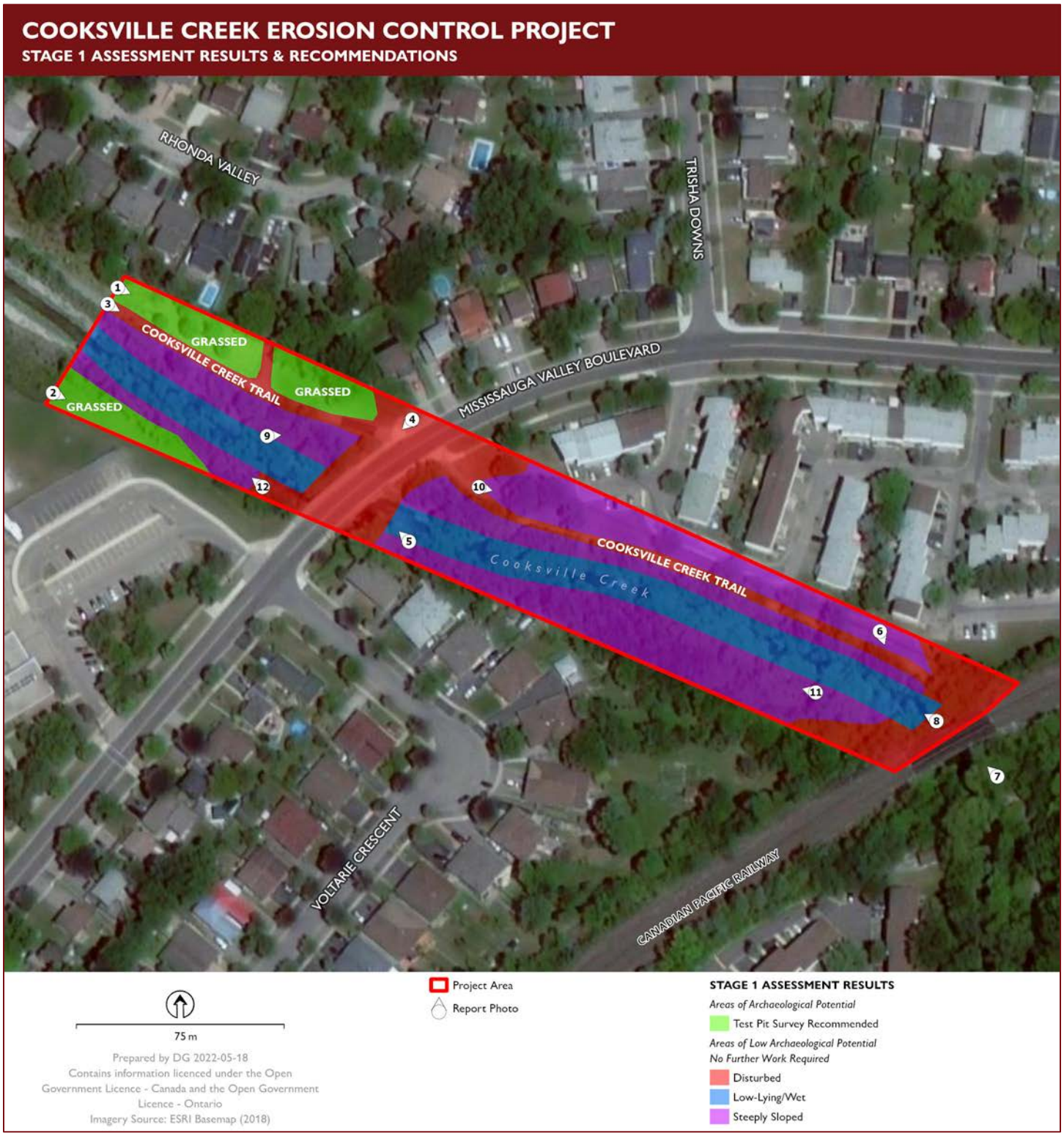
Map 6: Location of the Project Area on an 1877 Map of Peel County



Map 7: Project Area Shown on a 1954 Aerial Photograph

Map 8: Project Area Shown on a 1966 Aerial Photograph

Map 9: Project Area Shown on a 1975 Aerial Photograph



Map 10: Areas of Archaeological Potential

Map 11: Areas of Archaeological Potential Shown on Proponent Mapping

Map 12: Unaltered Proponent Mapping

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

February 8, 2023 Ref: 34715

Archaeology Program Unit
Ministry of Tourism, Culture and Sport
Culture Division, Programs and Services Branch
401 Bay Street, Suite 1700
Toronto, ON M7A 0A7
Fax: (416) 212-1802

Re: Request for Expedited Review – TMHC Project 2022-065

Dear Administrative Coordinator,

We have given Timmins Martelle Heritage Consultants Inc. (TMHC Inc.) direction to request an expedited review of the following report:

- *Stage 1 Archaeological Assessment, Municipal Class Environmental Assessment, Cooksville Creek Erosion Control Project, Part of Lot 14, Concession 1 NDS, Former Geographic Township of Toronto, Now City of Mississauga, Regional Municipality of Peel, Ontario* (P316-0499-2022).

The project was carried out under the license of Sherri Pearce MA. (P316).

The Stage 1 report was completed in support of the Cooksville Creek erosion control project. Due to the present risk to sanitary sewer infrastructure, repair works must be able to proceed in a timely manner. Progressing this project into detailed design would allow in-channel works to occur within the next available construction window (July 15 – March 15), and any necessary tree removal could be completed within the required window (September 1 to April 1) to reduce impact to local wildlife. The City of Mississauga wishes to proceed with the project and may require results of a Stage 2 assessment, depending on the spatial footprint of the preferred alternative which is currently being finalized. We kindly request a review date of March 14, 2023; a letter citing review and acceptance of the above report into the Provincial Register of Reports is required. Please note that this is an original report.

We thank you for your assistance with this matter.

Sincerely,
Matrix Solutions Inc.

Mariëtte Pushkar, M.Sc., P.Geo.
Senior Project Manager

mpushkar@matrix-solutions.com
Encl.

Ministry of Citizenship and Multiculturalism (MCM)

Archaeology Program Unit
Heritage Branch
Citizenship, Inclusion and Heritage Division
5th Floor, 400 University Ave.
Toronto ON M7A 2R9
Tel.: (416) 414-7787
Email: Jessica.Marr@ontario.ca

Ministère des Affaires civiques et du Multiculturalisme (MCM)

Unité des programme d'archéologie
Direction du patrimoine
Division de la citoyenneté, de l'inclusion et du patrimoine
5e étage, 400 ave. University
Toronto ON M7A 2R9
Tél. : (416) 414-7787
Email: Jessica.Marr@ontario.ca

Feb 10, 2023

Sherri Pearce (P316)
Timmins Martelle Heritage Consultants Inc.
105 - 1108 Dundas London ON N5W 3A7

RE: Entry into the Ontario Public Register of Archaeological Reports: Archaeological Assessment Report Entitled, "Stage 1 Archaeological Assessment Municipal Class Environmental Assessment Cooksville Creek Erosion Control Project Part of Lot 14, Concession 1 NDS Former Geographic Township of Toronto Now the City of Mississauga Regional Municipality of Peel, Ontario", Dated Feb 7, 2023, Filed with MCM Toronto Office on N/A, MCM Project Information Form Number P316-0499-2022, MCM File Number 0016696

Dear Ms. Pearce:

The above-mentioned report, which has been submitted to this ministry as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18, has been entered into the Ontario Public Register of Archaeological Reports without technical review.[1]

Please note that the ministry makes no representation or warranty as to the completeness, accuracy or quality of reports in the register.

Should you require further information, please do not hesitate to send your inquiry to Archaeology@Ontario.ca

cc. Archaeology Licensing Officer
Mariette Pushkar,Matrix Solutions, Inc.
Mariette Pushkar,Matrix Solutions, Inc.

1*In no way will the ministry be liable for any harm, damages, costs, expenses, losses, claims or actions that may result: (a) if the Report(s) or its recommendations are discovered to be inaccurate, incomplete, misleading or fraudulent; or (b) from the issuance of this letter. Further measures may need to be taken in the event that additional artifacts or archaeological sites are identified or the Report(s) is otherwise found to be inaccurate, incomplete, misleading or fraudulent.*

APPENDIX E
Public Consultation

Group	Company Name/Title	First Name	Last Name	Mailing Address	City	Province	Postal Code	Email	Phone
City of Mississauga	Planning and Building	Romas	Juknevicius		Mississauga	ON		romas.juknevicius@mississauga.ca	905-615-3200 x4155
City of Mississauga	City Council	John	Kovac		Mississauga	ON		john.kovac@mississauga.ca	
City of Mississauga	Planning and Building	Brandon	Williams		Mississauga	ON		brandon.williams@mississauga.ca	905-615-3200 x8753
City of Mississauga	Planning and Building	Bashar	Al-Hussaini		Mississauga	ON		bashar.al-hussaini@mississauga.ca	
City of Mississauga	Planning and Building	Marianne	Cassin		Mississauga	ON		marianne.cassin@mississauga.ca	905-615-3200 x5881
City of Mississauga	Planning and Building	Adam	Lucas		Mississauga	ON		adam.lucas@mississauga.ca	905-615-3200 x5525
City of Mississauga	Parks	Katie	Henley		Mississauga	ON		katie.henley@mississauga.ca	
City of Mississauga	Parks	Sharon	Chapman		Mississauga	ON		sharon.chapman@mississauga.ca	
City of Mississauga	Environmental Services	Lincoln	Kan		Mississauga	ON		lincoln.kan@mississauga.ca	
City of Mississauga	Rapid Transport Office	Jerry	Che		Mississauga	ON		jerry.che@mississauga.ca	
City of Mississauga	Rapid Transport Office	Wendy	Tian		Mississauga	ON		wendy.tian@mississauga.ca	
City of Mississauga	Realty	Bill	Moffatt		Mississauga	ON		bill.moffatt@mississauga.ca	
City of Mississauga	Realty	Varghese	George		Mississauga	ON		varghese.george@mississauga.ca	
Credit Valley Conservation (CVC)	Planner, Environmental Assessment	Iftekhar	Ahmad		Mississauga	ON		iftekhar.ahmad@cvc.ca	905-670-1615 ext 296
Credit Valley Conservation (CVC)	Planning and Permits	Josh	Campbell					josh.campbell@cvc.ca	
Region of Peel	Transportation	Asha	Saddi					asha.saddi@peelregion.ca	905-791-7800 x7794
Region of Peel	Planning	Tina	Detaramani					tina.detaramani@peelregion.ca	905-791-7800 x4554
Region of Peel	Transportation	Syeda	Banuri					syeda.banuri@peelregion.ca	
Region of Peel	Transportation	Mark	Crawford					mark.crawford@peelregion.ca	
Region of Peel	Infrastructure Planning and Asset Management	Megan	Lendvoy					megan.lendvoy@peelregion.ca	
Region of Peel	Real Property Asset Management	Jeremy	Schembri					jeremy.schembri@peelregion.ca	
Province of Ontario	MECP - separate submission process							eanotification.cregion@ontario.ca	
Province of Ontario	MNRF	Steven	Strong		Aurora	ON		steven.strong@ontario.ca	905-713-7361
Province of Ontario	Ministry of Municipal Affairs and Housing	Erika	Ivanic					erika.ivanic@ontario.ca	416-585-6085
Mississaugas of the Credit First Nation	Archaeological Inquiries	Adam	LaForme					adam.laforme@mncfn.ca	
Mississaugas of the Credit First Nation	Consultation Inquirues	Abby	LaForme					abby.laforme@mncfn.ca	
Mississaugas of the Credit First Nation	Director	Mark	LaForme					mark.laforme@mncfn.ca	
Mississaugas of the Credit First Nation	Consultation Coordinator	Fawn	Sault					Fawn.Sault@mncfn.ca	
Huron-Wendat First Nation		Maxime	Picard					maxime.picard@cnhw.gc.ca	
Huron-Wendat First Nation		Mario	Gros Louis					Mario.GrosLouis@wendake.ca	
Huron-Wendat First Nation		Lori-Jeanne	Bolduc					Lori-Jeanne.Bolduc@wendake.ca	
HDI								info@hdi.land	
Six Nations		Lonny	Bomberry					lonnybomberry@sixnations.ca	
Six Nations		Tanya	Hill-Montour					tanyahill-montour@sixnations.ca	
Alectra								recordsmississauga.info@alectrautilities.com	
Alectra	Manager, Capital Projects	Patrick	Leung					patrick.leung@alectrautilities.com	
Enbridge	Planning Manager	Ashutosh	Kahol					ashutosh.kahol@enbridge.com	
Bell		Meaghan	Palynchuk					meaghan.palynchuk@bell.ca	
Bell	Municipal Relations / Planning and Development General Mailbox							planninganddevelopment@bell.ca	
Rogers		Lily	Apa					lily.apa@rci.rogers.ca	
CN Rail	Property Group							proximity@cn.ca	
Peel Region District School Board	Director of Communications	Carla	Periera					communications@peelsb.com	
Hydro One								Regulatory@HydroOne.com	
Credit River Metis Council								crmcoutreach@gmail.com	
DFO								FisheriesProtection@dfo-mpo.gc.ca	

Ministry of the Environment, Conservation and Parks

Environmental Assessment Branch

1st Floor
135 St. Clair Avenue W
Toronto ON M4V 1P5
Tel.: 416 314-8001
Fax.: 416 314-8452

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Direction des évaluations environnementales

Rez-de-chaussée
135, avenue St. Clair Ouest
Toronto ON M4V 1P5
Tél. : 416 314-8001
Téléc. : 416 314-8452

November 4, 2022

Elizabeth Dollimore, P.Eng., MBA
Project Manager
City of Mississauga
elizabeth.dollimore@mississauga.ca

BY EMAIL ONLY

Re: **Cooksville Creek Erosion Control Project**
City of Mississauga
Schedule B Municipal Class Environmental Assessment
Notice of Study Commencement

Dear Ms. Dollimore,

This letter is in response to the Notice of Commencement for the above noted project. The Ministry of the Environment, Conservation and Parks (MECP) acknowledges that the project is following the approved environmental planning process for a Schedule B project under the Municipal Engineers Association's Municipal Class Environmental Assessment (Class EA).

The attached "Areas of Interest" document provides guidance regarding the ministry's interests with respect to the Class EA process. Please identify the areas of interest which are applicable to the project and ensure they are addressed. Proponents who address all the applicable areas of interest can minimize potential delays to the project schedule.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge, real or constructive, of the existence or potential existence of an Aboriginal or treaty right and contemplates conduct that may adversely impact that right. Before authorizing this project, the Crown must ensure that its duty to consult has been fulfilled, where such a duty is triggered. Although the duty to consult with Aboriginal peoples is a duty of the Crown, the Crown may delegate procedural aspects of this duty to project proponents while retaining oversight of the consultation process.

The proposed project may have the potential to affect Aboriginal or treaty rights protected under Section 35 of Canada's *Constitution Act* 1982. Where the Crown's duty to consult is triggered in relation to the proposed project**, the MECP is delegating the procedural aspects of rights-based consultation to the proponent through this letter.** The Crown intends to rely on the delegated consultation process in discharging its duty to consult and maintains the right to

participate in the consultation process as it sees fit.

Based on information provided to date and the Crown`s preliminary assessment the proponent is required to consult with the following communities who have been identified as potentially affected by the proposed project:

- Mississaugas of the Credit First Nation; and
- Six Nations of the Grand River (Both the Six Nations Elected Council and the Haudenosaunee Confederacy Chiefs Council (HCCC)/Haudenosaunee Development Institute (HDI)).

Steps that the proponent may need to take in relation to Aboriginal consultation for the proposed project are outlined in the "Code of Practice for Consultation in Ontario's Environmental Assessment Process".

Additional information related to Ontario's *Environmental Assessment Act* is available online at: www.ontario.ca/environmentalassessments

Please also refer to the attached document "A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities" for further information.

The proponent must contact the Director of Environmental Assessment Branch under the following circumstances after initial discussions with the communities identified by MECP:

- Aboriginal or treaty rights impacts are identified to you by the communities;
- You have reason to believe that your proposed project may adversely affect an Aboriginal or treaty right;
- Consultation with Indigenous communities or other stakeholders has reached an impasse; or
- A Section 16 Order request is expected based on impacts to Aboriginal or treaty rights.

The MECP will then assess the extent of any Crown duty to consult for the circumstances and will consider whether additional steps should be taken, including what role you will be asked to play should additional steps and activities be required.

Once the report is finalized, the proponent must issue a Notice of Completion providing a minimum 30-day period during which documentation may be reviewed and comment and input can be submitted to the Proponent.

Please ensure that the Notice of Completion advises that outstanding concerns are to be directed to the proponent for a response, and that in the event there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, Section 16 Order requests on those matters should be addressed in writing to:

Minister David Piccini
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Please note the project cannot proceed until at least 30 days after the end of the public review period provided for in the Notice of Completion.

Further, the project may not proceed after this time if:

- a Section 16 Order request has been submitted to the ministry regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights; or
- the Director has issued a Notice of Proposed Order regarding the project.

The public can request a higher level of assessment on a project if they are concerned about potential adverse impacts to constitutionally protected Aboriginal and treaty rights. In addition, the Minister may issue an order on his or her own initiative within a specified time period. The Director will issue a Notice of Proposed Order to the proponent if the Minister is considering an order for the project within 30 days after the conclusion of the comment period on the Notice of Completion. At this time, the Director may request additional information from the proponent.

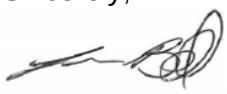
Once the requested information has been received, the Minister will have 30 days to make a decision or impose conditions on your project.

A draft copy of the report should be sent to me prior to the filing of the final report, allowing a minimum of 30 days for the ministry's technical reviewers to provide comments.

Please also ensure a copy of the final notice is sent to the ministry's Central Region EA notification email account (eanotification.cregion@ontario.ca) after the report is finalized.

Should you or your project team members have any questions regarding the material above, please contact me at trevor.bell@ontario.ca.

Sincerely,



Trevor Bell
Regional Environmental Planner

cc: Tina Dufresne, Manager, Halton Peel District Office, MECP
Solange Desautels, Supervisor, Project Coordination Unit, MECP
Mariëtte Pushkar, Senior Project Manager, Matrix Solutions Inc.
Liam Connolly, Water Resources E.I.T., Matrix Solutions Inc.

Attachments: Areas of Interest
A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities

AREAS OF INTEREST

It is suggested that you check off each applicable area after you have considered / addressed it.

☐ **Species at Risk**

- The Ministry of the Environment, Conservation and Parks has now assumed responsibility of Ontario's Species at Risk program. For any questions related to subsequent permit requirements, please contact SAROntario@ontario.ca.

☐ **Planning and Policy**

- Ontario has released "A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019)" which replaces the "Growth Plan for the Greater Golden Horseshoe (2017)". More information, including the Plan, is found here: https://www.placestogrow.ca.

- Parts of the study area may be subject to the A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019), Oak Ridges Moraine Conservation Plan (2017), Niagara Escarpment Plan (2017), Greenbelt Plan (2017) or Lake Simcoe Protection Plan (2014). Applicable policies should be referenced in the report, and the proponent should describe how the proposed project adheres to the relevant policies in these plans.

- The Provincial Policy Statement (2020) contains policies that protect Ontario's natural heritage and water resources. Applicable policies should be referenced in the report, and the proponent should describe how the proposed project is consistent with these policies.

☐ **Source Water Protection (all projects)**

The *Clean Water Act*, 2006 (CWA) aims to protect existing and future sources of drinking water. To achieve this, several types of vulnerable areas have been delineated around surface water intakes and wellheads for every municipal residential drinking water system that is located in a source protection area. These vulnerable areas are known as a Wellhead Protection Areas (WHPAs) and surface water Intake Protection Zones (IPZs). Other vulnerable areas that have been delineated under the CWA include Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), Event-based modelling areas (EBAs), and Issues Contributing Areas (ICAs). Source protection plans have been developed that include policies to address existing and future risks to sources of municipal drinking water within these vulnerable areas.

Projects that are subject to the Environmental Assessment Act that fall under a Class EA, or one of the Regulations, have the potential to impact sources of drinking water if they occur in designated vulnerable areas or in the vicinity of other at-risk drinking water systems (i.e. systems that are not municipal residential systems). MEA Class EA projects may include activities that, if located in a vulnerable area, could be a threat to sources of drinking water (i.e. have the potential to adversely affect the quality or quantity of drinking water sources) and the activity could therefore be subject to policies in a source protection plan. Where an activity poses a risk to drinking water, policies in the local source protection plan may impact how or where that activity is undertaken. Policies may prohibit certain activities, or they may require risk management measures for these activities. Municipal Official Plans, planning decisions, Class EA projects (where the project includes an activity that is a threat to drinking water) and

prescribed instruments must conform with policies that address significant risks to drinking water and must have regard for policies that address moderate or low risks.

- In October 2015, the MEA Parent Class EA document was amended to include reference to the Clean Water Act (Section A.2.10.6) and indicates that proponents undertaking a Municipal Class EA project must identify early in their process whether a project is or could potentially be occurring with a vulnerable area. **Given this requirement, please include a section in the report on source water protection.**

    - The proponent should identify the source protection area and should clearly document how the proximity of the project to sources of drinking water (municipal or other) and any delineated vulnerable areas was considered and assessed. Specifically, the report should discuss whether or not the project is located in a vulnerable area and provide applicable details about the area.

    - If located in a vulnerable area, proponents should document whether any project activities are prescribed drinking water threats and thus pose a risk to drinking water (this should be consulted on with the appropriate Source Protection Authority). Where an activity poses a risk to drinking water, the proponent must document and discuss in the report how the project adheres to or has regard to applicable policies in the local source protection plan. This section should then be used to inform and be reflected in other sections of the report, such as the identification of net positive/negative effects of alternatives, mitigation measures, evaluation of alternatives etc.

- While most source protection plans focused on including policies for significant drinking water threats in the WHPAs and IPZs it should be noted that even though source protection plan policies may not apply in HVAs, these are areas where aquifers are sensitive and at risk to impacts and within these areas, activities may impact the quality of sources of drinking water for systems other than municipal residential systems.

- In order to determine if this project is occurring within a vulnerable area, proponents can use this mapping tool: http://www.applications.ene.gov.on.ca/swp/en/index.php.The mapping tool will also provide a link to the appropriate source protection plan in order to identify what policies may be applicable in the vulnerable area.

- For further information on the maps or source protection plan policies which may relate to their project, proponents must contact the appropriate source protection authority. **Please consult with the local source protection authority to discuss potential impacts on drinking water. Please document the results of that consultation within the report and include all communication documents/correspondence.**

More Information

For more information on the *Clean Water Act*, source protection areas and plans, including specific information on the vulnerable areas and drinking water threats, please refer to Conservation Ontario's website where you will also find links to the local source protection plan/assessment report.

A list of the prescribed drinking water threats can be found in section 1.1 of Ontario Regulation 287/07 made under the *Clean Water Act*. In addition to prescribed drinking water threats, some source protection plans may include policies to address additional "local" threat activities, as

approved by the MECP.

- **Climate Change**

Ontario is leading the fight against climate change through the Climate Change Action Plan. Recently released, the plan lays out the specific actions Ontario will take in the next five years to meet its 2020 greenhouse gas reduction targets and establishes the framework necessary to meet its long-term targets. As a commitment of the action plan, **the province has now finalized a guide, "**Considering Climate Change in the Environmental Assessment Process**" (Guide).**

The Guide is now a part of the Environmental Assessment program's Guides and Codes of Practice. The Guide sets out the MECP's expectation for considering climate change in the preparation, execution and documentation of environmental assessment studies and processes. The guide provides examples, approaches, resources, and references to assist proponents with consideration of climate change in EA. **Proponents should review this Guide in detail.**

- The MECP expects proponents to:

    1. Consider during the assessment of alternative solutions and alternative designs, the following:
        a. the project's expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation); and
        b. resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation).
    2. Include a discrete section in the report detailing how climate change was considered in the EA.

    How climate change is considered can be qualitative or quantitative in nature, and should be scaled to the project's level of environmental effect. In all instances, both a project's impacts on climate change (mitigation) and impacts of climate change on a project (adaptation) should be considered.

- The MECP has also prepared another guide to support provincial land use planning direction related to the completion of energy and emission plans. The "Community Emissions Reduction Planning: A Guide for Municipalities" document is designed to educate stakeholders on the municipal opportunities to reduce energy and greenhouse gas emissions, and to provide guidance on methods and techniques to incorporate consideration of energy and greenhouse gas emissions into municipal activities of all types. We encourage you to review the Guide for information.

- **Air Quality, Dust and Noise**

- If there are sensitive receptors in the surrounding area of this project, an air quality/odour impact assessment will be useful to evaluate alternatives, determine impacts and identify appropriate mitigation measures. The scope of the assessment can be determined based on the potential effects of the proposed alternatives, and typically includes source and receptor characterization and a quantification of local air quality impacts on the sensitive receptors and the environment in the study area. The assessment will compare to all applicable standards or guidelines for all contaminants of concern. **Please contact this office for**

<u>further consultation on the level of Air Quality Impact Assessment required for this project if not already advised.</u>

- **<u>If a full Air Quality Impact Assessment is not required for the project, the report should still contain:</u>**

    - A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;
    - A discussion of the nearby sensitive receptors and the project's potential air quality impacts on present and future sensitive receptors;
    - A discussion of local air quality impacts that could arise from this project during both construction and operation; and
    - A discussion of potential mitigation measures.

- As a common practice, "air quality" should be used an evaluation criterion for all road projects.

- Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the study area are not adversely affected during construction activities.

- The MECP recommends that non-chloride dust-suppressants be applied. For a comprehensive list of fugitive dust prevention and control measures that could be applied, refer to *Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities*. report prepared for Environment Canada. March 2005.

- The report should consider the potential impacts of increased noise levels during the operation of the completed project. The proponent should explore all potential measures to mitigate significant noise impacts during the assessment of alternatives.

Ecosystem Protection and Restoration

- Any impacts to ecosystem form and function must be avoided where possible. The report should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

- All natural heritage features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. The following sensitive environmental features may be located within or adjacent to the study area:

    - Areas of Natural and Scientific Interest (ANSIs)
    - Rare Species of flora or fauna
    - Watercourses
    - Wetlands
    - Woodlots

We recommend consulting with the Ministry of Natural Resources and Forestry (MNRF), Fisheries and Oceans Canada (DFO) and your local conservation authority to determine if special measures or additional studies will be necessary to preserve and protect these

sensitive features. In addition, you may consider the provisions of the Rouge Park Management Plan if applicable.

Surface Water

- The report must include enough information to demonstrate that there will be no negative impacts on the natural features or ecological functions of any watercourses within the study area. Measures should be included in the planning and design process to ensure that any impacts to watercourses from construction or operational activities (e.g. spills, erosion, pollution) are mitigated as part of the proposed undertaking.

- Additional stormwater runoff from new pavement can impact receiving watercourses and flood conditions. Quality and quantity control measures to treat stormwater runoff should be considered for all new impervious areas and, where possible, existing surfaces. The ministry's Stormwater Management Planning and Design Manual (2003) should be referenced in the report and utilized when designing stormwater control methods. **A Stormwater Management Plan should be prepared as part of the Class EA process** that includes:

    - Strategies to address potential water quantity and erosion impacts related to stormwater draining into streams or other sensitive environmental features, and to ensure that adequate (enhanced) water quality is maintained
    - Watershed information, drainage conditions, and other relevant background information
    - Future drainage conditions, stormwater management options, information on erosion and sediment control during construction, and other details of the proposed works
    - Information on maintenance and monitoring commitments.

- Ontario Regulation 60/08 under the *Ontario Water Resources Act* (OWRA) applies to the Lake Simcoe Basin, which encompasses Lake Simcoe and the lands from which surface water drains into Lake Simcoe. If the proposed sewage treatment plant is listed in Table 1 of the regulation, the report should describe how the proposed project and its mitigation measures are consistent with the requirements of this regulation and the OWRA.

- Any potential approval requirements for surface water taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, except for certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information. Additionally, an Environmental Compliance Approval under the OWRA is required for municipal stormwater management works.

Groundwater

- The status of, and potential impacts to any well water supplies should be addressed. If the project involves groundwater takings or changes to drainage patterns, the quantity and quality of groundwater may be affected due to drawdown effects or the redirection of existing contamination flows. In addition, project activities may infringe on existing wells such that they must be reconstructed or sealed and abandoned. Appropriate information to

define existing groundwater conditions should be included in the report.

- If the potential construction or decommissioning of water wells is identified as an issue, the report should refer to Ontario Regulation 903, Wells, under the OWRA.

- Potential impacts to groundwater-dependent natural features should be addressed. Any changes to groundwater flow or quality from groundwater taking may interfere with the ecological processes of streams, wetlands or other surficial features. In addition, discharging contaminated or high volumes of groundwater to these features may have direct impacts on their function. Any potential effects should be identified, and appropriate mitigation measures should be recommended. The level of detail required will be dependent on the significance of the potential impacts.

- Any potential approval requirements for groundwater taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, with the exception of certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information.

Contaminated Soils

- Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with *Part XV.1 of the Environmental Protection Act* (EPA) and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. Please contact the appropriate MECP District Office for further consultation if contaminated sites are present.

- Any current or historical waste disposal sites should be identified in the report. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the EPA may be required for land uses on former disposal sites.

- The location of any underground storage tanks should be investigated in the report. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The ministry's Spills Action Centre must be contacted in such an event.

- The report should identify any underground transmission lines in the study area. The owners should be consulted to avoid impacts to this infrastructure, including potential spills.

Excess Materials Management

- Activities involving the management of excess soil should be completed in accordance with the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2014).

- All waste generated during construction must be disposed of in accordance with ministry requirements

Servicing and Facilities

- Any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste must have an Environmental Compliance Approval (ECA) before it can operate lawfully. Please consult with the Environmental Approvals Access and Service Integration Branch (EAASIB) to determine whether a new or amended ECA will be required for any proposed infrastructure.

- We recommend referring to the ministry's environmental land use planning guides to ensure that any potential land use conflicts are considered when planning for any infrastructure or facilities related to wastewater, pipelines, landfills or industrial uses.

Mitigation and Monitoring

- Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the report and regularly monitored during the construction stage of the project. In addition, we encourage proponents to conduct post-construction monitoring to ensure all mitigation measures have been effective and are functioning properly.

- Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

- The proponent's construction and post-construction monitoring plans must be documented in the report, as outlined in Section A.2.5 and A.4.1 of the MEA Class EA parent document.

Consultation

- The report must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the SR that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout the planning process. The Class EA also directs proponents to include copies of comments submitted on the project by interested stakeholders, and the proponent's responses to these comments.

Class EA Process

- The report should provide clear and complete documentation of the planning process in order to allow for transparency in decision-making.

- If this project is a Master Plan: there are several different approaches that can be used to conduct a Master Plan, examples of which are outlined in Appendix 4 of the Class EA. The Master Plan should clearly indicate the selected approach for conducting the plan, by identifying whether the levels of assessment, consultation and documentation are sufficient to fulfill the requirements for Schedule B or C projects. Please note that any Schedule B or C projects identified in the plan would be subject to Section 16 Order requests under the

Environmental Assessment Act, although the plan itself would not be.

- The report must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the report that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout the planning process. The Class EA also directs proponents to include copies of comments submitted on the project by interested stakeholders, and the proponent's responses to these comments.

- The Class EA requires the consideration of the effects of each alternative on all aspects of the environment. The report should include a level of detail (e.g. hydrogeological investigations, terrestrial and aquatic assessments) such that all potential impacts can be identified, and appropriate mitigation measures can be developed. Any supporting studies conducted during the Class EA process should be referenced and included as part of the report.

- Please include in the report a list of all subsequent permits or approvals that may be required for the implementation of the preferred alternative, including but not limited to, MECP's PTTW, EASR Registrations, ECAs, and Species at Risk permits, Conservation Authority permits, and approvals under the *Impact Assessment Act*, 2019.

- Ministry guidelines and other information related to the issues above are available at http://www.ontario.ca/environment-and-energy/environment-and-energy. We encourage you to review all the available guides and to reference any relevant information in the report.

A PROPONENT'S INTRODUCTION TO THE DELEGATION OF PROCEDURAL ASPECTS OF CONSULTATION WITH ABORIGINAL COMMUNITIES

Definitions

The following definitions are specific to this document and may not apply in other contexts:

Aboriginal communities – the First Nation or Métis communities identified by the Crown for the purpose of consultation.

Consultation – the Crown's legal obligation to consult when the Crown has knowledge of an established or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. This is the type of consultation required pursuant to s. 35 of the *Constitution Act, 1982*. Note that this definition does not include consultation with Aboriginal communities for other reasons, such as regulatory requirements.

Crown – the Ontario Crown, acting through a particular ministry or ministries.

Procedural aspects of consultation – those portions of consultation related to the process of consultation, such as notifying an Aboriginal community about a project, providing information about the potential impacts of a project, responding to concerns raised by an Aboriginal community and proposing changes to the project to avoid negative impacts.

Proponent – the person or entity that wants to undertake a project and requires an Ontario Crown decision or approval for the project.

I. Purpose

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that may adversely impact that right. In outlining a framework for the duty to consult, the Supreme Court of Canada has stated that the Crown may delegate procedural aspects of consultation to third parties. This document provides general information about the Ontario Crown's approach to delegation of the procedural aspects of consultation to proponents.

This document is not intended to instruct a proponent about an individual project, and it does not constitute legal advice.

II. Why is it Necessary to Consult with Aboriginal Communities?

The objective of the modern law of Aboriginal and treaty rights is the *reconciliation* of Aboriginal peoples and non-Aboriginal peoples and their respective rights, claims and interests. Consultation is an important component of the reconciliation process.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge of an existing or asserted Aboriginal or treaty right and contemplates conduct that might adversely impact that right. For example, the Crown's duty to consult is triggered when it considers issuing a permit, authorization or approval for a project which has the potential to adversely impact an Aboriginal right, such as the right to hunt, fish, or trap in a particular area.

The scope of consultation required in particular circumstances ranges across a spectrum depending on both the nature of the asserted or established right and the seriousness of the potential adverse impacts on that right.

Depending on the particular circumstances, the Crown may also need to take steps to accommodate the potentially impacted Aboriginal or treaty right. For example, the Crown may be required to avoid or minimize the potential adverse impacts of the project.

III. The Crown's Role and Responsibilities in the Delegated Consultation Process

The Crown has the responsibility for ensuring that the duty to consult, and accommodate where appropriate, is met. However, the Crown may delegate the procedural aspects of consultation to a proponent.

There are different ways in which the Crown may delegate the procedural aspects of consultation to a proponent, including through a letter, a memorandum of understanding, legislation, regulation, policy and codes of practice.

If the Crown decides to delegate procedural aspects of consultation, the Crown will generally:

- Ensure that the delegation of procedural aspects of consultation and the responsibilities of the proponent are clearly communicated to the proponent;
- Identify which Aboriginal communities must be consulted;
- Provide contact information for the Aboriginal communities;
- Revise, as necessary, the list of Aboriginal communities to be consulted as new information becomes available and is assessed by the Crown;
- Assess the scope of consultation owed to the Aboriginal communities;
- Maintain appropriate oversight of the actions taken by the proponent in fulfilling the procedural aspects of consultation;
- Assess the adequacy of consultation that is undertaken and any accommodation that may be required;
- Provide a contact within any responsible ministry in case issues arise that require direction from the Crown; and
- Participate in the consultation process as necessary and as determined by the Crown.

IV. The Proponent's Role and Responsibilities in the Delegated Consultation Process

Where aspects of the consultation process have been delegated to a proponent, the Crown, in meeting its duty to consult, will rely on the proponent's consultation activities and documentation of those activities. The consultation process informs the Crown's decision of whether or not to approve a proposed project or activity.

A proponent's role and responsibilities will vary depending on a variety of factors including the extent of consultation required in the circumstance and the procedural aspects of consultation the Crown has delegated to it. Proponents are often in a better position than the Crown to discuss a project and its potential impacts with Aboriginal communities and to determine ways to avoid or minimize the adverse impacts of a project.

A proponent can raise issues or questions with the Crown at any time during the consultation process. If issues or concerns arise during the consultation that cannot be addressed by the proponent, the proponent should contact the Crown.

a) What might a proponent be required to do in carrying out the procedural aspects of consultation?

Where the Crown delegates procedural aspects of consultation, it is often the proponent's responsibility to provide notice of the proposed project to the identified Aboriginal communities. The notice should indicate that the Crown has delegated the procedural aspects of consultation to the proponent and should include the following information:

- a description of the proposed project or activity;
- mapping;
- proposed timelines;
- details regarding anticipated environmental and other impacts;
- details regarding opportunities to comment; and
- any changes to the proposed project that have been made for seasonal conditions or other factors, where relevant.

Proponents should provide enough information and time to allow Aboriginal communities to provide meaningful feedback regarding the potential impacts of the project. Depending on the nature of consultation required for a project, a proponent also may be required to:

- provide the Crown with copies of any consultation plans prepared and an opportunity to review and comment;
- ensure that any necessary follow-up discussions with Aboriginal communities take place in a timely manner, including to confirm receipt of information, share and update information and to address questions or concerns that may arise;
- as appropriate, discuss with Aboriginal communities potential mitigation measures and/or changes to the project in response to concerns raised by Aboriginal communities;
- use language that is accessible and not overly technical, and translate material into Aboriginal languages where requested or appropriate;
- bear the reasonable costs associated with the consultation process such as, but not limited to, meeting hall rental, meal costs, document translation(s), or to address technical & capacity issues;
- provide the Crown with all the details about potential impacts on established or asserted Aboriginal or treaty rights, how these concerns have been considered and addressed by the proponent and the Aboriginal communities and any steps taken to mitigate the potential impacts;
- provide the Crown with complete and accurate documentation from these meetings and communications; and
- notify the Crown immediately if an Aboriginal community not identified by the Crown approaches the proponent seeking consultation opportunities.

b) What documentation and reporting does the Crown need from the proponent?

Proponents should keep records of all communications with the Aboriginal communities involved in the consultation process and any information provided to these Aboriginal communities.

As the Crown is required to assess the adequacy of consultation, it needs documentation to satisfy itself that the proponent has fulfilled the procedural aspects of consultation delegated to it. The documentation required would typically include:

- the date of meetings, the agendas, any materials distributed, those in attendance and copies of any minutes prepared;
- the description of the proposed project that was shared at the meeting;
- any and all concerns or other feedback provided by the communities;
- any information that was shared by a community in relation to its asserted or established Aboriginal or treaty rights and any potential adverse impacts of the proposed activity, approval or disposition on such rights;
- any proposed project changes or mitigation measures that were discussed, and feedback from Aboriginal communities about the proposed changes and measures;
- any commitments made by the proponent in response to any concerns raised, and feedback from Aboriginal communities on those commitments;
- copies of correspondence to or from Aboriginal communities, and any materials distributed electronically or by mail;
- information regarding any financial assistance provided by the proponent to enable participation by Aboriginal communities in the consultation;
- periodic consultation progress reports or copies of meeting notes if requested by the Crown;
- a summary of how the delegated aspects of consultation were carried out and the results; and
- a summary of issues raised by the Aboriginal communities, how the issues were addressed and any outstanding issues.

In certain circumstances, the Crown may share and discuss the proponent's consultation record with an Aboriginal community to ensure that it is an accurate reflection of the consultation process.

c) Will the Crown require a proponent to provide information about its commercial arrangements with Aboriginal communities?

The Crown may require a proponent to share information about aspects of commercial arrangements between the proponent and Aboriginal communities where the arrangements:

- include elements that are directed at mitigating or otherwise addressing impacts of the project;
- include securing an Aboriginal community's support for the project; or
- may potentially affect the obligations of the Crown to the Aboriginal communities.

The proponent should make every reasonable effort to exempt the Crown from confidentiality provisions in commercial arrangements with Aboriginal communities to the extent necessary to allow this information to be shared with the Crown.

The Crown cannot guarantee that information shared with the Crown will remain confidential. Confidential commercial information should not be provided to the Crown as part of the consultation record if it is not relevant to the duty to consult or otherwise required to be submitted to the Crown as part of the regulatory process.

V. What are the Roles and Responsibilities of Aboriginal Communities' in the Consultation Process?

Like the Crown, Aboriginal communities are expected to engage in consultation in good faith. This includes:

- responding to the consultation notice;
- engaging in the proposed consultation process;
- providing relevant documentation;
- clearly articulating the potential impacts of the proposed project on Aboriginal or treaty rights; and
- discussing ways to mitigates any adverse impacts.

Some Aboriginal communities have developed tools, such as consultation protocols, policies or processes that provide guidance on how they would prefer to be consulted. Although not legally binding, proponents are encouraged to respect these community processes where it is reasonable to do so. Please note that there is no obligation for a proponent to pay a fee to an Aboriginal community in order to enter into a consultation process.

To ensure that the Crown is aware of existing community consultation protocols, proponents should contact the relevant Crown ministry when presented with a consultation protocol by an Aboriginal community or anyone purporting to be a representative of an Aboriginal community.

VI. What if More Than One Provincial Crown Ministry is Involved in Approving a Proponent's Project?

Depending on the project and the required permits or approvals, one or more ministries may delegate procedural aspects of the Crown's duty to consult to the proponent. The proponent may contact individual ministries for guidance related to the delegation of procedural aspects of consultation for ministry-specific permits/approvals required for the project in question. Proponents are encouraged to seek input from all involved Crown ministries sooner rather than later.

NOTICE OF STUDY COMMENCEMENT

Cooksville Creek Erosion Control Project
Class Environmental Assessment

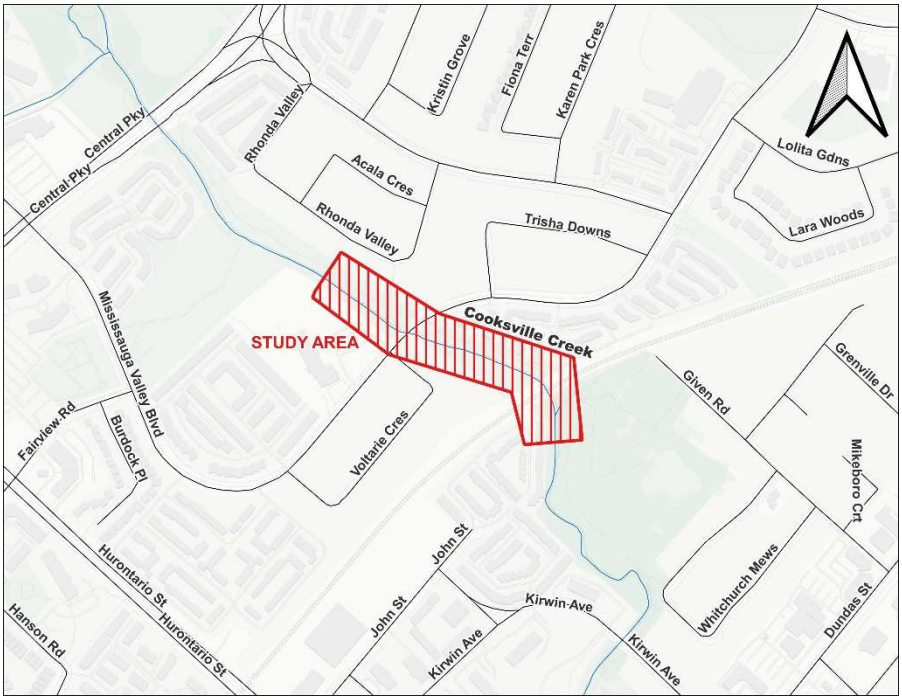
Issued September 29, 2022

The Study

The City of Mississauga, through their consultant Matrix Solutions Inc., is undertaking a Class Environmental Assessment to address erosion concerns for Cooksville Creek, from Mississauga Valley Blvd to CP Railway of Mississauga. The map below shows the location of the study area. The project will be carried out under *Schedule "B"* in accordance with the requirements of the *Class Environmental Assessment for Municipal Projects.*

We Want to Hear From You

Public consultation is a key component of this study. The Project Team invites public input and comments and will incorporate them into the planning and design of this project. A Public Information Centre (PIC) will be held as part of the process to provide an opportunity for the public to review and comment on the study findings. Notice of the PIC will be provided to the public and agencies as the study progresses.



Comments

The City wishes to ensure that anyone with an interest in this study has the opportunity to provide input on the study alternatives. With the exception of personal information, all comments will become part of the public record. To provide your comments, request additional information concerning this project or to join the study mailing list, please contact either of the Project Team members:

Elizabeth Dollimore P.Eng., MBA
Project Manager
City of Mississauga
201 City Centre Dr., Suite 800
Mississauga, Ontario, L5B 2T4
Tel: 905-615-3200 ext. 5303
elizabeth.dollimore@mississauga.ca

Mariëtte Pushkar M.Sc, P.Geo
Senior Project Manager
Matrix Solutions Inc.
171 Victoria St. North,
Kitchener, Ontario, N2H 5C5
Tel: 226-229-3835
mpushkar@matrix-solutions.com

City of Mississauga – Notice of Online Public Information Centre

Municipal Class Environmental Assessment Study:
Cooksville Creek Erosion Control Project
(Mississauga Valley Boulevard to the Canadian Pacific Railway)

What?

The City of Mississauga is undertaking a Schedule B Municipal Class Environmental Assessment (Class EA) study for erosion control and restoration of Cooksville Creek between Mississauga Valley Boulevard and the Canadian Pacific Railway.

Why?

Through its ongoing erosion monitoring program, the City of Mississauga recognizes that this section of Cooksville Creek needs rehabilitation to address existing erosion issues, failing bank protection, and to provide an opportunity to naturalize the site.

How?

The study has examined the creek and associated natural environment to identify existing erosion problems, potential future risks, and opportunities for restoration and environmental enhancement.

Through the Class EA process, three (3) alternative solutions were developed that have the potential to address the identified concerns and fulfill project objectives. These alternatives include:

- Alternative 1: a do-nothing alternative (always considered in a Class EA for comparative purposes)
- Alternative 2: local repairs
- Alternative 3: channel modification and realignment.

These alternatives will be evaluated using a common set of categories to identify a preferred solution. The preferred solution will be confirmed, and the details will be refined through public consultation.

At the completion of the study, a Project File Report to document the study process, project details, and consultation results will be made available for public review.

Get Involved!

Consultation is an important part of the Class EA process. We want to ensure that anyone with an interest can provide input into the planning and design of this project.

A narrated presentation and downloadable information package have been developed to present the study findings, alternative solutions considered, the evaluation process, and next steps. The information is now available on the City's project website:

https://mississauga.ca/cooksvillestudymvcp

Please provide your comments by **June 30, 2023**, using the comment form.

If you have any questions or comments regarding the study or wish to be added to the study mailing list, please contact:

Elizabeth Dollimore, P.Eng., MBA.
Project Manager
City of Mississauga
300 City Centre Drive
Mississauga, ON L5B 3C1
(905) 615-3200 ext.5303
Elizabeth.Dollimore@mississauga.ca

Mariëtte Pushkar, M.Sc., P.Geo.
Consultant Project Manager
Matrix Solutions Inc.
171 Victoria Street North
Kitchener, ON N2H 5C5
(226) 220-3835
mpushkar@matrix-solutions.com

Cooksville Creek Erosion Control Project

Mississauga Valley Boulevard to the Canadian Pacific Rail Crossing

City of Mississauga
Public Information Centre

June 1, 2023

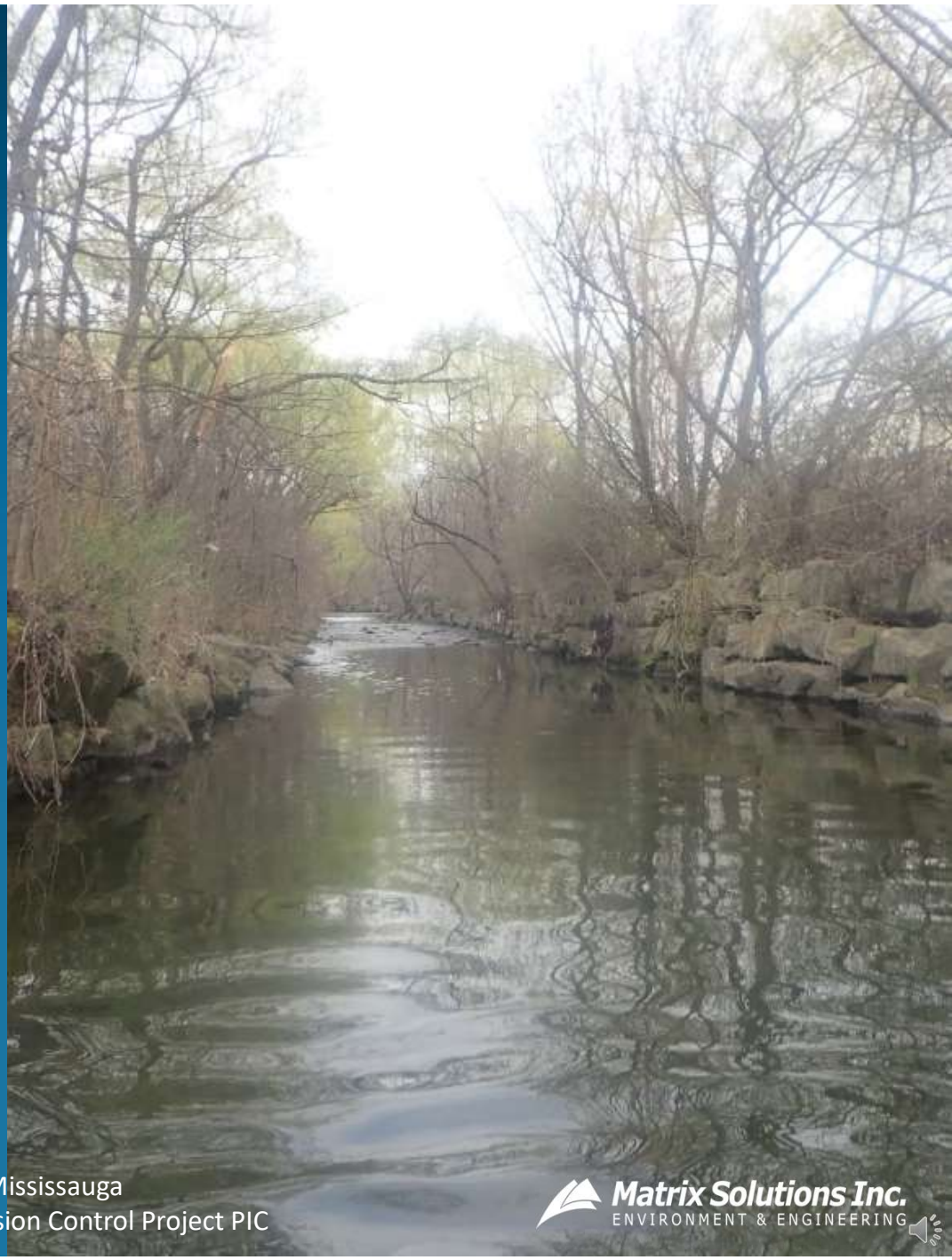
Land Acknowledgement

We acknowledge the lands which constitute the present-day City of Mississauga as being part of the Treaty and Traditional Territory of the Mississaugas of the Credit First Nation, the Haudenosaunee Confederacy, and the Huron-Wendat and Wyandot Nations. We recognize these peoples and their ancestors as peoples who inhabited these lands since time immemorial. The City of Mississauga is home to many global Indigenous Peoples.

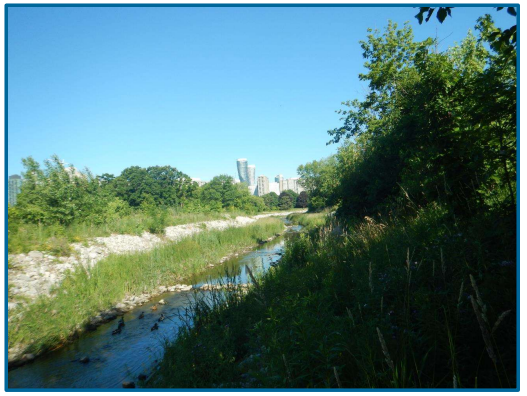
As a municipality, the City of Mississauga is actively working toward reconciliation by confronting our past and our present, providing space for Indigenous peoples within their territory, to recognize and uphold their Treaty Rights, and to support Indigenous Peoples. We formally recognize the Anishinaabe origins of our name and continue to make Mississauga a safe space for all Indigenous peoples.

Virtual Public Information Center Agenda

- Study Objectives
- Existing Conditions
- Alternative Solutions Development
- Next Steps



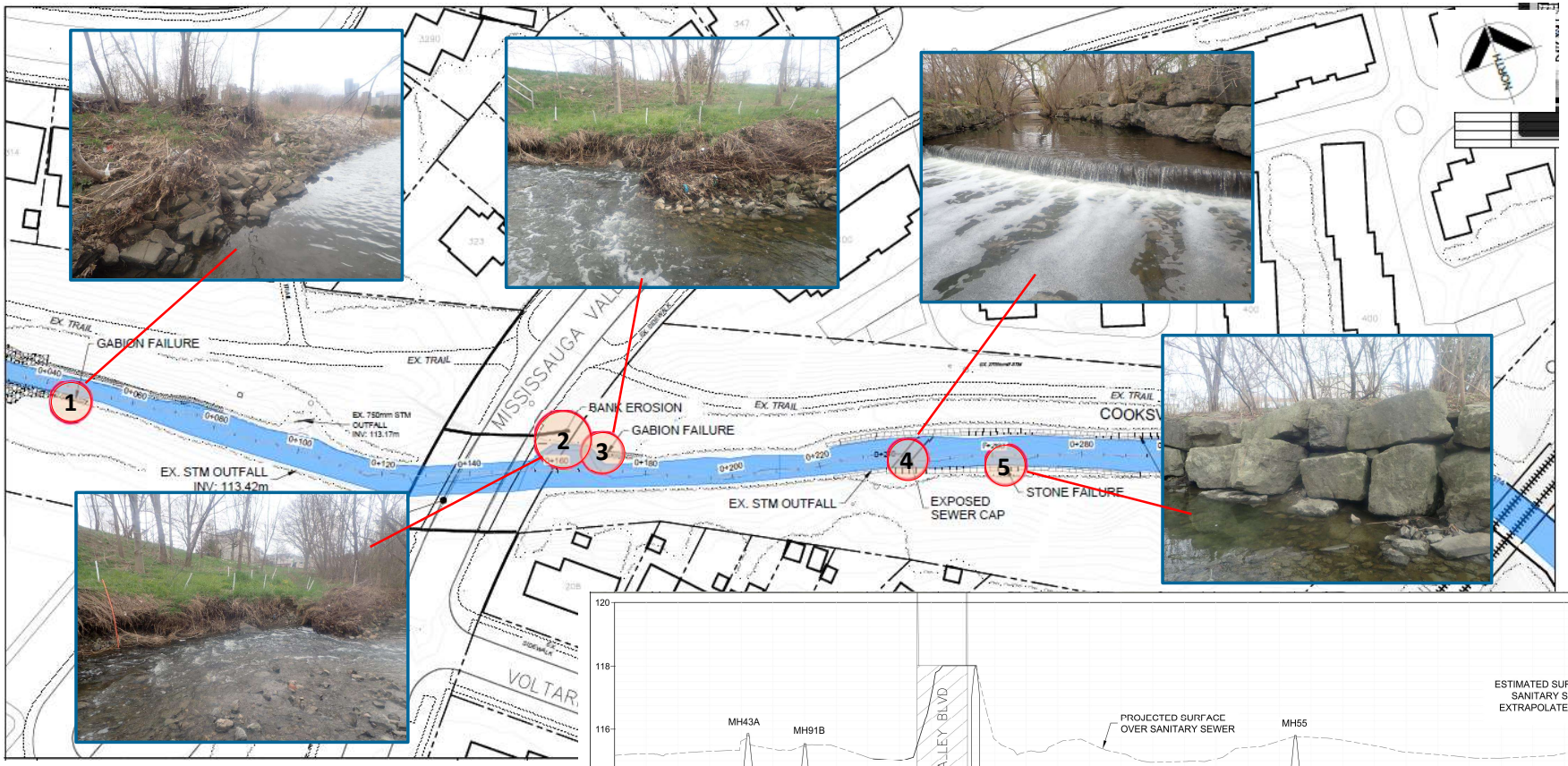
Study Objectives and Class EA Process

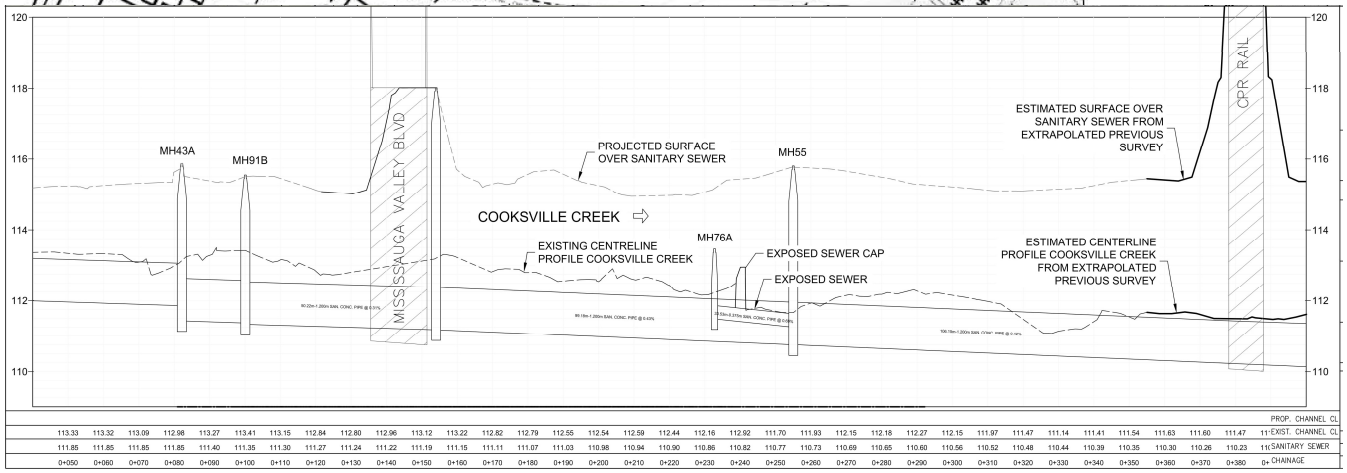


Identify Problem or Opportunity → Identify Potential Solutions → Inventory Natural, Social, Economic Environment → Identify Impacts of Alternatives → Evaluate Alternatives and Identify Solutions → Public Consultation → Select Preferred Solution

Phase 1 & 2 of the Class EA Process

Existing Study Area Conditions





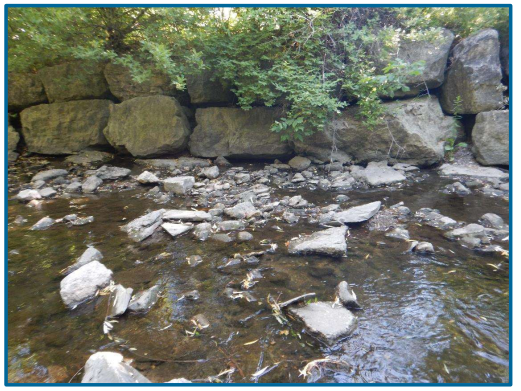
Existing Study Area Conditions

CHANNEL CONDITION

- There are two exposed concrete encased sanitary sewer crossings.
- Manholes are present a short distance from the creek banks.
- Bank treatments vary throughout the study area (armourstone, gabion) and are in a degraded state (eroded/failed, undercut, outflanked).
- Gabions under the concrete slabs below Mississauga Valley are failing; the concrete slabs are interfering with flow patterns and contributing to erosion.

GEOMORPHOLOGY

- Substrate on the creek bed includes locally exposed till (clayey), angular stone (riprap), shale fragments, and bedrock; the streambed is classified as gravel bed (D50 = 50 mm) based on the median grain size.
- The exposed sanitary sewers create backwater conditions/long pool; riffle features have developed in the creek.
- Overall, the creek has a relatively low grade (0.60%).
- The flow capacity for the creek is “bankfull flow” (60% of 2-year flow event); larger flows spill onto the floodplain.
- Hydraulic conditions in the creek result in stability for the largest stones, but anticipated mobility of most of the channel bed materials.



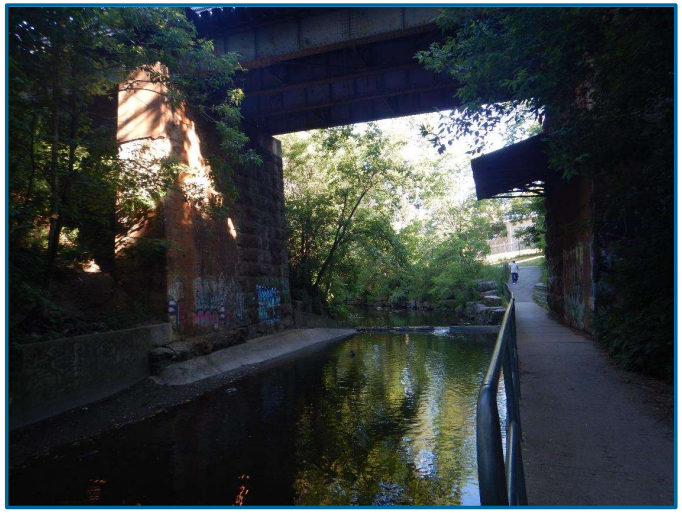
Existing Study Area Conditions

NATURAL ENVIRONMENT

- Field investigations completed during the spring and summer of 2022 include aquatic habitat assessment, Ecological Land Classification (ELC), vascular flora inventory, fauna inventory, species at risk screening, significant wildlife habitat screening, breeding bird surveys, incidental wildlife observations.
- Field observations did not identify any species at risk flora species.
- Breeding bird surveys identified the Eastern Wood Pewee (species of concern).

SOCIAL

- The site is situated on Mississauga property (Stonebrook Park and Richard Jones Park) and within a municipal sanitary sewer easement in City-owned parkland.
- A walking trail is located along the east bank; the asphalt is cracked and uneven in several locations.
- Previously undisturbed or minimally disturbed areas (grassed, treed) may have archaeological potential (to be further assessed).
- Private residential property occurs along the wooded City-owned lands on the west side of the creek.



Alternative Solutions Development

Alternative 1: Do Nothing

- No action taken to address the identified erosion issues.
- Always considered in an EA for comparative purposes.
- Continuation of ongoing erosion and risk to private property and municipal infrastructure is anticipated.

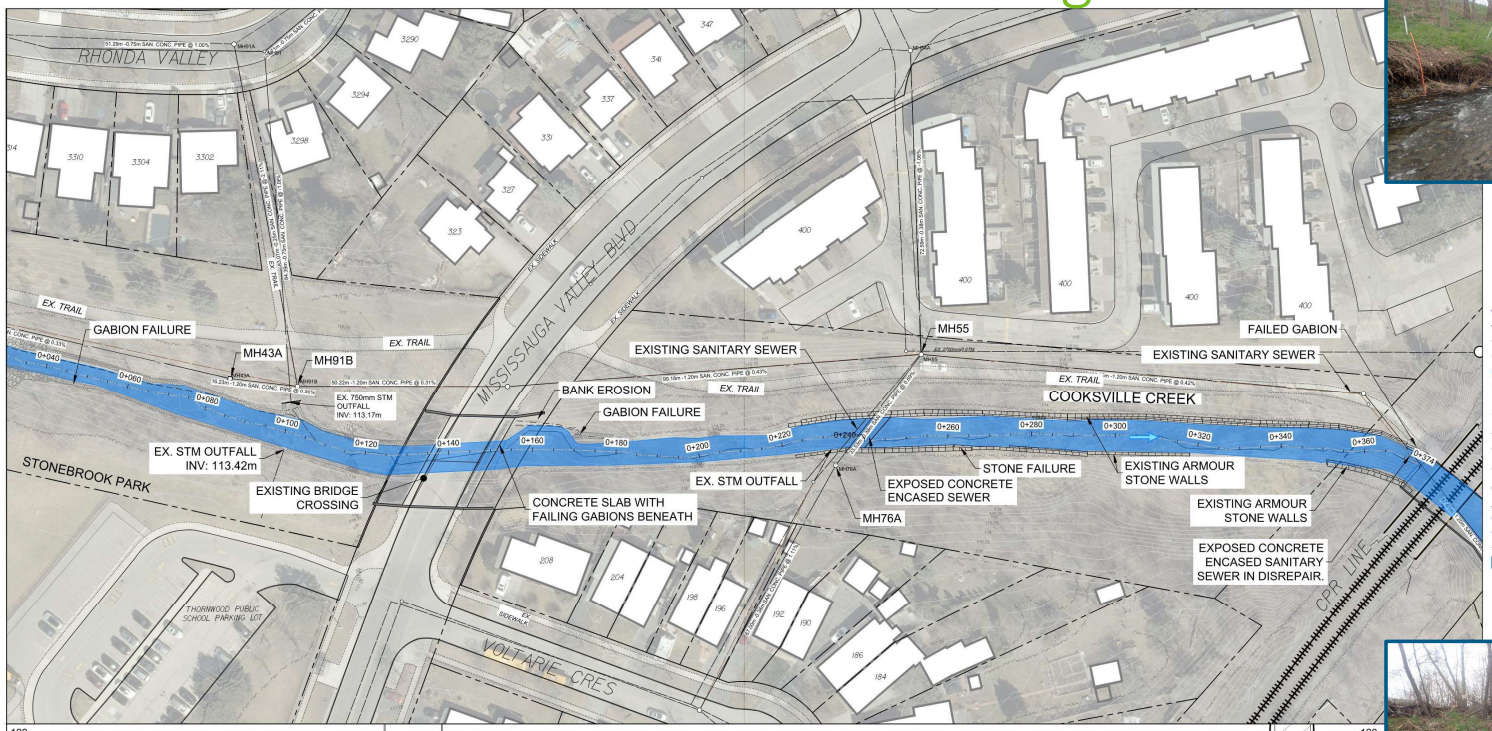
Alternative 2: Spot Repairs

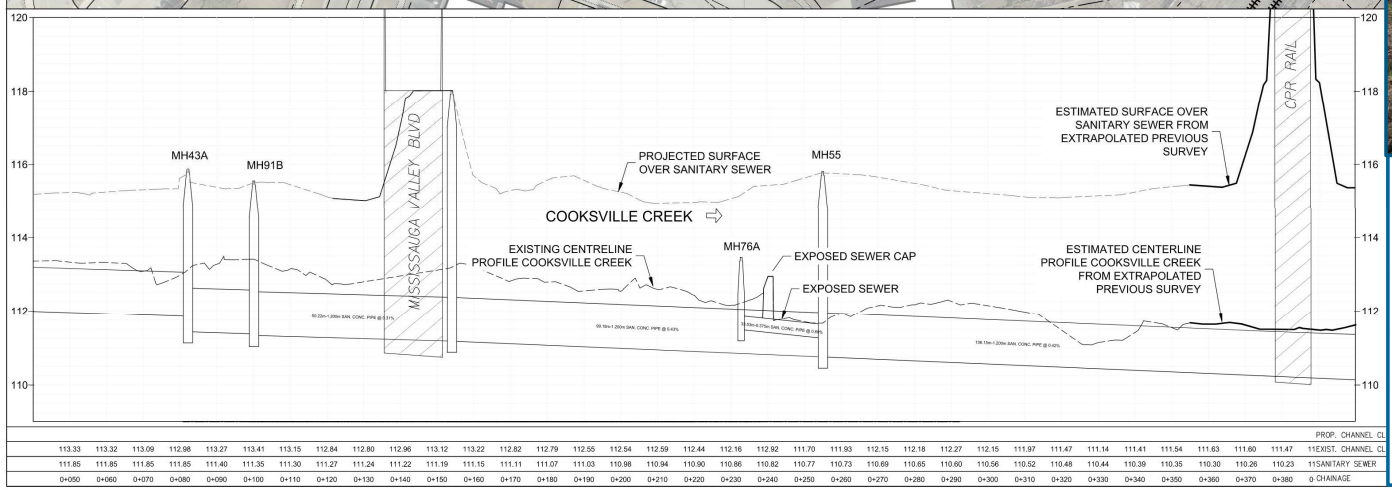
- Repair or replace failed gabions and/or large angular stone along creek banks.
- Repair or replace concrete lining.
- Protect the manholes that are at risk from channel widening.
- Protect sanitary sewer crossing.
- Replace or repair outfalls and associated structures.

Alternative 3: Channel Modification and Realignment

- Channel modifications to increase cross-section area.
- Realign channel away from trail where there is sufficient space.
- Protect sanitary sewer crossings.
- Incorporate repair/replacement of outfalls.
- Protect any manholes from channel processes.

Alternative 1 – Do Nothing





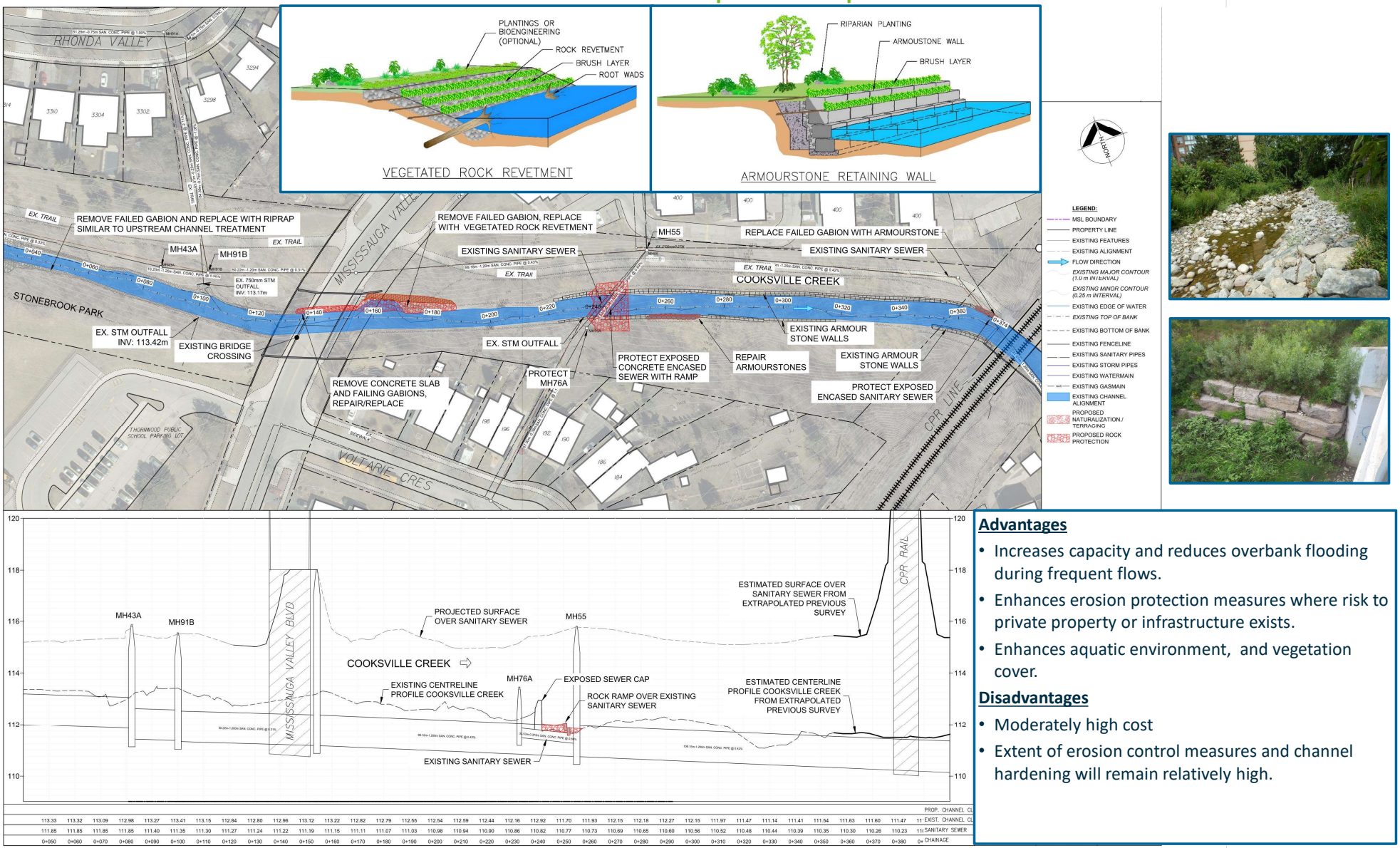
Advantages

- Low cost
- Continuation of natural channel processes
- Continuation of sediment supply

Disadvantages

- Risk to sanitary sewer infrastructure
- Long-term maintenance costs
- Risk to trail

Alternative 2 – Spot Repairs



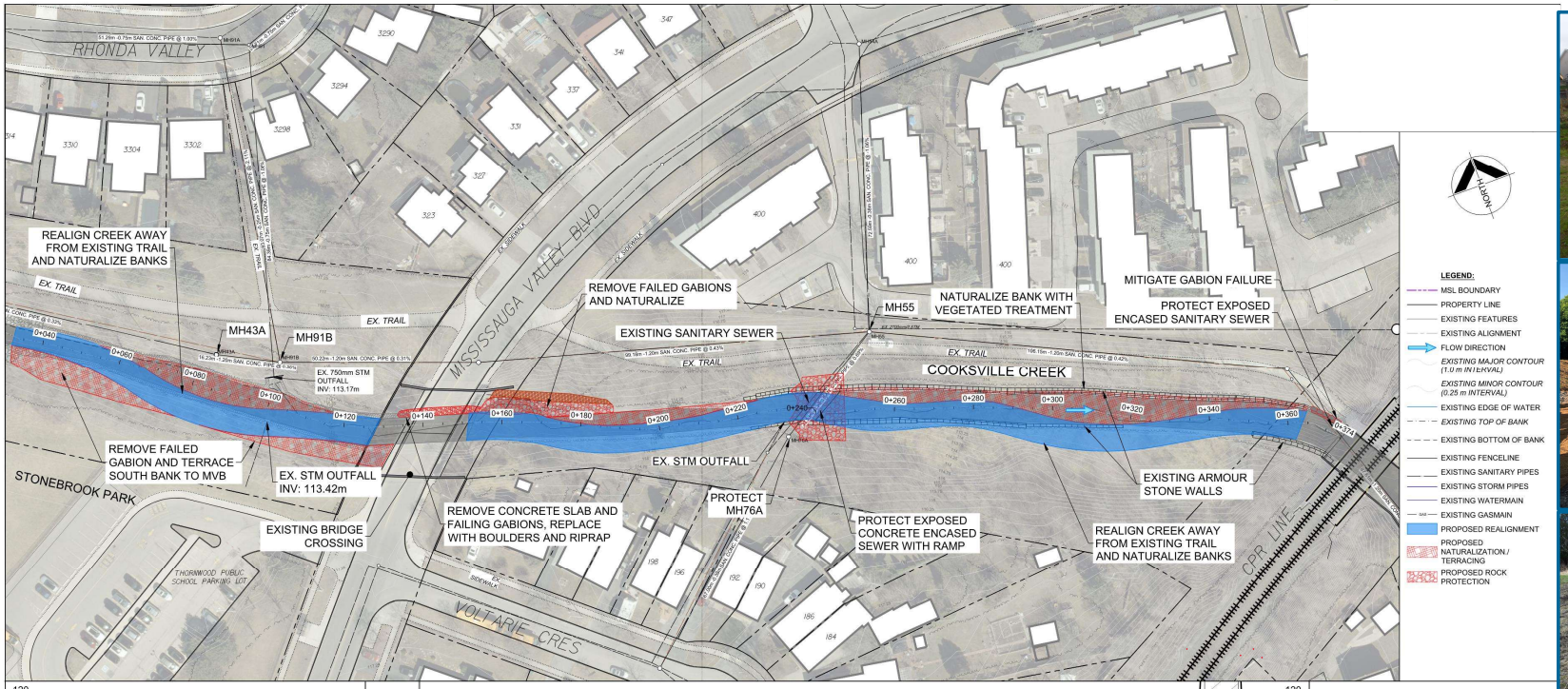
Advantages

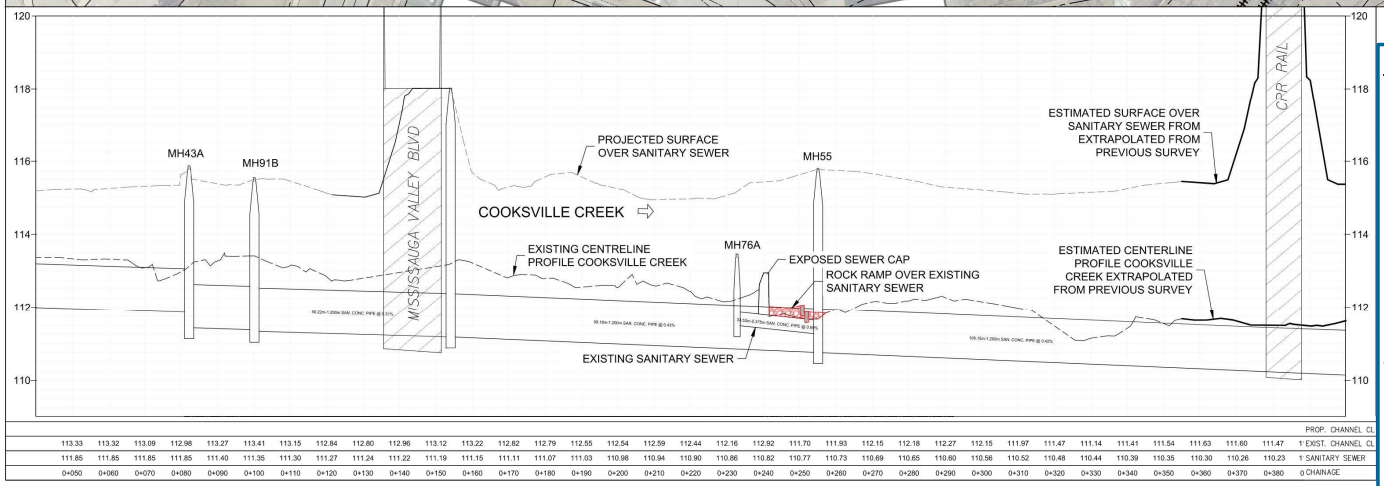
- Increases capacity and reduces overbank flooding during frequent flows.
- Enhances erosion protection measures where risk to private property or infrastructure exists.
- Enhances aquatic environment, and vegetation cover.

Disadvantages

- Moderately high cost
- Extent of erosion control measures and channel hardening will remain relatively high.

Alternative 3 - Channel Modifications/Realignment





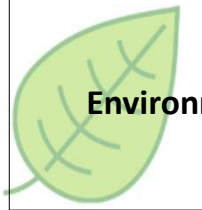
Advantages

- Reduces risk to sanitary sewer and associated infrastructure
- Replaces broken infrastructure (outfalls)
- Enhances vegetative buffer along channel banks
- Re-establishes natural channel profile and enhances planform where feasible
- Minimizes channel hardening

Disadvantages

- High cost
- Increase in footprint of channel; potential disruption of terrestrial habit with tree removal

Evaluation Criteria

Category	Criteria
 **Environment**	• Impact on aquatic habitat and species • Impact on terrestrial habitat and communities • Impact on Species at Risk (SAR) and associated habitat • Potential for enhancement
 **Technical**	• Erosion protection • Impacts to stream processes • Flood risk • Constructability • Construction impacts (temporary) – site access, noise, vibration, impacts to residents and businesses • Operation and maintenance
 **Social**	• Public health and safety • Protection of residents, buildings, and property • Aesthetics (vegetation removal, material placement, restoration) • Archaeological value • Indigenous communities
 **Economic**	• Flood damages • Construction cost (short term & long term) • Implementation costs • Operation and maintenance • Cost comparison

Next Steps

- Alternative Evaluation
- Selection of Preferred Alternative
- Project report

Contact Us

Elizabeth Dollimore, P.Eng., MBA.
Project Manager
City of Mississauga
300 City Centre Drive
Mississauga, ON L5B 3C1
Tel: (905) 615-3200 ext. 5303

Email: Elizabeth.Dollimore@mississauga.ca

Mariëtte Pushkar, M.Sc., P.Geo.
Project Manager
Matrix Solutions Inc.
171 Victoria Road
Kitchener, ON N2G 2T8
Phone: (519) 621-1500

Email: mpushkar@matrix-solutions.com

MISSISSAUGA

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Mississauga Municipal Class Environmental Assessment Study, Cooksville Creek Erosion Control Project, Mississauga Valley Boulevard to Canadian Pacific Railway
Public Information Centre Comment Form

1. Full Name:

2. Email Address:

3. Are you a:

- ☐ homeowner or tenant living near Cooksville Creek
- ☐ member of the general public
- ☐ member of an interest group
- ☐ consultant
- ☐ agency representative
- ☐ other

4. Would you like to be added to the project mailing list to receive future notifications?

◯ Yes ◯ No

5. The study team has identified spot repairs as an alternative (Alternative 2), which includes local channel modifications to address failing bank treatments and manage flow conditions.

   Do you have any comments or concerns regarding this recommended alternative?

6. The study team has identified channel modifications and realignment as an alternative (Alternative 3), which would consider the modification and potential realignment of the channel position to address the erosion issues identified.

   Do you have any comments or concerns regarding this recommended alternative?

7. Do you have any comments or concerns regarding the information presented on the existing conditions within the study area? Please specify:

8. This study is being conducted as a Schedule B Municipal Class Environmental Assessment. Do you have any questions about the Municipal Class Environmental Assessment process? Please specify:

9. Do you have any other comments or questions regarding this study?

Thank you for taking the time to participate in the Environmental Assessment process.

Please return your completed form to:

Elizabeth Dollimore, P.Eng., MBA, Project Manager, City of Mississauga at:
Elizabeth.Dollimore@mississauga.ca

or

Mariëtte Pushkar, M.Sc., P.Geo., Consultant Project Manager, Matrix Solutions Inc. at:
mpushkar@matrix-solutions.com

City of Mississauga Municipal Class Environmental Assessment Study, Cooksville Creek Erosion Control Project, Mississauga Valley Boulevard to Canadian Pacific Railway
Public Information Centre Comment Form

1. Full Name: Brian Pike

2. Email Address: brianjpike@gmail.com

3. Are you a:

- [x] homeowner or tenant living near Cooksville Creek
- [ ] member of the general public
- [ ] member of an interest group
- [ ] consultant
- [ ] agency representative
- [ ] other

4. Would you like to be added to the project mailing list to receive future notifications?

(●) Yes ( ) No

5. The study team has identified spot repairs as an alternative (Alternative 2), which includes local channel modifications to address failing bank treatments and manage flow conditions.

   Do you have any comments or concerns regarding this recommended alternative?

6. The study team has identified channel modifications and realignment as an alternative (Alternative 3), which would consider the modification and potential realignment of the channel position to address the erosion issues identified.

   Do you have any comments or concerns regarding this recommended alternative?

7. Do you have any comments or concerns regarding the information presented on the existing conditions within the study area? Please specify:

8. This study is being conducted as a Schedule B Municipal Class Environmental Assessment. Do you have any questions about the Municipal Class Environmental Assessment process? Please specify:

9. Do you have any other comments or questions regarding this study?

My major concern is the protection of the mature trees on the east bank of the creek. Any work that is done should include measures to protect them. Cutting them down and replanting afterwards is not good enough.

As a local resident I would also appreciate it if the city took steps to control the rats that will be

Thank you for taking the time to participate in the Environmental Assessment process.

Please return your completed form to:

Elizabeth Dollimore, P.Eng., MBA, Project Manager, City of Mississauga at:
Elizabeth.Dollimore@mississauga.ca

or

Mariëtte Pushkar, M.Sc., P.Geo., Consultant Project Manager, Matrix Solutions Inc. at:
mpushkar@matrix-solutions.com

City of Mississauga Municipal Class Environmental Assessment Study, Cooksville Creek Erosion Control Project, Mississauga Valley Boulevard to Canadian Pacific Railway
Public Information Centre Comment Form

1. Full Name: John MacInnis

2. Email Address: johnnymachspeed@gmail.com

3. Are you a:

- [x] homeowner or tenant living near Cooksville Creek
- [ ] member of the general public
- [ ] member of an interest group
- [ ] consultant
- [ ] agency representative
- [ ] other

4. Would you like to be added to the project mailing list to receive future notifications?

(●) Yes ( ) No

5. The study team has identified spot repairs as an alternative (Alternative 2), which includes local channel modifications to address failing bank treatments and manage flow conditions.

Do you have any comments or concerns regarding this recommended alternative?

Spot repairs are needed for the four houses on Voltaire Cres., the back yards will need erosion control, other than that the rest of the study area is fine.

6. The study team has identified channel modifications and realignment as an alternative (Alternative 3), which would consider the modification and potential realignment of the channel position to address the erosion issues identified.

Do you have any comments or concerns regarding this recommended alternative?

Realignment is not necessary, the channel position looks great.

7. Do you have any comments or concerns regarding the information presented on the existing conditions within the study area? Please specify:

The study area north of Mississauaga Valley just completed erosion and flooding control two years ago and still looks great. The issues are minimal (four backyards on Voltaire cres.)

8. This study is being conducted as a Schedule B Municipal Class Environmental Assessment. Do you have any questions about the Municipal Class Environmental Assessment process? Please specify:

9. Do you have any other comments or questions regarding this study?

From Kirwin Ave to Resolute Dr. the city has done a great job for the last ten years with flooding and erosion control issues . My family walk along the creek several times a week.

Thank you for taking the time to participate in the Environmental Assessment process.

Please return your completed form to:

Elizabeth Dollimore, P.Eng., MBA, Project Manager, City of Mississauga at:
Elizabeth.Dollimore@mississauga.ca

or

Mariëtte Pushkar, M.Sc., P.Geo., Consultant Project Manager, Matrix Solutions Inc. at:
mpushkar@matrix-solutions.com

City of Mississauga Municipal Class Environmental Assessment Study, Cooksville Creek Erosion Control Project, Mississauga Valley Boulevard to Canadian Pacific Railway
Public Information Centre Comment Form

1. Full Name: John MacInnis

2. Email Address: johnnymachspeed@gmail.com

3. Are you a:

- [x] homeowner or tenant living near Cooksville Creek
- [ ] member of the general public
- [ ] member of an interest group
- [ ] consultant
- [ ] agency representative
- [ ] other

4. Would you like to be added to the project mailing list to receive future notifications?

(●) Yes ( ) No

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Do you have any comments or concerns regarding this recommended alternative?

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Please return your completed form to:

Elizabeth Dollimore, P.Eng., MBA, Project Manager, City of Mississauga at:
Elizabeth.Dollimore@mississauga.ca

or

Mariëtte Pushkar, M.Sc., P.Geo., Consultant Project Manager, Matrix Solutions Inc. at:
mpushkar@matrix-solutions.com

Hydro One Networks Inc.

483 Bay Street
8th Floor South Tower
Toronto, Ontario M5G 2P5

HydroOne.com

June 19, 2023

Re: Cooksville Creek Erosion Control Mississauga Valley Boulevard to the CP Railway

Attention:
Elizabeth Dollimore P.Eng., MBA
Project Manager
City of Mississauga

Thank you for sending us notification regarding (Cooksville Creek Erosion Control Mississauga Valley Boulevard to the CP Railway). In our assessment, we confirm there are no existing Hydro One Transmission assets in the subject area.

If plans for the undertaking change or the study area expands beyond that shown, please contact Hydro One to assess impacts of existing or future planned electricity infrastructure.

Any future communications are sent to Secondarylanduse@hydroone.com.

Be advised that any changes to lot grading and/or drainage within proximity to Hydro One transmission corridor lands must be controlled and directed away from the transmission corridor.

Sent on behalf of,

Secondary Land Use
Asset Optimization
Strategy & Integrated Planning
Hydro One Networks Inc.

From	Comment
Region of Peel Public Works	**Built Environment Team, Chronic Disease and Injury Prevention – Kayle McMillen** As part of the social evaluation criteria for the Cooksville Creek Erosion Control Project, please consider the potential health benefits of residents who walk along the trail for recreation or transportation purposes as well as mitigating any safety risks. Public Health would support alternative designs that maintain or increase access to and accessibility of the trail to increase opportunities for residents to be physically active on a daily basis.
Resident	• As a consequence to the previous restoration work that was undertaken immediately upstream of the current study area, naturalization efforts led to the excessive growth of weeds (up to 5 feet tall) that have encroached into the backyards of adjacent residential homes. • The grassy vegetation used to be maintained by the City, but is no longer mowed. City should maintain vegetation buffers between walkway and backyards (i.e., not allow 4 – 5 ft high vegetation growth). • Vegetation (trees, shrubs) that had been planted as part of previous naturalization efforts were not properly watered and died. These have not been replaced and now a rock lined channel exists which is in contrast to the beautiful park setting that was in the area. • Previously, trees that had fallen into the creek caused blockage and local flooding; while tree fall is natural, any blockage in the creek contributes to flooding. • Any plantings should not contribute to weed encroachment into backyards.

Mariëtte Pushkar

From: Ahmad, Iftekhar <Iftekhar.Ahmad@cvc.ca>
Sent: November 4, 2022 1:08 PM
To: Mariëtte Pushkar
Cc: Elizabeth Dollimore; Liam Connolly
Subject: [External] CVC Comments (Notice of Commencement) - EA 22/005 - Cooksville Creek Erosion Control Project (Mississauga Valley Boulevard to CP Railway)

Hi Mariette,

CVC staff have now had the opportunity to review the Notice of Commencement (NOC) and provide these high level preliminary comments for your consideration.

CVC Comments

1. It is our understanding that the City through its ongoing erosion monitoring program recognizes the need for rehabilitation of the section of Cooksville Creek from Mississauga Valley Boulevard to CP Railway to address the existing erosion issues and therefore is currently undertaking the Schedule B Municipal Class Environmental Assessment study for the proposed erosion control and restoration works within the specified reach.

2. Here are the site characteristics of the subject study area based on CVC mapping.

    a. REGULATED AREA - The study area is located entirely within CVC's Regulated Area. A permit from CVC will be required for any grading or construction works within this area.

    b. WATERCOURSE - The study area is traversed by Cooksville Creek. Any alteration to a watercourse requires a permit from CVC. Our concerns for new construction would be to address the existing channel bank erosion, sediment control during construction, and to ensure no degradation to water quality.

    c. FLOODPLAIN - The study area is located within the regulatory storm floodplain associated with Cooksville Creek. A permit will be required from CVC for any construction activity in this area. Our primary concern is the protection of life and property from flood hazard. We have specific criteria and requirements for construction in the floodplain.

    d. VALLEY SLOPE - The study area is traversed by valley slope. Our primary concerns are to protect the environmental integrity of the valley system and to ensure that slope stability is addressed in the proposed erosion control works if any disturbance to the valley slope is proposed.

    e. MUNICIPAL GREENLANDS - The study area is within an area designated as Core Greenlands by the Region of Peel. It is the policy of the Region of Peel to protect the form and function of these natural areas. CVC provides technical support to this agency with respect to delineation of natural features and reviewing potential impacts from subsequent development within and adjacent to these lands.

    f. SIGNIFICANT WILDLIFE HABITAT - The study area is located within the Significant Wildlife Habitat.

    g. MISSISSAUGA NATURAL HERITAGE SYSTEM & NATURAL AREAS SURVEY - The study area is located within the City of Mississauga's Natural Heritage System and Urban Forest. The City's Natural Heritage System is made up of Significant Natural Areas, Natural Green Spaces, Special Management Areas, Residential Woodlands and Linkages as described in the City's Official Plan. The study area is also located within the City's Natural Areas Survey and designated as Significant Natural Site (MY3 & CV12). CVC provides technical support to the City with respect to the identification and delineation

of the natural heritage features or areas as well as reviewing proposals for potential negative impacts to the natural features or areas.

h. CREDIT RIVER WATERSHED NATURAL HERITAGE SYSTEM (CRWNHS) - The study area is located within the CRWNHS. The CRWNHS consists of High Functioning and Supporting terrestrial and aquatic natural heritage features, buffers, and complementary natural heritage areas (Centres for Biodiversity). Based on a watershed scale, the CRWNHS is intended to support Provincial, Regional and local municipal natural heritage systems as identified in their respective Strategies or Plans. As a watershed based management agency and landowner, CVC intends to implement the CRWNHS by using it as a strategic program guidance tool; to inform further development of CVC projects and policies; to assist CVC staff in providing technical advice to landowners and stakeholders on a watershed scale; and to promote a more consistent approach to natural heritage system planning across CVC's jurisdiction.

3. The extent of the proposed erosion control works are unclear at this time (based on the limited information provided in the NOC). Please note that hydraulic analysis demonstrating no negative impact to the floodplain on private properties will be required in support of the proposed erosion control works that will involve alteration (cut/fill) within the floodplain and/or channel. The hydraulic analysis will be completed by a qualified water resources engineer and will include the following:

   a. Cut/fill balance calculations.

   b. CVC's HEC-RAS model for the existing conditions with a comparison to the updated existing and the modelled proposed conditions. Since this reach is a boundary between 1D and 2D models, both will need to be updated.

   c. Technical memo summarizing the findings of the cut/fill balance and hydraulic assessment.

   The detailed requirements about the above can be found at: https://cvc.ca/wp-content/uploads//2021/06/rpt_TechnicalGuidelines-Floodproofing_v2_20201112.pdf. It is recommended that pre-consultation with CVC staff be completed prior to commencing any hydraulic analysis to discuss the submission expectations.

4. There are valley slopes which have slope heights greater than 2 m with slope inclinations shallower than 3:1. There are portions of the channel which have become incised due to the ongoing toe erosion. This could lead to future slope instability and should be considered in the EA. Please identify the current state of toe erosion through the study reach, and any associated locations susceptible to slope failure. Please note that the geotechnical investigation and slope stability analysis would be required if the proposed works involve disturbing or altering the valley slope, and/or altering the slope hazard (by any potential channel restoration works). A slope stability analysis is to be completed in accordance with CVC's Slope Stability Guideline at https://cvc.ca/wp-content/uploads//2021/06/Slope-Stability-Determination-Guidelines.pdf. Additional comments regarding the slope stability may be provided at the detailed design stage. It is recommended that pre-consultation with CVC staff be completed prior to commencing any geotechnical work.

5. At this time, it is unclear whether the proposed erosion control works would involve any channel realignment and/or significant bank modification. Please note that an erosion hazard assessment may be required depending on the extent of the proposed erosion control works. Please note that the erosion assessment is to establish both the existing and proposed conditions erosion hazard limits to demonstrate that the proposed works do not result in the offsite impacts to the neighboring properties. Please also consider how the proposed erosion control works will be tied into the existing reach at the downstream limit of study. CVC has noted deposition and scour issues at the current transition point upstream of Mississauga Valley Boulevard. It is recommended to consult with CVC staff prior to commencing the erosion hazard assessment for the submission expectations.

6. The proposed erosion control project is located in a warmwater fish community reach of Cooksville Creek. To ensure protection of the aquatic community and minimize impacts to fish passage, please consider the following:

    a. The proposed work should be completed within the warmwater timing window (July 1 to March 31), in dry weather, and with a comprehensive ESC plan in place. This should be noted in any natural heritage/fisheries report prepared as part of the project.

    b. Taking a sensitive and green approach to the project is most recommended to ensure that fish habitat, passage, and instream cover are accounted for and enhanced where possible. Please refer to CVC's Fish and Wildlife Crossing Guideline for more information.

    c. Eliminate or minimize energy dissipation drop structures (e.g. armourstone or equivalent) to the extent feasible. Ideally, slopes within the watercourse will be no more than 3%, and a maximum of 5%.

    d. Consider hydraulic fish passage criteria and natural channel design principles in the design of the channel.

    e. Where possible, please consider softer bank stabilization techniques throughout the reach. This will contribute to water quality and habitat enhancement while meeting the project goal (erosion control).

7. CVC strongly recommends that the project footprint be minimized to the extent possible and trees not be removed. Any ecological loss of the trees will be offset using CVC's Ecosystem Offsetting Guideline. Please consult CVC's Plant Selection Guidelines and indicate the location of the plantings on the applicable Restoration Plans at the detailed design stage. CVC strongly recommends any trees that are removed be re-planted along the riparian edge to increase canopy cover and contribute to stream shading.

8. If soil amendments are warranted, please consult CVC's Healthy Soils Guideline for recommendations.

9. Please be aware of the updates to and requirements of the Migratory Birds Convention Act which governs the protection and conservation of migratory birds within Canada. It is the proponent's responsibility to adhere to all pertinent laws, regulations and permit requirements including but not restricted to the Migratory Birds Convention Act and the Migratory Birds Regulations. To protect birds and bats and avoid contravention of the Migratory Birds Convention Act and Endangered Species Act, CVC recommends that vegetation clearing be avoided between April 1 and September 30 of a given year. Further information on the general nesting periods of migratory birds in Canada can be found at https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html.

10. Given that the works are proposed in or near water, it is the responsibility of the proponent to ensure that works, undertakings or activities do not cause the death of fish or cause the harmful alteration, disruption or destruction of fish habitat under the *Fisheries Act*. Please review the complete list of measures to avoid harm at http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html and implement those that are applicable to the proposed works. If it is not possible to avoid or mitigate impacts, the proponent can submit a request for review form to its region's Fish and Fish Habitat Protection Program office (via fisheriesprotection@dfo-mpo.gc.ca or 1 855 852-8320). Please refer to the Fisheries and Oceans Canada (DFO) website for additional information.

11. Please contact relevant agencies (MNDMNRF, MECP, DFO) for any necessary mitigation opportunities and permit requirements regarding fish, wildlife, and Species at Risk, as appropriate.

Given our interest in the proposed project, CVC staff would like to be kept informed of future meetings and proceedings throughout the EA study. We also request to be invited to participate on any Technical Advisory Committee that may be formed for this EA. Please forward any information or reports when available to ensure that this Authority's policy and program interests are reflected in the planning and design components of the project. CVC's EA review fee for this project is $5,920 plus any applicable future permit fees. CVC will issue an invoice to the attention of City's PM (Elizabeth Dollimore) shortly.

If you have any questions, please let me know.

Thanks, have a great weekend.

Best regards,
Iftekhar

I'm working remotely. The best way to reach me is by email or Microsoft Teams.

Iftekhar Ahmad | he/him/his
Planner, Environmental Assessment | Credit Valley Conservation
905-670-1615 ext 296 | M: 647-449-5962
iftekhar.ahmad@cvc.ca | cvc.ca

Credit Valley Conservation
inspired by nature

2022 CANADA'S GREENEST EMPLOYERS

GREATER TORONTO'S TOP 2022 EMPLOYERS

From: Liam Connolly <LConnolly@matrix-solutions.com>
Sent: Thursday, September 29, 2022 9:54 AM
Subject: [External] Cooksville Creek Erosion Control Project Class EA - Notice of Commencement

September 29, 2022

Hello,

On behalf of the City of Mississauga, this email provides with the Notice of Commencement for the Cooksville Creek Erosion Control Project Municipal Class Environmental Assessment (EA), between Mississauga Valley Blvd and the CP Rail line. If you have any questions or concerns about the project, please don't hesitate to get in touch with the Project Managers (contact information provided in attachment).

If you with to be removed from this mailing list, please let me know.

Thank you,

Liam Connolly E.I.T.

MATRIX SOLUTIONS INC. | Environment & Engineering
171 Victoria St. N, Kitchener, ON, N2H 5C5
www.matrix-solutions.com

Mariëtte Pushkar

From: Ahmad, Iftekhar <Iftekhar.Ahmad@cvc.ca>
Sent: December 21, 2022 4:17 PM
To: Mariëtte Pushkar
Cc: Elizabeth Dollimore; Karen Hofbauer; Kierian Keele; Jeff Prince
Subject: [External] CVC Comments (site meeting minutes including potential alternatives) - EA 22/005 - Cooksville Creek Erosion Control Project (Mississauga Valley Boulevard - CP Rail)

Hi Mariette,

Thank you for providing the minutes of the site meeting held on December 6, 2022. Here are our high level comments on the minutes for your consideration at this time.

CVC's High Level Comments

1. The minutes refer to meeting#3 – site walk, while this is our first site meeting with you/City. Could you please clarify the number?

2. CVC staff would not support the creek realignment option just to protect the trail but could be in a position to support for other reasons (noted in the minutes) subject to a comprehensive evaluation of the alternatives to the satisfaction of CVC.

3. Please provide details in the EA on how the existing elevated concrete pads/slabs with undercutting and interfering with flows underneath the Mississauga Valley Boulevard bridge will be addressed to improve the flow dynamics. It is our understanding through site discussion that no changes to the bridge structure are proposed as part of the EA. Please clarify the scope of work at this crossing and also confirm if the concrete pads/slabs are integral to the bridge structure.

4. Please show on the drawings the correct sewer alignment at the CP Railway crossing as there appears to be some discrepancy with the survey provided to us during the site meeting.

5. Scour assessment will be required for the remediation of the exposed sanitary sewers at/upstream of the CP Railway crossing. This assessment should inform the cover required to protect the infrastructure. Please use CVC's Fluvial Geomorphic Guidelines – Factsheet VI Scour Analysis for the scour assessment. Please also comment if the proposed cover will address the scour hazard on a short-term basis or a long-term basis (specify planning horizon). Please discuss scour assessment in the EA including commitment to complete it at the detailed design stage.

6. Tie-in of the subject reach with the engineered channel upstream (previously completed) is essential to alleviate the existing erosion hazard. Please clearly state the method to tie into the upstream channel and avoid replicating the magnitude of the channel hardening at this location.

7. CVC staff recommend that watercourse connection to the floodplain be considered as a goal of the project in all alternatives, where feasible.

8. In response to your question about counting all the shrubs and trees less than 5cm DBH, please note that the amount of offsetting recommended for understory and non-forested vegetation can be estimated. Please see Appendix E of CVC's Ecosystem Offsetting Guideline for the area percentage charts to aid with estimating the percent cover.

Please consider in the EA the above-mentioned comments (2-8) and also the comments provided on the Notice of Study Commencement on November 4, 2022 including information on the flood and slope/erosion hazards assessment.

If you have any questions, please let me know.

Thanks and have a great holiday break.

Best regards,
Iftekhar

I'm working remotely. The best way to reach me is by email or Microsoft Teams.

Iftekhar Ahmad | he/him/his
Planner, Environmental Assessment | Credit Valley Conservation
905-670-1615 ext 296 | M: 647-449-5962
iftekhar.ahmad@cvc.ca | cvc.ca

From: Mariëtte Pushkar <mpushkar@matrix-solutions.com>
Sent: Friday, December 9, 2022 12:08 PM
To: Ahmad, Iftekhar <Iftekhar.Ahmad@cvc.ca>
Cc: Elizabeth Dollimore <Elizabeth.Dollimore@mississauga.ca>; Karen Hofbauer <khofbauer@matrix-solutions.com>; Kierian Keele <kkeele@matrix-solutions.com>; Jeff Prince <jprince@matrix-solutions.com>
Subject: [External] Cooksville Creek EA- Site Meeting Minutes

Hello Iftekhar,

Please see attached draft meeting minutes, including a summary of the alternatives in the attached.

Kindly provide any edits to the minutes at your earliest convenience.

We look forward to receiving the high level input regarding the project and alternatives within the next few weeks.

Thanks,

Mariëtte

Mariëtte Pushkar, M.Sc., P.Geo
Senior Fluvial Geomorphologist
(Cell: 226.220.3835)

Ecosystem Recovery Inc. has joined Matrix Solutions Inc.
Click to learn more about the merger

171 Victoria St. N.
Kitchener, ON N2H 5C5
Tel: (519) 621-1500
www.matrix-solutions.com

Mariëtte Pushkar

From: Ahmad, Iftekhar <Iftekhar.Ahmad@cvc.ca>
Sent: March 14, 2024 1:33 PM
To: Mariëtte Pushkar
Cc: Elizabeth Dollimore; Jeff Prince; Karen Hofbauer
Subject: [External] CVC Comments - EA 22/005 - Cooksville Creek Erosion Control Project (Mississauga Valley Boulevard to CP Rail)
Attachments: Plant-Selection-Guideline-FINAL-APRIL-24th-2018.pdf; rpt_Buffer Planting Guide_CVC_v1_2023.pdf; rpt_CVCEcoOffset_FINAL_20200313_na.pdf; CVC-Fish-and-Wildlife-Crossing-Guidelines-final-web_na.pdf; CVC-Healthy-Soils-Guidelines-NHS-Web-V5.pdf; CVC Parameters.pdf; 2021.04.07-StandardNotesforDrawingsSubmittedforCVCReview.pdf

Hi Mariette,

Appreciate your patience as we completed our review of your current submission.

CVC staff have now had the opportunity to review the draft Project File Report (February 2024) and modeling, and provide these comments for your consideration.

General Comments

1. Please provide the following information in the Erosion and Sediment Control (ESC) plans at the detailed design stage:

    a. Please clearly define the limit of disturbance within the area of the proposed works and incorporate appropriate silt control measures.

    b. The plans should include ESC measures for each stage of construction as necessary, flow diversion, dewatering, cofferdam location or other work area isolation measures, construction access and staging, and material stockpiling areas.

    c. The plans should include detailed construction sequencing for the proposed works.

    d. The ESC measures should be installed in accordance with the Ontario Provincial Standard Drawings (OPSDs).

    e. Please review the "Standard notes for drawings submitted for CVC review (attached)" and apply them to the ESC plans, as necessary.

2. The final drawings and technical reports must be signed and stamped by a registered Professional Engineer / qualified professionals and submitted to CVC prior to the issuance of CVC permit.

Engineering Comments

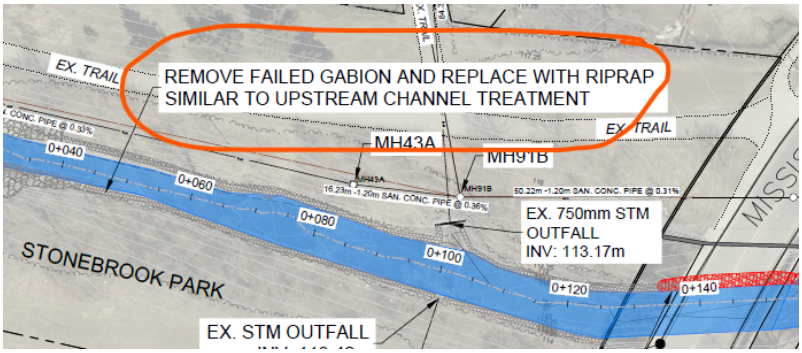
3. It is noted in table 8 (potential alternatives evaluation matrix) of the report that that there would be no impact to the flood hazard (specifically the regional flood elevation) for the alternatives 2 and 3. A similar statement is provided in section 7.2. Please confirm if the

proposed rocky ramp over the existing sanitary sewer between the stations 0+240 and 0+250 will result in any localized impacts to the flood hazard.

4. Please note that for the preferred alternative, CVC staff will not accept any unjustified increases in the flood hazard greater than 5 cm for any storm event that is not bound within the channel.

5. Please ensure that any adjusted modelling parameters match those outlined in CVC's standard parameters (attached).

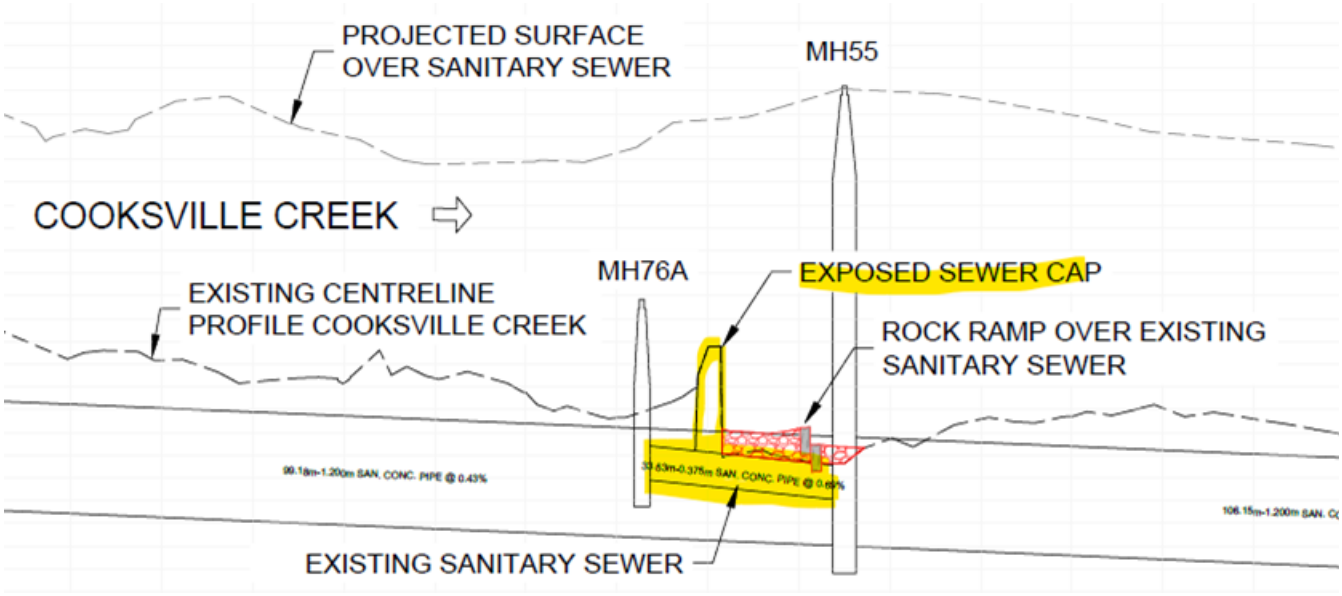
6. It is noted in the report that preference will be given to the softer bioengineered measures rather than the harder measures. Please discuss if a softer approach such as a vegetated rock revetment can be used at the upstream tie-in to the existing channel design (marked in circle in the image below). Please provide adequate justification why the harder measures are required at the specific locations.



7. It is our understanding that the rocky ramp is proposed to protect the existing sanitary sewer between the stations 0+240 and 0+250 as shown in Figure 9 of the report. It is also our understanding that the proposal of the rocky ramp to protect the sewer will be discussed with Region of Peel as part of the EA process. However, we will require the following information to better understand the proposed works shown in Figure 9 for this sewer crossing.

   a. Please clarify why the rocky ramp extends over the armourstone banks.

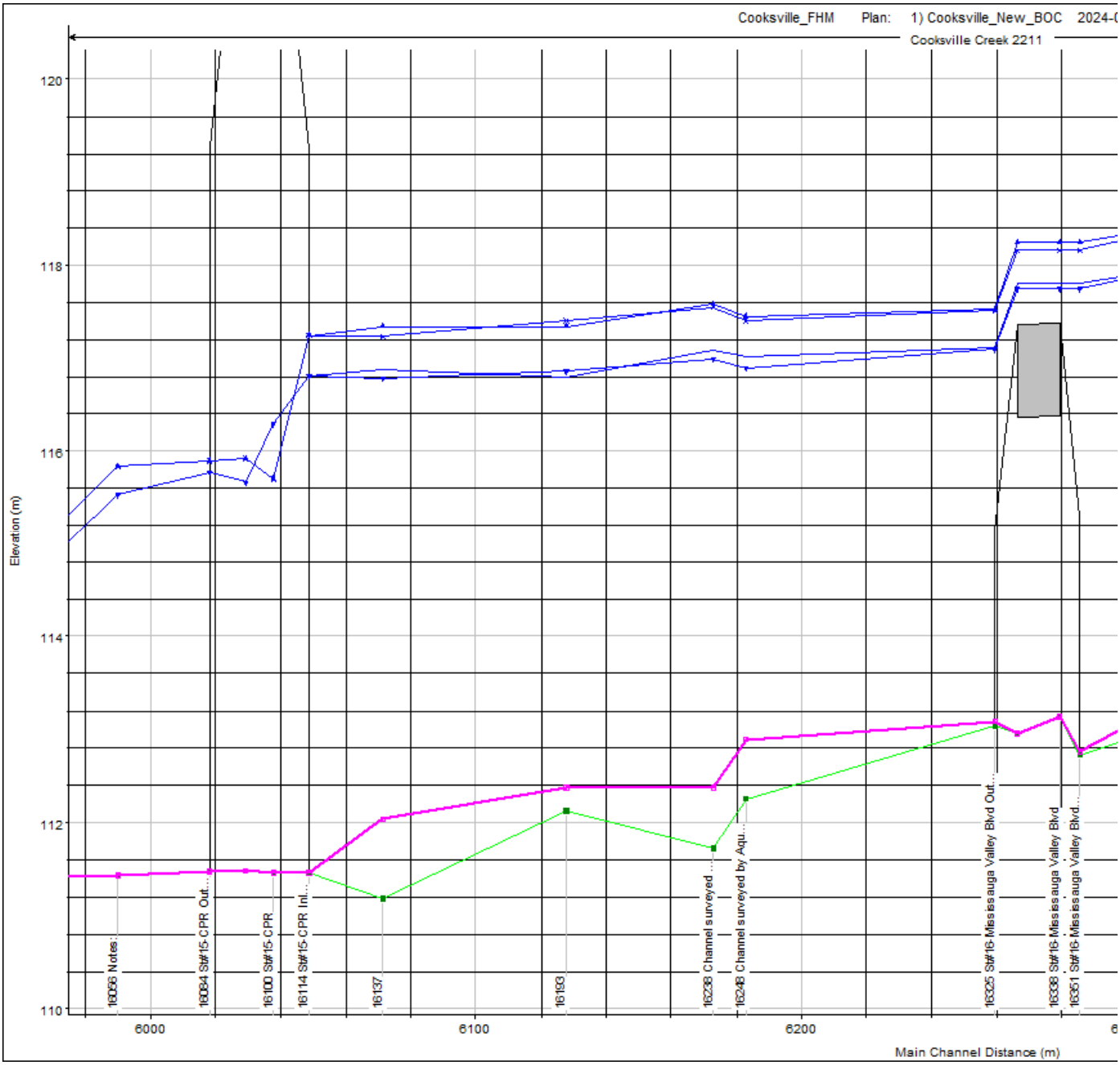
   b. The exposed sewer cap is shown in the profile view but not in the plan view. It also appears that the sewer cap is not properly shown in the profile view. Our understanding is that the sewer cap should be shown covering the entire pipe section shown in the profile view (see image below). Please clarify and update the figure, as necessary.



c. The armourstones are shown in the profile view as a feature within the rocky ramp but are not included in the plan view. Please update the figure, as necessary.

d. Please confirm if the proposed works will provide long-term or short-term protection of the existing sanitary sewer.

8. There are considerable differences in the channel bed elevation between Mississauga Valley Boulevard and the CPR. Please confirm that the New BOC model accounts for all the present day scour throughout the study reach.



9. Please state all relevant modelling information (datum, date of last update modeller, and any specific notes) in the description section of the HEC-RAS model.

10. Please confirm that the submitted hydraulic model only contains two plans: Cooksville_Existing_BOC, and Cooksville_New_BOC.

11. Please provide hydraulic modelling for the proposed alternatives in the next submission to support the selection of the preferred alternative.

12. It appears that the 2D component of the HEC-RAS modelling was not included in this submission. CVC had provided the 1D/2D modelling used to generate the approved floodplain mapping for this reach of Cooksville Creek, since the 2D modelling is required due to the spill around the river station 16738. The submitted BOC shows that the reach was modelled purely 1D. Furthermore, the submitted 1D modelling does not match Figure 4

"Regulatory Floodlines" in the report, which appears to closely match the existing approved floodlines. Please provide clarification and include all the relevant modelling for future review.

13. CVC's 2015 LiDAR was used in the current terrain file within the model. Please note that the topographic survey completed by Matrix in 2022 should be compiled with the LiDAR to carry out the 2D component of the modelling. CVC's 2015 LiDAR does not capture the various topographic changes with the creek corridor due to recent erosion and failure of the previous works.

14. Please confirm the HEC-RAS model version being used for the study.

Ecology Comments

15. Section 7.1 on page 53 of the report references Figure 10 for the conceptual design of the preferred alternative which is not correct. Please change it to Figure 9 which is the relevant drawing for the preferred alternative.

16. The report highlights the collapsed gabions supporting the concrete pads underneath the bridge at the Mississauga Valley Boulevard crossing. However, there is no discussion how these will be replaced/repaired. Please address the anticipated design approach to this crossing and refer to CVC's Fish and Wildlife Crossing Guidelines (attached) for guidance. Please consider identifying opportunities to incorporate natural channel design principles into the proposed design. For example, the replacement of the existing concrete bed with the natural material should be considered.

17. All in-water works should be completed within the warmwater timing window (July 1 to March 31), under the dry conditions. This should be added to the mitigation measures on page 59 of the report and to the drawings notes at the detailed design stage.

18. CVC continues to emphasize the need for a balanced approach that would seek to minimize the footprint and extent of the works in order to avoid and reduce the impact on the riparian areas and tree removal. As such, all vegetation removals within CVC's regulated areas should be compensated/offset following CVC's Ecosystem Offsetting Guidelines (attached). Please reference this document in the report when discussing restoration and compensation recommendations, to be implemented at the detailed design stage.

19. Please seek the softest bank treatment possible to allow the maximum planting potential possible.

20. The following information should be provided and discussed in the design brief or other relevant document at the detailed design stage:

    a. Detailed vegetation removals and protection plans.

    b. Detailed restoration plan showing:

        - How the selected species complement the existing ELC communities and are consistent with the riparian conditions.

        - Compensation needs as detailed in CVC's Ecosystem Offsetting Guidelines (attached).

c. Demonstrate how the proposed design maintains/enhances connectivity at an ecosystem level, along with any velocity and grading information.

d. Please also consider CVC's Healthy Soils Guideline (attached), Buffer Enhancement Guideline (attached), and CVC's Plant Selection Guideline for preparing the restoration plan. The Buffer Enhancement Guideline is a tool that provides planting design configurations and principles, species assemblages, and density calculations based on the area and intent of the restoration plan.

If you have any questions, please contact me.

Thanks,

Best regards,
Iftekhar

Iftekhar Ahmad | MES | he/him/his
Planner, Environmental Assessment | Planning and Development Services | Credit Valley Conservation
905-670-1615 ext. 296 | M: 647-449-5962
iftekhar.ahmad@cvc.ca | cvc.ca

From: Mariëtte Pushkar <mpushkar@matrix-solutions.com>
Sent: Tuesday, February 13, 2024 8:29 AM
To: Ahmad, Iftekhar <Iftekhar.Ahmad@cvc.ca>
Cc: Elizabeth Dollimore <Elizabeth.Dollimore@mississauga.ca>; Jeff Prince <jprince@matrix-solutions.com>; Karen Hofbauer <khofbauer@matrix-solutions.com>
Subject: [External] Cooksville Creek Erosion Control EA: Mississauga Valley Boulevard to CPR

Hello Iftekhar,

We have completed a draft of the Environmental Assessment study report pertaining to the section of Cooksville Creek that extends from the CPR crossing to upstream of Mississauga Valley Boulevard. The file can be downloaded from this link (note: the link is valid only for 7 days): https://we.tl/t-pSkItT4gmm

As part of the consultation process, we look forward to receiving comments from CVC pertaining to the study report. Once received, we will update the report and file it for the mandatory 30 day review period. Could you give us an estimate regarding the time required for CVC to provide their review comments?

Thanks,

Mariëtte

Mariëtte Pushkar, M.Sc., P.Geo | Principal Fluvial Geomorphologist
MATRIX SOLUTIONS INC. | Environment & Engineering
171 Victoria St. N, Kitchener, ON N2H 5C5
C 226.220.3835 | **T** 519.772.3777
24-Hour Emergency Spill Response 1.877.774.5525
www.matrix-solutions.com