

## APPENDIX E - NATURAL ENVIRONMENT REPORT



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# Niagara Street Bridge Replacement

## Natural Environment Report and Arborist Report

*Palmer Project #*  
1400353

*Prepared For*  
Associated Engineering (Ontario) Ltd.

December 23, 2021

December 23, 2021

Andrea LaPlante, P.Eng.  
Environmental Assessment Coordinator  
Associated Engineering (Ont.) Ltd.  
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Niagara-on-the-Lake, ON  
L0S 1J0

Dear Andrea LaPlante:

**Re: Niagara Street Bridge Replacement Natural Environment Report (NER), including  
Arborist Report**  
**Project #: 1400353**

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Palmer was retained by Associated Engineering (AE) to assess the natural heritage environmental conditions as part of the Environmental Assessment (EA) process for the reconstruction project of the Niagara Street Bridge over the Welland River (the Study Area). It is understood that the bridge will be replaced, including the abutments and piers within and adjacent to the river. The conceptual design of the replacement bridge is a two-span design with a single pier, replacing a four-span bridge with three piers. This report details the potential impacts and recommended mitigations to be implemented as part of the project design. These mitigations, specifically locations are recommended to be refined at the detailed design stage of the project.

Yours truly,

**Palmer™**

Prepared By:



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Austin Adams, M.Sc., EP  
Senior Ecologist

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# 1. Introduction

Palmer was retained by Associated Engineering (AE) to assess the natural heritage environmental conditions in support of the replacement of the Niagara Street Bridge project over the Welland River in Welland, Ontario (the Study Area). It is understood that the bridge will be replaced with a two-span steel I-girder bridge, and the existing substructures (abutments and piers) on either side of the river will be replaced. The Study Area is located approximately 200 m to the north of the intersection of East Main Street and Niagara Street (**Figure 1**). Currently, the existing bridge is a four-span bridge with three piers. The two-span bridge will allow for the removal of two piers from the Welland River.

This Environmental Impact Study (EIS) is prepared in support of the bridge replacement Class Environmental Assessment (EA) prepared by AE to support the final design, and the permitting and approval process. The memo describes the background review and field investigations undertaken to support the characterization of existing natural environmental conditions through this area and the identification of potential impacts and recommendations for general and site-specific mitigation and compensation measures.

Palmer understands that this design has been determined through the Environmental Assessment (EA) process, and the conceptual design has been developed. The mitigations developed in this report reflect the existing conditions and the conceptual design of the bridge replacement. The locations and configurations of specific mitigations would need to be refined at the detailed design stage of the project.

The objectives of this study are to inventory and assess the existing terrestrial features and functions within the Study Area, including Ecological Land Classification (ELC) mapping, terrestrial and aquatic habitat characterization, Species at Risk (SAR) habitat screening, and a tree inventory for the trees within the area of proposed construction works. This information has been used to support the development of the proposed reconstruction design and provide guidance on the design and mitigation recommendations and implementation.



Imagery (2020) provided by Welland WMS

CLIENT: 	PROJECT: <b>Niagara Street Bridge</b>		LEGEND:  Study Area
	PROJECT NO. 1400353	REVISION: 1-1	
PREPARED BY: 	DATE: Jan 29, 2021	SCALE: 1:1200	<b>Site Location</b>  <b>Figure 1</b>
	DRAWN: CV	DATUM: NAD 1983	
	CHECKED: AZ	PROJECTION: UTM zone 17	

## 2. Environmental Policy

Environmental policies relevant to the Study Area have been reviewed and summarized in the following sections. The applicable environmental policies and regulations of the Province, NPCA Regulations and Policies, the provincial *Endangered Species Act* (ESA), the federal *Fisheries Act* and the federal *Migratory Birds Convention Act* (MBCA) have all been considered.

### 2.1 Provincial Policy Statement

The *Provincial Policy Statement, 2020* (PPS) provides direction to regional and local municipalities regarding planning policies for the protection and management of natural heritage features and resources. The PPS defines eight natural heritage features and provides planning policies for each. The *Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement* (OMNR, 2010) is a technical guidance document used to help assess the natural heritage features listed.

Section 2.1 of the PPS relates to Natural Heritage. The following subsections are provided:

*2.1.4 Development and site alteration shall not be permitted in:*

- a) significant wetlands in Ecoregions 5E, 6E and 7E; and*
- b) significant coastal wetlands.*

*2.1.5 Development and site alteration shall not be permitted in:*

- a) significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E;*
- b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River);*
- c) significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River);*
- d) significant wildlife habitat;*
- e) significant areas of natural and scientific interest; and*
- f) coastal wetlands in Ecoregions 5E, 6E and 7E that are not subject to policy 2.1.4(b) unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.*

*2.1.6 Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.*

*2.1.7 Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.*

*2.1.8 Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5 and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.*

Section 4.11 of the PPS states that, in addition to land use approvals under the *Planning Act*, infrastructure may also require approval subject to other legislation and regulations.

Each of these natural heritage features is afforded varying levels of protection subject to guidelines, and in some cases, regulations. The Study Area is located in Ecoregion 7E (Crins, Gray, Uhlig, & Wester, 2009).

## 2.2 Conservation Authorities Act

The Ontario Provincial Legislature created the *Conservation Authorities Act* in 1946 to ensure the conservation, restoration and responsible management of water, land and natural habitat. The Act authorizes the formation of Conservation Authorities.

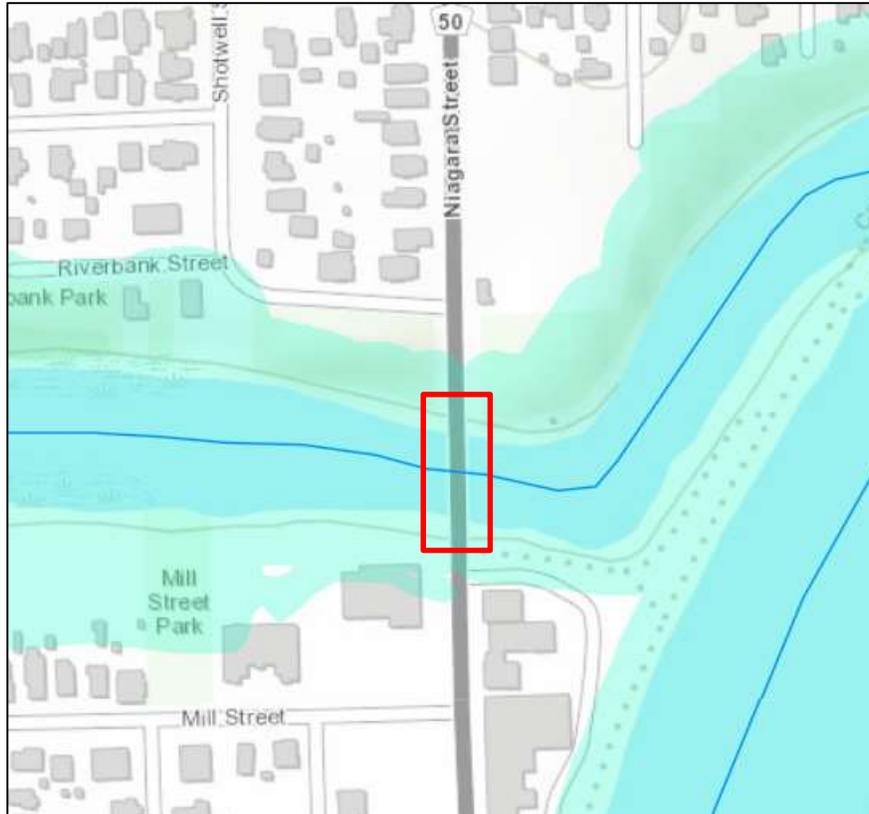
Although the Act has been amended many times since 1946, the following original key elements remain:

- A Conservation Authority (CA) must be a local initiative established at the request of a watershed's municipalities;
- Each CA operates independently in a co-operative, cost sharing partnership between member municipalities and the Province of Ontario; and
- Each CA must have jurisdiction over one or more watersheds and the ability to enforce regulations in order to ensure a complete and rational approach to issues such as flood control and erosion.

Through the Conservation Authorities Act, CAs are able to regulate development and activities in or adjacent to river or stream valleys, Great Lakes and large inland lakes shorelines, watercourses, hazardous lands and wetlands. Conservation Authorities provide technical review as commenting agencies on development applications under the *Planning Act*.

The Conservation Authorities Act directs all Conservation Authorities to produce local regulations to streamline development approvals. Ontario Regulation 155/06 enables the Niagara Peninsula Conservation Authority (NPCA) to provide Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses within their jurisdiction.

The Study Area falls within NPCA regulated lands (green zone in **Map A**). The associated NPCA policies, regulations and permitting will therefore apply and approvals will be required from the agency.



**Map A: NPCA Regulated Area encompassing the project Study Area**

## 2.3 Niagara Region Official Plan

The Niagara Regional Official Plan sets out Natural Heritage policies in *Chapter 7 – Natural Environment* (Niagara Region, 2014). This chapter explains the Region’s *Healthy Landscape* approach, identifies the Core Natural Heritage System (NHS) and policies, and sets out measures to implement the identified NHS policies. On Schedule C (Core Natural Areas) of the Official Plan, the Study Area is identified as outside the Greenbelt Plan Area, but within Niagara Escarpment Plan (NEP) Area, and containing Environmental Conservation Areas (ECA – green areas on **Map A**).

The ECAs within the Study Area are likely classified as such for Significant Woodland characteristics, being (as per policy 7.B.1.5) woodlands >4 hectares (ha) out of urban areas and north of the Niagara Escarpment, or woodlands that contain other ECA types per Policy 7.B.1.4. Policy 7.B.1.11 of the Official Plan states that “*development and site alteration may be permitted without an amendment to this Plan in ECAs, if it has been demonstrated (e.g., via EIS) that, over the long term, there will be no significant negative impact on the Core Natural Heritage System*”.

Similarly, Policy 7.B.1.26 states that *expansion to an existing use (e.g., improvements to road systems) located within an Environmental Conservation Area or Fish Habitat or adjacent lands to a Core Natural Heritage System Component as identified in Table 7-1 may be permitted if it will have no significant negative impact on the natural feature or its ecological functions*. Table 7.1 states that for areas that are within or adjacent to ECAs, and EIS is required, and in addition a Tree Saving Plan is required for ECAs that are defined by Significant Woodlands.

## 2.4 Endangered Species Act (2007)

Species designated as *Threatened* or *Endangered* by the Committee on the Status of Species at Risk in Ontario (COSSARO), otherwise known as Species at Risk in Ontario (SARO), and their habitats (e.g., areas essential for breeding, rearing, feeding, hibernation and migration) are afforded legal protection under the *Endangered Species Act* (ESA) (Government of Ontario, 2007).

The protection provisions for species and their habitat within the ESA apply only to those species listed as *Threatened* or *Endangered* on the SARO list. *Special Concern* species may be afforded protection through policy instruments respecting significant wildlife habitat as defined by the Province or other relevant authority, or other protections contained in Official Plan policies.

## 2.5 Migratory Birds Convention Act (1994)

The *Migratory Birds Convention Act* (MBCA) and Migratory Birds Regulations (MBR) (2014) protect most species of migratory birds and their nests and eggs anywhere they are found in Canada (Government of Canada, 1994). General prohibitions under the MBCA and MBR protect migratory birds, their nests and eggs and prohibit the deposition of harmful substances in waters / areas frequented by them. The MBR includes an additional prohibition against incidental take, which is the inadvertent harming or destruction of birds, nests or eggs.

Compliance with the MBCA and MBR is best achieved through due diligence, which identifies potential risk based on a site-specific analysis in consideration of the Avoidance Guidelines and Best Management Practices information on the Environment Canada website.

## 2.6 Federal Fisheries Act

The *Fisheries Act* was updated in 2013 to provide provisions for the sustainability and ongoing productivity of commercial, recreational, and Aboriginal fisheries. Under Section 35, projects are prohibited from causing serious harm to fish unless authorized by Fisheries and Oceans Canada (DFO). “*Serious harm to fish*” is defined as “*the death of fish or any permanent alteration to, or destruction of, fish habitat*”. “*Serious harm to fish*” includes the following:

1. *The death of fish;*
2. *A permanent alteration to fish habitat of a spatial scale, duration or intensity that limits or diminishes the ability of fish to use such habitats as spawning grounds, or as nursery, rearing, or food supply areas, or as a migration corridor, or any other area in order to carry out one or more of their life processes; or*
3. *The destruction of fish habitat of a spatial scale, duration, or intensity that fish can no longer rely upon such habitats for use as spawning grounds, or as nursery, rearing, or food supply areas, or as a migration corridor, or any other area in order to carry out one or more of their life processes.*

Commercial, recreational or Aboriginal (CRA) fisheries include those fish that fall within the scope of applicable federal or provincial fisheries regulations as well as those that can be fished by Aboriginal organizations or their members for food, social or ceremonial purposes, or for purposes set out in a land claims agreement. Fish that support these fisheries are those that contribute to the productivity of a fishery and may reside in bodies of water that contain fisheries or in water bodies that are connected by a watercourse to such water bodies.

Determining the applicability of the Section 35 prohibition to particular water bodies is now made on a case-by-case basis through a self-assessment process to determine if serious harm to CRA fisheries may occur. DFO provides on-line guidance for the self-assessment process including stipulations for when projects may be exempt from DFO review, Measures to Avoid Causing Harm, and Pathway of Effects diagrams for determining how common development projects may impact fisheries. A self-assessment under the federal Fisheries Act will be completed during subsequent phases of the project.

The Welland River supports CRA fisheries and to protect fish and fish habitat, efforts should be made to avoid, mitigate and/or offset harm.

## 3. Study Approach

### 3.1 Background Review and Agency Consultation

Palmer has initiated agency consultation and reviewed relevant background material to provide a focus to field investigations and ensure compliance with regulations and policy. On-going agency consultation has been undertaken as part of this project by Palmer and AE. Background review included the following:

- Collection and review of relevant mapping and reports, including Natural Heritage Information Centre (NHIC) make-a-map application for species occurrences and designated area mapping (Ministry of Natural Resources and Forestry, 2021).
- NPCA Open Data
- Fisheries and Oceans Canada (DFO) Aquatic Species at Risk mapping (Fisheries and Oceans Canada, 2020).
- Natural heritage and SAR information obtained from Land Information Ontario (LIO) (Government of Ontario, 2020).

### 3.2 Ecological Surveys

Palmer undertook field investigations on June 22 and 23, 2020 to inventory existing vegetation communities, conduct a tree inventory, and to provide an assessment of the ecological features and functions within the Study Area. Survey methods are described below.

#### 3.2.1 Vegetation and Flora

Vegetation communities were mapped and described following the ELC System for Southern Ontario (Lee, et al., 1998). Vegetation community boundaries were delineated on field maps through the interpretation of recent aerial photographs and refined in the field. Information collected or verified during ELC surveys includes dominant species cover, community structure, as well as level of disturbance, presence of indicator species, and other notable features.

Searches for Butternut (*Juglans cinerea*), an *Endangered* SAR tree, were completed during the botanical surveys and tree inventory.

#### 3.2.2 Tree Inventory

A tree inventory was completed for all trees in the area of proposed construction surrounding the existing bridge where tree removal may be required. The inventory was completed in accordance with the Regional *Tree and Forest Conservation By-law No. 30-2008* (Niagara Region, 2008) by an ISA certified arborist on June 22, 2020. All trees in the Study Area within or adjacent to the proposed grading limits were inventoried to establish Tree Protection Zones (TPZ) as relevant. The Site Plan Drawings for the project area were overlaid with georeferenced air photos to guide this inventory. Information collected during the inventory includes species name, tree or tag number, DBH, location, crown spread, a general health assessment (structure and vigour), and notes on tree trunk and canopy conditions.

### 3.2.3 Species at Risk

For the purposes of this report, Species at Risk (SAR) include species listed as *Endangered*, *Threatened* or *Special Concern* under Ontario's ESA. The protection provisions for species and their habitat within the ESA apply only to those species listed as *Endangered* or *Threatened* on the SARO list. *Special Concern* species may be afforded protection through policy instruments respecting significant wildlife habitat as defined by the Province or other relevant authority, or other protections contained in municipal Official Plan policies.

Prior to field work, existing SAR records were queried from the NHIC database and Ontario Reptile and Amphibian Atlas (ORAA).

Habitats on site were characterized and screened for evidence of or potential use by this species. Professional Experience also dictates that SAR screenings consider bat species, especially in treed habitats adjacent to open waters. A brief discussion of the status, habitat requirements, and assessment of likely presence of SAR species within the Study Area is provided in **Section 3.3**.

### 3.2.4 Aquatic Habitat

An assessment of the existing aquatic habitat and riparian conditions were conducted on June 22 and 23, 2020. The weather conditions were approximately 28°C, clear, no precipitation, with low to no wind. The assessment was carried out by assessing the existing conditions of the Welland River, in the vicinity of the Niagara Street Bridge, recording the following parameters:

- Identification of in-stream barriers to fish passage;
- General channel morphology measurements;
- Bank undercuts and instream cover;
- Point source impacts (e.g., outfalls, sources of pollution) and surrounding land uses;
- Baseflow, flow regime characteristics (e.g., flashy urban system);
- Water quality;
- Substrate type;
- Critical habitats (spawning, nursery or rearing grounds);
- Riparian cover and shading;
- Groundwater discharge and upwellings; and
- Other measurements that indicate the quality of the habitat such as entrenchment, erosion, degradation.

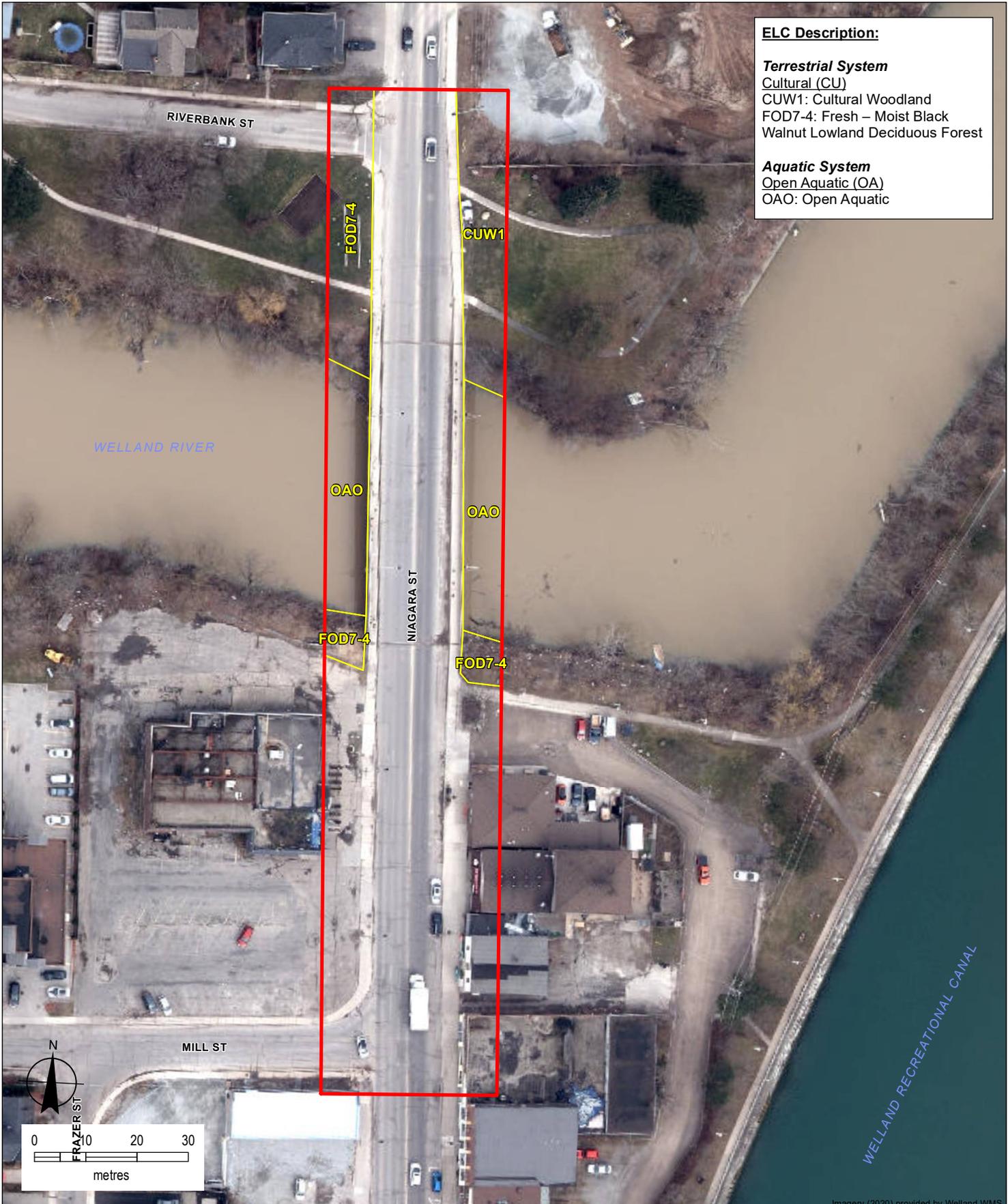
## 4. Existing Conditions

### 4.1 Vegetation Communities and Flora

Field investigations and background review identified three (3) vegetation communities immediately adjacent to the proposed bridge reconstruction works project area (**Figure 2**). The communities are heavily influenced by non-native/exotic species, with 18 of the 37 (49%) species identified being non-native to Ontario (Ministry of Natural Resources and Forestry, 2020) (**Appendix A**). All species observed are considered locally and provincially common (Oldham, 2010; Ministry of Natural Resources and Forestry, 2020). The ELC descriptions of these vegetation communities are provided in **Table 1**.

**Table 1. Vegetation Communities identified in the Study Area**

Vegetation ELC Community	Vegetation Community Description
<b>FOD7-4</b> – Fresh – Moist Black Walnut Lowland Deciduous Forest	This mature community type is located in a total of three locations surrounding the Niagara Street bridge. Canopy and subcanopy cover consist primarily of Black Walnut ( <i>Juglans nigra</i> ) and Manitoba Maple ( <i>Acer negundo</i> ), with few Crack Willow ( <i>Salix euxina</i> ), Green Ash ( <i>Fraxinus pennsylvanica</i> ) and European Black Alder ( <i>Alnus glutinosa</i> ) at a height of 15 to 20 m, providing 30 to 40% cover. Understory vegetation comprises of mainly European Buckthorn ( <i>Rhamnus cathartica</i> ) and Red-osier Dogwood ( <i>Cornus sericea</i> ), with Green Ash and Silver Maple ( <i>Acer saccharinum</i> ) providing 30% cover at average height of 1 to 2 m. Groundcover is dominated by Fowl Bluegrass ( <i>Poa palustris</i> ), along with abundant amounts of Wild Carrot ( <i>Daucus carota</i> ) and Common Dandelion ( <i>Taraxacum officinale</i> ) and other herbaceous species, providing 40% cover at <0.5 m. Standing snags and deadfall logs are rare. This community possesses a riverine topography and are positioned on steep slopes.
<b>CUW1</b> – Cultural Woodland	This young community is located in the northeast vegetated area adjacent to the Niagara Street bridge. Little-leaved Linden ( <i>Tilia cordata</i> ) is the dominant species in the canopy, along with occasional Horse Chestnut ( <i>Aesculus hippocastanum</i> ) and Yellow Birch ( <i>Betula alleghaniensis</i> ), providing 30% cover at a height of approximately 20 m. The subcanopy contains Manitoba Maple and Pin Cherry ( <i>Prunus pensylvanica</i> ) at a height of approximately 15 m, providing 20% cover. Understory vegetation at a height of 1 to 2 m includes European Buckthorn and Tatarian Honeysuckle ( <i>Lonicera tatarica</i> ) providing 20%. Overall, the ground is sparsely vegetated. Mosses and grasses dominate the groundcover along with occasional herbaceous species such as Common Dandelion and Poison Ivy ( <i>Toxicodendron radicans</i> ) providing cover of 25% at <0.5 m. No standing snags or deadfall logs are present. This community has a riverine topography and is located along the steep slopes. Due to the dominance of Little-leaved Linden and Horse Chestnut in this community, it is suspected that the bank was rehabilitated as part of the adjacent park works when doing bank hardening.
<b>OAO</b> – Open Aquatic	Water within the Welland River was too sediment laden at the time of the survey to assess for aquatic vegetation. Waters were observed to be <2 m deep at the time of the survey.



**ELC Description:**

**Terrestrial System**  
 Cultural (CU)  
 CUW1: Cultural Woodland  
 FOD7-4: Fresh – Moist Black Walnut Lowland Deciduous Forest

**Aquatic System**  
 Open Aquatic (OA)  
 OAO: Open Aquatic

Imagery (2020) provided by Welland WMS

CLIENT:  Associated Engineering

PREPARED BY:  Palmer

PROJECT: Niagara Street Bridge	
PROJECT NO. 1400353	REVISION: 1-1
DATE: Oct 08, 2021	SCALE: 1:1000
DRAWN: CV	DATUM: NAD 1983
CHECKED: AZ	PROJECTION: UTM zone 17

LEGEND:

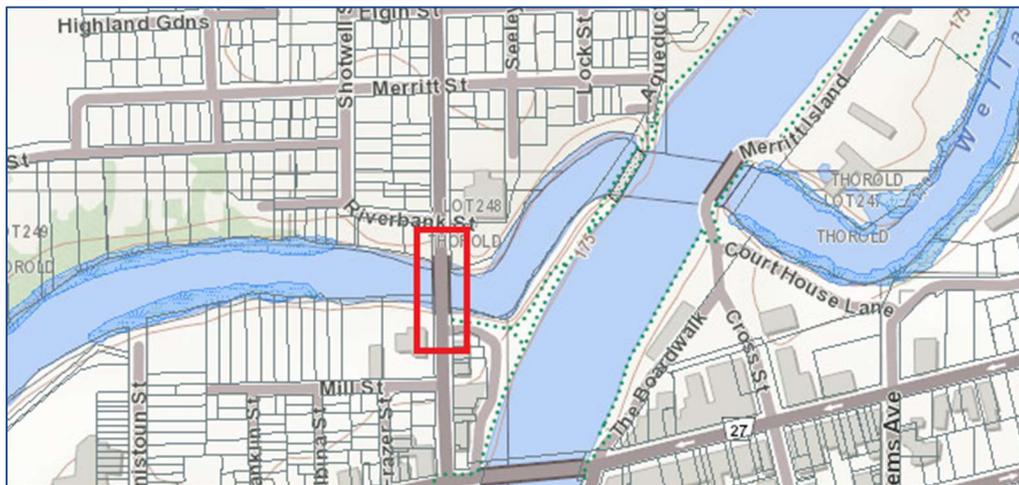
-  Study Area
-  Ecological Land Classification (ELC)

**Existing Ecological Conditions**

**Figure 2**

### 4.1.1 Wetlands

As depicted on NHIC mapping, units belonging to two (2) Provincially Significant Wetlands (PSW) are identified within the vicinity of the Study Area (**Map B**). These include the “Welland River West Wetland Complex” PSW and the “Welland River Between the Canals” PSW. Both wetlands include areas on both margins of the Welland River. The Welland River West Wetland Complex is found more than 100 m upstream of the Study Area, while the Welland River Between the Canals PSW is >400 m downstream of the Study Area, on the east side of the Welland canal. As the Welland River West Wetland Complex is upstream, and due to the distances of both wetlands from the bridge, there are no expected impacts on these wetlands from the project.



**Map B: PSW (darker blue polygons) upstream and downstream of the Study Area (MNRF Make-a-Map)**

## 4.2 Tree Inventory

The tree inventory consisted of 51 individual tagged trees (**Table 2, Figure 3**). Of the 51 individual trees in and adjacent to the Study Area, 29 (57%) were native species. There were no SAR trees observed, such as Butternut. There were two (2) ash trees, one of which was in very poor condition due to Emerald Ash Borer (EAB), while the other was in good to fair condition. The full tree inventory is provided in **Appendix B**.

**Table 2. Summary of Tree Inventory Results**

Common Name	Scientific Name	Count
Black Walnut*	<i>Juglans nigra</i>	7
Chokecherry*	<i>Prunus virginiana</i>	5
Crack Willow	<i>Salix euxina</i>	5
Eastern Cottonwood*	<i>Populus deltoides</i>	1
European Black Alder	<i>Alnus glutinosa</i>	1
Green Ash*	<i>Fraxinus pennsylvanica</i>	2
Honey Locust (cultivar)	<i>Gleditsia triacanthos</i> (cultivar)	2

Common Name	Scientific Name	Count
Horse Chestnut	<i>Aesculus hippocastanum</i>	1
Little-leaved Linden	<i>Tilia cordata</i>	11
Manitoba Maple*	<i>Acer negundo</i>	12
Norway Maple	<i>Acer platanoides</i>	2
Yellow Birch*	<i>Betula alleghaniensis</i>	2
<b>Total</b>		<b>51</b>

\*Native species

**TREE PRESERVATION SPECIFICATIONS**

**GENERAL NOTES**

- THIS VEGETATION PROTECTION PLAN IS DESIGNED TO WORK IN CONCERT WITH THE ARBORIST REPORT FOR THE PROJECT.
- ALL TREE PROTECTION FENCING SHALL BE IN PLACE AND INSPECTED BY NIAGARA REGION INFRASTRUCTURE PLANNING AND DEVELOPMENT ENGINEERING DIVISION PRIOR TO ANY DEMOLITION OR CONSTRUCTION ACTIVITY.
- TREE PROTECTION BARRIERS SHALL REMAIN IN PLACE AND IN GOOD CONDITION UNTIL ALL CONSTRUCTION IS COMPLETE AND APPROVED BY THE NIAGARA REGION INFRASTRUCTURE PLANNING AND DEVELOPMENT ENGINEERING DIVISION.
- AN INTERNATIONAL SOCIETY OF ARBORICULTURE (ISA) CERTIFIED ARBORIST SHALL BE ON SITE FOR ANY WORK WHICH IMPACTS ANY TREE OR TREE PROTECTION ZONE.
- ALL ARBORICULTURE WORK SUCH AS PRUNING OF BRANCHES AND ROOTS, SHALL BE DONE BY A QUALIFIED TREE WORKER CERTIFIED WITH THE ISA.

**TREE PROTECTION AND FENCING**

- ALL EXISTING TREES WHICH ARE TO REMAIN SHALL BE FULLY PROTECTED WITH FENCING ERECTED AROUND THE TREE PROTECTION ZONE (TPZ) IN ACCORDANCE WITH **APPENDIX A** OF THIS REPORT.
- TREE PROTECTION FENCING MUST BE AT LEAST 1.2 M TALL AND IS RECOMMENDED TO BE ORANGE CONSTRUCTION SAFETY FENCING. FENCING SHOULD BE SECURED TO METAL "T-BAR" SUPPORTS A MAXIMUM OF 2.0 M APART, BEING 1.2 M ABOVE GROUND AND 1.2 M BELOW GROUND (2.4 M). THE ORANGE CONSTRUCTION SAFETY FENCING SHOULD BE SUPPORTED BY A WIRE WOVEN THROUGH THE TOP AND SECURED TO EACH T-BAR.
- AREAS WITHIN THE PROTECTIVE FENCING SHALL REMAIN UNDISTURBED AND SHALL NOT BE USED FOR THE STORAGE OF BUILDING MATERIALS OR EQUIPMENT.
- NO RIGGING CABLES SHALL BE WRAPPED AROUND OR INSTALLED IN TREES; AND SURPLUS SOIL, EQUIPMENT, DEBRIS OR MATERIALS SHALL NOT BE PLACED OVER ROOT SYSTEMS OF THE TREES WITHIN THE PROTECTIVE FENCING. NO CONTAMINANTS WILL BE DUMPED OR FLUSHED WHERE FEEDER ROOTS OF TREES EXIST.
- WHERE ROOT SYSTEMS OF PROTECTED TREES ARE EXPOSED DIRECTLY ADJACENT TO OR DAMAGED BY CONSTRUCTION WORK, THEY SHALL BE TRIMMED NEATLY BY A QUALIFIED ARBORIST AND THE AREA BACK FILLED WITH APPROPRIATE MATERIAL TO PREVENT DISSICATION.
- TREE PROTECTION ZONES ARE TO INCLUDE SIGNAGE (AS PER BELOW) INSTALLED ON CONSTRUCTION-FACING SIDES OF THE PROTECTIVE BARRIER. SIGNS SHALL BE 40 CM X 60 CM AND INCLUDE THE NIAGARA REGION LOGO.

**TREE PROTECTION ZONE (TPZ)**

All construction related activities, including grade alteration, excavation, soil compaction, any materials or equipment storage, disposal of liquid and vehicular traffic are NOT permitted within this TPZ.

This tree protection barrier must remain in good condition and must not be removed or altered without authorization of Niagara Region Infrastructure Planning and Development Engineering Division. Concerns or inquiries regarding this TPZ can be directed to the 905-9800-6000 ext. 3627.

- IN THE EVENT THAT TREES TO BE PRESERVED ARE INADVERTENTLY DAMAGED BEYOND REPAIR, THEY SHALL BE SUBJECT TO SUITABLE COMPENSATION AS DETERMINED BY THE NIAGARA REGION INFRASTRUCTURE PLANNING AND DEVELOPMENT ENGINEERING DIVISION AND REVIEW OF THE TREE INVENTORY AND ANALYSIS.

**TREE PRUNING**

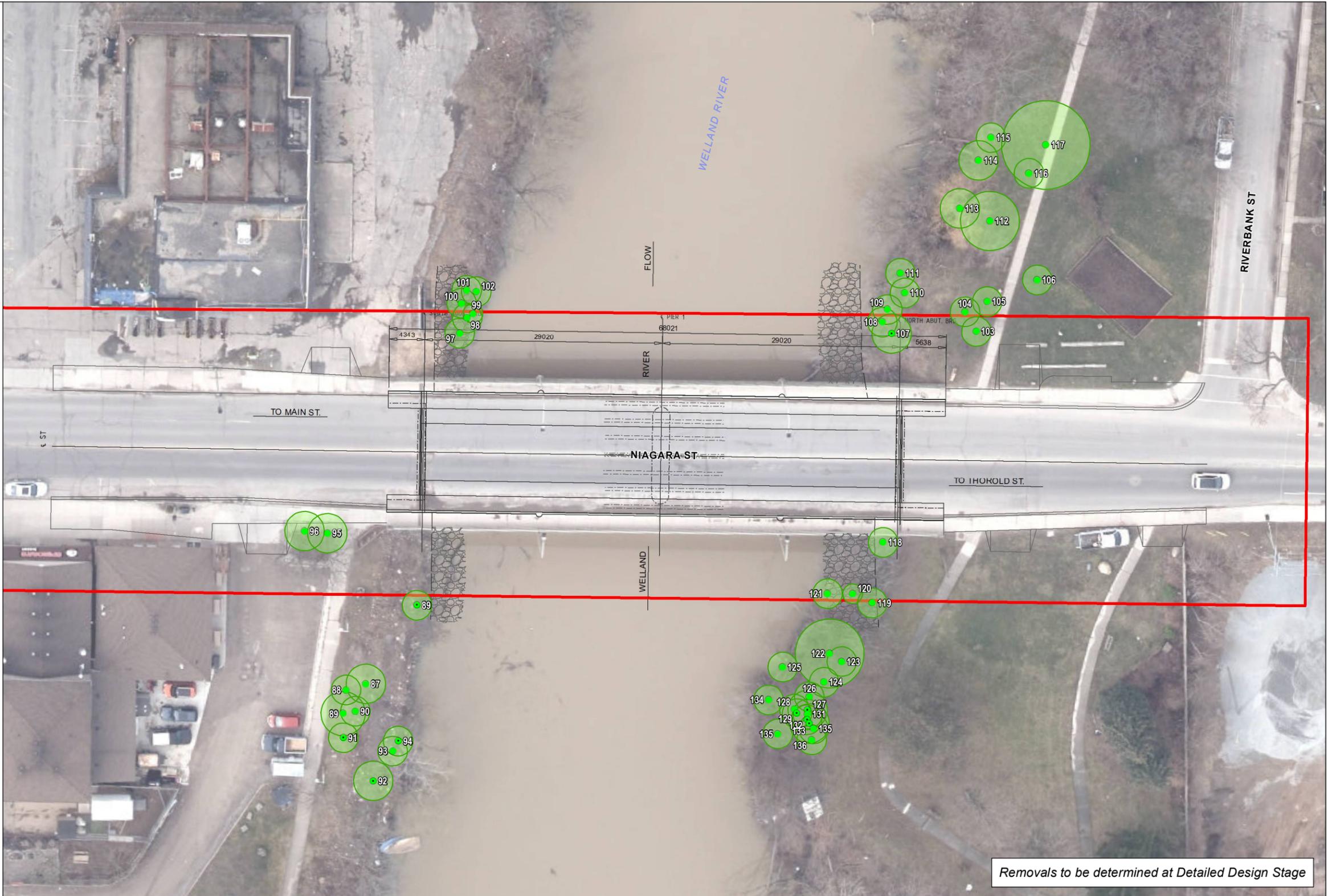
- WHERE LIMBS OR PORTIONS OF TREES ARE REMOVED TO ACCOMMODATE CONSTRUCTION WORK, THEY WILL BE CAREFULLY REMOVED BY AN ISA CERTIFIED ARBORIST.
- IF ANY DAMAGE OCCURS TO TREES, INCLUDING BROKEN LIMBS, DAMAGE TO ROOTS, OR WOUNDS TO THE MAIN TRUNK, IT MUST BE REPORTED TO THE PROJECT CONSULTING ARBORIST IMMEDIATELY SO THAT MITIGATION MEASURES CAN BE PROMPTLY IMPLEMENTED.

**TREE REMOVAL**

- TREES ARE TO BE FELLED INTO THE CONSTRUCTION AREA TO REDUCE THE POTENTIAL FOR INJURY/DAMAGE TO ADJACENT TREES AND PROTECTED AREAS.
- TO AVOID INTERFERENCE WITH THE EGGS, NESTS OR YOUNG OF BIRDS PROTECTED UNDER THE FEDERAL MIGRATORY BIRDS CONVENTION ACT (GOVERNMENT OF CANADA, 1994), REMOVALS SHOULD NOT OCCUR FROM APRIL 15 TO JULY 31 OF ANY GIVEN YEAR. IDEALLY, REMOVAL SHOULD OCCUR FROM AUGUST THROUGH DECEMBER TO AVOID INTERFERENCE WITH ALL NESTING BIRDS. SHOULD REMOVAL BE REQUIRED WITHIN THE APRIL 15 TO JULY 31 BREEDING PERIOD, A QUALIFIED AVIAN BIOLOGIST SHOULD CONDUCT A THOROUGH SURVEY IMMEDIATELY PRIOR TO THE DESIRED TREE REMOVAL DATE TO CONFIRM PRESENCE OR ABSENCE OF PROTECTED SPECIES. IF PROTECTED SPECIES ARE PRESENT, REMOVAL CANNOT OCCUR WITHOUT A PERMIT FROM THE CANADIAN WILDLIFE SERVICE.
- NO BRANCHES OR BRUSH FROM CLEARING IS TO BE STORED ON THE SITE. CUTTING, BRUSH AND CHIPPING CLEANUP ARE TO BE COMPLETED OUTSIDE OF THE MIGRATORY BIRD NESTING SEASON.

**ROOT PROTECTION – RETAINING WALL**

- EXPOSED ROOTS SHALL BE PRUNED BACK TO THE FACE OF THE RETAINING WALL. NO ROOTS GREATER THAN 6 CM (2.5") IN DIAMETER SHALL BE PRUNED WITHOUT AUTHORIZATION OF THE NIAGARA REGION INFRASTRUCTURE PLANNING AND DEVELOPMENT ENGINEERING DIVISION AND IN CONSULTATION WITH THE PROJECT ARBORIST.
- ALL ROOTS MUST BE PRUNED WITH CLEAN AND SHARP HAND TOOLS ONLY. SHOVELS, PICKS OR OTHER CONSTRUCTION TOOLS SHALL NOT BE USED TO PRUNE ROOTS. WOUND DRESSINGS OR PRUNING PAINT SHALL NOT BE USED TO COVER THE ENDS OF ANY CUT.
- ROOTS SHOULD BE PRUNED IN A SIMILAR FASHION AS BRANCHES, TAKING CARE TO MAINTAIN THE INTEGRITY OF THE ROOT BARK RIDGE, WHERE PRESENT. ROOTS SHOULD BE PRUNED BACK TO A LATERAL ROOT AT LEAST ONE THIRD OF THE DIAMETER; ROOT STUBS MUST NOT BE LEFT UPON COMPLETION OF ROOT PRUNING.
- PROLONGED EXPOSURE OF TREE ROOTS MUST BE AVOIDED. ALL PRUNED ROOTS SHOULD BE COVERED WITH SOIL OR EXCAVATED TRENCHES SHOULD BE BACKFILLED WITH NATIVE MATERIAL AS SOON AS POSSIBLE FOLLOWING ROOT PRUNING.
- IF RETAINING WALL CONSTRUCTION IS NOT SCHEDULED TO OCCUR IMMEDIATELY AFTER ROOT-SENSITIVE EXCAVATION AND ROOT PRUNING, THE SLOPE SURFACE SHOULD BE BACKFILLED WITH APPROPRIATE MATERIAL TO PREVENT DISSICATION.
- THE TPZ FENCING SHOULD BE SET TO THE LIMIT OF THE RETAINING WALL AREA TO ENSURE THAT CONSTRUCTION DOES NOT EXTEND BEYOND THE LIMIT OF ROOT PRUNING.



Removals to be determined at Detailed Design Stage

CLIENT:		
PROJECT:	Niagara Street Bridge	
PROJECT NO.:	1400353	REVISION: 1-1
DATE:	Oct 01, 2021	SCALE: 1:500
DRAWN:	CV	DATUM: NAD 1983
CHECKED:	AZ	PROJECTION: UTM zone 17
PREPARED BY:		

LEGEND:

- Inventoried Tree
- Study Area
- Tree Protection Zone (TPZ)

**Tree Inventory**

**Figure 3**

### 4.3 Species at Risk

The background review revealed records within or adjacent to the Study Area for:

- Eastern Meadowlark (*Sturnella magna*) – Threatened;
- Swamp Rose-mallow (*Hibiscus moscheutos*) – Special Concern;
- Snapping Turtle (*Chelydra serpentina*) – Special Concern;
- Mapleleaf (*Quadrula quadrula*) – Special Concern; and
- Eastern Pond Mussel (*Ligumia nasuta*) – Special Concern.

Based on agency consultation and background review, the results of our field work, and our professional experience on habitat preferences, six (6) additional SAR have been assessed through site surveys and/or habitat screening based on observation or identification of potential suitable habitat (**Table 3**).

Recognizing that specialized surveys were not within the scope of the project, of the above listed species that have potential suitable habitat in the general Study Area, none of the listed species were recorded during the field surveys and opportunistic observations. Regardless, recommendations to appropriately mitigate impacts to potential habitat have been provided.

**Table 3. SAR Habitat Screening**

Species and Status	Habitat Requirement Overview	Habitat Suitability	SARO Status
<b>Flora</b>			
Butternut ( <i>Juglans cinerea</i> )	Butternut grows best on rich, moist, well-drained loams often found on stream bank sites but may be found on well-drained gravelly sites, especially those of limestone origin (COSEWIC, 2017).	Absent – Species not observed	Endangered
Swamp Rose-mallow ( <i>Hibiscus moscheutos</i> )	Swamp Rose-mallow most commonly found in deep-water cattail marshes and meadow marshes, and can also be found in open wet woods, thickets, spoil banks, and drainage ditches (Ministry of Natural Resources and Forestry, 2019).	Absent – Species not observed	Special Concern
<b>Birds</b>			
Eastern Meadowlark ( <i>Sturnella magna</i> )	This bird prefers pastures and hayfields, but is also found to breed in orchards, shrubby fields and human use areas such as airports and roadsides. Eastern meadowlark nests are built on the ground and well-camouflaged with a roof woven from grasses (MNRF, 2018).	Absent – Species not observed and no habitat within Study Area	Threatened
Barn Swallow ( <i>Hirundo rustica</i> )	Barn Swallow prefer to nest within human made structures such as barns, bridges, and culverts. Barn swallow nests are cup-shaped and made of mud; they are typically attached to horizontal beams or vertical walls underneath an overhang (Ministry of Natural Resources and Forestry, 2015)	Potential – bridge may be used as a nesting structure. One old, inactive nest was observed during surveys.	Threatened
<b>Bats</b>			

Species and Status	Habitat Requirement Overview	Habitat Suitability	SARO Status
Eastern Small-footed Myotis ( <i>Myotis leibii</i> ), Endangered	Roosts in a variety of habitats including caves, hollow trees, buildings, and bridges in the summer. In the winter, they hibernate in abandoned caves or mines (Ministry of Natural Resources and Forestry, 2017).	Potential – Welland River treed banks	Endangered
Little Brown Myotis ( <i>Myotis lucifugus</i> ), Endangered	In the summer, roosts in trees, barns, attics and abandoned buildings to raise their young. In the winter, they hibernate in abandoned mines or caves (Ministry of Natural Resources and Forestry, 2018).	Potential – Welland River treed banks	Endangered
Northern Myotis ( <i>Myotis septentrionalis</i> ), Endangered	Roosts under loose bark and cavities in trees in boreal forests. In the winter, the hibernate in abandoned caves or mines (Ministry of Natural Resources and Forestry, 2018).	Potential – Welland River treed banks	Endangered
Tri-colored Bat ( <i>Perimyotis subflavus</i> ), Endangered	In the summer, forms day roosts in a range of habitats including older forest and sometimes barns. These bats overwinter in caves (Ministry of Natural Resources and Forestry, 2017).	Potential – Welland River treed banks	Endangered
<b>Herptiles</b>			
Snapping Turtle	Snapping turtles spend the majority of their lives in water and travel slightly upland to gravel or sandy embankments or beaches to lay their eggs (MNRF, 2019).	Potential – Welland River and banks	Special Concern
<b>Freshwater Mussels</b>			
Eastern Pond Mussel ( <i>Ligumia nasuta</i> )	Eastern pondmussel is typically found in sheltered areas of lakes and in slow-moving areas of river and canals with sand or mud bottoms. Formerly common, since the introduction of the invasive zebra mussel, there are now only two (2) known populations in Canada: one in the delta of Lake St. Clair and the second in Lyn Creek, a small tributary of the upper St. Lawrence River.	Potential – Welland River	Special Concern
Mapleleaf ( <i>Quadrula quadrula</i> )	This species Mapleleaf mussel is found in medium to large rivers with slow to moderate currents and firmly packed sand, gravel, or clay and mud bottoms.	Potential – Welland River	Special Concern

## 4.4 Aquatic Habitat

Aquatic habitat was assessed in the vicinity of the Niagara Street Bridge as much as possible given the poor water clarity conditions of the water at the time of the survey (**Photo 1** and **2** below). Through this area, the northeast banks exhibited undercutting and some dead, overhanging trees (**Photo 3**), with some signs of slumping on the slopes. The southeast banks were artificially hardened with eroding concrete (**Photo 4**). The in-stream portions contained coarse sands, gabion stones, and a storm outlet. The banks along the southwest area had 10 to 20 cm of stone undercutting and coarse sands. There were some artificially hardened banks, while gabion stones were observed in-stream closer to the bridge. In-stream

logs were observed by the northwest banks, as well as abundant amounts of debris and dumping. Overall, this corner of the bridge showed eroded slopes with exposed soils and little ground vegetation. Remnants of artificial hardening were observed over coarse sands/muck and slight (<10 cm) undercut banks were also observed. Overall, cobble substrate was located adjacent to the bridge, while muck was below the bridge. At the time of the assessment, the wetted width of the river appeared to be approximately 40 m.

The Niagara Street Bridge crosses over a portion of the Welland River, which supports a cold-warm generalist fish community (**Table 4**). This list is compiled from the LIO database, from four fishing events; two at the Niagara Street Bridge, two at the entrance under the Welland canal. The current fish community within the Welland River watershed is comprised of generalist species tolerant of a range of habitat conditions (Eakins, 2021). These species all dictate a spring/early summer spawning season (Fisheries and Oceans Canada, 2013).

**Table 4: Fish Species of the Welland Rive near Niagara Street**

Common Name	Scientific Name	SARO Status	Thermal Regime	Spawning Season
Bigmouth buffalo	<i>Ictiobus cyprinellus</i>	Not at Risk – S2?*	Warm	spring
Black crappie	<i>Pomoxis nigromaculatus</i>	S4	Cool	spring
Blackside darter	<i>Percina maculata</i>	S4	Cool	spring
Bluegill	<i>Lepomis macrochirus</i>	S5	Warm	Summer
Bluntnose minnow	<i>Pimephales notatus</i>	S5	Warm	Summer
Bowfin	<i>Amia calva</i>	S4	Warm	Spring
Brook silverside	<i>Labidesthes sicculus</i>	S4	Warm	Spring-Summer
Brown bullhead	<i>Ameiurus nebulosus</i>	S5	Warm	Spring
Central mudminnow	<i>Umbra limi</i>	S5	Cool	Spring
Channel catfish	<i>Ictalurus punctatus</i>	S4	Warm	Spring-Summer
Common carp	<i>Cyprinus carpio</i>	Invasive	Warm	Spring-Summer
Common shiner	<i>Luxilus cornutus</i>	S5	Cool	Spring
Emerald shiner	<i>Notropis atherinoides</i>	S5	Cool	Summer
Fathead minnow	<i>Pimephales promelas</i>	S5	Warm	Spring-Summer
Freshwater drum	<i>Aplodinotus grunniens</i>	S5	Warm	Spring-Summer
Gizzard shad	<i>Dorosoma cepedianum</i>	S4	Cool	Summer
Golden shiner	<i>Notemigonus crysoleucas</i>	S5	Cool	Summer
Goldfish	<i>Carassius auratus</i>	Invasive	Warm	Spring-Summer
Green Sunfish	<i>Lepomis cyanellus</i>	S4	Warm	Summer
Johnny Darter	<i>Etheostoma nigrum</i>	S5	Cool	Spring
Largemouth Bass	<i>Micropterus salmoides</i>	S5	Warm	Spring
Logperch	<i>Percina caprodes</i>	S5	Warm	Spring
Mimic Shiner	<i>Notropis volucellus</i>	S5	Warm	Summer
Redhorse sp.	<i>Moxostoma sp.</i>	Varies	Varies	Spring
North American Catfishes	North American Catfishes	S4	Warm	Spring-Summer
Northern Pike	<i>Esox lucius</i>	S5	Cool	Spring

Common Name	Scientific Name	SARO Status	Thermal Regime	Spawning Season
Pumpkinseed	<i>Lepomis gibbosus</i>	S5	Warm	Spring-Summer
Quillback	<i>Carpoides Cyprinus</i>	S4	Cool	Spring
Rock Bass	<i>Ambloplites rupestris</i>	S5	Cool	Spring
Rudd	<i>Scardinius erythrophthalmus</i>	Invasive	Cool	Spring
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	S5	Warm	Spring
Smallmouth Bass	<i>Micropterus dolomieu</i>	S5	Cool	Spring
Sunfishes	<i>Lepomis</i> sp.	varies	Warm	Summer
Tadpole Madtom	<i>Noturus gyrinus</i>	S4	Warm	Summer
Tessellated Darter	<i>Etheostoma olmstedii</i>	S4	Cool	Spring
Walleye	<i>Stizostedion vitreum</i>	S5	Cool	Spring
White Bass	<i>Morone chrysops</i>	S4	Warm	Spring
White Crappie	<i>Pomoxis annularis</i>	S4	Warm	Spring
White Perch	<i>Morone americana</i>	Invasive	Warm	Spring
White Sucker	<i>Catostomus commersoni</i>	S5	Cool	Spring
Yellow Bullhead	<i>Ameiurus natalis</i>	S4	Warm	Spring
Yellow Perch	<i>Perca flavescens</i>	S5	Cool	Spring

\*Great Lakes-Upper St. Lawrence Population



*Photo 1: Northeast Bank of the Welland River at the Niagara Street Bridge*



*Photo 2: Undercutting at the Northeast Bank of the Welland River*



*Photo 3: Undercutting on northeast side of Niagara Bridge*



*Photo 4: Artificial hardening on southeast side of Niagara Bridge*

## 5. Impact Assessment

The project will replace and widen the Niagara Street Bridge project over the Welland River. The general development plan is presented in **Appendix C** and **Figure 4**. The current bridge will be replaced with a two-span steel I-girder bridge, and the substructures (abutments and piers) on either side of the river will be replaced. The existing bridge is a four-span bridge with three piers. The two-span bridge design will allow for the removal of two piers from the Welland River. Replacement of the abutments and piers will require “in the dry” works within the Welland River. To replace the bridge, a laydown area and a crane pad are assumed to be required. A temporary ramp is also assumed to be required to access the streambed to allow machinery access to replace the abutments and piers.

### 5.1 Potential Impacts

The following potential impacts are based on Palmer’s understanding of the conceptual design (**Appendix C**) and general workplan. The potential impacts should be refined during the detailed design stage of the project, to help position and implement specific mitigations.

#### 5.1.1 Protection of Watercourse and Fish Habitat

The potential impacts to the function of the Welland River from the proposed bridge replacement works on are predominately associated with sedimentation and temporary disruptions to fish and mussel habitat. The deck surface, abutments and piers must be removed and replaced, and will require near-water/in-water work. These near-water/in-water work may create impacts to flow, temperature, and overall water quality. Work area exclusions may also trap fish, mussels and/or turtles in work areas.

There is not expected to be a temporary or permanent increase in existing footprint above the ordinary high water mark. In fact, with the reduction of three piers to one, the footprint of the bridge will be reduced within the watercourse.

#### 5.1.2 Tree Removals and Tree Damage

It is presumed that tree and brush removal will be required to accommodate abutment replacement and to potentially accommodate a crane pad/near bridge work areas. Certain trees are also assumed to be removed to accommodate a construction ramp for abutment and pier replacement; the likely location being the southeast side where slopes are gentlest.

Based on the current proposed design and associated disturbance limits, approximately 22 trees may require removal to accommodate the bridge abutment and pier replacement works, being those within and near the Study Area on **Figure 3**. Specific trees to be removed should be determined at the detailed design stage. Impacts to adjacent retained trees may also be possible, in the form of mechanical trunk damage, root compression by heavy machinery, and branch damage from adjacent works.



Imagery (2020) provided by Welland WMS

CLIENT: 	PROJECT: Niagara Street Bridge		LEGEND:  Study Area
	PROJECT NO. 1400353	REVISION: 1-1	
PREPARED BY: 	DATE: Oct 01, 2021	SCALE: 1:1000	
	DRAWN: CV	DATUM: NAD 1983	
	CHECKED: AZ	PROJECTION: UTM zone 17	

**Proposed Bridge Design and Mitigation Recommendations**

**Figure 4**

### **5.1.3 Potential Impacts to Terrestrial Wildlife**

Potential impacts to wildlife are possible due to construction activity including tree and vegetation removal (habitats), grading, use of machinery and nearby disturbances. These activities should be avoided and/or minimized to the greatest extent feasible, specifically in regard to the protection of breeding birds and bat activity periods. Impacts to wildlife are associated with the construction works and are therefore considered short-term.

The Welland River and banks have the potential to be general and nesting habitat for Snapping Turtle, particularly during the spring nesting season. Additionally, larger trees near water may host potential roosting habitats for bats.

## 6. Mitigation

The following mitigations are identified at this conceptual design stage. Through the finalization of the detailed design and construction, mitigation and protection measures must be implemented. All of these measures are to be refined, detailed and conveyed as part of the final tender document for appropriate understanding and implementation by the contractor under the supervision of the Contract Administrator.

Detailed mitigation for the project is outlined in the following sections, and the following general mitigation and enhancement measures are provided:

- To minimize the potential for erosion and off-site transport of sediment into the Welland River, the project will implement Best Practices related to erosion and sediment control (ESC). ESC measures used by the contractor on all construction should meet guidelines as outlined in *Erosion and Sediment Control Guideline for Urban Construction* (ESC Guideline), or equivalent standards (Greater Golden Horseshoe Conservation Authorities, 2006).
  - At minimum, heavy-duty ESC fencing as per OPSD219.130 is proposed to be installed and maintained around the periphery of the bridge area where cofferdams are not required.
- In certain areas, ESC fencing should be constructed in concert with the wildlife exclusion recommendations outlined in Section 6.4 (below).
- Where necessary, trees proposed to be retained will be protected by tree protection fencing (TPF), as per Section 6.2.
- In the unlikely event that SAR are encountered, work will stop and the MECP will be contacted for direction.
- All exposed and newly constructed surfaces should be stabilized using appropriate means in accordance with the characteristics of the exposed soils. These surfaces should be fully stabilized and re-vegetated as quickly as possible following the completion of the works.
- All activities, including the maintenance of construction machinery, should be controlled to prevent the entry of petroleum products, debris, rubble, concrete or other deleterious substances into the natural environment. Refueling should not occur within 30 m of any woodland, wetland or watercourse.
  - The Niagara Street roadway and/or parking area south of the building in the southwest corner is recommended for this purpose.

Through implementation of measures as included above, potential adverse impacts to the natural heritage system that comprises the Study Area may be mitigated.

### 6.1 In-Stream Works

The protection of fish and mussel habitat during construction works is to be achieved via adherence to timing windows, wildlife relocation, and work isolation and ESC measures during all phases of the construction-related works. This will help to ensure that no fish or mussels are directly or indirectly harmed

as a result of the proposed works. All in-water and near-water works should be completed outside the southern regions spring spawning window of March 15 to July 15 (Fisheries and Oceans Canada, 2020).

Works associated with portions of the abutment and pier replacement are proposed to be completed “in the dry”. This is proposed to be completed by temporarily placing a phased, partial stream diversion cofferdam where works are required within or adjacent to the stream bed. In-water and near-water works should also be completed during low flow seasons (i.e., preferably mid-late summer or winter).

If fish, mussels or turtles become stranded in the isolated areas, a qualified ecologist is to capture the individuals and relocate them to suitable habitat upstream of the work site. A fish and wildlife salvage permit is recommended to be obtained from MNRF prior to the commencement of in-water works.

### 6.1.1 Fisheries Permitting and Cofferdam Codes of Practice

The potential impacts from this type of project are relatively well known, and the removal and construction of the bridge deck, abutments and piers, and the installation of the bank stabilization measures are expected to be installed using standard isolation/exclusion measures, including coffer dams and diversion channels. Should the project be able to follow the practices detailed in the DFO’s *Interim code of practice: Temporary cofferdams and diversion channels* guidelines, under the *Fish and Fish Habitat Protection Program*, the project should be able to proceed following the submission of a DFO *Notification Form*.

It is not expected that DFO requirements would extend beyond the *Notification Form*. The following are the portions of the *Interim code of practice: Temporary cofferdams and diversion channels* that are considered applicable to the Project. These codes of practice should be reviewed and built into the design drawings and dewatering plan for the work areas and isolation/exclusion measures. Required mitigation would also include fish removal (salvage) should they get trapped in an isolation work area, and completing the work outside the windows identified in Section 6.1.

#### Protection of Fish (and Mussels)

- Plan in water works, undertakings and activities to respect timing windows to protect fish and fish habitat.
  - For this project, the in-water work timing window is **July 16<sup>h</sup> to March 14<sup>th</sup>** of a given year, outside the spring-summer spawning period (Fisheries and Oceans Canada, 2013).
- Limit the duration of in-water works, undertakings and activities so that it does not diminish the ability of fish to carry out one or more of their life processes (e.g., spawning, rearing, feeding, migrating).
- Capture and relocate any fish and mussels trapped within an isolated/enclosed work area (e.g., cofferdam) and safely relocate them to an appropriate location in the same water body.
  - Dewater gradually to reduce the potential for stranding fish.
  - Relocate any fish and mussels as per applicable permits for capturing and relocating.

#### Protection of Fish Passage

- Maintain fish passage during all phases of works, undertakings and activities, meaning that cofferdams should not extend the entire length of the creek, allowing a route for fish movement.
  - Avoid changing flow or water levels.

- Avoid obstructing and interfering with the movement and migration of fish.

#### Protection of the Riparian Zone

- Use existing trails, roads, access points or cut lines wherever possible.
- Avoid tree/shrub removal whenever possible; see the Arborist Report (Palmer, 2021).
- Use methods to prevent soil compaction (e.g., swamp mats, rig-matting, pads).
- Avoid stockpiling of material on stream banks and riparian zones.
- Limit access to banks or areas adjacent to water bodies.
- Prune or top the vegetation instead of grubbing/uprooting to ensure root structure stability
- Limit grubbing on watercourse banks to the area required for the footprint of the works, undertakings and activities.
- Construct access points and approaches perpendicular to the watercourse or water body.
- Remove vegetation or species selectively and in phases.
- Re-vegetate the disturbed areas with native species suitable for the Site (See Section 6.3).
- Restore the banks affected by the work, undertakings and activities to their natural state (profile, vegetation, etc.).

#### Protection of Aquatic Habitat

- Avoid disturbing or removing aquatic vegetation, natural wood debris, rocks, sand or other materials from the banks, shoreline or the bed of the water body, beyond the work area.
- Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks.
- Salvage, reinstate or match habitat structure (e.g., large wood debris, boulders, instream aquatic vegetation/substrate) to its natural state

#### Protection of Fish Habitat from Sedimentation

- Use only clean materials (e.g., rock, coarse gravel, wood, steel, snow) for works, undertakings and activities.
- Develop and implement an erosion and sediment control (ESC) plan to minimize sedimentation of the water body during all phases of the works, undertakings and activities.
- Conduct all in-water works, undertakings and activities in isolation of open or flowing water to reduce the introduction of sediment into the watercourse.
- Maintain the natural flow regime for any diversion works.
- Schedule work to avoid wet, windy and rainy periods and heed weather advisories.
- Regularly inspect and maintain the ESC measures and structures during all phases of the project.
- Regularly monitor the watercourse for signs of sedimentation during all phases of the works, undertakings and activities and take corrective action when needed.
- Use biodegradable ESC materials whenever possible.
- Keep the ESC measures in place until all disturbed ground has been permanently stabilized.
- Remove all ESC materials once site has been stabilized.
- Use methods to prevent substrate compaction (e.g., swamp mats, rig-matting, pads).
- Dispose of and stabilize all excavated material above the ordinary high water mark or top of bank of nearby water bodies and ensure sediment re-entry to the watercourse is prevented.

- Use appropriate isolation materials and designs to minimize disturbance to the bed and banks of the watercourse or water body.
- Protect pump discharge areas to prevent erosion and the release of suspended sediments downstream.
- Pump any residual water from the isolated worksite into a designated treatment area (e.g., settling pond, behind filter fabric dam, vegetated areas, enviobags).
  - Remove accumulated sediments from the isolated area before removing the isolation barrier.
  - Partially reflood the dewatered site in order to re-suspend remaining deposits and pump any residual sediment-laden water from the site.

#### Protection of fish and fish habitat from deleterious substances (including suspended sediment)

- Develop and immediately implement a response plan to prevent deleterious substances from entering a water body. The response plan should include:
  - Stop works, undertakings and activities in the event of a spill of a deleterious substance.
  - Immediately report any spills (e.g., sewage, oil, fuel or other deleterious material), whether near or directly into a water body.
  - Keep an emergency spill kit on site during the works, undertakings and activities.
  - Contain any water with deleterious substances.
  - Ensure clean-up measures are suitably applied so as not to result in further alteration of the bed and/or banks of the watercourse.
  - Clean-up and appropriately dispose of the sediment-laden water and water contaminated with deleterious substances.
  - Maintain all machinery on site in a clean condition and free of fluid leaks.
  - Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.
  - Dispose of all waste materials (e.g., construction, demolition, commercial logging) above the ordinary high water mark to prevent entry into the water body.
  - Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, poured concrete or other chemicals do not enter the watercourse.

#### Additional Measures for Cofferdams

- Construct the cofferdam using non-earthen material (e.g., water-inflated portable dams, pea gravel bags, concrete blocks, steel or wood wall, clean rock, sheet pile or other appropriate designs).
  - Take the necessary measures to seal the cofferdams and thus minimize the amount of water to be managed.
  - Use clean rock void of erodible material.
  - Use adequately sized material (i.e., moderately sized rock and not sand or gravel) to withstand anticipated flows during construction.
  - Construct cofferdams sufficiently high to prevent overtopping in the event of sudden increases in water levels.
- Regularly inspect and maintain cofferdam during all phases of the project.
- Do not excavate inside the cofferdam or sediment filtering curtain until the cofferdam/curtain/work area is completely isolated from flow.

- Only install and operate dewatering pumps once the cofferdam is complete and isolation has been achieved.
  - Pumps should be monitored at all times, and back-up pumps should be readily available on-site in case of pump failure or high flow events.

### 6.1.2 Fish and Mussel Salvage

As fish and mussels may be present cofferdam installation or inadvertently enter an isolation area, the relocation of fish and mussels from the work area may be required. The incorporation of this activity into the construction schedule would be required. An MNRF *Application for a Licence to Collect Fish* would be required for this activity.

## 6.2 Tree Protection

### 6.2.1 Tree Protection Fencing

Where necessary, trees proposed to be retained will be protected by tree protection fencing (TPF), which is to be placed a minimum of one (1) metre outside the dripline, in accordance with the *City of Welland Municipal Standards* (City of Welland, 2013). Fencing provides protection from potential damage during construction activities such as the use of machinery near trees and branches and stockpiling of materials over the root zone. Orange construction safety fencing should be secured to metal “T-bar” supports a maximum of 2.0 m apart, being a minimum of 1.2 m above ground and 1.2 m below ground. Fencing should be supported with a wire woven through the top and secured to each T-bar.

The locations of TPF should be determined at detailed design.

### 6.2.2 Additional Tree Protection Measures

Additional tree protection measures may be required, and should be detailed in an Arborist Report for the project at the detailed design stage. Such measures may include limb and/or root pruning of trees to be retained. Generally, it is recommended that pruning occur prior to construction by an ISA certified arborist using good arboricultural practices. As trees to be removed are located on riverine slopes, it is recommended wherever possible that the trees be removed and grinded rather than root removal. This will allow for the retention of root biomass to help control erosion as restoration plantings develop.

## 6.3 Restoration and Tree Replacement

Restoration of the Study Area will serve to enhance the natural heritage features and functions of the area and help control erosion beyond the bridge repairs. Planting and restoration efforts should aim to restore the natural areas where disturbances have occurred as a result of construction works.

It is recommended that the construction area be revegetated at the earliest practical opportunity. After the installation of the abutments and other on-shore items, the remaining work areas should be de-compacted

with a low pressure Airspade (or similar) to a depth of 300 mm and/or the addition of certified weed-free topsoil and compost mix, as necessary.

This area should be planted with a native seed mix such as Ontario Seed Company Mixture 8215 (Creek Bank Native Seed Mixture (Wet Meadow Type)) at a rate of 25 kgs/ha (Ontario Seed Company, 2020); the mixture is best planted in fall, typically between October 15 and November 15. A mixture such as this would promote native diversity to the area and conforms to the TRCA *Seed Mix Guidelines* (Toronto and Region Conservation Authority, 2004). OSC Mixture 8215 contains:

- Big Bluestem (*Andropogon gerardii*);
- Black Eyed Susan (*Rudbeckia hirta*);
- Bottlebrush Grass (*Elymus hystrix*);
- Fowl Bluegrass (*Poa palustris*);
- Fowl Mannagrass (*Glyceria striata*);
- Fox Sedge (*Carex vulpinoidea*); and
- New England Aster (*Aster novae-angliae*).

To assist in the establishment, a nurse crop of Common Oats (*Avena sativa*) or Buckwheat (*Fagopyrum esculentu*) should also be seeded at a rate of 22-25 kg/ha.

After seeding the ground cover, replacement trees should be planted in the Study Area. The total replacement trees required should be identified in the Arborist Report at Detailed Design. The City of Welland generally practices a 1:1 tree compensation ratio for tree removals (Metsa, E., personal communication, September 2, 2021).

The Ontario *Tree Atlas* shows select species that are appropriate to plant in the Welland area (Ministry of Natural Resources and Forestry, 2021). Referring to the *Tree Atlas* and considering the species to be removed on the Study Area, the following species are recommended for replacement plantings:

- Basswood (*Tilia americana*);
- Bitternut Hickory (*Carya cordiformis*);
- Black Walnut (*Juglans nigra*);
- Shagbark Hickory (*Carya ovata*); and
- Sugar Maple (*Acer saccharum*);

Ash (*Fraxinus*) species are not yet recommended due to the effects of EAB in Ontario. In terms of sizes, for trees to be planted in the western property limit, compensation plantings are recommended to be 3 - 5 gallon potted stock. As this area overlaps in places with minimum protection distances for tree to remain, compensation trees are recommended to be manually planted (hand-dig) only with field-fit planting to avoid existing tree roots.

## 6.4 Terrestrial Wildlife Timing and Exclusion Fencing

### 6.4.1 Birds and Bats

To avoid potential interaction with SAR bats and birds, a combined timing window has been recommended to avoid both breeding birds and roosting bats. To avoid impacts to breeding birds, tree clearing within the C1 nesting calendar period should be avoided, which is primarily April 1 to the end of August (Government of Canada, 2019). In order to avoid potential impacts to bat species, all tree removals should be completed outside the bat maternity roost season and hibernation period of April 15 to September 30 (Ministry of Natural Resources, 1984; Ontario Ministry of Natural Resources, 2011).

### 6.4.2 Barn Swallow

During field surveys, an old, inactive nest was observed during surveys on the underside of the Niagara Street Bridge (**Photo 5**). As part of Detailed Design, it is recommended that the underside of the Niagara Street bridge be resurveyed for potential Barn Swallow nests in the breeding season (April through early July) prior to initiation of construction works, including demolition. If present, a Notice of Activity will need to be submitted through the Ministry's Registry to ensure that the proposed habitat removal conforms to Section 9 and 10 of the *Endangered Species Act*.



*Photo 5: Inactive nest under bridge*

If Barn Swallow are present, part of the registry requirements is the creation of alternative habitats prior to return to the nest. Plans for the creation of alternative structures are found in *Creating Nesting Habitat for*

*Barn Swallows* (Ministry of Natural Resources and Forestry, 2016). A recommended location for such a structure is along the southeast bank of the Welland River, away from regular human exposure, but in close proximity to the bridge.

As waiting to resurvey the bridge may delay the project several months, an alternative recommendation is to consult with the MECP regarding current findings and install the alternative structure in advance of planned demolition, if registry and compensation are recommended by MECP. It would be recommended to remove the existing nest at that time, provided it is confirmed unoccupied.

### **6.4.3 Herpetofauna**

As the riparian shores have the potential to be nesting habitat for Snapping Turtle, turtle/herpetofauna exclusion fencing should be installed to prevent access to specific areas where activities that could harm animals are to occur (Ontario Ministry of Natural Resources, 2013). Exclusion fencing can be combined with ESC fencing and should be installed prior to species' emergence from hibernation.

To provide robust fencing for turtle/herpetofauna of different species, the recommended depth of a fence to be installed is 10 - 20 cm depth of buried fence, and a height of 100 cm. This height is to account of general exclusion of turtles (60 cm height) and general exclusion of snakes (100 cm height) (Ontario Ministry of Natural Resources, 2013). For the fencing, it is recommended that light-duty geotextile fencing with wooden stakes be used if the proposed works as construction duration is anticipated to be short (4 – 5 days). Geotextile fencing with nylon mesh lining should be avoided due to the risk of entanglement by snakes. Hardware cloth fences are another effective option. Note that OPSD219.130 standards should also be maintained for this fencing to the degree feasible.

The exact locations of wildlife exclusion fencing should be determined at detailed design. In general, ESC and wildlife exclusion fencing should look to extend the cofferdam exclusion zones beyond the riparian slopes to the tablelands above.

## 7. Conclusion

The findings of this study are the result of a background review, ecological field surveys, and an analysis of data using current scientific understanding of the ecology of the area and natural heritage policy requirements. This information is provided in support of the bridge replacement design and construction.

Yours truly,

**Palmer**<sup>TM</sup>



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# Appendix A

## Flora List

# Appendix A

## Flora List

Family	Scientific Name	Common Name	COSEWIC	SARA	SARO	NHIC			Coefficient of Conservatism	Coefficient of Wetness	Niagara
						Global	Provincial	Exotic			
Aceraceae	<i>Acer negundo</i>	Manitoba Maple				G5	S5		0	0	
Aceraceae	<i>Acer nigrum</i>	Black Maple				G5	S4?		7	3	
Aceraceae	<i>Acer platanoides</i>	Norway Maple				GNR	SNA	SE5		5	
Aceraceae	<i>Acer saccharinum</i>	Silver Maple				G5	S5		5	-3	
Aceraceae	<i>Acer saccharum</i>	Sugar Maple				G5	S5		4	3	
Anacardiaceae	<i>Toxicodendron radicans</i>	Poison Ivy				G5	S5		2	0	
Apiaceae	<i>Daucus carota</i>	Wild Carrot				GNR	SNA	SE5		5	
Asteraceae	<i>Arctium minus</i>	Common Burdock				GNR	SNA	SE5		3	
Asteraceae	<i>Euthamia graminifolia</i>	Grass-leaved Goldenrod				G5	S5		2	0	
Asteraceae	<i>Solidago flexicaulis</i>	Zigzag Goldenrod				G5	S5		6	3	
Asteraceae	<i>Taraxacum officinale</i>	Common Dandelion				G5	SNA	SE5		3	
Balsaminaceae	<i>Impatiens capensis</i>	Spotted Jewelweed				G5	S5		4	-3	
Betulaceae	<i>Alnus glutinosa</i>	European Black Alder				GNR	SNA	SE4		-3	
Betulaceae	<i>Betula alleghaniensis</i>	Yellow Birch				G5	S5		6	0	
Caprifoliaceae	<i>Lonicera tatarica</i>	Tatarian Honeysuckle				GNR	SNA	SE5		3	

**Legend:**

COSEWIC - Committee on the Status of Endangered Wildlife in Canada

SARA - Ontario Species at Risk Act List

SARO - Species at Risk in Ontario

NHIC - Natural Heritage Information Centre

Niagara Rank – Oldham, 2010.

Coefficients – Oldham et al., 1995

Family	Scientific Name	Common Name	COSEWIC	SARA	SARO	NHIC			Coefficient of Conservatism	Coefficient of Wetness	Niagara
						Global	Provincial	Exotic			
Caprifoliaceae	<i>Lonicera xylosteum</i>	Dwarf Honeysuckle				GNR	SNA	SE2		5	
Cornaceae	<i>Cornus sericea</i>	Red-osier Dogwood				G5	S5		2	-3	
Fabaceae	<i>Vicia cracca</i>	Tufted Vetch				GNR	SNA	SE5		5	
Hippocastanaceae	<i>Aesculus hippocastanum</i>	Horse Chestnut				GNR	SNA	SE2		5	
Iridaceae	<i>Iris pseudacorus</i>	Yellow Iris				GNR	SNA	SE4		-5	
Juglandaceae	<i>Juglans nigra</i>	Black Walnut				G5	S4?		5	3	
Lamiaceae	<i>Marrubium vulgare</i>	Common Horehound				GNR	SNA	SE2		3	
Poaceae	<i>Elymus repens</i>	Quackgrass				GNR	SNA	SE5		3	
Poaceae	<i>Poa palustris</i>	Fowl Bluegrass				G5	S5		5	-3	
Primulaceae	<i>Lysimachia nummularia</i>	Creeping Yellow Loosestrife				GNR	SNA	SE5		-3	
Ranunculaceae	<i>Anemonastrum canadense</i>	Canada Anemone				G5	S5		3	-3	
Rhamnaceae	<i>Rhamnus cathartica</i>	European Buckthorn				GNR	SNA	SE5		0	
Rosaceae	<i>Potentilla anserina</i>	Silverweed				G5	S5		5	-3	
Rosaceae	<i>Prunus pensylvanica</i>	Pin Cherry				G5	S5		3	3	
Rosaceae	<i>Rosa rugosa</i>	Rugosa Rose				GNR	SNA	SE1		3	
Rosaceae	<i>Rubus idaeus</i>	Red Raspberry				G5	S5		2	3	
Rubiaceae	<i>Galium trifidum</i>	Three-petalled Bedstraw				GNR	S5		5	-3	
Salicaceae	<i>Populus deltoides</i>	Eastern Cottonwood				G5	S5		4	0	
Salicaceae	<i>Salix euxina</i>	Crack Willow				GNR	SNA	SE		0	
Solanaceae	<i>Solanum dulcamara</i>	Bittersweet Nightshade				GNR	SNA	SE5		0	
Tiliaceae	<i>Tilia cordata</i>	Little-leaved Linden				GNR	SNA	SE1		5	

**Legend:**

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Family	Scientific Name	Common Name	COSEWIC	SARA	SARO	NHIC			Coefficient of Conservatism	Coefficient of Wetness	Niagara
						Global	Provincial	Exotic			
Vitaceae	<i>Parthenocissus quinquefolia</i>	Virginia Creeper				G5	S4?		6	3	
	<i>Nuphar lutea</i>	Yellow Water-lily									
	<i>Rorippa amphibia</i>	Great Yellowcress									

**Legend:**

COSEWIC - Committee on the Status of Endangered Wildlife in Canada

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# Appendix B

## Tree Inventory

# Appendix B

## Tree Inventory

Tag #	Scientific Name	Common Name	DBH (cm)	Effective DBH (cm)	Tree Protection Zone (TPZ) (m)	Condition (G /F/P/D)	
						Structure	Vigour
86	<i>Alnus glutinosa</i>	European Black Alder	26,16	37	2.4	G	F
87	<i>Juglans nigra</i>	Black Walnut	15, 10, 8, 4	20	1.8	F	G
88	<i>Acer negundo</i>	Manitoba Maple	15,9	17	1.8	F	G
89	<i>Betula alleghaniensis</i>	Yellow Birch	27		2.7	G	G
90	<i>Juglans nigra</i>	Black Walnut	11		1.8	F	G
91	<i>Juglans nigra</i>	Black Walnut	16		1.8	G	G
92	<i>Populus deltoides</i>	Eastern Cottonwood	33		2.4	G	G
93	<i>Salix fragilis</i>	Crack Willow	17		1.8	F	G
94	<i>Salix fragilis</i>	Crack Willow	14		1.8	F	G
95	<i>Gleditsia triacanthos</i>	Honey Locust (cult.)	35		2.4	G	G
96	<i>Gleditsia triacanthos</i>	Honey Locust (cult.)	30		2.4	G	G
97	<i>Acer negundo</i>	Manitoba Maple	10		1.8	VP	F
98	<i>Juglans nigra</i>	Black Walnut	15		1.8	VP	G
99	<i>Fraxinus pennsylvanica</i>	Green Ash	9		1.2	F	G
100	<i>Acer platanoides</i>	Norway Maple	10, 7	12	1.8	P	P
101	<i>Acer platanoides</i>	Norway Maple	25,10,12	29	1.8	F	G
102	<i>Juglans nigra</i>	Black Walnut	22		1.8	F	G
103	<i>Prunus virginiana</i>	Chokecherry	12		1.8	G	G
104	<i>Prunus virginiana</i>	Chokecherry	11		1.8	G	G
105	<i>Prunus virginiana</i>	Chokecherry	13		1.8	G	G
106	<i>Prunus virginiana</i>	Chokecherry	12		1.8	G	G

DBH: Diameter at Breast Height. For multi-stemmed trees, Effective DBH is calculated as the square root of the sum of squares.

TPZ: Minimum Tree Protection Zone

Condition: Good, Fair, Poor, Dead

Tag #	Scientific Name	Common Name	DBH (cm)	Effective DBH (cm)	Tree Protection Zone (TPZ) (m)	Condition (G /F/P/D)	
						Structure	Vigour
107	<i>Acer negundo</i>	Manitoba Maple	23,16,18	33	2.4	VP	G
108	<i>Juglans nigra</i>	Black Walnut	15,7,7	18	1.8	VP	G
109	<i>Acer negundo</i>	Manitoba Maple	12,9,12,	19	1.8	VP	F
110	<i>Acer negundo</i>	Manitoba Maple	12,15,21	28	1.8	VP	G
111	<i>Acer negundo</i>	Manitoba Maple	20,9,15	27	1.8	VP	G
112	<i>Salix fragilis</i>	Crack Willow	33,28,35	56	3.6	VP	G
113	<i>Salix fragilis</i>	Crack Willow	33		2.4	VP	G
114	<i>Acer negundo</i>	Manitoba Maple	27,18	32	2.4	VP	F
115	<i>Acer negundo</i>	Manitoba Maple	14		1.8	VP	G
116	<i>Acer negundo</i>	Manitoba Maple	7,7,8	13	1.8	F	G
117	<i>Salix fragilis</i>	Crack Willow	82		5.4	VP	G
118	<i>Acer negundo</i>	Manitoba Maple	8,8,5	12	1.8	F	G
119	<i>Prunus virginiana</i>	Chokecherry	14,12,10,8,8	24	1.8	F	F(P)
120	<i>Tilia cordata</i>	Little-leaved Linden	7		1.2	G	G
121	<i>Juglans nigra</i>	Black Walnut	17		1.8	G	G
122	<i>Aesculus hippocastanum</i>	Horse Chestnut	62		4.2	G	G
123	<i>Tilia cordata</i>	Little-leaved Linden	10,9,8,4	16	1.8	F	G
124	<i>Tilia cordata</i>	Little-leaved Linden	12,10,8,6,6	19	1.8	F	G
125	<i>Fraxinus pennsylvanica</i>	Green Ash	18,10,9	22	1.8	VP	P
126	<i>Tilia cordata</i>	Little-leaved Linden	21		1.8	G	G
127	<i>Betula alleghaniensis</i>	Yellow Birch	32		2.4	G	G
128	<i>Tilia cordata</i>	Little-leaved Linden	22		1.8	G	G
129	<i>Tilia cordata</i>	Little-leaved Linden	11		1.8	F	F
130	<i>Tilia cordata</i>	Little-leaved Linden	21		1.8	G	G
131	<i>Tilia cordata</i>	Little-leaved Linden	14		1.8	G	G

DBH: Diameter at Brest Height. For multi-stemmed trees, Effective DBH is calculated as the square root of the sum of squares.

TPZ: Minimum Tree Protection Zone

Condition: Good, Fair, Poor, Dead

Tag #	Scientific Name	Common Name	DBH (cm)	Effective DBH (cm)	Tree Protection Zone (TPZ) (m)	Condition (G /F/P/D)	
						Structure	Vigour
132	<i>Tilia cordata</i>	Little-leaved Linden	24,29	38	2.4	G	G
133	<i>Acer negundo</i>	Manitoba Maple	17		1.8	P(F)	F
134	<i>Acer negundo</i>	Manitoba Maple	20,19	28	1.8	VP	P
135	<i>Tilia cordata</i>	Little-leaved Linden	22,14	26	1.8	G	G
136	<i>Tilia cordata</i>	Little-leaved Linden	23		1.8	G	G

DBH: Diameter at Breast Height. For multi-stemmed trees, Effective DBH is calculated as the square root of the sum of squares.

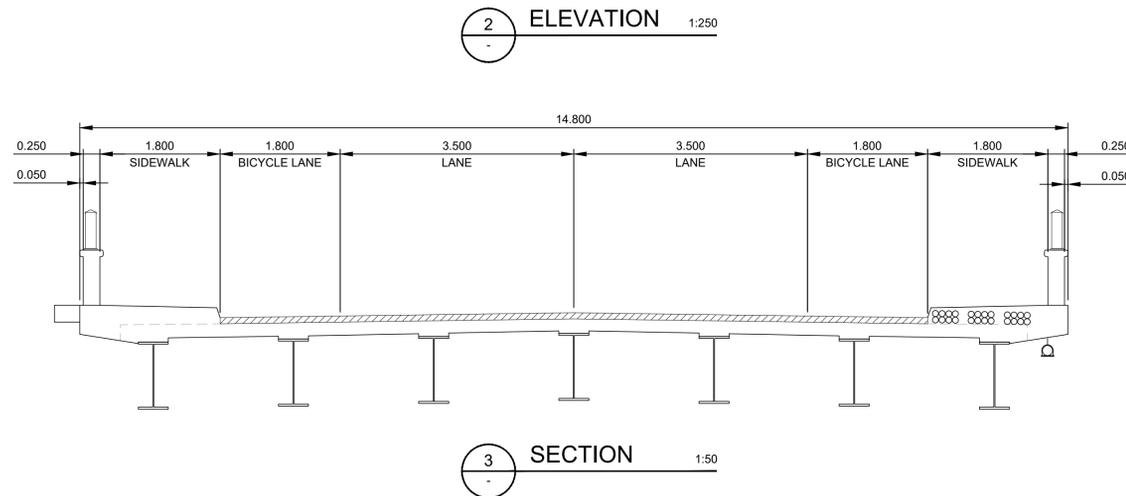
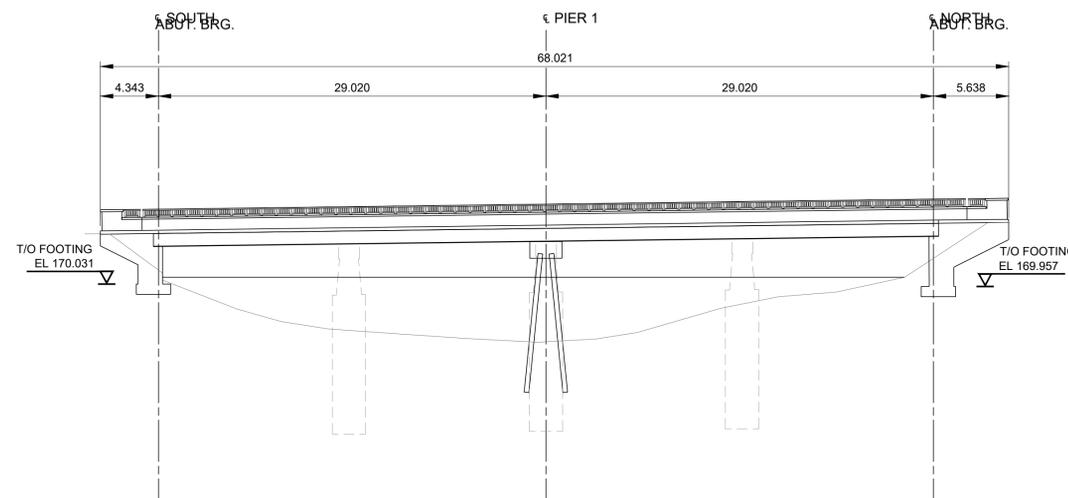
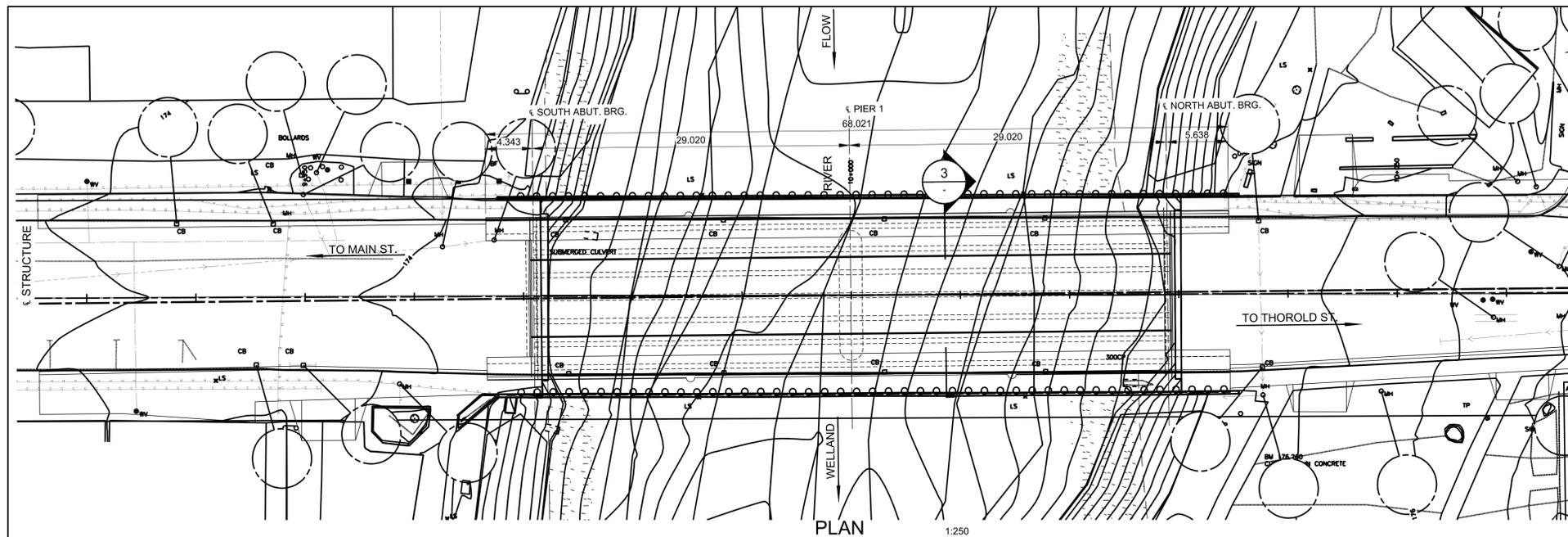
TPZ: Minimum Tree Protection Zone

Condition: Good, Fair, Poor, Dead



# Appendix C

## General Development Plan



**GENERAL NOTES**

1. THE STRUCTURE REHABILITATION IS DESIGNED IN ACCORDANCE WITH THE CANADIAN HIGHWAY BRIDGE DESIGN CODE CAN/CSA-S6-14 (CHBDC).  
LIVE LOAD CL-625-ON TRUCK LOAD.
2. ALL WORK SHALL CONFORM TO THE LATEST REVISIONS OF THE ONTARIO PROVINCIAL DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS) UNLESS NOTED OTHERWISE ON THE DRAWINGS OR IN THE SPECIFICATIONS.
3. CLASS OF CONCRETE:  
MINIMUM STRENGTH AT 7 DAYS 21 MPa  
AT 28 DAY 35 MPa  
MAXIMUM AGGREGATE SIZE 20 mm
4. CLEAR COVER TO REINFORCING STEEL  
ALL SURFACES 50 ± 10 mm

**REINFORCING STEEL**

- NO REINFORCING STEEL IS TO BE REMOVED UNLESS AUTHORIZED BY THE CONTRACT ADMINISTRATOR.
- REINFORCING STEEL SHALL BE GRADE 400W UNLESS OTHERWISE SPECIFIED.
- BARS TO BE BENT COLD, MINIMUM INSIDE RADIUS TO BE 4 DIAMETERS. BARS NOT TO BE BENT ON SITE.
- UNLESS SHOWN OTHERWISE, TENSION LAP SPLICES SHALL BE CLASS B.  
15M BARS TO LAP 550 mm  
20M BARS TO LAP 700 mm
- BAR HOOKS SHALL HAVE STANDARD HOOK DIMENSIONS USING MINIMUM BEND DIAMETERS, WHILE STIRRUPS AND TIES SHALL BE IN ACCORDANCE WITH THE STRUCTURAL STANDARD DRAWINGS, UNLESS NOTES OTHERWISE.
- ALL STRUCTURAL STEEL SHALL CONFORM TO CSA STANDARD CAN/CSA-G40.21-04. ROLLED SECTIONS SHALL CONFORM TO CSA STANDARD CAN/CSA-G40.21.04 OR ASTM SPECIFICATION A588.

**CONSTRUCTION NOTES**

1. CONTRACTOR SHALL PROVIDE THE NECESSARY SHORING OR SUPPORTS DURING DEMOLITION AND CONSTRUCTION TO ENSURE THE INTEGRITY AND STABILITY OF THE EXISTING STRUCTURE.
2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, DETAILS AND ELEVATIONS OF THE EXISTING STRUCTURE THAT ARE RELEVANT TO THE WORK SHOWN ON THE DRAWINGS PRIOR TO THE COMMENCEMENT OF THE WORK. ANY DISCREPANCIES SHALL BE REPORTED TO THE CONTRACT ADMINISTRATOR AND THE PROPOSED ADJUSTMENT OF THE WORK REQUIRED TO MATCH THE EXISTING STRUCTURE SHALL BE SUBMITTED FOR APPROVAL.
3. DRAWINGS NOT TO BE SCALED.
4. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ADEQUATE PROTECTION OF ALL UTILITIES AND SERVICES DURING CONSTRUCTION. COORDINATE WITH REGIONAL STAFF PRIOR TO REMOVALS COMMENCE.
5. THE CONTRACTOR SHALL CHECK AND VERIFY ALL EXISTING UTILITIES WITHIN THE WORK AREA. CARRY OUT ALL NECESSARY PROTECTION AND PRECAUTIONARY MEASURES OR ARRANGE TO DIVERT AS MAY BE REQUIRED BY RELEVANT AUTHORITIES PRIOR TO CONSTRUCTION WORK.

**TRAFFIC**

1. FULL ROAD CLOSURE WITH DETAILED DETOUR PLAN.

**CONSTRUCTION**

1. INSTALL SILT FENCING, TURBIDITY CURTAINS AND MONITORING SYSTEM.
2. INSTALL COFFERDAMS AROUND EXISTING PIERS AND ABUTMENTS.
3. REMOVE EXISTING 4-SPAN BRIDGE, ABUTMENTS, PIER CAPS AND PIER COLUMNS.
4. DRIVE PROPOSED H-PILES FOR ABUTMENTS AND STEEL TUBE PILES FOR PIER.
5. CONSTRUCT FOUNDATIONS.
6. POUR PROPOSED INTEGRAL ABUTMENTS AND WINGWALLS.
7. POUR PROPOSED PIER CAP.
8. PLACE PROPOSED BEARING PADS ON PIERS AND ABUTMENTS.
9. BACKFILL ABUTMENTS.
10. PLACE STEEL GIRDERS.
11. POUR DECK, CURBS, BARRIER WALLS AND SIDEWALKS.
12. POUR APPROACH SLAB.
13. INSTALL TL-4 BARRIER.
14. CONSTRUCT PROPOSED RR50 RE-ALIGNMENT.
15. PLACE NEW ROAD SUBBASE.
16. WATERPROOF AND PAVE.
17. LINE PAINTING.
18. MAINTAIN TRAILS THROUGHOUT CONSTRUCTION.

NO	REVISION	DATE	INIT
A	ISSUED FOR REVIEW	2021/05/25	DF

NOT ISSUED FOR CONSTRUCTION  
CONCEPTUAL DESIGN FOR  
DISCUSSION PURPOSES ONLY

DRAFTING	KVH
DESIGN	RR
CHECKED BY	PB
APPROVED BY	CC

**Niagara Region**  
PUBLIC WORKS



**2019-T-275**  
**RR50 (NIAGARA ST) BRIDGE (050205) REPAIRS**  
**BETWEEN RIVERBANK STREET AND MILL STREET**  
**IN THE CITY OF WELLAND**  
**IN THE REGION OF NIAGARA**  
**GENERAL ARRANGEMENT**

CAD No.	2019-5369
DATE	2021-05-25
SCALE	AS SHOWN
REF. No.	
DWG No.	5369-00-S-303
REV.	A