



Appendix B

Environmental Reports

INTRODUCTION

The Ayr Stormwater Management Master Plan study area (Figure 1, below) is located within the lower Nith River subwatershed of the larger Grand River watershed.

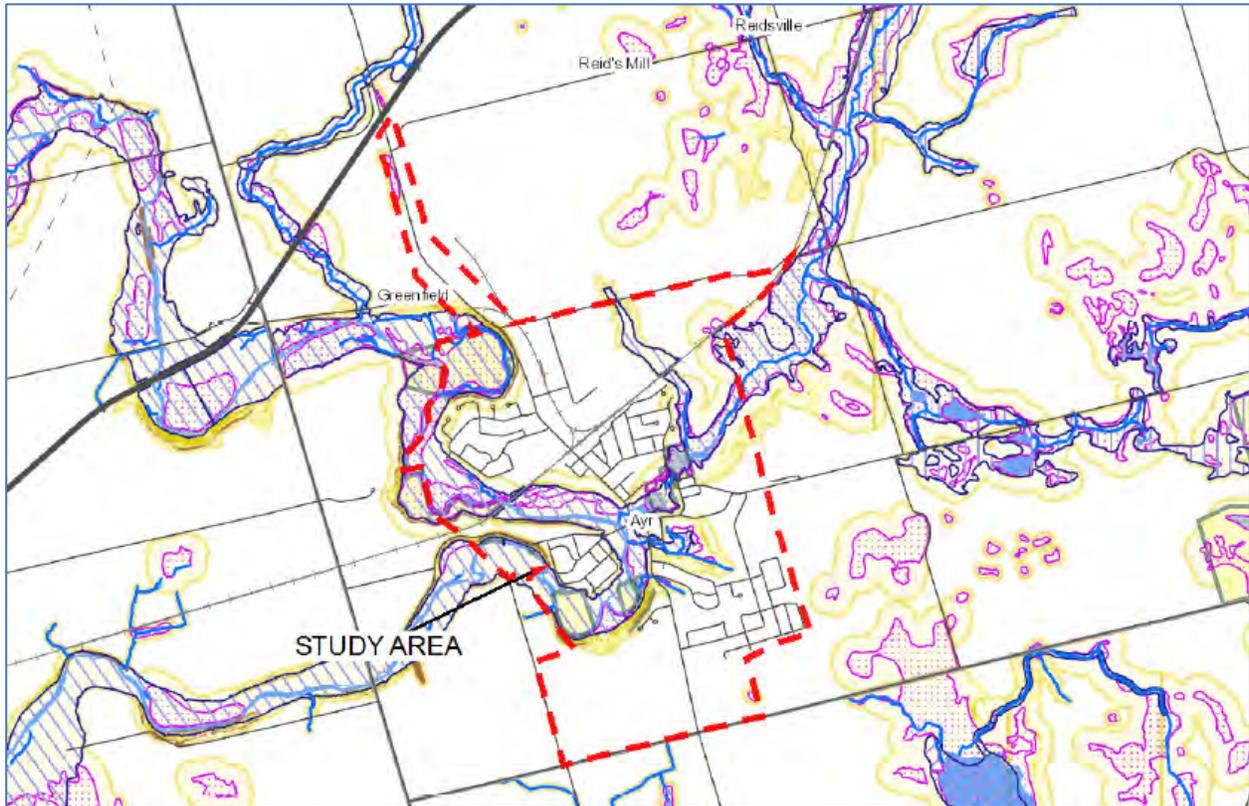


Figure 1: Ayr SWMMP Study Area (red dashed boundary), showing Nith River to the west of Ayr, Cedar Creek entering from the northeast, and Eden Creek entering the Nith River at Greenfield to the north.

The study area includes the segment of the Nith River that meanders through the Town of Ayr. Additionally, the study area includes the lowermost segment of the Nith River tributary Cedar Creek and its two historic Ayr mill ponds, Watson Pond and Jedburgh Pond, that are located just upstream of the confluence with the Nith River. The northernmost extension of the study area includes a small portion of the subwatershed drainage area of the Nith River tributary Eden Creek, but does not include any portion of the Eden Creek watercourse.

The fish habitat classification and fish community of each watercourse is described in the sections below, with reference to the occurrence of sensitive habitat conditions (e.g., groundwater-fed coldwater habitat), sensitive species (e.g., listed aquatic Species at Risk), fisheries objectives (e.g., fish community composition) and fisheries management challenges (e.g., nutrient inputs from agricultural sources, fish migration barriers, lack of riparian habitat).

The Grand River Conservation Authority (GRCA) provided key fisheries information in a 08 April 2020 letter in response to request for information. During subsequent consultation GRCA staff provided pertinent sections of the 2005 Grand River Fisheries Management Plan (GRFMP) and extracted available fish collection data from GRCA's GIS files.

Information on the occurrence and distribution of aquatic species at risk (SAR) with federal Species at Risk Act (SARA) and/or provincial Endangered Species Act (ESA) designations was obtained from on-line Department of Fisheries and Oceans (DFO) mapping.

NITH RIVER

The Nith River enters the study area from the northwest, meanders through Ayr and exits to the southwest. GRFMP identifies the segment of the Nith River within the Town of Ayr as part of the “Lower Nith River” that extends from the Town of Plattsville to the confluence with the Grand River at the Town of Paris. The main stem of the lower Nith River contains warmwater fish habitat and GRFMP fish community objectives include for the resident fish community “a diverse warmwater fish community dominated by top predators (e.g., walleye, smallmouth bass and pike)” and for seasonal migrants from Lake Erie via the Grand River “a seasonal coldwater fish community (i.e., migratory rainbow trout)”.

The GRFMP identifies landscape-level issues and challenges involving both rural and urban landuse impacts resulting in “excess nutrients, sediment inputs, riparian zone destruction, increased water temperatures, land drainage with related effects on summer baseflows, water treatment plant effluents, stormwater discharge”. Immediately upstream of the study area, the GRFMP identifies the remains of the former Greenfield Dam as a seasonal barrier to upstream fish migration in the Nith River during low flow periods.

GRCA provided the following list of fish species (Table 1) comprising the Nith River fish community in the vicinity of Ayr as reflected by MNR survey point records comprising sampling efforts over the years by GRCA, MNR and ROM:

Table 1: Nith River Fish Species

SUCKER FAMILY	CATOSTOMIDAE	
white sucker	<i>Catostomus commersonii</i>	
northern hog sucker	<i>Hypentelium nigricans</i>	
black redhorse	<i>Moxostoma duquesnei</i>	Threatened (SARA, ESA)
golden redhorse	<i>Moxostoma erythrurum</i>	
shorthead redhorse	<i>Moxostoma macrolepidotum</i>	
greater redhorse	<i>Moxostoma valenciennesi</i>	
MINNOW FAMILY	CYPRINIDAE	
common carp	<i>Cyprinus carpio</i>	non-native
striped shiner	<i>Luxilus chrysocephalus</i>	
common shiner	<i>Luxilus cornutus</i>	
hornyhead chub	<i>Nocomis biguttatus</i>	
river chub	<i>Nocomis micropogon</i>	
blacknose shiner	<i>Notropis heterolepis</i>	
silver shiner	<i>Notropis photogenis</i>	Threatened (SARA, ESA)
rosyface shiner	<i>Notropis rubellus</i>	
mimic shiner	<i>Notropis volucellus</i>	

bluntnose minnow	<i>Pimephales notatus</i>	
longnose dace	<i>Rhinichthys cataractae</i>	
CATFISH FAMILY	ICTALURIDAE	
stonecat	<i>Noturus flavus</i>	
SALMON FAMILY	SALMONIDAE	
rainbow trout	<i>Oncorhynchus mykiss</i>	non-native coldwater sportfish; seasonal migrant
PIKE FAMILY	ESOCIDAE	
northern pike	<i>Esox lucius</i>	top predator, sportfish
SUNFISH FAMILY	CENTRARCHIDAE	
rock bass	<i>Ambloplites rupestris</i>	
smallmouth bass	<i>Micropterus dolomieu</i>	top predator, sportfish
black crappie	<i>Pomoxis nigromaculatus</i>	
PERCH FAMILY	PERCIDAE	
greenside darter	<i>Etheostoma blennioides</i>	
rainbow darter	<i>Etheostoma caeruleum</i>	
johnny darter	<i>Etheostoma nigrum</i>	
blackside darter	<i>Percina shumardi</i>	
STICKLEBACK FAMILY	GASTEROSTEIDAE	
brook stickleback	<i>Culaea inconstans</i>	

The Nith River fish community is dominated by native species, and the fish collection records reveal a diverse assemblage of species within the sucker, minnow and perch families. Highlights of the local Nith River fish community include the occurrence of resident top predator sportfish Smallmouth Bass and Northern Pike and the migratory Rainbow Trout. The Nith River is a migratory route for Rainbow Trout and, at Ayr, Rainbow Trout are known to leave the Nith and migrate up into Cedar Creek and Eden Creek, although passage within Cedar Creek is limited to Watson Pond, the lower of the two mill ponds.

The Nith River fish species are all spring spawners, with relatively short egg incubation periods in the spring or very early summer such that young-of-the year fish hatch shortly after eggs are deposited and disperse into rearing/nursery habitats.

DFO online aquatic SAR mapping (purple-coloured watercourse segments on Figure 2, below) indicates the presence in the Nith River of two federally and provincially Threatened species (Black Redhorse and Silver Shiner) and one federally and provincially designated Special Concern species (Rainbow Mussel). None of these species has federally defined Critical Habitat and no Critical Habitat of aquatic SAR is mapped within this segment of the Nith River. The provincial Endangered Species Act (ESA) protects the general habitat of the two Threatened fish species, which includes the Nith River channel and adjacent riparian and floodplain areas.

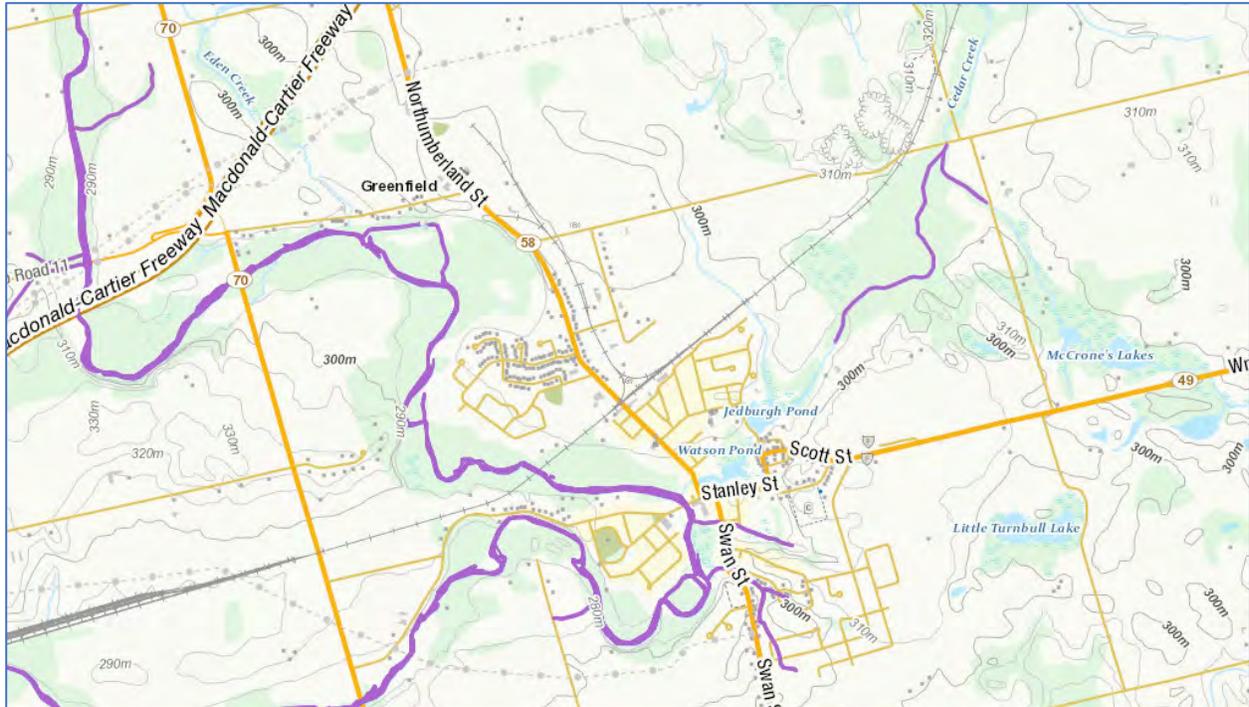


Figure 2: DFO Aquatic SAR mapping showing purple-shaded reaches of the Nith River in and near Ayr that indicate habitat of Black Redhorse, Silver Shiner and Rainbow Mussel.

CEDAR CREEK

Cedar Creek enters the study area from the northeast as a flowing coldwater creek and, in the centre of Ayr just upstream of its confluence with the Nith River, includes the historic mill ponds Watson Pond and Jedburgh Pond in the GRCA-owned Upper Mill Pond property. The ponds also contain coldwater habitat. GRCA provided comments and information that discussed salmonid migratory access, presence, artificial stocking, and spawning in the vicinity of the ponds in Ayr.

The GRFMP identifies issues in Cedar Creek and other coldwater lower Nith River tributaries as involving rural land use impacts (e.g., nutrient and sediment inputs, riparian zone destruction and alterations in flow conditions), aggregate extraction impacts (e.g., changes to groundwater conditions), and effects of on-line ponds (e.g., negative impacts on fish migration, possible positive effects of limiting fish migration to exclude non-native predators, loss of flowing-water habitat, and water temperature and water quality effects).

GRCA reported that upstream migration into Cedar Creek from the Nith River over the lower Ayr dam into Watson Pond is known for Rainbow Trout, a species that can jump low barriers. Upstream passage by other, non-jumping, Nith River fish species was not reported. Upstream migration by Rainbow Trout beyond the upper dam into Jedburgh Pond has not been reported. GRCA reported that native coldwater Brook Trout spawning in Cedar Creek upstream of Jedburgh Pond. As such, the Cedar Creek fish community is mostly separated from that of the Nith River and the native resident Brook Trout population is protected by the upper Ayr dam from potential invasion by and competition with the non-native Rainbow Trout and with the non-native Brown Trout that GRCA stocks in Watson Pond as a put-and-take fishery.

GRCA provided the following list of fish species (Table 2) from MNRF aquatic survey data for Cedar Creek (above, between and below the Watson and Jedburgh mill ponds):

Table 2: Cedar Creek Fish Species

SUCKER FAMILY	CATOSTOMIDAE	
white sucker	<i>Catostomus commersonii</i>	
black redhorse	<i>Moxostoma duquesnei</i>	Threatened (SARA, ESA)
MINNOW FAMILY	CYPRINIDAE	
fathead minnow	<i>Pimephales promelas</i>	
blacknose dace	<i>Rhinichthys atratulus</i>	
longnose dace	<i>Rhinichthys cataractae</i>	
creek chub	<i>Semotilus atromaculatus</i>	
SALMON FAMILY	SALMONIDAE	
rainbow trout	<i>Oncorhynchus mykiss</i>	non-native coldwater sportfish; seasonal migrant
brook trout	<i>Salvelinus fontinalis</i>	native coldwater sportfish; resident
MUDMINNOW FAMILY	UMBRIDAE	
central mudminnow	<i>Umbra limi</i>	
SUNFISH FAMILY	CENTRARCHIDAE	
pumpkinseed	<i>Lepomis gibbosus</i>	
largemouth bass	<i>Micropterus salmoides</i>	top predator, sportfish
STICKLEBACK FAMILY	GASTEROSTEIDAE	
brook stickleback	<i>Culaea inconstans</i>	
SCULPIN FAMILY	COTTIDAE	
mottled sculpin	<i>Cottus bairdii</i>	coldwater prey/forage fish

The Cedar Creek fish community is less diverse than that of the Nith River and notably contains resident coldwater species Brook Trout and Mottled Sculpin, which are indicative of good water quality and input of cold groundwater that maintains coldwater conditions year-round. The occurrence of migratory Rainbow Trout within the Cedar Creek is limited to the lowermost Watson Pond and the upper Ayr dam protects the native coldwater fishery from invasion by this non-native species. The occurrence of Largemouth Bass in Cedar Creek is entirely a consequence of historical stocking within the mill ponds as Largemouth Bass requires warm temperature and still water conditions that naturally flowing reaches of Cedar Creek cannot provide. Otherwise, the fish community includes several native minnows, most of which are associated with flowing stream habitats and the native Central Mudminnow and Brook Stickleback which are characteristic of headwater drainage features and small watercourses.

The Cedar Creek fish species include mostly spring spawners. Brook Trout is a fall spawner, the eggs of which incubate in streambed substrates over the winter and hatch the following spring. This confers an extended sensitive period on those portions of Cedar Creek where Brook Trout spawn and indicates use of the October 1 – May 31 construction timing restriction, with possible extension to July 15 to also protect the Cedar Creek spring-spawning species. While coldwater habitat occurs in Watson and Jedburgh Ponds, it could be argued that only the spring-spawning timing restriction of March 15 – July 15 should apply as Brook Trout spawning habitat does not occur in the ponds.

DFO online aquatic SAR mapping (purple-coloured watercourse segments on Figure 3, below) indicates the presence of a single Threatened species (Black Redhorse) in flowing sections of Cedar Creek upstream of Watson Pond and Jedburgh Pond. Federally assigned Critical Habitat has not been defined for Black Redhorse and therefore no Critical Habitat of SAR is mapped within Cedar Creek. The provincial Endangered Species Act (ESA) protects the general habitat of Black Redhorse within Cedar Creek, which includes the mapped channel sections and adjacent riparian and floodplain areas.

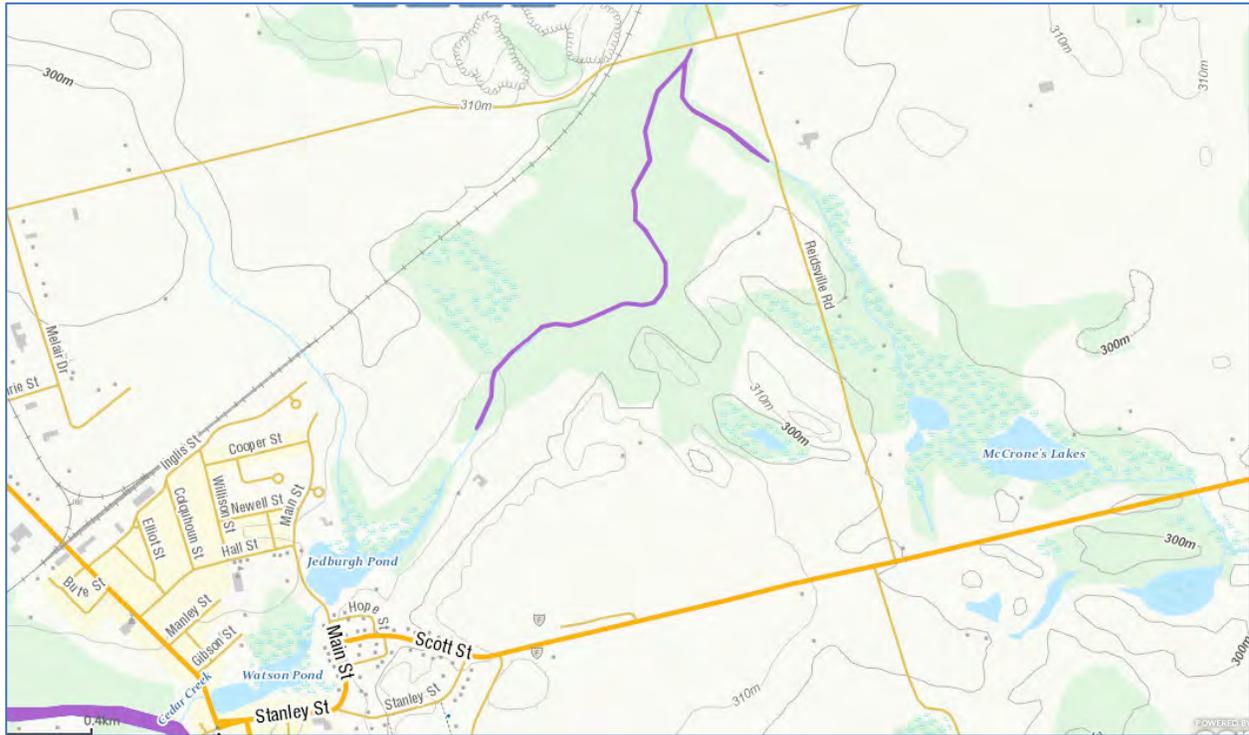


Figure 3: DFO Aquatic SAR mapping showing purple-shaded reaches of Cedar Creek upstream of Ayr that indicates habitat of Black Redhorse.

EDEN CREEK

Eden Creek is northwest and entirely outside of the study area, but a small northern extension of the study area includes part of the Eden Creek subwatershed. GRFMP indicates that Eden Creek is a mixed water fishery that includes both coldwater and warmwater habitats and associated species.

The GRFMP identifies issues with Eden Creek as including effects of rural land use practices that contribute excess nutrients and sediments, limit the extent of riparian habitat and alter the flow regime through water-taking.

GRCA cited MNRF aquatic survey data available through GIS records to list the following fish species in the lower portion of Eden Creek (between Alps Rd & the confluence with the Nith River):

Table 3: Eden Creek Fish Species

SUCKER FAMILY	CATOSTOMIDAE	
white sucker	<i>Catostomus commersonii</i>	

northern hog sucker	<i>Hypentelium nigricans</i>	
MINNOW FAMILY	CYPRINIDAE	
common shiner	<i>Luxilus cornutus</i>	
blacknose dace	<i>Rhinichthys atratulus</i>	
longnose dace	<i>Rhinichthys cataractae</i>	
creek chub	<i>Semotilus atromaculatus</i>	
SALMON FAMILY	SALMONIDAE	
rainbow trout	<i>Oncorhynchus mykiss</i>	non-native coldwater sportfish; seasonal migrant
brook trout	<i>Salvelinus fontinalis</i>	native coldwater sportfish; resident
MUDMINNOW FAMILY	UMBRIDAE	
central mudminnow	<i>Umbra limi</i>	
SUNFISH FAMILY	CENTRARCHIDAE	
bluegill	<i>Lepomis macrochirus</i>	
STICKLEBACK FAMILY	GASTEROSTEIDAE	
brook stickleback	<i>Culaea inconstans</i>	
SCULPIN FAMILY	COTTIDAE	
mottled sculpin	<i>Cottus bairdii</i>	coldwater prey/forage fish

The Eden Creek fish community is like that of Cedar Creek, with mostly native species, most of which are characteristic of flowing water habitat, and notably including the coldwater Brook Trout and Mottled Sculpin. Rainbow Trout are recorded in Eden Creek, but it was not reported whether this migratory non-native is able to ascend Eden Creek reaches containing the native Brook Trout.

As Eden Creek does not occur within the study area, it is unlikely that any stormwater management projects would involve works or activities within the watercourse or near enough to it that construction timing restrictions for spring-spawning or fall-spawning species would be required.

DFO's online aquatic SAR mapping indicates no SAR and no Critical Habitat of SAR in Eden Creek.

AQUATIC SPECIES AT RISK

Three aquatic SAR are known to occur within the study area reaches of the Nith River, one of which, the Black Redhorse, also occurs within parts of lower Cedar Creek.

The Black Redhorse (*Moxostoma duquesnei*) is a member of the sucker family that is listed as Threatened federally and provincially. Suitable habitat for the Black Redhorse is shallow, medium-sized weed-free rivers and creeks with sand and gravel substrates. Spawning habitat is fast-flowing water over gravelly riffles where eggs are deposited in the spring (May/June) of each year and hatch shortly thereafter. The Black Redhorse is a resident species that occurs year-round in the study area within the Nith River and in lower reaches of Cedar Creek. It is not known to occur in Eden Creek. Threats to Black Redhorse in Ontario include upstream migration barriers (e.g., dams, weirs, impassable culverts), water level fluctuations, and the availability of suitable habitat with clean clear unpolluted water that allows for production of its aquatic invertebrate prey and successful reproduction. In Ontario the Black Redhorse and its "general habitat" are protected by the Endangered Species Act. Black Redhorse is one of the aquatic species subject to O. Reg. 242/08

section 23.4 which identifies mitigation and restoration measures for certain works and activities within or adjacent to watercourses, and as such affords protection to both instream and riparian habitat in watercourses in which it occurs.

The Silver Shiner (*Notropis photogenis*) is a member of the minnow family that is listed as Threatened federally and provincially. Suitable habitat for the Silver Shiner is medium to large weed-free creeks and rivers with sand and gravel substrates. Spawning habitat is fast-flowing water over gravelly riffles where eggs are deposited in June/July and hatch soon afterward. The Silver Shiner is a resident species that occurs year-round in the study area within the Nith River. It is not known to occur in either of Cedar Creek or Eden Creek. Threats to Silver Shiner in Ontario include dams that create upstream migration barriers and alter natural flowing water habitats, land use impacts that degrade water quality and increase sedimentation, predation by artificially stocked sportfish and capture for use as bait fish. Temperature is noted as a limiting factor as Silver Shiner in southern Ontario are at the extreme northern limit of the species' geographic range. In Ontario the Silver Shiner and its "general habitat" are protected by the Endangered Species Act and O. Reg. 242/08. For Silver Shiner the general habitat is described in detail under three categories of decreasing sensitivity including "Category 1: Flowing pools, runs and riffles in occupied reaches", "Category 2: Shallow, nearshore habitats, and areas with aquatic vegetation in occupied reaches" and "Category 3: Floodplains and riparian edges adjacent to occupied reaches". Within the study area, Silver Shiner habitat therefore includes the entire segment of the Nith River, its floodplain and banks.

The Rainbow (*Villosa iris*) is a small freshwater mussel that is listed as Special Concern federally and provincially. It was previously listed as provincially Threatened and nationally Endangered but was subsequently found to occur in abundance in southern Ontario and was downlisted to Special Concern. The Rainbow occurs in small to medium sized rivers with fast flow and sand/gravel/rock substrates. Within the study area, the Rainbow occurs within the Nith River. It is not known to occur in Cedar Creek or Eden Creek. As a Special Concern species, neither it nor its habitat are protected by the Endangered Species Act.

SUMMARY AND CONCLUSIONS

Fish habitat within the Ayr SWMMP study area includes portions of the warmwater Nith River and the coldwater Cedar Creek. Eden Creek fish habitat is outside of the study area, which includes only a small portion of land that drains towards Eden Creek but no segments of the creek itself.

The GRFMP identifies rural and land use impacts on the Nith River and its tributaries of impaired water quality (nutrients, turbidity, temperature) and sedimentation within streambeds, altered flow conditions due to water-taking and impoundments, and reduced extent of vegetated riparian habitats. Stormwater management can address impaired water quality, sedimentation and flow conditions. Where stormwater facilities and/or their outlets are constructed near watercourses, there may be opportunities to restore naturally vegetated riparian habitat.

Work and activities to create, retrofit, modify or maintain SWM facilities near water within the study area may trigger mitigation measures to protect fish and fish habitat (e.g., seasonal construction timing restrictions combined with appropriate physical measures such as erosion and sedimentation controls) and measures to protect aquatic SAR (i.e., individuals and general habitat of Threatened Black Redhorse and Silver Shiner in compliance with the provincial ESA and the federal SARA).

DFO describes seasonal mitigation measures as follows: “Restricted activity timing windows are applied to protect fish from impacts of works or undertakings in and around water during spawning migrations and other critical life history stages.” In Ontario, the timing “windows”, or more intuitively “restrictions”, are based on fish community life history characteristics and are timed to respect a distinction between fish species that spawn in the spring and those that spawn in the fall. Eggs of spring spawners mature quickly and hatch soon afterward in that same spring or early summer. Eggs of fall spawners, of which the coldwater Brook Trout and the stocked Brown Trout are the only representatives in Ayr, overwinter in the streambed substrates where they are deposited during spawning and do not hatch until the following spring. The specific timing restrictions are applied regionally, to Ontario’s Northwest, Northeast and Southern Regions, respectively, and reflect regional climatic and fish community differences. The Southern Region timing restrictions that apply to the watercourses in the Ayr SWMMP study area are:

- Spring spawning timing restriction applies to Nith River (March 15 – July 15).
- Fall spawning timing restriction applies to Cedar Creek and Eden Creek (October 1 – May 31).

For SWM works and activities near water and within the general habitat of Threatened SAR Black Redhorse and/or Silver Shiner, the “Aquatic Species” exemption in Section 23.4 of O. Reg. 242/08 may apply if the type and extent of disturbance meets criteria and, if so, will guide the application of appropriate mitigation, monitoring and restoration measures. Otherwise, work and activities near water could require both ESA and SARA permits issued by the provincial Ministry of Environment, Conservation and Parks (MECP) and DFO respectively.

In summary, stormwater management represents an opportunity for local improvements to fish habitat through improved water quality and water quantity and possibly also through localized habitat restoration. Constraints to construction and operation of specific stormwater management facilities will need to be assessed on a site-specific basis that takes into account the watercourse involved and the local characteristics and sensitivities of its fish community and fish habitat.

Technical Report

DESKTOP NATURAL TERRESTRIAL AND WETLAND ENVIRONMENTAL SCREENING REPORT

COLE # 2019-0506 AYR SWM-MP

for:

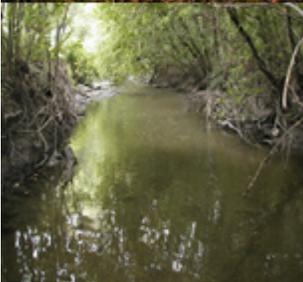
COLE ENGINEERING GROUP LTD.

by:

LGL Limited
environmental research associates

APRIL 2020

LGL PROJECT NO. TA8993



prepared by:



Digital signature

Derek Morningstar, M.Sc., PWS
SENIOR ECOLOGIST

reviewed by



Digital signature

Allison Featherstone, Hons.B.Sc.
VICE-PRESIDENT,
SENIOR PLANNING ECOLOGIST

LGL Limited
environmental research associates
445 Thompson Drive, Unit 2
Cambridge, Ontario N1T 2K7
Tel: 519-622-3300 Fax: 519-622-3310
Email: cambridge@lgl.com
URL: www.lgl.com

Version History:

Date:	April 27, 2020	Version:	1, Draft
	April 30, 2020		2, Final

APRIL 2020
LGL PROJECT TA8993

TABLE OF CONTENTS

1.0	Introduction	1
2.0	Methods.....	1
3.0	Results.....	3
3.1	Region of Waterloo Official Plan	3
3.2	Natural Areas	5
3.3	Aquatic Habitat	5
3.4	Species At Risk.....	8
3.4.1	Terrestrial Species at Risk	8
3.4.2	Aquatic Species at Risk.....	9
4.0	Conclusion.....	14

LIST OF TABLES

Table 1	Species at Risk that Could Occur at the Study Area, Based on Review of Publicly Available Databases.....	10
Table 2	Summary of Environmental Permits and Regulations Review.	15

LIST OF FIGURES

Figure 1	Ayr Land Use.....	2
Figure 2	Region of Waterloo Greenlands Network	4
Figure 3	Natural Areas.....	6
Figure 4	Wetlands, Woodlands and ANSI.....	7

1.0 INTRODUCTION

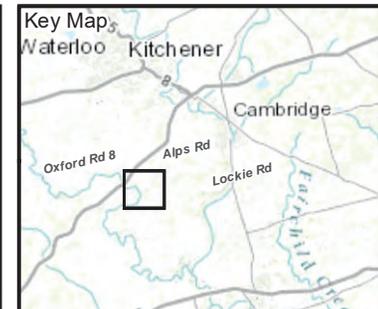
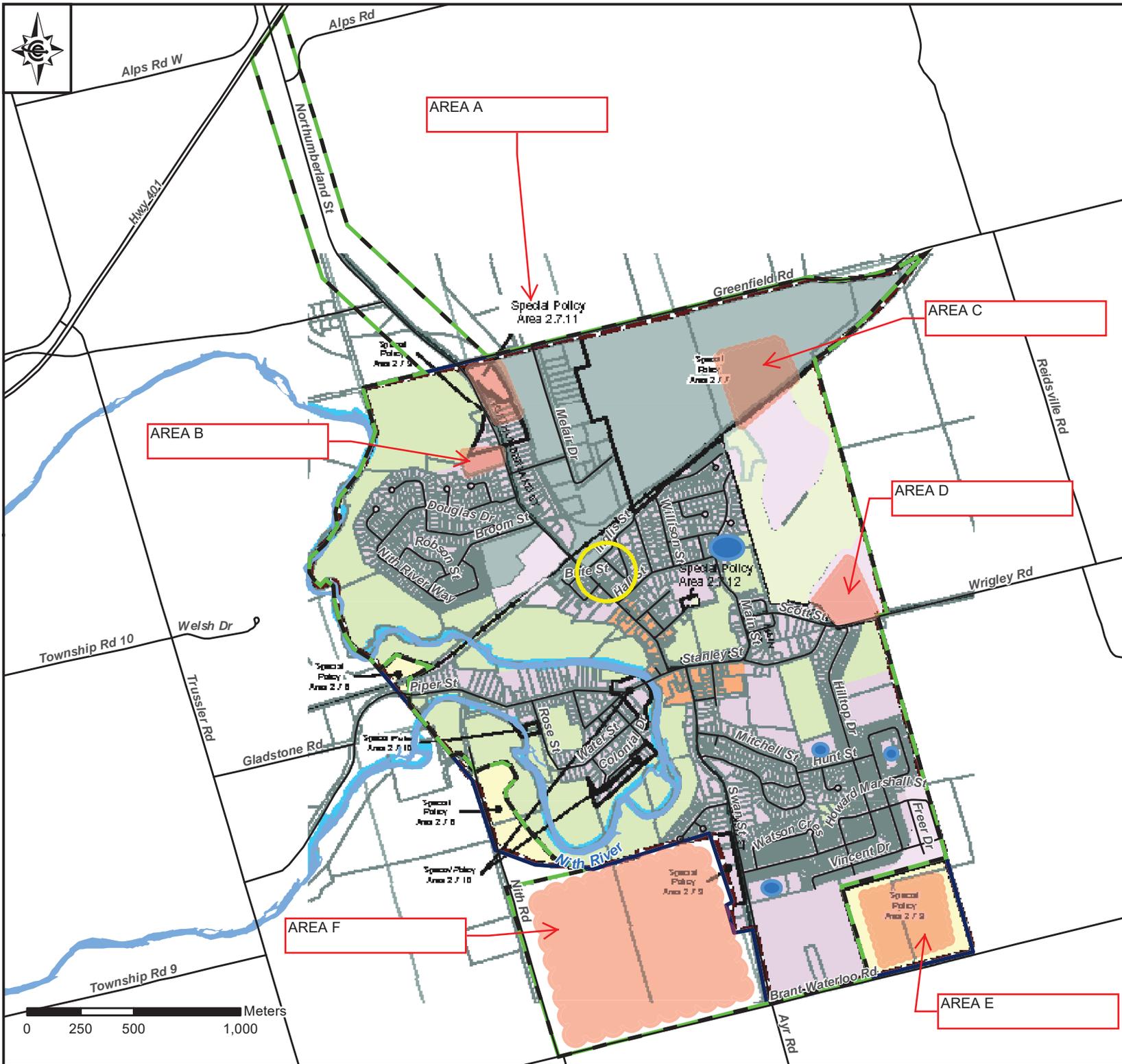
As part of the planning for future residential (and other) development in the Town of Ayr (Ayr), Region of Waterloo, Ontario, LGL Limited (LGL) was retained to complete a Natural Heritage Screening Report. The purpose of the Natural Heritage Screening Report is to compile information from available sources to determine the species at risk (SAR) and sensitive natural heritage features that are known within the Township of Ayr (Study Area), which could be affected by future development. In particular, the Natural Heritage Screening will be used by Cole Engineering Ltd. (Cole) in the development of a Stormwater Management Master Plan for Ayr. For the purpose of this report, the Study Area is the Town of Ayr, plus an area extending to Highway 401, with areas of approximate future development (Figure 1).

2.0 METHODS

LGL conducted a desktop-based review of natural heritage constraints for the Study Area. The databases reviewed to determine these constraints include the following:

- Land Information Ontario (LIO) (natural areas and species);
- Atlas of the Mammals of Ontario;
- Bat Conservation International Species Profiles;
- Atlas of the Breeding Birds of Ontario;
- eBird;
- iNaturalist;
- Aquatic species at Risk Maps (Department of Fisheries and Oceans Canada);
- Butterfly Atlas of Ontario;
- Alvars of Ontario;
- Tallgrass Ontario (Simcoe Lowlands Physiographic region);
- The Vascular Plants of Ontario (Oldham and Brinker, 2009);
- Vascular Plants at Risk in Ontario (Leslie, 2018);
- Grand River Conservation Authority (GRCA) Regulation Limits (and a request for information);
- Township of North Dumfries Official Plan; and,
- Region of Waterloo Official Plan.

From these databases, LGL developed figures showing where the natural feature polygons that occur within the Study Area. A table of the SAR that could occur in the area was also developed.



- Legend**
- Approximate Study Boundary
 - Municipal Boundary
 - Watercourse
- Landuse Type**
- Agricultural
 - Urban Growth Centre
 - General Industrial
 - Open Space
 - Urban Residential and Ancillary
 - Urban Growth Centre
- Approximate Future Development
- SWM Facilities

**Figure 1
Ayr Land Use**

Township of North Dumfries
Storm Water Management
Master Plan



Project No.:	Date:
2019-0506	November 2019

3.0 RESULTS

The study Area consists of several land use types, including agricultural, urban growth, industrial, residential and open space. Most notably, the Nith River and Cedar Creek, their tributaries and associated riparian habitat fall within the Study Area. There are also areas of wetlands, woodlands and aquatic features.

A site reconnaissance was conducted on April 24, 2020 to confirm the site conditions visible from public roads. A closer inspection may be required in advance of construction when the development areas are better known, but the description below provides an account of the current site conditions on that date.

Area A is a fallow field with mowed grass. It slopes from Northumberland Road towards the rail tracks. There is a fencerow of mature trees of mixed species between the mowed field and the houses.

Area B is currently under construction for a housing development. It is unclear whether any space will remain for stormwater management, or if this has already been incorporated into the development underway. West of the area, there are mature coniferous trees and then the landscape slopes steeply towards the Nith River.

Area C is not easily visible from the road, but appears to be an agricultural field that was most recently used for corn. The area adjacent to the railroad appears to have been filled with some gravel and rock material.

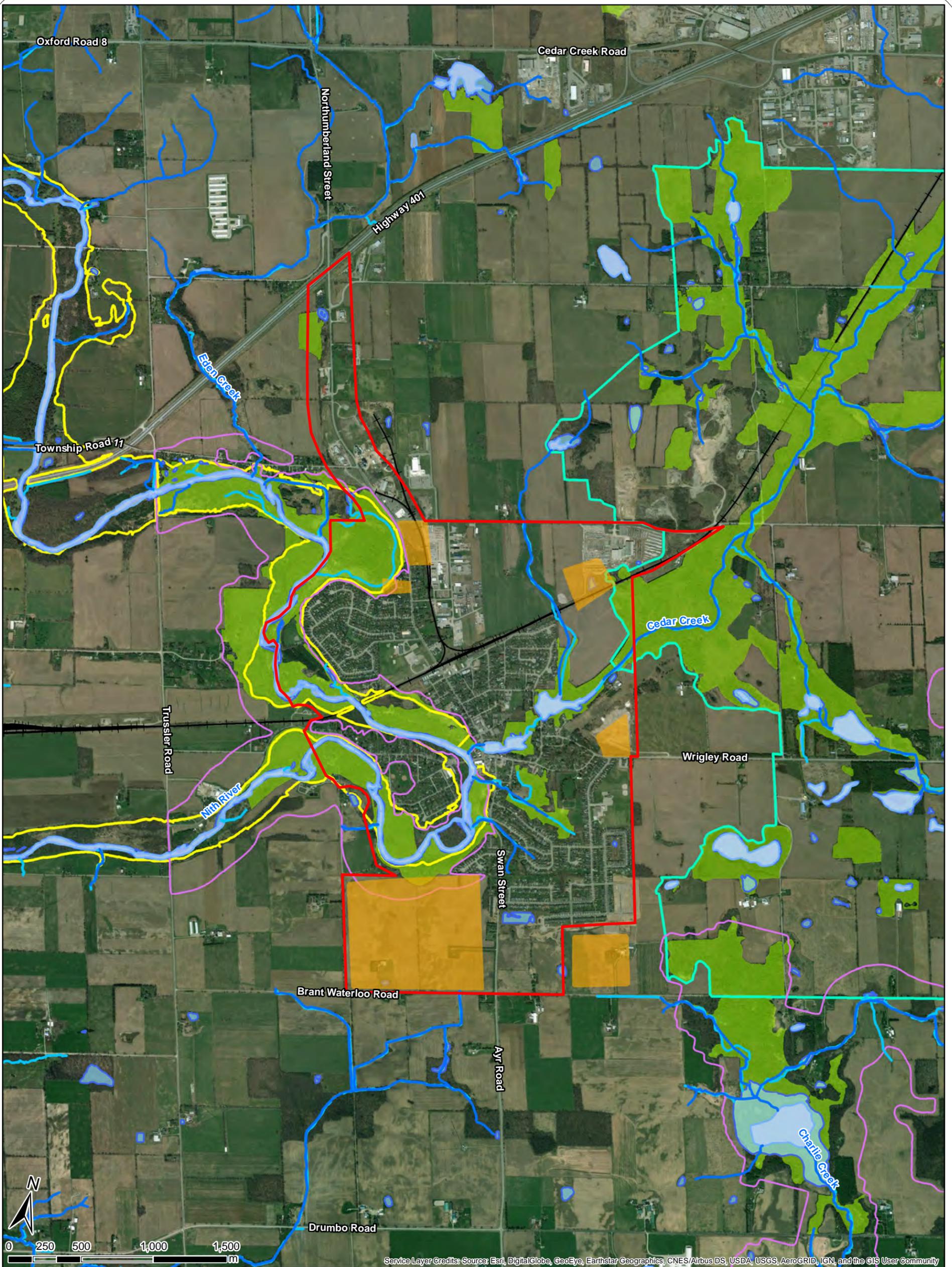
Area D is an aggregate pit that appears to be in the process of reclamation. The entire area is barren soil, with some pooled water in the low points. There are some mature trees between Wrigley Road and the former pit.

Area E is mostly agricultural fields, but there are stockpiles of aggregate material and an old house with associated outbuildings. There is also a small vegetated area just west of the house. The field to the west of the house was most recently in corn and the field to the east of the house was most recently in wheat, although the crop appears to be older and may not have been planted in 2019. The Charlie Creek is on the south side of Brant-Waterloo Road, flowing to the east.

Area F is a larger area which is made up of a few sections of agricultural land. Most of the fields were most recently in corn production. There is a fencerow of mature trees that splits the fields in a northerly direction and mature trees between the fields and the roads. There is a large house in the eastern field, surrounded by trees. Another old farmhouse is in the western field, where there is a small horse pasture, a small pond surrounded by wetland and a small wetland near Brant-Waterloo Road. Mature trees also line the drive up to the house and around the house and associated outbuildings.

3.1 REGION OF WATERLOO OFFICIAL PLAN

Map 4 of the Waterloo Regional Official Plan (2015) depicts the Greenlands Network. These layers have been super-imposed onto the Figure 2 to show where they fall within the Study Area. Area B, C and F have a small overlap with Core Environmental Features and Significant Valleyland. Areas B and F are also within the area of the Growth Plan for the Greater Golden Horseshoe. Area B also has a small amount of overlap with the Environmentally Sensitive Landscape for the Dumfries Carolinian Area. Refinement of the Future Development Areas may be necessary to avoid overlap with these natural areas.



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Region of Waterloo Greenlands Network

- | | |
|---|---|
|  Railway |  Waterbody (GRCA) |
|  Watercourse (LIO) |  Significant Valleys |
|  Watercourse (GRCA) |  Growth Plan for the Greater Golden Horseshoe |
|  Study Area |  Environmentally Sensitive Landscape: Dumfries Carolinian |
|  Approximate Future Development |  Core Environmental Features:
Provincially Significant Wetlands, Environmentally Sensitive Policy Areas,
Forests greater than 4 ha |
|  Waterbody (LIO) | |

Data sources: Ministry of Natural Resources and Forestry, Grand River Conservation Authority, Region of Waterloo.
Contains information licenced under the Open Government Licence - Ontario, GRCA Open Data Licence v2 and Region of Waterloo Open Data Licence v2.0



Project	TA8993	Figure	2
Date	April, 2020	Prepared By	AJ
Scale	1:25,000	Verified By	DSU

The North Dumfries Official Plan generally defers the management of environmentally significant features to the Region of Waterloo. Map 5A of the North Dumfries Official Plan shows the Greenlands Network, using the same layers for Significant Valleylands, Environmentally Sensitive Landscape and Core Environmental Features as the Region of Waterloo.

3.2 NATURAL AREAS

In addition to the areas mapped by the Region of Waterloo, other natural areas occur in the Study Area. Portions of Area A, B, C, and F fall within the regulation limit, managed by the Grand River Conservation Area (GRCA) and the edge of Area B is also within the floodplain (Figure 3). Similarly, there are wetlands and woodland within the Study Area and Areas of Natural and Scientific Interest (ANSI), just outside of the Study Area (Figure 4).

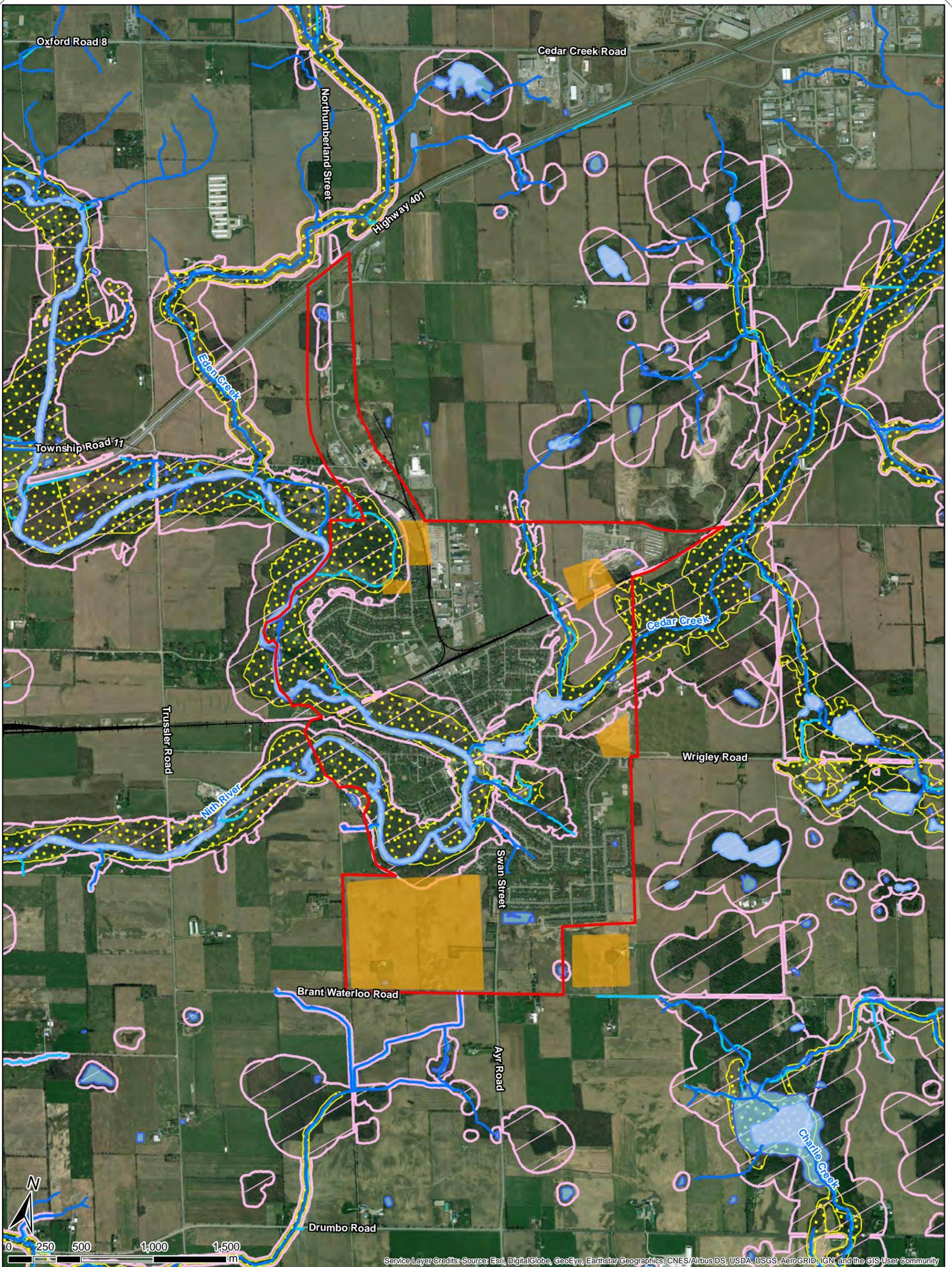
The GRCA has layers for wetlands and regulation limits that occur within the Study Area (Figure 3). Many of these are associated with the Nith River and the Cedar Creek. The Greenfield Swamp Complex PSW is associated with the Nith River, and is located near Area B, with a very small area of overlap. The Roseville Swamp Cedar Creek Wetland Complex PSW is associated with the Cedar Creek and is located between Areas C and D, again with a small area of overlap with Area C.

In a letter dated on April 8, 2020, the GRCA described some discrepancies in the wetland mapping available. They described a discrepancy for wetland mapping that is west of Northumberland Street and south of the tracks. This is not one of the Future Development Areas. They suggest that a site visit is necessary to confirm the wetland boundary, but this may only be necessary if infrastructure is proposed in or near this location. The GRCA also described an unevaluated wetland that is east of Swan Street and south of Hilltop Drive, but this too is not within the Future Development Areas. Based on a site reconnaissance, there are small wetland areas within Area F that are not mapped. Wetlands are dynamic based on annual surface water and the presence of wetland plants. Despite the avoidance of wetlands by most of the Future Development Areas, any infrastructure that is planned in close proximity to wetlands may require a seasonal in-field wetland boundary delineation in advance of construction.

Three ANSI's are located near the Study Area, but not within it (Figure 4). The Little Turnbull Lake ANSI and the McCrone Lake ANSI are life science ANSI's and the Ingersoll Moraine Outwash Fan is an earth science ANSI. These natural areas should be considered if there is the potential for offsite impacts or cumulative effects from the development.

3.3 AQUATIC HABITAT

There are several watercourses and waterbodies and the potential for aquatic SAR which are associated with the Nith River, Cedar Creek and their tributaries, but these will be addressed in a separate report. Aquatic SAR are included in Table 1 for completeness, but are not addressed further in this report.



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Natural Areas

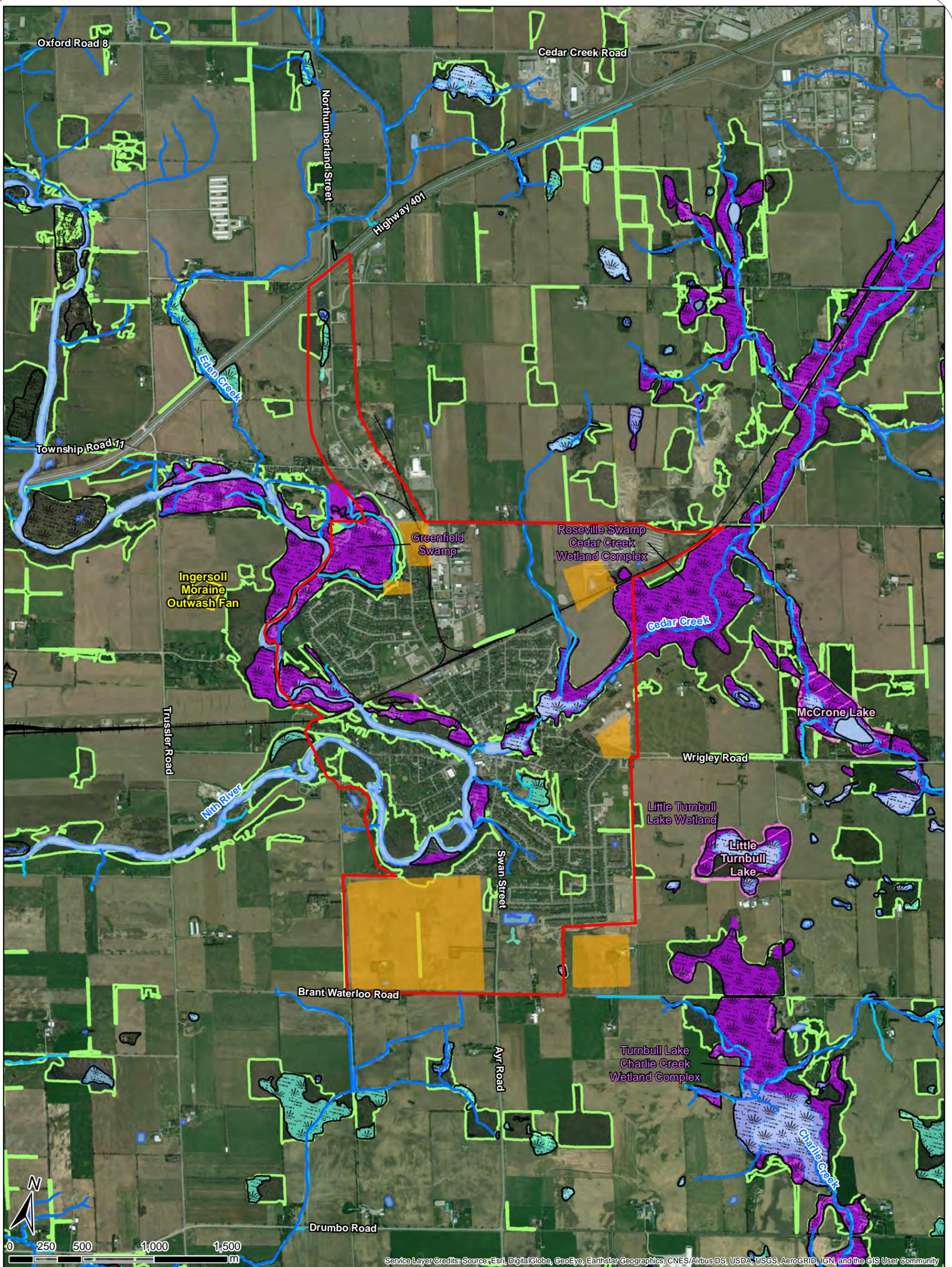
-  Railway
-  Watercourse (LIO)
-  Watercourse (GRCA)
-  Study Area
-  Approximate Future Development
-  Waterbody (LIO)
-  Waterbody (GRCA)
-  Regulation Limit (GRCA)
-  Regulatory Floodplain (GRCA)

Data sources: Ministry of Natural Resources and Forestry, Grand River Conservation Authority

Contains information licenced under the Open Government Licence - Ontario and GRCA Open Data Licence v2



Project	TA8993	Figure	3
Date	April, 2020	Prepared By	AJ
Scale	1:25,000	Verified By	DSU



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Wetlands, Woodlands and ANSI

- | | | |
|--------------------------------|----------------------------------|-------------|
| Railway | Waterbody (GRCA) | Wooded Area |
| Watercourse (LIO) | ANSI, Life Science | |
| Watercourse (GRCA) | ANSI, Earth Science | |
| Study Area | Regulated Wetland (GRCA) | |
| Approximate Future Development | Provincially Significant Wetland | |
| Waterbody (LIO) | Wetland Not Evaluated Per OWES | |

Data sources: Ministry of Natural Resources and Forestry, Grand River Conservation Authority
 Contains information licenced under the Open Government Licence - Ontario and GRCA Open Data Licence v2



Project	TA8993	Figure	4
Date	April, 2020	Prepared By	AJ
Scale	1:25,000	Verified By	DSU

3.4 SPECIES AT RISK

Protection for species in Ontario is provided through the *Endangered Species Act* (ESA). That protection is afforded to species that have been listed as Endangered (END) or Threatened (THR) on the Species at Risk in Ontario (SARO) list, as designated by the Committee on the Status of Species at Risk in Ontario (COSSARO). Species listed as Special Concern (SC) are not afforded protection on the ESA, but are considered to be at risk to become endangered if there is further decline of the species. The federal *Species at Risk Act* (SARA) generally applies on federal land, for federal projects or on projects where Environment and Climate Change Canada (ECCC) is of the opinion that protection has not been sufficiently provided by the province for a particular species. When the responsibility for SAR was transitioned from the Ministry of Natural Resources and Forestry (MNR) to the Ministry of Environment, Conservation and Parks (MECP), there was a change in direction for information and permitting requests and the process is still being resolved. Current direction is to rely on available online resources for screening purposes and to contact the MECP later in the process of a project when potential impacts to SAR are better known. Therefore, an information request was not submitted to the MECP for this project.

Through a review of the species atlases, NHIC and online resources, 32 species were identified as END, THR and SC (Table 1). Of these, 21 species are listed as END or THR. Table 1 provides a habitat description for each of these species. Other species at risk may occur within the Study Area that have not been identified here. General species inventories in advance of construction will help to further refine the plant and animal species, including SAR that use areas which will be disturbed.

3.4.1 Terrestrial Species at Risk

Bird species afforded protection include the Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Bobolink (*Dolichonyx oryzivorus*), Cerulean Warbler (*Setophaga cerulea*) Chimney Swift (*Chaetura pelagica*), Eastern Meadowlark (*Sturnella magna*) and Least Bittern (*Ixobrychus exilis*).

Bank Swallow could nest in many locations, often in material stockpiles or small embankments which are not easily discernable from aerial imagery and none were visible from the roadside reconnaissance on April 24, 2020. The Nith River bank itself is a highly probable area for this species to nest, but avoidance of this feature may be necessary anyways.

Barn Swallow can occur in many man-made structures such as buildings, bridges and culverts and Chimney Swift also typically uses man-made chimney or chimney-like structures. Many of these occur in the Study Area in general. There may be rail underpasses suitable for this species in Area C and there are houses, barns and outbuildings which may be suitable in Areas E and F.

Bobolink and Eastern Meadowlark occur in grasslands which could include agricultural fields that are in hay production, pasture or in fields left fallow. As of April 24, 2020, most of the fields within the Future Development Areas were most recently in rotational crop. There is a small horse pasture in Area F which could be suitable for these species, but it is not optimal because it does not meet the field area typically required for them.

Cerulean Warbler typically nests in large tracts of deciduous forest and Least Bittern nests in large open marsh habitat. While both of these habitat types exist in the Study Area, the Future Development Areas avoid them.

Birds of most species are also protected under the *Migratory Birds Convention Act*. A breeding bird survey may be necessary to determine actual bird nesting at and close to any above-ground development.

Four mammal species, all bats, have been identified through their species distribution maps on the BCI website. These include the Eastern Small-footed Myotis (*Myotis leibii*), Little Brown Myotis (*Myotis lucifugus*), Tri-colored Bat (*Perimyotis subflavus*) and the Northern Myotis (*Myotis septentrionalis*). These species all use different habitat types which could occur within the Study Area. Although the Future Development Areas have mostly avoided woodlands, wetlands and buildings, a specific search for habitat and possibly for species presence may be required in advance of development. Based on the site reconnaissance on April 24, 2020 there does not appear to be any features suitable for bat hibernation within the Future Development Areas, nor were there any areas that appear suitable as maternity roost areas for Eastern Small-footed Myotis, Northern Myotis or Tri-colored Bat. There are trees along the edges of many of the fields within the Future Development Areas which could be suitable for maternity roosting areas for Little Brown Myotis. The old houses and outbuildings on Areas E and F may also be suitable as roosts for Little Brown Myotis and should be surveyed prior to development.

The Blanding's Turtle (*Emydoidea blandingii*) was identified in the Study Area through the NHIC, last recorded in 2011. This species uses wetlands, which have been avoided in the selection of the Future Development Areas, but do exist in other parts within the Study Area. The small wetland pockets in Area F could provide habitat, but are very small and not close to other suitable wetlands. However, any wetlands or aquatic areas that are near development may require further investigation for this species, and they could also move into stormwater ponds, if constructed.

Several plants have been identified within the Waterloo Region in the Rare Vascular Plants of Ontario (2009) or Vascular Plants at Risk in Ontario (Leslie, 2018), but there is no record specifically known within the Study Area. Protected vascular plant species include the American Chestnut (*Castanea dentata*), American Columbo (*Frasera carolinensis*), American Ginseng (*Panax quinquefolius*), Butternut (*Juglans cinerea*), False Hop Sedge (*Carex lupuliformis*) and White Wood Aster (*Eurybia divaricata*).

Trees in woodlands are also protected by the Region of Waterloo under Bylaw Number 08-026. A Tree bylaw does not currently exist for the Township of North Dumfries, but was introduced at an Advisory Committee meeting in June 2019. Therefore, a bylaw could provide some protection for trees in the future. A botanical inventory and tree inventory may be required in advance of development to search for these species.

In advance of construction, it may also be necessary to assess Significant Wildlife Habitat that may be under protection through the Provincial Policy Statement and the Planning Act through and Environmental Impact Statement (EIS).

3.4.2 Aquatic Species at Risk

Aquatic species identified through background review include two fish species, the Silver Shiner (*Notropis photogenis*) and the Black Redhorse (*Moxostoma duquesnei*) and one mollusc, the Wavy-rayed Lampmussel (*Lampsilis fasciola*). Aquatic species protected under the ESA, SARA or the *Fisheries Act* will be addressed in a separate report.

Table 1 Species at Risk that Could Occur at the Study Area, Based on Review of Publicly Available Databases.

Common Name	Scientific Name	Species At Risk Act (Sch 1)	Endangered Species Act	Habitat Requirements ⁵	Potential to Occur in the Future Development Areas
Monarch	<i>Danaus plexippus</i>	SC	SC	In Ontario, monarch is found throughout the northern and southern regions of the province. This butterfly is found wherever there are milkweed (<i>Asclepius</i> spp.) plants for its caterpillars and wildflowers that supply a nectar source for adults. It is often found on abandoned farmland, meadows, open wetlands, prairies and roadsides, but also in city gardens and parks. Important staging areas during migration occur along the north shores of the Great Lakes (COSEWIC 2010).	Moderate – most fields are rotation crop which is not suitable for this species. Some field edges may be fallow and contain milkweed in limited abundance.
Bank swallow	<i>Riparia riparia</i>	THR	THR	In Ontario, the bank swallow breeds in a variety of natural and anthropogenic habitats, including lake bluffs, stream and river banks, sand and gravel pits, and road cuts. Nests are generally built in a vertical or near-vertical bank. Breeding sites are typically located near open foraging sites such as rivers, lakes, grasslands, agricultural fields, wetlands and riparian woods. Forested areas are generally avoided (Garrison 1999).	High – Area B includes a small portion of the Nith River valley. Aggregate stockpiles are present in Area D and may be present at other areas depending on site use.
Barn swallow	<i>Hirundo rustica</i>	THR	THR	In Ontario, barn swallow breeds in areas that contain a suitable nesting structure, open areas for foraging, and a body of water. This species nests in human made structures including barns, buildings, sheds, bridges, and culverts. Preferred foraging habitat includes grassy fields, pastures, agricultural cropland, lake and river shorelines, cleared right-of-ways, and wetlands (COSEWIC 2011). Mud nests are fastened to vertical walls or built on a ledge underneath an overhang. Suitable nests from previous years are reused (Brown and Brown 1999).	High – Potential rail underpass structures at Area C, houses barns and outbuildings at Area E and F
Bobolink	<i>Dolichonyx oryzivorus</i>	THR	THR	In Ontario, bobolink breeds in grasslands or graminoid dominated hayfields with tall vegetation (Gabhauer 2007). Bobolink prefers grassland habitat with a forb component and a moderate litter layer. They have low tolerance for presence of woody vegetation and are sensitive to frequent mowing within the breeding season. They are most abundant in established, but regularly maintained, hayfields, but also breed in lightly grazed pastures, old or fallow fields, cultural meadows and newly planted hayfields. Their nest is woven from grasses and forbs. It is built on the ground, in dense vegetation, usually under the cover of one or more forbs (Martin and Gavin 1995).	Low – As of April 24, 2020 fields are predominantly in rotation crop. One small field (approximately 0.75 hectares) is horse pasture, but likely too small for this species. If fields are left fallow or turned to hay or pasture, this species may nest.
Canada warbler	<i>Cardellina canadensis</i>	THR	SC	In Ontario, breeding habitat for Canada warbler consists of moist mixed forests with a well-developed shrubby understory. This includes low-lying areas such as cedar and alder swamps, and riparian thickets (McLaren 2007). It is also found in densely vegetated regenerating forest openings. Suitable habitat often contains a developed moss layer and an uneven forest floor. Nests are well concealed on or near the ground in dense shrub or fern cover, often in stumps, fallen logs, overhanging stream banks or mossy hummocks (Reitsma et al. 2010).	Low – no mature forest within Future Development Areas. However, forest associated with the Nith Valley near Areas A and B may be suitable.
Cerulean warbler	<i>Setophaga cerulea</i>	END	THR	In Ontario, breeding habitat of cerulean warbler consists of second-growth or mature deciduous forest with a tall canopy of uneven vertical structure and a sparse understory. This habitat occurs in both wet bottomland forests and upland areas, and often contains large hickory and oak trees. This species may be attracted to gaps or openings in the upper canopy. The cerulean warbler is associated with large forest tracks, but may occur in woodlots as small as 10 ha (COSEWIC 2010). Nests are usually built on a horizontal limb in the mid-story or canopy of a large deciduous tree (Buehler et al. 2013).	Low – no mature forest within Future Development Areas. However, forest associated with the Nith Valley near Areas A and B may be suitable.
Chimney swift	<i>Chaetura pelagica</i>	THR	THR	In Ontario, chimney swift breeding habitat is varied and includes urban, suburban, rural and wooded sites. They are most commonly associated with towns and cities with large concentrations of chimneys. Preferred nesting sites are dark, sheltered spots with a vertical surface to which the bird can grip. Unused chimneys are the primary nesting and roosting structure, but other anthropogenic structures and large diameter cavity trees are also used (COSEWIC 2007).	Moderate – Old houses at Areas E and F may have chimneys suitable for this species to nest.
Common nighthawk	<i>Chordeiles minor</i>	THR	SC	These aerial foragers require areas with large open habitat. This includes farmland, open woodlands, clearcuts, burns, rock outcrops, alvars, bog ferns, prairies, gravel pits and gravel rooftops in cities (Sandilands 2007)	Moderate – this species could nest on open areas such as abandoned fields or aggregate storage areas.

Common Name	Scientific Name	Species At Risk Act (Sch 1)	Endangered Species Act	Habitat Requirements ⁵	Potential to Occur in the Future Development Areas
Eastern meadowlark	<i>Sturnella magna</i>	THR	THR	In Ontario, the eastern meadowlark breeds in pastures, hayfields, meadows and old fields. Eastern meadowlark prefers moderately tall grasslands with abundant litter cover, high grass proportion, and a forb component (Hull 2003). They prefer well drained sites or slopes, and sites with different cover layers (Roseberry and Klimstra 1970)	Low – As of April 24, 2020 fields are predominantly in rotation crop. One small field (approximately 0.75 hectares) is horse pasture, but likely too small for this species. If fields are left fallow or turned to hay or pasture, this species may nest.
Eastern wood-pewee	<i>Contopus virens</i>	SC	SC	The eastern wood-pewee inhabits a wide variety of wooded upland and lowland habitats but is most commonly associated with the mid-canopy of forest clearings, and edge habitat in deciduous and mixed forests. It also occurs in anthropogenic habitats that provide an open forested aspect such as parks and suburban neighbourhoods. It prefers intermediate-age mature forest stands with little understory vegetation (COSEWIC 2012).	Low – no mature forest within Future Development Areas. However, forest associated with the Nith Valley near Areas A and B may be suitable. May occur in the small wooded areas in Area E and F.
Grasshopper sparrow pratensis subspecies	<i>Ammodramus savannarum (pratensis subspecies)</i>	SC	SC	In Ontario, grasshopper sparrow is found in medium to large grasslands with low herbaceous cover and few shrubs. It also uses a wide variety of agricultural fields, including cereal crops and pastures. Close-grazed pastures and limestone plains (e.g. Carden and Napanee Plains) support highest density of this bird in the province (COSEWIC 2013).	Low – No shrubby grasslands identified in the Future Development Areas. This habitat could develop over time if fields are left fallow, and there is some potential that it could use open crop fields or the small horse pasture.
Least bittern	<i>Ixobrychus exilis</i>	THR	THR	In Ontario, the least bittern breeds in marshes, usually greater than 5 ha, with emergent vegetation, relatively stable water levels and areas of open water. Preferred habitat has water less than 1 m deep (usually 10 – 50 cm). Nests are built in tall stands of dense emergent or woody vegetation (Woodliffe 2007). Clarity of water is important as siltation, turbidity, or excessive eutrophication hinders foraging efficiency (COSEWIC 2009).	Low – There are no large marsh areas within the Future Development Areas.
Peregrine falcon (anatum subspecies)	<i>Falco peregrinus anatum</i>	SC	SC	In Ontario, peregrine falcon breeds in areas containing suitable nesting locations and sufficient prey resources. Such habitat includes both natural locations containing cliff faces (heights of 50 - 200 m preferred) and also anthropogenic landscapes including urban centres containing tall buildings, open pit mines and quarries, and road cuts. Peregrine falcons' nest on cliff ledges and crevices and building ledges. Nests consist of a simple scrape in the substrate (COSEWIC 2007).	Low – There are no cliff faces or tall man-made structures (buildings, bridge, etc.) within the Future Development Areas.
Wood thrush	<i>Hylocichla mustelina</i>	THR	SC	In Ontario, wood thrush breeds in moist, deciduous hardwood or mixed stands that are often previously disturbed, with a dense deciduous undergrowth and with tall trees for singing perches. This species selects nesting sites with the following characteristics: lower elevations with trees less than 16 m in height, a closed canopy cover (>70 %), a high variety of deciduous tree species, moderate sub-canopy and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter (COSEWIC 2012).	Low – no mature forest within Future Development Areas. However, forest associated with the Nith Valley near Areas A and B may be suitable. May occur in the small wooded areas in Area E and F.
Eastern small-footed myotis	<i>Myotis leibii</i>	—	END	This species is not known to roost within trees, but there is very little known about its roosting habits. The species generally roosts on the ground under rocks, in rock crevices, talus slopes and rock piles. It occasionally inhabits buildings. Areas near the entrances of caves or abandoned mines may be used for hibernaculum, where the conditions are drafty with low humidity, and may be subfreezing (Humphrey 2017).	Low – no cliffs, crevices or rock piles suitable for this species were visible from the road during the site reconnaissance on April 24, 2020
Little brown myotis	<i>Myotis lucifugus</i>	END	END	In Ontario, this species range is extensive and covers much of the province. It will roost in both natural and man-made structures. They require a number of large dead trees, in specific stages of decay and that project above the canopy in relatively open areas (Lacki, 2007). May form nursery colonies in the attics of buildings within 1 km of water. Caves or abandoned mines may be used for hibernaculum, but high humidity and stable above freezing temperatures are required.	High – Some fencerow trees in Areas A, B, D, E and F have cavities which may be suitable for roosting. Old houses, barns and outbuildings in Areas E and F may also be suitable.

Common Name	Scientific Name	Species At Risk Act (Sch 1)	Endangered Species Act	Habitat Requirements ⁵	Potential to Occur in the Future Development Areas
Tri-colored bat	<i>Perimyotis subflavus</i>	END	END	In Ontario, tri-colored bat may roost in foliage, in clumps of old leaves, hanging moss or squirrel nests. They are occasionally found in buildings although there are no records of this in Canada (Poissant et al, 2010). They typically feed over aquatic areas with an affinity to large-bodied water and will likely roost in close proximity to these. Hibernation sites are found deep within caves or mines in areas of relatively warm temperatures. These bats have strong roost fidelity to their winter hibernation sites and may choose the exact same spot in a cave or mine from year to year.	Low – No leaf clumps were visible during the site reconnaissance on April 24, 2020. However, this species may use the habitat along the Nith River or Cedar Creek.
Northern myotis	<i>Myotis septentrionalis</i>	END	END	In Ontario, this species range is extensive and covers much of the province. It will usually roost in hollows, crevices, and under loose bark of mature trees. Roosts may be established in the main trunk or a large branch of either living or dead trees. Caves or abandoned mines may be used for hibernaculum, but high humidity and stable above freezing temperatures are required (COSSARO 2012).	Low – No mature forest within Future Development Areas. However, forest associated with the Nith Valley near Areas A and B may be suitable.
Blanding's turtle - Great Lakes/St. Lawrence population	<i>Emydoidea blandingii</i>	THR	THR	In Ontario, Blanding's turtle will use a range of aquatic habitats, but favor those with shallow, standing or slow-moving water, rich nutrient levels, organic substrates and abundant aquatic vegetation. They will use rivers, but prefer slow-moving currents and are likely only transients in this type of habitat. This species is known to travel great distances over land in the spring in order to reach nesting sites, which can include dry conifer or mixed forests, partially vegetated fields, and roadsides. Suitable nesting substrates include organic soils, sands, gravel and cobble. They hibernate underwater and infrequently under debris close to water bodies (COSEWIC 2005).	Low – Limited wetland habitat within the Future Development Areas, but the specie could occur in the wetlands adjacent to these areas.
Eastern ribbonsnake - (Great Lakes population)	<i>Thamnophis sauritus</i>	SC	SC	In Ontario, eastern ribbonsnake is semi-aquatic, and is rarely found far from shallow ponds, marshes, bogs, streams or swamps bordered by dense vegetation. They prefer sunny locations and bask in low shrub branches. Hibernation occurs in mammal burrows, rock fissures or even ant mounds (COSEWIC 2012).	Low – Limited wetland habitat within the Future Development Areas, but the specie could occur in the wetlands adjacent to these areas.
American chestnut	<i>Castanea dentata</i>	END	END	In Ontario, American chestnut occurs in mixed or deciduous forests in the Carolinian zone (Farrar 1995). It is often found in communities with dense canopy cover and often associated with oak and maple. This tree grows primarily on acidic, sand or gravel soils (Boland et al. 2012).	Moderate – This species was historically very common and remnant individuals could occur anywhere.
American columbo	<i>Frasera caroliniensis</i>	END	END	In Ontario, American columbo is most commonly associated with open deciduous forested slopes, but it can also be found in thickets, swamps and clearings. It is often associated with oak, hickory and sassafras trees. American columbo grows on a wide variety of soils, particularly dry mesic to mesic clay and clay loam soils (COSEWIC 2006).	Low – typically occurs in prairie and open deciduous forest, which does not appear to be present in the Future Development Areas
American ginseng	<i>Panax quinquefolius</i>	END	END	In Ontario, American ginseng is found in moist, undisturbed and relatively mature deciduous woods often dominated by sugar maple. It is commonly found on well-drained, south-facing slopes. American ginseng grows under closed canopies in neutral, loamy soils (COSEWIC 2000).	Low – No mature forest within Future Development Areas. However, forest associated with the Nith Valley near Areas A and B may be suitable.
Broad beech fern	<i>Phegopteris hexagonoptera</i>	—	SC	In Ontario, broad beech fern inhabits rich, undisturbed mature deciduous forest dominated by beech and maple. It typically grows in moist to wet, sandy soils of lower valley slopes and occasionally swamps (van Overbeeke et al. 2013).	Low – No mature forest within Future Development Areas. However, forest associated with the Nith Valley near Areas A and B may be suitable.
Butternut	<i>Juglans cinerea</i>	END	END	In Ontario, butternut is found along stream banks, on wooded valley slopes, and in deciduous and mixed forests. It is commonly associated with beech, maple, oak and hickory (Voss and Reznicek 2012). Butternut prefers moist, fertile, well-drained soils, but can also be found in rocky limestone soils. This species is shade intolerant (Farrar 1995).	Moderate – This species was historically very common and remnant individuals could occur anywhere.
False hop sedge	<i>Carex lupuliformis</i>	END	END	In Ontario, false hop sedge occurs in marshes, riverine swamps, borders of vernal pools, and wet depressions of forests. It occasionally occurs in shallow water or very wet floodplain forests. Usually grows under a moderately open canopy but can tolerate high levels of sunshine. Substrates are calcareous or neutral and include moist wet mucks, silt loams, or alluvial deposits with a sandy texture (Environment Canada 2014).	Low – Limited wetland habitat within the Future Development Areas, but the specie could occur in the wetlands adjacent to these areas.
Green dragon	<i>Arisaema dracontium</i>	—	SC	In Ontario, green dragon occurs in somewhat-wet to wet deciduous forests along streams. In particular, it grows in maple forest and forest dominated by red ash and white elm trees. Green dragon is restricted to shaded or partially shaded seasonally inundated floodplains (Donley et al. 2013). It is primarily restricted to southwestern Ontario.	Low – Limited wetland habitat within the Future Development Areas, but the specie could occur in the wetlands adjacent to these areas.

Common Name	Scientific Name	Species At Risk Act (Sch 1)	Endangered Species Act	Habitat Requirements ⁵	Potential to Occur in the Future Development Areas
White wood aster	<i>Eurybia divaricata</i>	THR	THR	In Ontario, white wood aster grows in open, dry to moist, deciduous woodlands with well-drained soils. It seems to grow along trails in forests dominated by sugar maple and American beech, with associates such as red, white, and black oak, shagbark hickory, and basswood (COSEWIC 2002).	Low – No mature forest within Future Development Areas. However, forest associated with the Nith Valley near Areas A and B may be suitable.
Aquatic Species					
Black redhorse	<i>Moxostoma duquesnei</i>	—	THR	In Ontario, Black Redhorse has been found in tributaries of Lake Erie, Lake St. Clair, Lake Huron and Lake Ontario. In the Lake Erie drainage, it is known from the Grand River watershed and Catfish Creek, however the Catfish Creek population is considered extirpated. In the Lake St. Clair drainage, it is present in the Thames River watershed. In the Lake Huron drainage, it is found in the Saugeen, Bayfield River, Maitland River and Ausable River watersheds. In the Lake Ontario drainage, it has been found in Spencer Creek and Lake Simcoe, however Lake Simcoe records are considered to be introductions. Habitats are typically found in moderately sized to large rivers and streams with moderate to fast flows. It is rarely found associated with aquatic vegetation. Preferred substrates include rubble, gravel, sand, boulders and silt. In summer, this fish species generally prefers pools, and they overwinter in deeper pools. Spring spawning has been observed in riffle habitats, over substrates ranging from fine gravel to large cobble, and at water temperatures between 15°C and 21°C (COSEWIC, 2015).	To be discussed in the aquatic screening Report
Silver shiner	<i>Notropis photogenis</i>	—	THR	In Ontario, the Silver Shiner is found in tributaries of lakes St. Clair Thames River), Erie (Grand River) and Ontario (Bronte and Sixteen Mile Creek). They prefer moderately-flowing sections of larger streams with clear water and moderate currents. Usual substrates include gravel, rubble, boulder, and sand. Aquatic vegetation may be present or absent. The Silver Shiner most frequently occurs in deep, swift riffles and faster currents of pools below riffles. Spawning habitat is suggested to occur in relatively deep riffles (COSEWIC, 2011).	To be discussed in the aquatic screening Report
Rainbow	<i>Villosa iris</i>	END	SC	In Ontario, is found in St. Clair delta and the Saugeen, Maitland, Bayfield, Ausable, Sydenham, Thames, Grand, Trent, Moira and Salmon Rivers. The Rainbow mussel is found in shallow, well- oxygenated waters of small to medium-sized rivers (often near emergent vegetation) and sometimes lakes. It is most abundant in waters less than 1 m deep. Preferred substrates are cobble, gravel, sand and occasionally mud or boulder (DFO, 2016).	To be discussed in the aquatic screening Report
Wavy-rayed lampmussel	<i>Lampsilis fasciola</i>	SC	THR	In Ontario, Wavy-rayed Lampmussel inhabits clear, medium-sized rivers and streams, with steady flow and stable substrate. It is typically found in clean sand or gravel substrates, often stabilized with cobble or boulders, in and around riffle areas up to 1 m in depth. It may also be found in large creeks and rivers. This species is known to occur in the Ausable, Grand, Maitland, Sydenham, and Thames (North and South) rivers, and in the St. Clair River delta (Morris 2011).	To be discussed in the aquatic screening Report

4.0 CONCLUSION

The proposed future residential developments in the Study Area may intersect with several environmental constraints, including wetlands, woodlands, watercourses and habitat for SAR. However, the selection of Future Development Areas have focussed on locations that are mostly outside of these habitat types and where there is existing human disturbance and rotational crop fields. In advance of development of infrastructure, site-specific inventories of these habitats and the habitat of SAR should be conducted to determine if permits are required. A summary of the environmental permits which could be required is provided in Table 2.

Table 2 Summary of Environmental Permits and Regulations Review.

Legislation	Plan/Regulation/ By-law	Permit/ Approval/ Authorization	Required						Comments	
			Area A	Area B	Area C	Area D	Area E	Area F		
Federal Approvals										
<i>Fisheries Act</i>	n/a	Harmful, Alteration, Disruption, Destruction (HADD). DFO Review process required for all in-water work and for all works below the high water mark.								To be determined in the Aquatic Screening Report To be determined in the Aquatic Screening Report
<i>Migratory Birds Convention Act</i>	n/a	Project must abide by MBCA legislation for vegetation removals.	yes	yes	yes	yes	yes	yes	yes	The MBCA requirements should be documented in a site specific Environmental Impact Study (EIS). Typically, observing seasonal constraints for vegetation removal will help to avoid contravention of this act.
<i>Species at Risk Act</i>	n/a	SARA permit- for terrestrial species, applicable to Federal Lands only; or for aquatic species.	no	no	no	no	no	no	no	No requirement identified at this time unless ECCC is of the opinion that species were not provided adequate protection by the province.
Provincial Approvals										
<i>Conservation Authorities Act</i>	Ontario Regulation (GRCA) Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (O.Reg.150/06).	A permit is required for all works identified within Regulated Areas. Regulated features include but are not limited to watercourses, wetlands, valleylands (plus setbacks), hazardous lands, lands within 120m of Provincially Significant Wetlands, dynamic beach/waterfront (plus setbacks).	yes	yes	yes	no	no	yes		In many cases, there is only small overlap of the regulation limit and the Future Development Area. Refinement of the Future Development Areas may result in avoiding regulation limit areas. Area F has wetlands that are not identified and may be added to the regulation limit area.
<i>Endangered Species Act</i>	Several Regulations Exist.	Ministry of the Environment, Conservation and Parks (MECP) administers the Endangered Species Act, 2007 (ESA) in Ontario.	Unlikely	Unlikely	Unlikely	Unlikely	Possible	Possible		Screening for potential SAR Bat Habitat for tree removals; Kentucky Coffee Tree identified but not considered under the ESA by the MECP where trees are of planted origin; Potential for Monarch identified however this species is not regulated under the ESA. No aquatic SAR habitat identified.
Municipal Approvals										
Greenlands Network, Significant Valleylands, Core Environmental Features, Environmentally Sensitive Landscapes	Region of Waterloo Official Plan, Township of North Dumfries Official Plan	Region of Waterloo, Township of North Dumfries	no	yes	yes	no	no	yes		Small areas of overlap with the Future Development Areas could be avoided by refinement of these areas.
<i>Tree Protection By-laws</i>	Region of Waterloo - Woodland Tree Protection Bylaw 08-026 Township of North Dumfries – no bylaw currently enacted	“woodland” means land that is located within the boundaries of The Regional Municipality of Waterloo that is at least one hectare or more in area with at least: (i) 1,000 trees, of any size, per hectare; (ii) 750 trees, measuring over five centimetres in diameter, per hectare; (iii) 500 trees, measuring over 12 centimetres in diameter, per hectare; or (iv) 250 trees, measuring over 20 centimetres in diameter, per hectare; but does not include a cultivated fruit or nut orchard or a plantation established for the purpose of producing Christmas trees.	yes	yes	no	no	Possible around house	Possible around house and wetland		Field assessment may be necessary to determine if areas meet the definition of a woodland. Refinement of the Future Development Areas may avoid woodland areas.