RIVERSIDE SOUTH DEVELOPMENT CORPORATION

# RIVERSIDE SOUTH PHASE 17

## ENVIRONMENTAL IMPACT STATEMENT AND TREE CONSERVATION REPORT

Project No.: 201-03736-00

SEPTEMBER 08, 2020 FINAL

wsp

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## ENVIRONMENTAL IMPACT STATEMENT AND TREE CONSERVATION REPORT

### RIVERSIDE SOUTH DEVELOPMENT CORPORATION

FINAL

PROJECT NO.: 201-03736-00
DATE: SEPTEMBER 08, 2020

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September 08, 2020

FINAL

Marcel Denomme
RIVERSIDE SOUTH DEVELOPMENT CORPORATION
2193 Arch Street
Ottawa, ON K1G 2H5

**Subject: Riverside South Phase 17 – Environmental Impact Statement and Tree Conservation Report**

Dear Marcel:

The following Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) for the proposed Riverside South Phase 17 subdivision development in Ottawa, Ontario, has been prepared in accordance with the City of Ottawa's EIS and TCR guidelines.

This report is intended to provide an assessment of environmental impacts and proposed mitigation measures based on the findings from ecological field investigations and desktop screenings.

Natural heritage features have been identified and evaluated during the spring/summer season of 2020. Such features and their associated wildlife and/or vegetation surveys are described in this report.

If you have any questions pertaining to the methods, results, or impacts and mitigation presented in the report, please contact me at your convenience.

Yours sincerely,

Alex Zeller
Project Ecologist

WSP ref.: 201-03736-00

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# REVISION HISTORY

First issue

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|---|---|---|---|---|
| September 1, 2020 | Draft for client review | | | |
| Prepared by | Reviewed and Approved by | | | |
| Cody Pytlak, Ecologist | Alex Zeller, Project Ecologist | | | |
| Revision 1 | | | | |
| September 8, 2020 | Final for submission to City of Ottawa | | | |
| Prepared by | Reviewed and Approved by | | | |
| Cody Pytlak, Ecologist | Alex Zeller, Project Ecologist | | | |

# SIGNATURES

CONTRIBUTORS

Cody Pytlak, B.A.
Ecologist

REVIEWED BY

Alex Zeller, M.Sc.
Project Ecologist

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# EXECUTIVE SUMMARY

Riverside South Development Corporation (RSDC) retained WSP Canada Inc. (WSP) to undertake an Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) for the proposed Riverside South Phase 17 development, located at 4775 and 4875 Spratt Road, in Ottawa, Ontario. The primary objective of this EIS and TCR is to evaluate the environmental impacts associated with the proposed development.

Natural heritage field investigations for the Project were conducted in the spring and summer of 2020 and consisted of: Headwater Drainage Feature (HDF) assessment, Ecological Land Classification (ELC), wetland identification, significant woodland evaluation, tree inventory, Significant Wildlife Habitat (SWH) identification and evaluation, amphibian breeding surveys, breeding bird surveys, acoustic bat surveys, Species at Risk (SAR) surveys and SAR habitat identification, and incidental wildlife observations. Results from a review of background natural heritage records and on-site field investigations are summarized below:

1) HDFs are located within the Study Area, and it is expected that one tributary will be partially removed to accommodate construction. Based on field observations, this reach is not considered to be direct fish habitat and therefore flows can be integrated into the proposed stormwater management system.

2) The vegetation communities recorded during field investigations are commonly found throughout Ottawa and eastern Ontario and consist mainly of deciduous forest, deciduous swamp, thicket swamp, and mixed meadow. Vegetation species within these communities are considered common throughout Ontario. No provincially rare vegetation species were observed. Non-native/invasive species were abundant throughout the Study Area

3) Two significant woodlands are located within the Study Area; however, they are both outside of the development area and are not expected to be directly impacted.

4) The wetland communities within the Study Area are not considered to be provincially significant.

5) Forest communities within the subject property were abundant with young to mid-aged trees and shrubs, representing native and invasive species. Mature trees occurred occasionally throughout. Hedgerows were made up of mid-aged trees, with some large, mature trees present in the northwestern corner of the subject property. Seven trees were identified to be 'Distinctive' [≥ 50 cm diameter at breast height (DBH)], and ten were identified as specimen trees (>70 cm DBH and in good health). Overall, tree health is in moderate to good condition, although there is evidence of substantial damage from Emerald Ash Borer and invasive Common Buckthorn and Glossy Buckthorn are prevalent throughout the Study Area.

6) Tree mitigation and protection measures have been recommended to limit the number of Distinctive and specimen trees requiring removal and to provide suitable protection techniques for trees being retained.

7) A significant number of Butternut trees (Endangered) are found throughout the development area. Surveys are still on-going to identify and evaluate the health of trees. Further consultation will be required with the Ontario Ministry of Environment, Conservation, and Parks to establish authorization requirements prior to further site alteration.

8) Bobolink (Threatened) was observed to be nesting on the eastern side of the subject property. However, there is no suitable habitat for Bobolink within the project footprint and impacts on Bobolink is not expected.

9) Additional mitigation measures have been proposed to limit the development impacts on terrestrial environments and wildlife**.**

The compensation measures proposed should mitigate the negative impacts associated with this development while retaining valuable natural heritage assets for future residential development. The additional negative impacts noted in this report, primarily associated with the construction of the development, can be mitigated with the proposed mitigation measures.

# 1 INTRODUCTION

## 1.1 PURPOSE

Riverside South Development Corporation (RSDC) retained WSP Canada Inc. (WSP) to complete an Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) for the proposed RSDC Phase 17 Development (herein known as "the Project"), located at 4775 and 4875 Spratt Road, in the City of Ottawa (**Figure 1**).

This EIS has been prepared to describe the existing natural heritage features within the Study Area and to evaluate the potential environmental impacts associated with the proposed development based on field investigations and desktop screening results. Mitigation measures have been provided to offset the anticipated environmental impacts.

For this report, the Study Area includes the area within 120 metres (m) of the Project footprint to account for policy requirements and setback distances outlined in the *Provincial Policy Statement* (PPS) (Ministry of Municipal Affairs and Housing, 2014) and the accompanying *Natural Heritage Reference Manual* (NHRM) (MNR, 2010).

**The "Study Area" for this project includes the subject properties, plus a 120m buffer from this area** (see **Figure 1**)**.** In addition, specific species and features will be considered up to two kilometres (km) from the proposed development as it may relate to specific environmental policy or legislation.

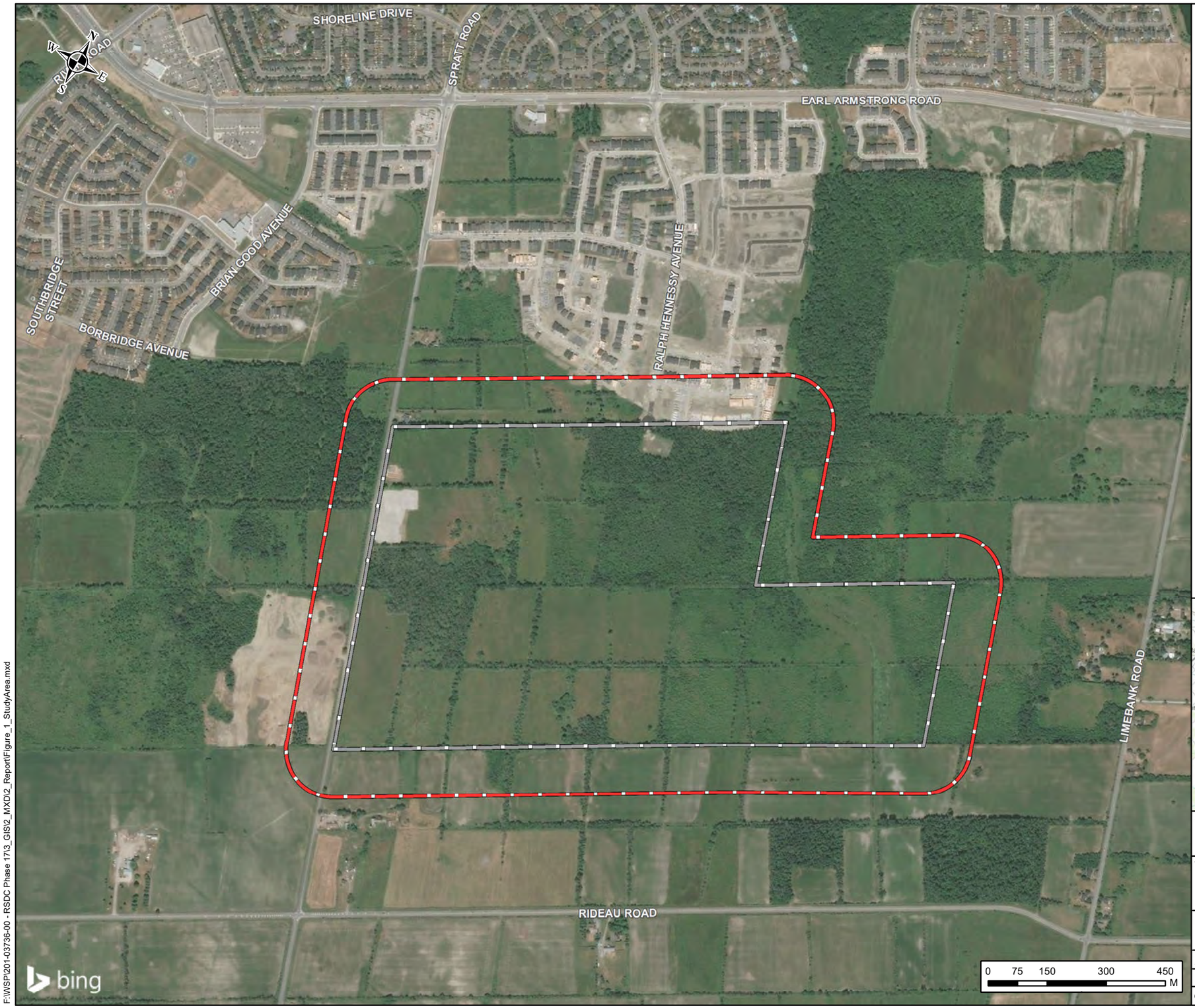
## 1.2 BACKGROUND

RSDC is submitting a Draft Plan of Subdivision application for the development located at 4775 and 4875 Spratt Road, in Ottawa, Ontario. The preliminary development plan calls for a mix of single-detached dwellings, with townhouses, two parks, one medium density residential block, one school block, and one commercial block.

Within the City of Ottawa, an EIS is required when development or site alteration, as defined in Section 4.7.8 of the Official Plan (City of Ottawa, 2003), is proposed in or adjacent to environmentally designated lands or other features of the City's natural heritage system (NHS). In this case, candidate significant woodlands and wetlands, in addition to surface water features and potential habitat for Species at Risk triggered the requirement for an EIS and TCR.

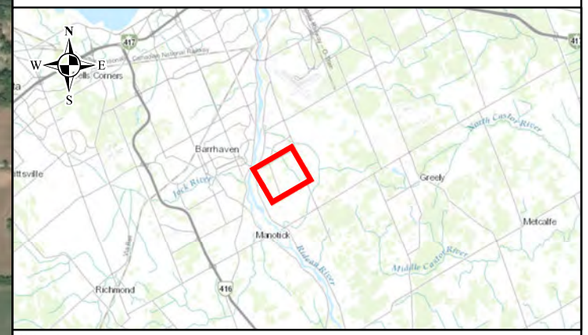
This report has been prepared to consider federal, provincial, and municipal policies and regulations from relevant regulatory agencies in order to maintain compliance with the government legislation that pertains to the Project.

Furthermore, this report has been prepared to support the Project in the following ways: 1) to not contravene the *Endangered Species Act, 2007* (ESA); 2) to evaluate environmental impacts; and, 3) to develop a mitigation plan addressing potential impacts.




Subject Property

Study Area




Client:
**Riverside South Development Corporation**

Title:
**Study Area**

Prepared By:

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| Date: August 2020 | **Figure: 1** | |
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## 1.3 PROPERTY INFORMATION

| | |
|---|---|
| **Owner:** | Riverside South Development Corporation |
| **Address:** | 4775 Spratt Road and 4875 Spratt Road, Ottawa, Ontario |
| **Lot and concession:** | Part of Lots 23 & 24, Concession 1 |
| **Property Identification Number(s):** | n/a |
| **Zoning:** | DR – Development Reserve (Sections 237 and 238) |
| **Official Plan designation (Schedule B):** | General Urban Area |
| **Existing Land Uses:** | Forested, Meadow |

## 1.4 STUDY APPROACH

The following approach has been developed to provide a clear methodological direction towards characterizing the natural environment and assessing the potential for significant species and habitats within the Study Area.

**Policy Framework:** This section outlines the policies and legislation that apply to the protection of natural heritage features within the Study Area as it relates to the Project.

**Natural Heritage Screening:** This section provides detailed background information collected from a variety of publicly accessible resource databases to describe the natural heritage features and significant features that may occur within the Study Area.

**Methodology:** This section provides a summary of the specific protocols and methods used to evaluate potential natural heritage features and species identified within the natural heritage screening.

**Survey Results:** This section provides the results from the field surveys. This also includes any incidental observations or notable observations made by the field biologists.

**Description of the Proposed Project:** This section provides a summary of the Project, including the construction activities and other activities which may have an impact on the natural environment.

**Impact Assessment and Mitigation:** This section provides the assessment of potential environmental impacts associated with the Project on the natural heritage system, including the natural heritage features and species surveyed in this study.

The mitigation measures proposed in this section are aimed at reducing or eliminating potential impacts on natural heritage features. Where mitigation may not be possible, compensation may be proposed.

This section will also identify any future permitting or agency authorizations that may be required before the Project may proceed.

**Summary and Conclusions:** This section provides a summary of the Study's findings, outlines any notable provisions, and provides WSP's general recommendation on whether this Project should proceed as planned.

**TREE CONSERVATION REPORT REQUIREMENTS**

For the purposes of this integrated report, the Tree Conservation Report (TCR) requirements will be addressed throughout this report. To aid in the review, sections which address specific **requirements under the TCR guidelines will be marked with the "tree" symbol** as illustrated to the left.

# 2 POLICY FRAMEWORK

This study references the regulatory agencies and legislative authorities, mandated to protect different elements of the NHS, features, and functions within the City of Ottawa, Ontario, and Canada. **Table 1** provides a list of the applicable policies and legislation for the protection of natural heritage features and SAR either municipally, provincially, and/or federally. The scope of this report evaluates the natural heritage features and SAR governed by the policies outlined in the table below.

**Table 1 Policies, Legislation and Background Sources**

| Policy/Regulations | Reference Materials and Supporting Documents |
|---|---|
| ***Federal Government of Canada*** | |
| ***Migratory Birds Convention Act* (MBCA, 1994) (S.C. 1994, c. 22)** | Environment and Climate Change Canada (ECCC) – online resources |
| ***Species at Risk Act* (SARA, 2002) (S.C. 2002, c. 29)** | Federal Species at Risk Public Registry:<br>• *Distribution of Aquatic Species at Risk mapping (Accessed:* 04/21/20*)* |
| ***Fisheries Act* (1985) (R.S.C., 1985, c. F-14)** | Fisheries and Oceans Canada – online resources |
| ***Province of Ontario*** | |
| **Provincial Policy Statement (2014), under *Planning Act*, R.S.O. (1990) c. P.13**<br><br>**AND**<br><br>**Ontario *Endangered Species Act* (2007) (S.O. 2007, c. 6)** | Ministry of Natural Resources and Forestry (MNRF) – Kemptville District |
| | MNRF Natural Heritage Information Centre (NHIC) – Online (Accessed: 04/21/20):<br>• *Species at Risk occurrence records*<br>• *Species of Conservation Concern*<br>• *Natural Heritage Features* |
| | NHRM (MNR, 2010) |
| | Significant Wildlife Habitat Technical Guide (MNR, 2000):<br>— *Significant Wildlife Habitat Eco-region 6E Criterion Schedules* (MNRF, 2015) |
| | Ministry of the Environment, Conservation and Parks (MECP):<br>— *Species at Risk in Ontario (SARO) List (O.Reg. 230/08)* |
| | Ecological Land Classification for Southern Ontario, First Approximation and its Application (Lee, et al., 1998) |
| | Ontario Breeding Bird Atlas (OBBA) – Online (Accessed: 04/21/20) |
| | Ontario Reptile and Amphibian Atlas (ORAA) – Online (Accessed: 04/21/20) |
| | Ontario Butterfly Atlas (OBA) – Online (Accessed: 04/21/20) |
| | iNaturalist Observation Records – Online (Accessed: 04/21/20 |
| | Atlas of the Mammals of Ontario (AMO) (Dobbyn, 1994) |
| ***City of Ottawa*** | |
| | Official Plan; Schedules B (Urban Policy Plan), K (Environmental Constraints), and L2 (Natural Heritage System Overlay (South) – Online (Accessed: 04/22/20) |
| | Environmental Impact Statement Guidelines (City of Ottawa, 2015c) |

| Policy/Regulations | Reference Materials and Supporting Documents |
|---|---|
| **City of Ottawa Official Plan (2003)**  | City of Ottawa Tree Conservation Report Guidelines – Online (Accessed: 04/21/20) |
| | Site Alteration By-Law (2018) – Online (Accessed: 04/21/20) |
| | Protocol for Wildlife Protection During Construction (2015) |
| ***Rideau Valley Conservation Authority (RVCA)*** | |
| **Rideau Valley Conservation Authority: *Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses* (Ontario Regulation 174/06), under *Conservation Authorities Act*, (R.S.O. 1990, c. C.27)** | RVCA Regulations Mapping – Online (Accessed: 04/22/20) |

## 2.1 ONTARIO ENDANGERED SPECIES ACT, 2007

The Ontario ESA prohibits the killing or harming of species identified as Threatened or Endangered under the Act. Section 10 of the ESA prohibits the damage or destruction of a species' habitat that has been classified as Endangered or Threatened on the Species at Risk in Ontario (SARO) List in Ontario Regulation (O. Reg.) 230/08.

Under the ESA, "habitat" is defined as:

> "*with respect to any other species of animal, plant or other organism, an area on which the species depends, directly or indirectly, to carry on its life processes, including life processes such as reproduction, rearing, hibernation, migration or feeding.*"

General habitat protection is afforded to all species once they become listed as Threatened or Endangered and remains in place until a regulated habitat is designated.

Regulated habitat is defined as:

> "*with respect to a species of animal, plant or any other organism for which a regulation made under Clause 55 (1) (a) is in force, the area prescribed by that regulation as the habitat of the species.*"

Regulated habitat provides more precise details on the species-specific habitats such as specific features, geographic boundaries, or unique requirements of a species.

# 3 DESCRIPTION OF THE NATURAL ENVIRONMENT

The following sections provide a desktop screening of the existing natural environment features identified within the Study Area. This section outlines relevant natural heritage background information, which the EIS and TCR will be based.

## 3.1 HISTORIC LAND USE

A desktop review of recent and historic aerial images highlights the land use within and adjacent to the Study Area (City of Ottawa, 2020) (**Figure 2**). From this review, the surrounding landscape was predominantly agricultural, dating back to at least 1976 but has been gradually developed within the past 20 to 30 years.

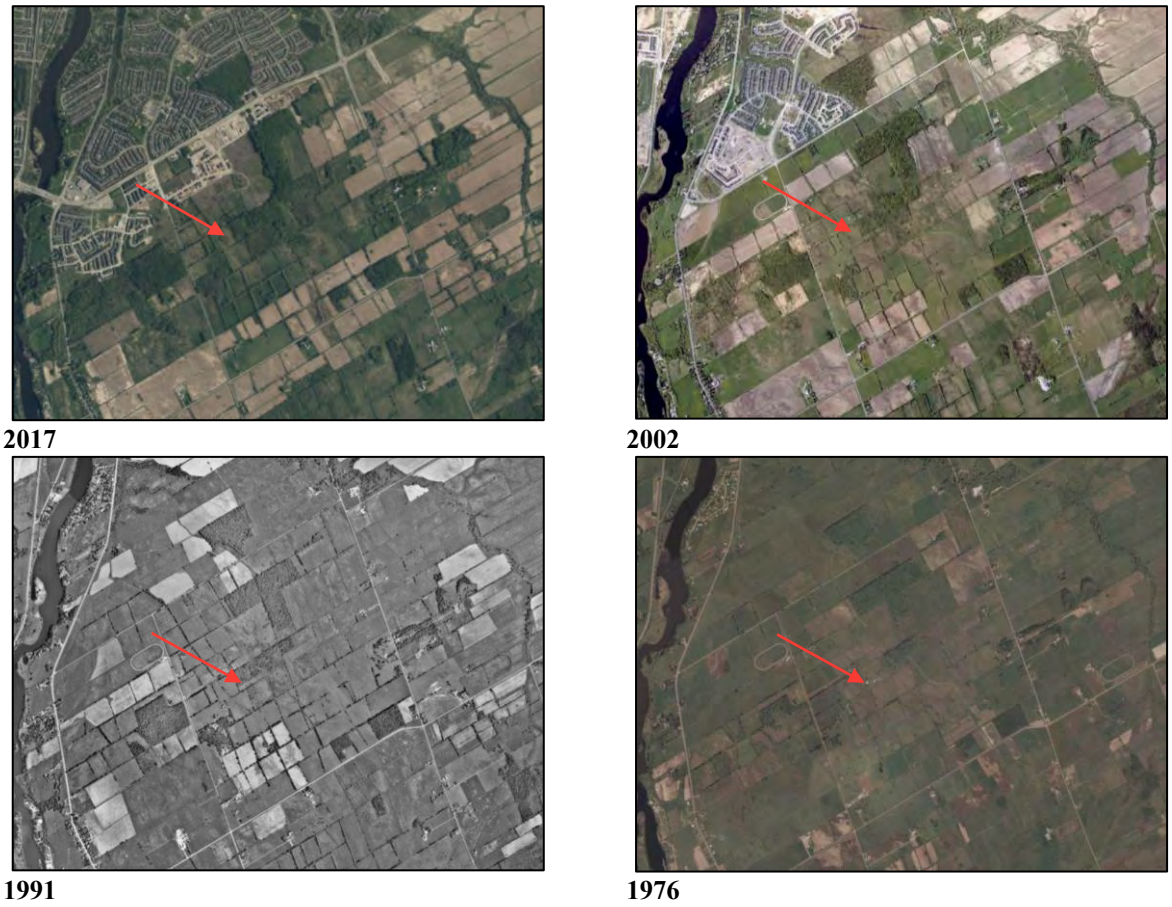



**Figure 2 Land Use Change**

## 3.2 LANDFORM, GEOLOGY AND SOILS

Much of the Study Area is situated within the North Gower Drumlin Field physiographic region, with a small portion of the northwestern corner of the Study Area located within the Ottawa Valley Clay Plains physiographic region

(Ministry of Northern Development and Mines, 2017). The centre of the Study Area lies mainly within a Till Plains physiographic landform, with the edges of the Study Area located within a Clay Plains physiographic landform (Ministry of Northern Development and Mines, 2017).

The surficial geology for the majority of the Study Area consists of stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain. Additionally, there is a small area of Paleozoic bedrock in the southwestern corner of the Study Area, and an area of coarse-textured marine deposits consisting of sand, gravel, minor silt and clay Foreshore, and basinal deposits in the northwestern corner of the Study Area (Ministry of Northern Development and Mines, 2017). The underlying bedrock of the Study Area is part of the Oxford Formation, consisting of dolomite and limestone (Natural Resources Canada, 2016).

## 3.3 AQUATIC ENVIRONMENT

The Study Area is within the Rideau Valley watershed. More specifically, the Study Area is located within the Lower Rideau River sub-watershed. The subject property is located predominately within the Mosquito Creek catchment, with the southwest corner of the property located within the Rideau River – Hogs Back catchment (Rideau Valley Conservation Authority, 2020).

Background studies indicate landcover within the Mosquito Creek catchment area is dominated by crop and pastureland (47%) and woodland (19%). Settlement and transportation make up 16% and 5% of the landcover and has likely increased since evaluated in 2012 (Rideau Valley Conservation Authority, 2012a). Mosquito Creek itself has been classified as a coolwater stream, and the catchment area has 37 recorded fish species (Rideau Valley Conservation Authority, 2012a).

Background studies on the Rideau River – Hogs Back catchment state that the landcover is dominated by settlement (44%), followed by crop and pastureland (23%). Similar to the Mosquito Creek catchment, the percentage of settlement has likely increased since the study was completed in 2012 (Rideau Valley Conservation Authority, 2012b). The catchment contains a warm/cool water recreational and baitfish fishery, with 40 species of fish (Rideau Valley Conservation Authority, 2012b).

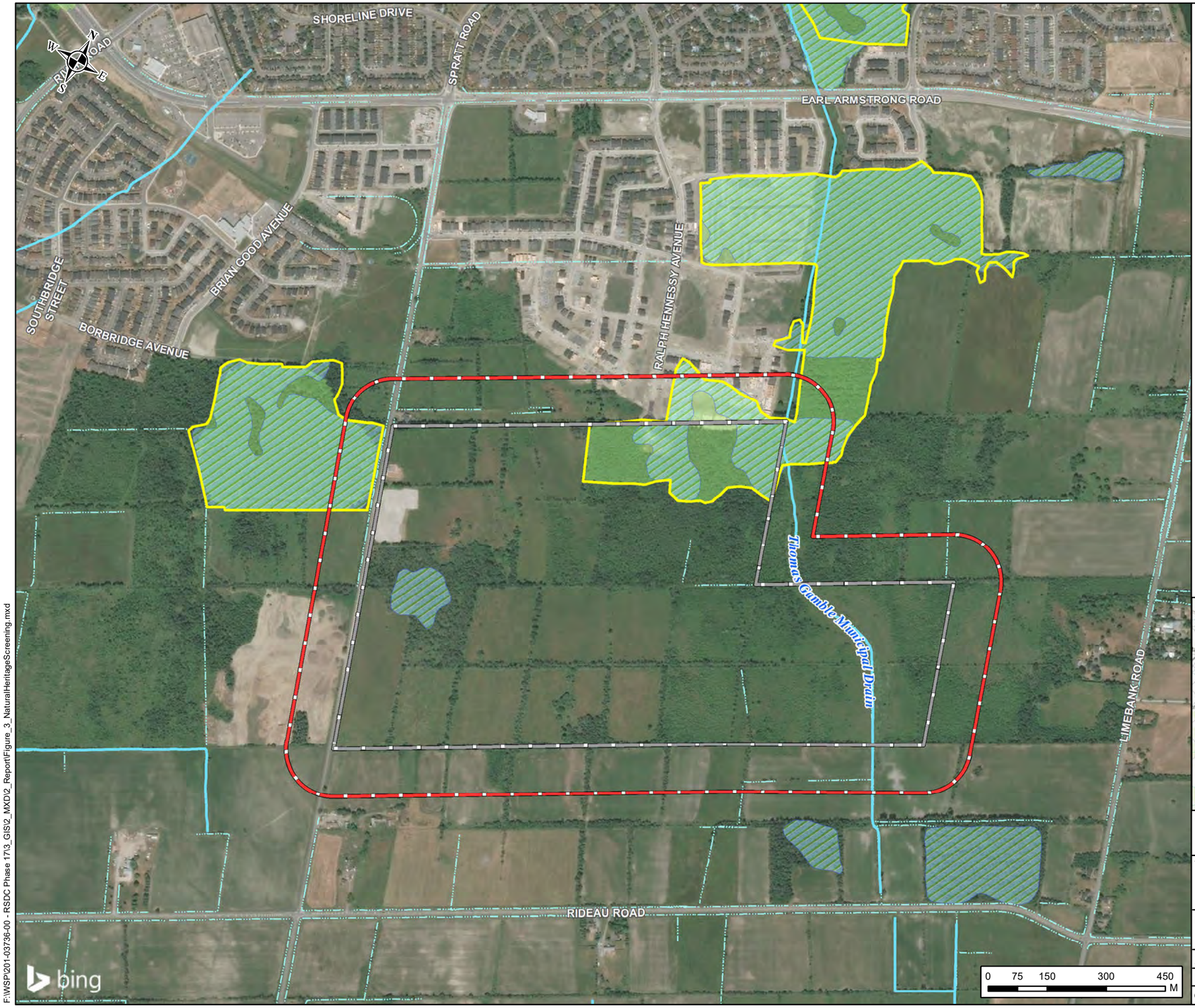
### *3.3.1 FLOODPLAIN AND REGULATED LIMIT*

The RVCA is the governing body that regulates flood potential, protects natural heritage features, and enhances the ecosystems within the Rideau Valley watershed. Development within regulated areas is governed by O. Reg. 174/06 *Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses.* RVCA also maintains, monitors, and collects information related to water quality/quantity, fisheries resources, forestry, land use, and wetlands.

The RVCA and City of Ottawa OP indicate that both regulation limits and floodplain areas are not located within the Study Area.

### *3.3.2 HEADWATER DRAINAGE FEATURES*

Mapping by both the RVCA and the City of Ottawa indicate that the Thomas Gamble Municipal Drain is located along the eastern boundary of the subject property. Multiple ditches and headwater drainage features within the subject property are connected to the municipal drain. The Thomas Gamble Municipal Drain flows north and eventually discharges into stormwater management ponds located adjacent to River Road, north of Earl Armstrong Road.




Subject Property

Study Area

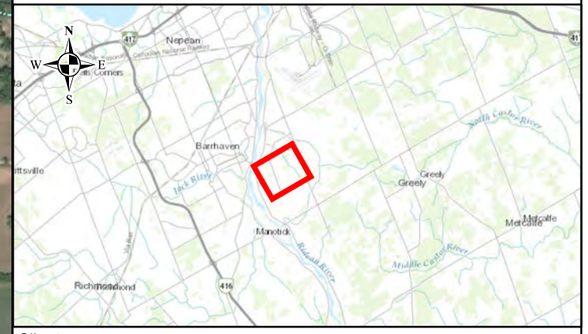
Urban Natural Features (City of Ottawa)

Significant Woodland (MNRF, 2013)

Wetland (MNRF)

Ditch (City of Ottawa, 2019)

Watercourse (MNRF, 2011)




Client:
**Riverside South Development Corporation**

Title:
**Natural Heritage Screening**

Prepared By:
WSP

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## 3.4 NATURAL HERITAGE FEATURES

Several specific natural heritage features require consideration for protection under the Ontario PPS (Ministry of Municipal Affairs and Housing, 2014). The protection of these features is generally administered by the City of Ottawa, consistent with relevant provincial and federal legislation. These features are:

- Provincially Significant Wetlands;
- Significant Woodlands;
- Significant Valleylands;
- Areas of Natural and Scientific Interest (ANSI);
- Significant Wildlife Habitat (SWH);
- Species at Risk (SAR) habitat; and,
- Fish habitat.

The section below provides a review of available background materials to determine the potential presence of these natural heritage features within the Study Area. Where possible, natural heritage features have been illustrated in **Figure 3.**

### 3.4.1 WETLANDS

A review of the City of Ottawa online mapping service (City of Ottawa, 2020) and provincial natural heritage mapping accessed through the NHIC (MNRF, 2020) indicates there are multiple unevaluated wetlands present within the Study Area. The wetlands are generally located within forested areas and likely consist of swamp communities.

### 3.4.2 WOODLANDS

Provincial natural heritage mapping and aerial imagery show a large woodland, known as the Armstrong Road South Woods, is located within the northeast corner of the Study Area. The woodland extends beyond the boundary of the Study Area. A portion of the forest interior is included in the City's NHS mapping, as indicated in Schedule L2 of the OP, and is also listed as an Urban Natural Feature in Schedule K (Environmental Constraints) of the OP.

A small woodland is located on the western boundary of the Study Area, but is not included within the City's NHS mapping or designated as an Urban Natural Feature.

### 3.4.3 VALLEYLANDS

No Significant Valleylands were identified within or adjacent to the Study Area.

### 3.4.4 AREAS OF NATURAL AND SCIENTIFIC INTEREST

No ANSIs were identified within or adjacent to the Study Area.

### 3.4.5 SIGNIFICANT WILDLIFE HABITAT

No SWH were identified within or adjacent to the Study Area.

### 3.4.6 FISH HABITAT

Background studies of the Mosquito Creek catchment indicate that the Thomas Gamble Municipal Drain supports fish habitat for baitfish species, with the following species observed during sampling (Rideau Valley Conservation Authority, 2012a):

- Brassy Minnow (*Hybognathus hankinsoni*)
- Brook Stickleback (*Culaea inconstans*)
- Creek Chub (*Semotilus atromaculatus*)
- Fathead Minnow (*Pimephales promelas*)

## 3.5 SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN

Background data were collected and reviewed to identify SAR and SCC with occurrence records within the Study Area. Publicly available databases (**Table 1**) were consulted to develop a list of SAR that have a record within a 1 $km^2$ or 10 $km^2$ grid (dependent on the database being consulted) encompassing the Study Area. Due to natural changes and anthropogenic developments in the Project Study Area, the background review collected current records (i.e. ≤ 30 years) that occurred within the Study Area.

**Table 2** provides a list of these species along with corresponding federal, provincial, SAR and/or SCC designations (i.e. S-Ranks). S-Ranks is a provincial status used by the NHIC to set protection priorities for rare species and is based on the number of occurrences in Ontario. The MNRF tracks species with S1 to S3 (vulnerable to critically imperilled) designations and is therefore considered provincially rare and/or SCC.

Furthermore, species listed within **Table 2** were further evaluated based on their habitat preferences and the likelihood of occurrence for the Study Area. The habitat screening was built on habitat requirements defined by the MNR (2000), background records, and air-photo interpretation in order to identify the presence of suitable habitat for SAR/SCC within the Study Area. The results of the screening are documented in **Appendix A – Species at Risk Screening**.

**Table 2 Species at Risk and Species of Conservation Concern Wildlife Records**

| Scientific Name | Common Name | S-Rank[1] | SARA (Schedule 1)[2] | ESA | Info. Source[2] |
|---|---|---|---|---|---|
| **Vascular Plants** | | | | | |
| *Juglans cinerea* | Butternut | S3? | END | END | City of Ottawa |
| **Insects** | | | | | |
| *Danaus plexippus* | Monarch | S2N, S4B | SC | SC | OBA, iNat |
| **Herpetoza** | | | | | |
| *Emydoidea blandingii* | Blanding's Turtle | S3 | THR | THR | iNat |
| *Graptemys geographica* | Northern Map Turtle | S3 | SC | SC | ORAA, iNat |
| *Chelydra serpentina* | Snapping Turtle | S4 | SC | SC | ORAA |
| **Birds** | | | | | |
| *Contopus virens* | Bank Swallow | S4B | THR | THR | OBBA |
| *Hirundo rustica* | Barn Swallow | S4B | THR | THR | OBBA |
| *Dolichonyx oryzivorus* | Bobolink | S4B | THR | THR | OBBA |
| *Chaetura pelagica* | Chimney Swift | S4B, S4N | THR | THR | OBBA |
| *Sturnella magna* | Eastern Meadowlark | S4B | THR | THR | OBBA |
| *Contopus virens* | Eastern Wood-Pewee | S4B | SC | SC | OBBA |
| *Ammodramus savannarum* | Grasshopper Sparrow | S4B | SC | SC | OBBA |
| *Progne subis* | Purple Martin | S3, S4B | --- | --- | OBBA |
| *Asio flammeus* | Short-eared Owl | S2N, S4B | SC | SC | OBBA |
| *Hylocichla mustelina* | Wood Thrush | S4B | THR | SC | OBBA |
| **Mammals** | | | | | |
| *Myotis lucifugus* | Little Brown Myotis | S3 | END | END | AMO |
| *Myotis leibii* | Eastern Small-footed Myotis | S2S3 | --- | END | AMO |
| *Myotis septentrionalis* | Northern Myotis | S3 | END | END | AMO |
| *Perimyotis subflavus* | Tri-colored Bat | S3? | END | END | AMO |

| Scientific Name | Common Name | S-Rank[1] | SARA (Schedule 1)[2] | ESA | Info. Source[2] |
|---|---|---|---|---|---|

*[1]S-Rank is an indicator of commonness in the Province of Ontario. A scale between 1 and 5, with 5 being very common and 1 being the least common. [2]END = Endangered; THR = Threatened; SC = Special Concern. [3]Information sources include: NHIC = Natural Heritage Information Centre; OBBA = Ontario Breeding Bird Atlas; ORAA = Ontario Reptile and Amphibian Atlas; OBA = Ontario Butterfly Atlas; AMO = Atlas of the Mammals of Ontario; iNat = iNaturalist; City of Ottawa: MacPherson, 2018; --- denotes no information or not applicable.*

## 3.6 TREES

Aerial photos indicate that the northeastern and southwestern corners of the subject property contain wooded areas that are likely mid-aged to mature forest communities. Furthermore, trees are present within hedgerows throughout the remainder of the property.

## 3.7 WILDLIFE HABITAT

In addition to the SAR and SCC noted above in **Table 2**, a review of current and historic aerial photos of the Study Area was used to identify potential wildlife habitat. Several species of fauna common to the City of Ottawa rural and urban areas are known to live in the habitats present within the Study Area. These species may include, but are not limited to:

- **Mammals**: Raccoons (*Procyon lotor*), White-tailed Deer (*Odocoileus virginanus*), Eastern Gray Squirrel (*Sciurus carolinensis*), Eastern Cottontail (*Sylvilagus floridamus*), Eastern Coyote (*Canis latrans* var.), among others.
- **Reptiles & Amphibians:** Eastern Gartersnake (*Thamnophis sirtalis*), Green Frog (*Rana clamitans*), Leopard Frog (*Lithobates pipiens*), among others.
- **Birds:** Black-capped Chickadee (*Poecile atricapillus*), Canada Goose (*Branta canadensis*), Song Sparrow (*Melospiza melodia*), among others.

## 3.8 OTHER DEVELOPMENT CONSTRAINTS

Based on the literature and sources reviewed, no additional development constraints were identified.

# 4 METHODOLOGY

## 4.1 SCOPE OF WORK

Based on the background information of the Project's natural heritage features and wildlife occurrence records, ecological surveys outlined below were conducted to assess the impacts of the Project on the natural environment. These surveys follow industry-standard protocols and are intended to establish baseline conditions. Such baseline conditions were then used to evaluate the potential for negative impacts, which may occur as a result of Project development.

Surveys were undertaken only within the subject property. If possible, natural features within the larger Study Area were evaluated from a distance or via air-photo interpretation.

### AQUATIC ENVIRONMENT

- Headwater Drainage Feature Assessment

### NATURAL HERITAGE FEATURES

- Ecological Land Classification (ELC), including:
  - Vegetation survey
  - Wetland identification
  - Woodland identification
- Significant Wildlife Habitat
  - Amphibian breeding surveys
  - Breeding bird surveys
  - Bat maternity roost surveys
  - General habitat assessment for SCC

### SPECIES AT RISK

- Breeding bird surveys, including:
  - Targeted Bobolink and Eastern Meadowlark surveys
- SAR bat habitat assessment and acoustic surveys
- Butternut tree search
- Incidental SAR and SAR habitat observations

### TREES

- Tree evaluation of development area
  - Distinctive/specimen tree search and evaluation

### INCIDENTAL WILDLIFE

- Visual and auditory observations of wildlife during all field studies

# 4.2 AQUATIC ENVIRONMENT

## 4.2.1 HEADWATER DRAINAGE FEATURE ASSESSMENT

The HDF assessment followed the Toronto and Region Conservation Authority and Credit Valley Conservation protocol, 'Evaluation, Classification and Management of Headwater Drainage Features Guidelines' (Toronto and Region Conservation Authority and Credit Valley Conservation, 2014). Field surveys were carried out following the rapid assessment method, which utilizes the Unconstrained Headwater Sampling (Section 4, Module 11) methodology in the Ontario Stream Assessment Protocol (Stanfield, 2017).

Due to health restrictions related to COVID-19, electrofishing sampling was unable to be completed during the HDF assessments. Following consultation with Jennifer Lamoureaux from the RVCA, WSP biologists completed visual searches for fish during HDF assessments and other site visits, in place of electrofishing sampling.

# 4.3 NATURAL HERITAGE FEATURES

## 4.3.1 VEGETATION COMMUNITIES

Vegetation communities within the Study Area were characterized and mapped using the ELC system for southern Ontario (Lee, et al., 1998). Vegetation communities were first delineated by air-photo interpretation and then verified while on-site. Due to property access restrictions, only communities accessible from within the subject property were thoroughly evaluated. Communities outside of the subject property were evaluated from a distance as best possible.

The ELC protocol recommends that a vegetation community be a minimum of 0.5 ha in size before they are defined as a discrete community. Unique communities less than 0.5 ha or disturbed/planted vegetation were described to the community level only. In some instances, where vegetation is less than 0.5 ha, but appears relatively undisturbed and clearly fits within an ELC vegetation type, the more refined classification was used.

In 2007, the MNRF refined their original vegetation type codes to more fully encompass the vast range of natural and cultural communities across southern Ontario. Through this process, many new codes have been added, while some have changed slightly. These new ELC codes have been used for reporting purposes for the Project as they are more representative of the vegetation communities within the Study Area.

### VEGETATION SURVEY

A vegetation inventory was completed in conjunction with ELC surveys, and a list of vascular plant species was compiled. In addition, this inventory was also used to screen for any SAR and/or provincially rare species not previously identified within the Study Area.

Scientific nomenclature, English colloquial names, and scientific binomials of plant species generally followed Newmaster et. al. (2005), with updates taken from published volumes of the Flora of North America Editorial Committee (2000 + accessed 2015) and Michigan Flora Online (2015).

## 4.3.2 WETLANDS

The delineation of wetland features within the Study Area was conducted by using ELC to map wetland attributes and vegetation.

### 4.3.3 WOODLANDS

The woodlands within the Study Area were assessed for significance following the updated guidelines outlined in the City of Ottawa Official Plan Amendment No. 179 [Section 2.4.4 of the Official Plan (City of Ottawa, 2003)].

1. *Any treed area meeting the definition of woodlands in the Forestry Act, R.S.O 1990, c.F.26 or forest in Ecological Land Classification for southern Ontario*
2. *In the rural area, meeting any one of the criteria in the Natural Heritage Reference Manual (MNR, 2010), as assessed in a subwatershed planning context and applied in accordance with Council-approved guidelines, where such guidelines exist*
3. *In the urban area, any area 0.8 hectares in size or larger, supporting woodland 60 years of age and older at the time of evaluation*

For the woodlands within this Study Area, criteria #1 and #3 will be used to determine significance. The ELC delineation will be used to determine the size of the woodland, and historic aerial images will be used to estimate the age.

### 4.3.4 SIGNIFICANT WILDLIFE HABITAT

#### AMPHIBIAN BREEDING SURVEYS

The SWH preliminary assessment identified the potential for candidate amphibian breeding habitat to occur within the Study Area. Therefore, amphibian breeding surveys were conducted and followed the *Marsh Monitoring Program - Participant's Handbook for Surveying Amphibians* (Bird Studies Canada, 2008). In accordance with the survey protocol, three different surveys were conducted between April 1st and June 30th, with at least two weeks between each visit. Surveys began at least one-half hour after sunset during evenings with a minimum night temperature of $5^0$C, $10^0$C, and $17^0$C for each of the three respective surveys. Survey points aligned with the wetland or aquatic features within the Study Area.

Each amphibian survey involved standing at a predetermined station for three minutes and listened for amphibian calls. The calling activity of individuals estimated to be within 100 m of the observation point was documented. All individuals beyond 100 m were recorded as outside the count semi-circle. Calling activity was then ranked using one of the three abundance code categories:

Code 1: Number of individuals can be accurately counted

Code 2: Calls are distinguishable and some calls simultaneous, number of individuals can be reliably estimated

Code 3: Full chorus; calls continuous and overlapping, number of individuals cannot be estimated

In areas where candidate amphibian woodland habitat exists, vernal pools (if present) were visually examined for egg masses and amphibian larvae in conjunction with other field surveys. These searches occurred between May and June when amphibians were concentrated around suitable breeding habitat.

#### BREEDING BIRD SURVEYS

Diurnal breeding bird surveys to evaluate and confirm bird SWH and habitat for SAR and/or SCC birds were conducted within the Study Area following the methods outlined in the Ontario Breeding Bird Atlas Guide for Participants (Bird Studies Canada, 2001). These surveys were completed in June 2020.

Each survey consisted of five-minute point counts to establish quantitative estimates of bird abundance in habitat types within the Study Area. To supplement the surveys, area searches noting all individual bird species and their corresponding breeding evidence were also completed while traversing the habitat on foot.

### BAT MATERNITY COLONIES

The desktop review identified the potential for candidate bat maternity colony habitat to occur within the Study Area. Therefore, a snag/cavity tree count was conducted within the forested habitats and followed the methodology outlined in the *Bat Survey Methodology – Hibernacula and Maternity Roosts* informal publication distributed by the MNRF (MNRF, 2015).

The survey was intended to count snag/cavity trees to ascertain whether the habitat is candidate SWH for maternity colony habitat for several non-SAR and SAR bats, including; Little Brown Myotis (*Myotis lucifungus*), Eastern Small-footed Myotis (*Myotis leibii*), Northern Myotis (*Myotis septentrionalis*), and Tricolored Bat (*Perimyotis subflavus*). The four bat SAR are all listed as Endangered, federally and provincially.

A search for cavity trees was conducted during the leaf-off period in the spring. The maternity roosting period is throughout June and July, and trees suitable for maternity colonies consist of larger snags or trees displaying cavities with a DBH ≥ 25 cm. Large cavity trees were noted when it met the following criteria:

- Tree exhibits cavities or crevices most often originating as cracks, scars, knot holes, or woodpecker cavities
- The tree contains a large DBH (≥ 25 cm)
- The tree contains large amounts of loose, peeling bark
- Cavity/crevice is high in cavity tree (≥ 10 m)
- The tree exhibits early stages of decay (decay class 1-3) (Watt, 1999)

To supplement the snag/cavity tree surveys, three acoustic surveys for bats was conducted using a Wildlife Acoustic's Echo Meter Touch 2 Pro ultrasonic module. The acoustic surveys were completed in tandem with the amphibian breeding surveys. The survey consisted of listening for bat calls for ten minutes throughout the Study Area. The survey was conducted a half-hour after sunset when bats typically emerge from roosts to forage. Results of the acoustic survey were then used to identify the presence/absence and species of bats within the Survey Area.

### HABITAT FOR SPECIES OF CONSERVATION CONCERN

Summarized below are the SCC with a likelihood of occurrence based on current records and the presence of suitable habitat conditions within the Project's Study Area (**Appendix A**). They include **Eastern Wood-Pewee, Grasshopper Sparrow, Purple Martin, Short-eared Owl, Northern Map Turtle, Snapping Turtle, and Monarch.**

Due to accessibility restrictions, the surveys used to identify the presence or absence of SCC and SCC habitat within the Study Area could only be completed within the subject property and from the public pathway along the southern border of the property.

General habitat observations were also noted as it relates to SCC with potential to occur (**Table 2)** and their associated habitat requirements (**Appendix A**).

### INCIDENTAL OBSERVATIONS OF SIGNIFICANT WILDLIFE HABITAT

Incidental observation of other candidate SWH was also undertaken during all site visits, specifically the presence of features that are not easily identifiable via aerial photography. If required, species-specific surveys were conducted following consultation with the MECP and the City of Ottawa.

## *4.3.5 SPECIES AT RISK AND SPECIES AT RISK HABITAT*

Ecological Land Classification surveys were used to identify candidate habitat for the SAR with potential to occur listed in **Appendix A.** Suitable habitat descriptions is included in the screening table in **Appendix A**.

### BOBOLINK & EASTERN MEADOWLARK

Field surveys to determine the presence or absence of Bobolink and other grassland SAR birds were undertaken by a qualified biologist, using the MNRF's Bobolink and Eastern Meadowlark survey protocol (MNR, 2011). The surveys consisted of establishing a transect across suitable meadow habitats and locating survey stations along the transect at a 250m interval. The target surveys for Bobolink and Eastern Meadowlark were appended to the two breeding bird surveys (methodology described above), with a third visit occurring in early July.

The biologist recorded any visual or auditory observations of Bobolink or Eastern Meadowlark, their sex, general behaviour, and interactions with other Bobolink, Eastern Meadowlark, or other species. The biologist also recorded any Bobolink or Eastern Meadowlark observations when travelling between point count stations.

General habitat conditions assessed at each survey station, including vegetation community class, estimated percentage of grass and broad-leaved plants, and the presence of litter for nest building.

### BUTTERNUT

A search for Butternut (*Juglans cinerea*) trees within the development footprint, plus a 50 m buffer, was included in the tree and vegetation inventories. The survey consisted of walking through the Study Area and identifying any Butternut specimens. The general health, DBH, and GPS coordinates of all Butternut trees encountered were recorded. If necessary, a Butternut Health Assessment (BHA) was completed to fully assess the condition of the tree.

### SPECIES AT RISK BATS

The presence or absence of SAR bat habitat was evaluated by using methods described in **Section 4.3.4**. Subsequently, three rounds of acoustic detection were performed for the incidental documentation of SAR bats. As suitable habitat is present in the Study Area in the form of woodlands (for roosting) and open areas over water (for foraging), it is anticipated for bats to be present in the Study Area.

### INCIDENTAL SPECIES AT RISK AND SPECIES AT RISK HABITAT OBSERVATIONS

In addition to the habitat for the species noted above, incidental SAR and SAR habitat observations were noted during all site visits.

Should any SAR or SAR habitat be identified within or adjacent to the site during field surveys, appropriate measures will be proposed to reduce or eliminate the impact of the proposed development on the observed species or habitat. This may include further consultation with the MECP and/or additional species-specific surveys.

## 4.4 TREES

Following the City of Ottawa's *Tree Conservation Report Guidelines* (City of Ottawa, 2019), and in consultation with the City of Ottawa's Planning Forester, trees > 10 cm DBH were surveyed within the project footprint. Large stands of trees were assessed as a group based on species composition and density as per standard protocols. The tree survey also included a search for high-quality specimen trees, which were recorded for species, DBH, condition, and location.

## 4.5 INCIDENTAL WILDLIFE

A wildlife assessment within the property was completed through incidental observations while on site. Any incidental observations of wildlife, as well as other wildlife evidence such as dens, tracks, and scat, were documented by means of observational notes, photos, and UTM coordinates. Such observations were used to substantiate baseline conditions and gather conclusions on the overall ecological function of the Study Area.

# 5 RESULTS

The following sections outline the findings from the field surveys and characterize the existing conditions within the Study Area.

## 5.1 SITE INVESTIGATIONS

A total of 12 site visits were made to assess the ecological features and functions identified in the background records review. However, ongoing visits to complete Butternut Health Assessments are continuing at the time of reporting.

The dates, times, surveyor names, and weather conditions for all surveys are listed in **Table 3.** As required, resumes of key staff involved in the project have been included in **Appendix B**. Photographs from site visits are included in **Appendix C.**

**Table 3 Field Survey Details**

| Date | Surveyor | Start Time | End Time | Weather Conditions | Purpose |
|---|---|---|---|---|---|
| **April 7th, 2020** | A. Rous<br>C. Pytlak | 13:30 | 15:30 | 13°C, partly cloudy with gentle wind | Headwater Drainage Feature Assessment #1 |
| **May 5th, 2020** | C. Pytlak | 20:15 | 22:00 | 8°C, clear with no wind | Amphibian Breeding Survey #1<br>Bat Acoustic Monitoring |
| **May 6th, 2020** | C. Pytlak | 9:00 | 13:30 | 13°C, clear and sunny with low wind | Bat Maternity Colony Habitat Assessment |
| **May 27th, 2020** | A. Rous<br>C. Pytlak | 11:30 | 13:00 | 35°C, clear and sunny with a light breeze | Headwater Drainage Feature Assessment #2 |
| **May 27th, 2020** | C. Pytlak | 21:10 | 22:20 | 29°C, partly cloudy with a light breeze | Amphibian Breeding Survey #2<br>Bat Acoustic Monitoring |
| **June 3rd, 2020** | C. Pytlak | 6:30 | 10:00 | 15°C, overcast with low wind | Breeding Bird Survey #1<br>Grassland SAR Survey #1 |
| **June 24th, 2020** | C. Pytlak | 6:30 | 9:30 | 19°C, partly cloudy with a moderate breeze | Breeding Bird Survey #2<br>Grassland SAR Survey #3 |
| **June 29th, 2020** | C. Pytlak | 21:30 | 22:30 | 23°, partly cloudy with a gentle breeze | Amphibian Breeding Survey #3<br>Bat Acoustic Monitoring |

| Date | Surveyor | Start Time | End Time | Weather Conditions | Purpose |
|---|---|---|---|---|---|
| **July 6th, 2020** | C. Pytlak | 7:00 | 8:15 | 20°, clear with no wind | Grassland SAR Survey #3 |
| **July 16th, 2020** | A. Orr<br>C. Pytlak | 8:30 | 15:30 | 28°, overcast with intermittent rain and gentle wind | Ecological Land Classification<br>Vegetation Inventory |
| **July 22nd, 2020** | A. Orr<br>C. Pytlak | 8:30 | 13:00 | 25°, partly cloudy with a gentle breeze | Ecological Land Classification<br>Vegetation Inventory |
| **August 6th, 2020** | C. McFaul<br>C. Pytlak | 9:00 | 13:00 | 27°, clear with no wind | Tree Survey<br>Butternut Search |
| **Ongoing** | C. McFaul<br>A. Orr | - | - | - | Butternut Health Assessments |

# 5.2 AQUATIC ENVIRONMENT

## *5.2.1 HEADWATER DRAINAGE FEATURE ASSESSMENT*

Two site visits were completed (April 7th and May 27th, 2020) to identify site characteristics and evaluate the function of the headwater drainage features located within the subject property. Three separate tributaries were identified and surveyed.

The following sections describe the characteristics and conditions of the tributaries and associated reaches. Classification and management recommendations for the reaches are detailed in Error! Reference source not found.. The HDF survey locations are illustrated in **Figure 4,** and management recommendations are highlighted in **Figure 5**. Field data sheets have been included in **Appendix D.**

### TRIBUTARY HDF-A1

This tributary is the Thomas Gamble Municipal Drain, which flows north through the eastern side of the Study Area. This tributary enters the subject property from an adjacent property and flows out into the property to the north behind existing residential developments. This tributary is relatively flat and is channelized through the entire surveyed tributary. Minimal surface flow was observed during both surveys. The watercourse had a measured bankfull width of 4.1 m and a bankfull depth of 950 mm.

The substrate was predominately clay with some sand. Sediment transport from sheet erosion was recorded, but no evidence of sediment deposition.

No fish were observed during field surveys.

### REACH HDF-B1

This tributary is a channelized watercourse located on the eastern boundary of the Study Area. This channel flows into Tributary HDF-A1. This tributary is also relatively flat, with a steep drop where it enters into Tributary HDF-A1. This channel contained standing water during both surveys, with some dry areas present at the time of the second survey. This feature has a bankfull width of 3.1 m and a bankfull depth of 450 mm.

The substrate consists of clay and silt, and sheet erosion was noted within and around the feature. Sediment deposition was measured to be moderate.

No fish were observed during field surveys.

### REACH HDF-C1

This channelized tributary flows east into HDF-A1 from the west, approximately 400m south of HDF-B1. This channel had minimal surface flow during the initial survey and was dry at the time of the second survey. The channel gradient is relatively flat. The bankfull width is 1.6 m and a bankfull depth of 450 mm. The substrate consists of clay and sand. Sheet erosion was noted within and around the feature, with minimal sediment deposition.

No fish were observed during field surveys.

### REACH HDF-C2

This reach flows south into HDF-C1. This channelized feature had minimal surface flow during the initial survey and was dry at the time of the second survey. This feature has a relatively flat gradient. The bankfull width was measured to be 2.1 m with a bankfull depth of 250 mm. The substrate consists of clay and silt. Sheet erosion was noted within and around the feature, with no sediment deposition.

No fish were observed during field surveys.

### REACH HDF-C3

This reach flows north into HDF-C1. Standing water was present during the initial survey, and the channel was dry at the time of the second survey. This feature has a relatively flat gradient. The bankfull width was measured to be 2.1 m with a bankfull depth of 150 mm. The substrate consists of clay and silt. Sheet erosion was noted within and around the feature, with no sediment deposition.

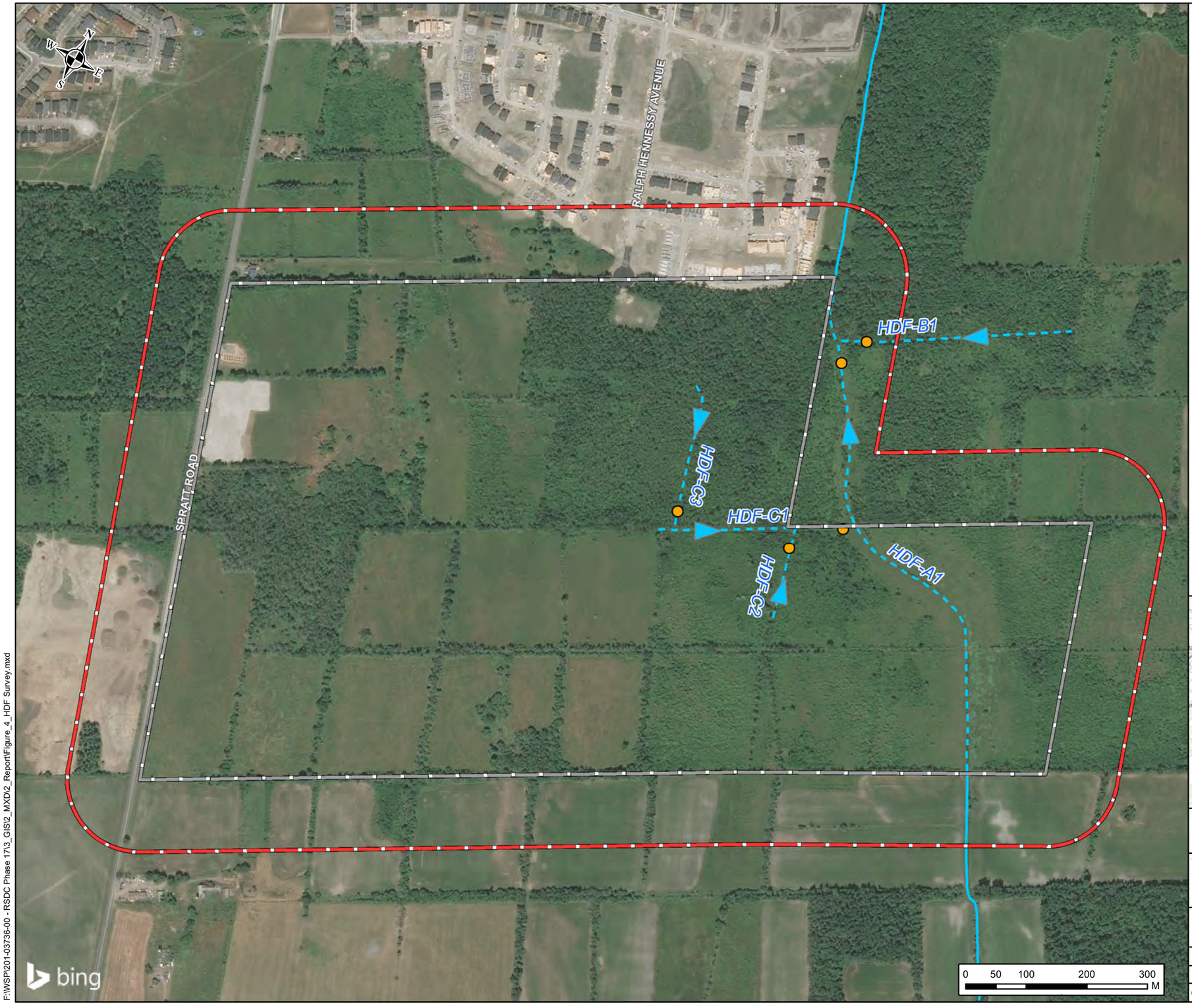
No fish were observed during field surveys.

**Table 4 Headwater Drainage Feature Assessment Management Recommendations**

| Drainage Feature Segment | Step 1 | | Step 2 | Step 3 | Step 4 | Management Recommendation[1] |
|---|---|---|---|---|---|---|
| | Hydrology | Modifiers | Riparian | Fish Habitat | Terrestrial Habitat | |
| **HDF-A1** | Valued functions:<br>Minimal surface flow in a channelized watercourse | | Valued function: Meadow | Valued functions: Suitable fish habitat; no fish observed | Contributing functions | **Conservation** |
| **HDF-B1** | Contributing functions: Standing water, with | | Important function: Forest | Contributing functions | Contributing functions | **Conservation** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | some dry areas in a channelized watercourse | | | | | |
| **HDF-C1** | Contributing functions: Channelized watercourse with minimal surface flow during first survey; dry during summer survey | | Valued function: Meadow | Contributing functions | Contributing functions | **Mitigation** |
| **HDF-C2** | Contributing functions: Channelized watercourse with minimal surface flow during first survey; dry during summer survey | | Important function: Forest | Contributing functions | Contributing functions | **Mitigation** |
| **HDF-C3** | Contributing functions: Standing water during initial survey, dry at time of second survey; channelized watercourse. | | Important function: Forest | Contributing functions | Contributing functions | **Mitigation** |

[1]*Conservation – Valued Functions: e.g. seasonal fish habitat with woody riparian cover, marshes with amphibian breeding habitat, or general amphibian habitat with woody riparian cover; Mitigation – Contributing Functions: e.g. contributing fish habitat with meadow vegetation or limited cover* (Toronto and Region Conservation Authority and Credit Valley Conservation, 2014).




Subject Property

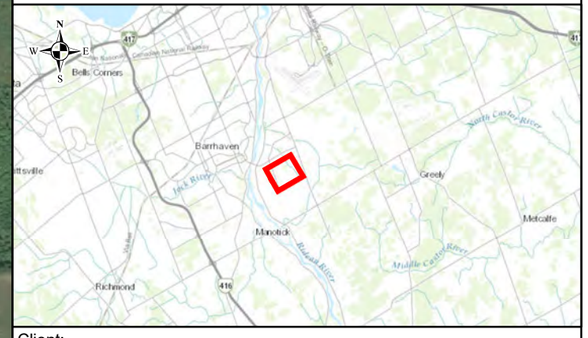
Study Area

Watercourse (MNRF, 2011)

**Headwater Drainage Feature Assessment**

Headwater Drainage Feature Assessment Sampling Location

Sampled Headwater Drainage Feature and Flow Direction




Client:
**Riverside South Development Corporation**

Title:
**Headwater Drainage Features**

Prepared By:
WSP

| | | |
|---|---|---|
| 201-03736-00 | 1:6,500 | Review: AZ |
| Date: August 2020 | **Figure: 4** | |
| © Queen's Printer for Ontario | | |

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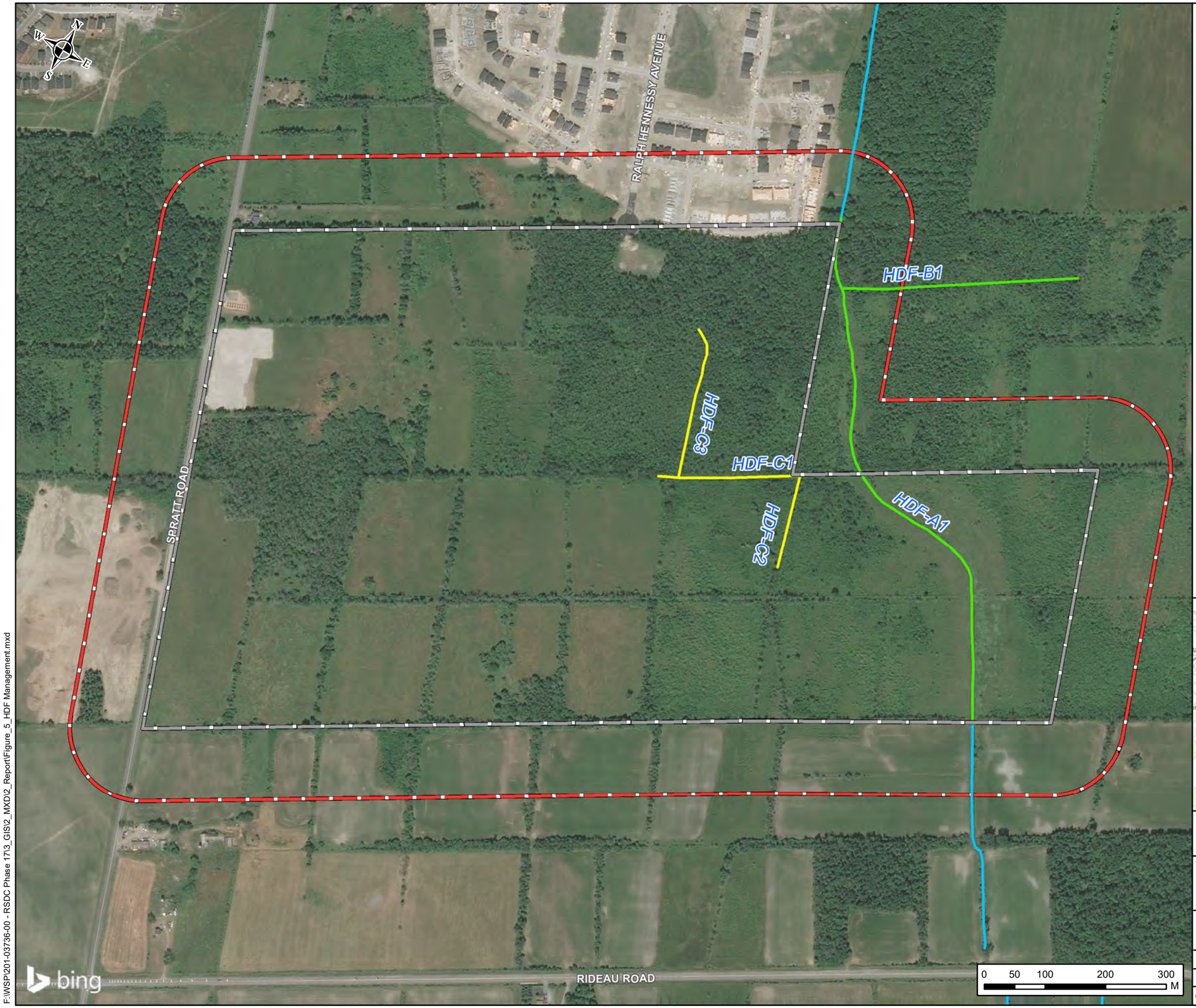


Subject Property

Study Area

Watercourse (MNRF, 2011)

**Management Recommendation**

Conservation

Mitigation


Client:
**Riverside South Development Corporation**

Title:
**Headwater Drainage Feature Management Recommendations**

Prepared By:
WSP

| | | |
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| 201-03736-00 | 1:6,500 | Review: AZ |
| Date: August 2020 | **Figure: 5** | |
| © Queen's Printer for Ontario | | |

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# 5.3 NATURAL HERITAGE FEATURES

## 5.3.1 VEGETATION COMMUNITIES

The ELC survey identified a total of 20 communities within the Study Area, including areas with residential or commercial development. Only communities within the subject property in which biologists had access to were thoroughly evaluated. Communities located on adjacent properties were evaluated from a distance or roadside using binoculars.

Most of the communities present within the Study Area had evidence of cultural influence from former agricultural uses, recent and on-going residential development, or commercial uses. All vegetation communities surveyed within the Study Area are considered common within Ontario. **Table 5** outlines the communities documented during ELC surveys and summarizes the abundant vegetation cover. The location, type, and boundaries of vegetation communities are delineated in **Figure 6**. Reference photos for the vegetation communities are included in **Appendix C**.

### VEGETATION SURVEY

The vegetation survey identified 109 species throughout the subject property. The FODM7-2 and MEMM3 communities contained the highest diversity, with 58 and 41 species recorded respectively.

Approximately 65% of the species recorded are native species. The average coefficient of conservatism (ranked on a 0-10 scale), which represents a plant's degree of fidelity to a range of parameters (Oldham, 1995), of all plants is 1.1. This suggests that the majority of plant species recorded during the survey are tolerant of a variety of habitat conditions and disturbance.

Of the native species recorded, all of them had S-Ranks of S5 or S4, indicating they are common and have stable populations within Ontario. Only one locally rare species, Black Walnut (*Juglans nigra*) was recorded during field surveys (Brunton, 2005). Nearly all other species recorded during the survey are considered to be common in the City of Ottawa.

One SAR, Butternut (Endangered), was recorded during the vegetation surveys. Butternut is discussed more thoroughly in **Section 5.4**.

The full vegetation inventory is included in **Appendix E**.

**Table 5 Ecological Land Classification Results**

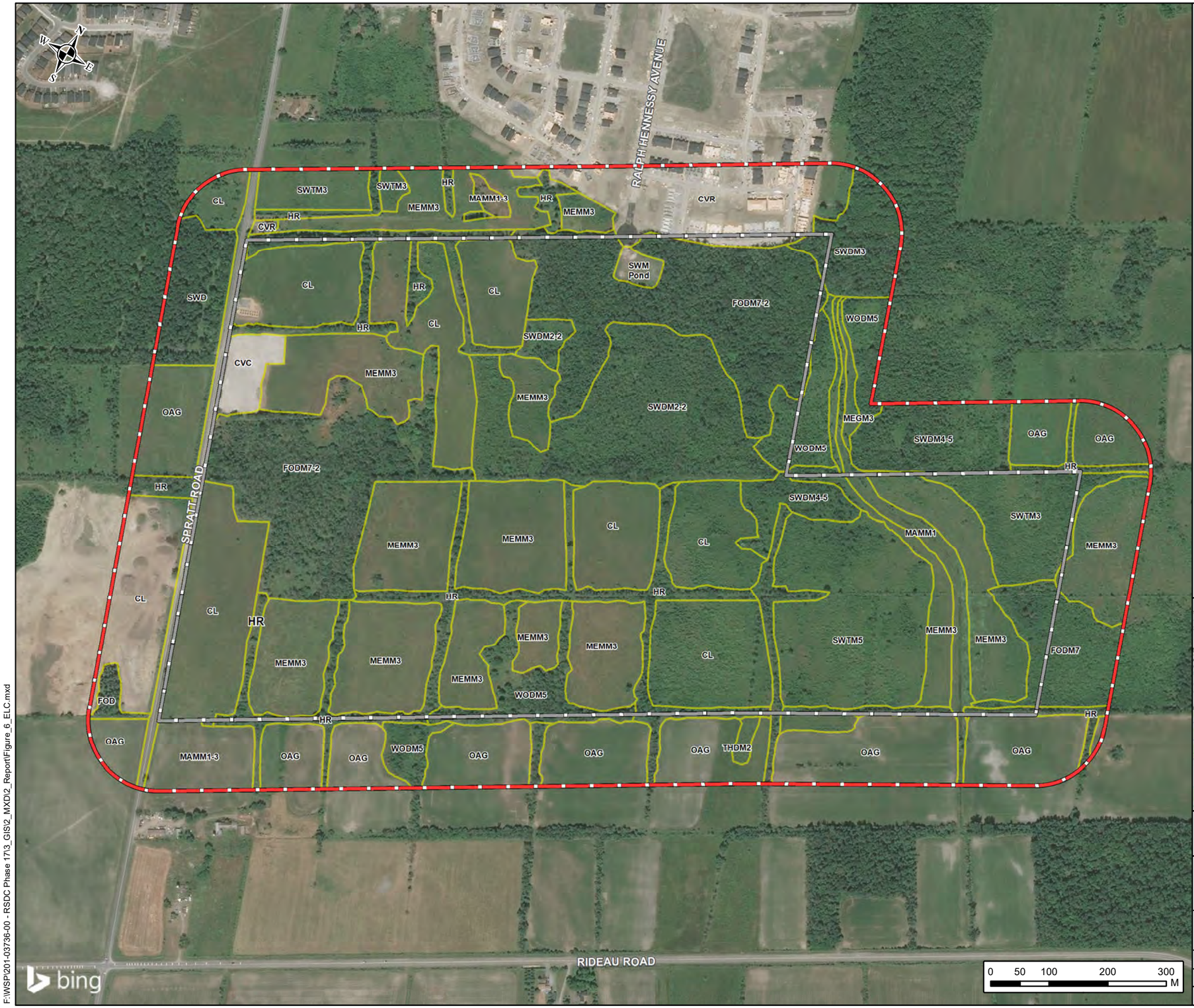
| ELC Type | Total Area (ha) | Community Description |
|---|---|---|
| **Cleared Land (CL)** | | |
| **CL**<br>Cleared Land | 26 | Former fields and meadows which have been stripped of top soil are present throughout the subject property. These plots of cleared land are now vacant, with some being used for soil stockpiling. Several areas have begun to regenerate into mixed meadow communities with sparse ground cover. |
| **Commercial, Industrial, and Residential** | | |
| **CVC**<br>Commercial/Industrial | 1.1 | Located with access to Spratt Road, this area is currently being used for site trailers and offices, as well as equipment and machinery storage and parking for construction projects on adjacent properties. |

| ELC Type | Total Area (ha) | Community Description |
|---|---|---|
| **CVR**<br>Residential | 5.8 | Existing residential developments consisting of townhomes and single-family homes present in the northern boundary of the Study Area |
| **Deciduous Forest (FOD)** | | |
| **FOD**<br>Deciduous Forest | 0.4 | Remnant deciduous forest community located on the western boundary of the Study Area; outside of the subject property. |
| **FODM7**<br>Fresh – Moist Lowland Deciduous Forest Ecosite | 3.2 | Located on the southeastern boundary of the subject property. This community is a mid-aged mixed deciduous forest. |
| **FODM7-2**<br>Fresh – Moist Green Ash – Hardwood Lowland Deciduous Forest Type | 19.2 | Two separate units consisting of part of the large woodland on the northern boundary of the subject property and the smaller woodland on the western boundary of the subject property.<br>These mid-aged communities are dominated by Green Ash (*Fraxinus pennsylvanica*) and American Elm (*Ulmus americana*) in the canopy and sub-canopy layers. Trembling Aspen (*Populus tremuloides*), Sugar Maple (*Acer saccharum*), and Basswood (*Tilia americana*) are also present within the canopy. Manitoba Maple (*Acer negundo*) is abundant in the subcanopy of the smaller unit on the western side of the subject property.<br>The understorey of both units is comprised of Green Ash, American Elm, European Buckthorn (*Rhamnus cathartica*) and Glossy Buckthorn (*Alnus frangula*). The ground layer is comprised of Thicket Creeper (*Parthenocissus inserta*), Avens speces (*Geum* sp.), Enchanter's Nightshade (*Circaea canadensis*), and Riverbank Grape (*Vitis riparia*).<br>Both units had evidence of Emerald Ash Borer, although the unit on the western boundary was more severely affected. Other signs of disturbance include wind throw, browse, and noise from nearby construction. Wildlife features in these communities include snag trees, vernal pools, and fallen logs. |
| **Deciduous Shrub Thicket (THD)** | | |
| **THDM2**<br>Dry - Fresh Deciduous Shrub Thicket Ecosite | 0.2 | Located outside of the subject property. This deciduous shrub thicket is comprised mainly of Glossy Buckthorn and European Buckthorn. |
| **Deciduous Swamp (SWD)** | | |
| **SWD**<br>Deciduous Swamp | 2.5 | This community located west of Spratt Road; inaccessible from the subject property |
| **SWDM2-2**<br>Green Ash Mineral Deciduous Swamp Type | 9.5 | Forms part of the large woodland in the northern half of the subject property.<br>A relatively young community with a semi-open canopy consisting of American Elm, Basswood, and Willow species (*Salix* sp.). Green Ash and American Elm form the dominant vegetation within the sub-canopy |

| ELC Type | Total Area (ha) | Community Description |
|---|---|---|
| | | The understorey and ground layer make up much of the vegetation cover. The dominant species include Green Ash, American Elm, and Glossy Buckthorn in the understorey, and Thicket Creeper, Poison Ivy (*Toxicodendron radicans*), Sedge species (*Carex* sp.), and Sensitive Fern (*Onoclea sensibilis*) in the ground layer.<br>This community had been heavily disturbed from Emerald Ash Borer. Evidence of vernal pools was recorded during the survey. |
| **SWDM3**<br>Maple Mineral Deciduous Swamp | 2.5 | This community is part of the large woodland in the northern half of the subject property. Only a small area of this community is present within the subject property, and it extends northeast beyond the Study Area.<br>The canopy and subcanopy layers are both comprised of Silver Maple (*Acer saccharinum*), American Elm, Basswood, and Green Ash. The understorey is mainly Field Horsetail (*Equisetum arvense*) and Ostrish Fern (*Matteuccia struthiopteris*), Poison Ivy, and Wood-sorrel species (*Oxalis* sp.). |
| **SWDM4-5**<br>Poplar Mineral Deciduous Swamp | 4.4 | This community is present in two areas near the eastern boundary of the subject property. This is a pioneer community with moderate to low canopy and sub-canopy cover consisting of Trembling Aspen and Green Ash. The understorey has greater vegetative cover comprised of Glossy Buckthorn and Willow species. The ground layer is dominated by Thicket Creeper, Tufted Vetch, and Fragrant Bedstraw (*Galium triflorum*).<br>This community has experienced disturbance from Emerald Ash Borer. |
| **Deciduous Thicket Swamp (SWT)** | | |
| **SWTM3**<br>Willow Mineral Deciduous Thicket Swamp Ecosite | 4.9 | Young thicket swamp located on the eastern boundary of the subject property. This community is dominated by Bebb's Willow (*Salix bebbiana*), Meadow Willow (*Salix petiolaris*), European Buckthorn, and Red-osier Dogwood (*Cornus sericea*). |
| **SWTM5**<br>Mineral Deciduous Thicket Swamp Ecosite | 7.7 | Young thicket swamp located west of the Thomas Gamble Municipal Drain. This community contains no canopy cover and minimal sub-canopy cover, comprised of American Elm and Green Ash. A moderately dense understorey is comprised of Green Ash, Willow species, Red-osier Dogwood, and European Buckthorn. The ground layer vegetation is dominated by Red Clover (*Trifolium pratense*), Grass-leaved Goldenrod (*Euthamia graminifolia*), and Purple Loosestrife (*Lythrum salicaria*).<br>This community forms a complex with the adjacent MEMM3 community. |
| **Deciduous Woodland (WOD)** | | |

| ELC Type | Total Area (ha) | Community Description |
|---|---|---|
| **WODM5**<br>Fresh-Moist Deciduous Woodland | 6 | This community is present along the southern boundary of the subject property, and in the northeastern corner of the Study Area.<br>Limited canopy and sub-canopy cover, dominated by American Elm, Green Ash, and Trembling Aspen. Minimal understorey vegetation cover, consisting of Glossy Buckthorn, European Buckthorn, Willow species, and Red-osier Dogwood. Ground layer is dominated by Fragrant Bedstraw and Canada Thistle (*Cirsium arvense*).<br>Numerous dead Ash trees, as a result of Emerald Ash Borer, were present in this woodland.<br>The polygon in the northeastern corner is forms a complex with adjacent MEGM5 and SWTM3 communities. |
| **Graminoid Meadow (MEG)** | | |
| **MEGM3**<br>Dry-Fresh Graminoid Meadow Ecosite | 0.7 | Graminoid-dominated meadow located beyond the northeastern boundary of the subject property. This meadow contains very minimal sub-canopy cover, comprised of Trembling Aspen, Green Ash, and Glossy Buckthorn. Kentucky Bluegrass (*Poa pratensis*) and Smooth Brome (*Bromus inermis*) are dominant within the understorey. Fragrant Bedstraw and Tufted Vetch are the dominant species in the ground layer. |
| **Hedgerow (HR)** | | |
| **HR**<br>Hedgerow | 11.7 | Mid-aged to mature treed hedgerows present throughout the subject property. Hedgerows are comprised mainly of Bur Oak (*Quercus macrocarpa*), Basswood, American Elm, Green Ash, and Sugar Maple. Other vegetation species in the hedgerows include Glossy Buckthorn, European Buckthorn, Red-osier Dogwood, Riverbank Grape, and Dog-strangling Vine (*Vincetoxicum rossicum*).<br>Many of the hedgerows comprised of Green Ash and American Elm were in poor condition; with most trees dead or dying. The hedgerows dominated by Bur Oak were in good condition and were generally older. |
| **Meadow Marsh (MAM)** | | |
| **MAMM1**<br>Graminoid Meadow Marsh Ecosite | 1.9 | This community is associated with the riparian habitat along the Thomas Gamble Municipal Drain. It is dominated by Reed-canary Grass (*Phalaris arundinacea*), Broad-leaved Cattail (*Typha latifolia*), and Purple Loosestrife. |
| **MAMM1-3**<br>Reed-canary Grass Graminoid Meadow Marsh Type | 2.2 | Small graminoid meadows dominated by Reed-canary Grass located in several areas outside of the subject property. |
| **Mixed Meadow (MEMM)** | | |
| **MEMM3** | 30.9 | This community is present throughout the subject property and was most commonly encountered as regenerating meadows in |

| ELC Type | Total Area (ha) | Community Description |
|---|---|---|
| Dry – Fresh Mixed Meadow Ecosite | | areas that had been cleared of top soil. The understorey layer is comprised of Tall Goldenrod (*Solidago altissima*), Wild Carrot (*Daucus carota*), Orchard Grass (*Dactylis glomerata*), and Red Raspberry (*Rubus idaeus*). The ground layer is comprised of Tufted Vetch (*Vicia cracca*), Bedstraw species (*Galium* sp.), Red Clover, and Common Dandelion (*Taraxacum officinale*).<br><br>Evidence of disturbance from machinery tracks was found in most of these meadows. The MEMM3 meadow adjacent to the Thomas Gamble Municipal Drain also had evidence of deer beds and tracks.<br><br>The MEMM3 community on the eastern boundary forms a complex with the adjacent SWTM5 community. |
| **Open Agriculture (OAG)** | | |
| **OAG**<br>Open Agriculture | 18.7 | Active row crop fields on properties surrounding the subject property. |
| **Stormwater Pond (SWP)** | | |
| **SWP**<br>Stormwater Pond | 0.4 | Temporary/incomplete stormwater pond located on northern boundary of subject property. This area has been cleared and excavated, and was flooded with water during early site visits (April-May). Evidence of disturbance and injury to trees resulting from stockpiling of soil around the borders of this community. |



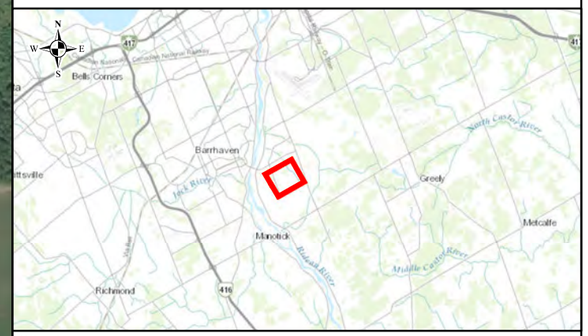

Subject Property

Study Area

Vegetation Community

## Ecological Land Classification

**CL-** Cleared Land
**CVC-** Commercial/Industrial
**CVR-** Residential
**FOD-** Deciduous Forest
**FODM7-** Fresh - Moist Lowland Deciduous Forest Ecosite
**FODM7-2-** Fresh - Moist Green Ash - Hardwood Lowland Deciduous Forest Type
**HR-** Hedgerow
**MAMM1-** Graminoid Mineral Meadow Marsh Ecosite
**MAMM1-3-** Reed-canary Grass Graminoid Mineral Meadow Marsh Type
**MEGM3-** Dry - Fresh Graminoid Meadow Ecosite
**MEMM3-** Dry - Fresh Mixed Meadow Ecosite
**OAG-** Open Agriculture
**SWD-** Deciduous Swamp
**SWDM2-2-** Green Ash Mineral Deciduous Swamp Type
**SWDM3-** Maple Mineral Deciduous Swamp Ecosite
**SWDM4-5-** Poplar Mineral Deciduous Swamp Type
**SWMP-** Stormwater Pond
**SWTM3-** Willow Mineral Deciduous Thicket Swamp Ecosite
**SWTM5-** Mineral Deciduous Thicket Swamp Ecosite
**THDM2-** Dry - Fresh Deciduous Shrub Thicket Ecosite
**WODM5-** Fresh - Moist Deciduous Woodland Ecosite




Client:
**Riverside South Development Corporation**

Title:
**Ecological Land Classification**

Prepared By: WSP

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| 201-03736-00 | 1:6,500 | Review: AZ |
| Date: August 2020 | **Figure: 6** | |
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### 5.3.2 WETLANDS

Wetland communities were identified and delineated throughout the Study Area. The wetland communities present within the Study Area. General conditions of these communities are described in Section 5.3.1, and locations are shown in **Figure 6**.

MAMM1 and SWTM5 communities are associated with the Thomas Gamble Municipal Drain and the riparian habitat.

SWDM2-2, SWDM4-5, and SWTM3 communities are all within the large woodland in the northern half of the Study Area. The Thomas Gamble Municipal Drain and some of its tributaries are located within these wetland communities. Furthermore, these communities had vernal pools present during early spring site visits (April – May).

SWD and MAMM1-3 communities are located outside the subject property and were evaluated from a distance and delineated using aerial imagery. These communities do not appear to be influenced or associated directly with any watercourses or tributaries based on the available mapping.

RVCA mapping shows that none of the wetlands within the Study Area are provided with regulation limit setbacks.

**Provincially Significant Wetlands (PSW) are absent from the Study Area.**

### 5.3.3 WOODLANDS

Four separate woodland communities meeting the requirements to be considered a forest under the *Forestry Act, R.S.O 1990, c.F.26* are located within the Study Area although only three are located directly within the subject property. **Table 6** summarizes the condition of woodlands within the Study Area. The woodland communities are delineated in **Figure 7**.

Woodland A, located in the northern portion of the Study Area and extends northeast of the Study Area, contains the FODM7-2, SWDM2-2, and SWDM3 communities described in Section 5.3.1. This woodland is listed as the Armstrong Road South Woods Urban Natural Area (Brunton, 2005). Portions of this woodland, particularly along the southern and western boundaries, are mid-aged and have been negatively affected by Emerald Ash Borer and invasive species. Areas of this woodland near the northeastern corner of the subject property and Study Area contain mature trees, including several large Silver Maple and Sugar Maple. These areas appear to be less affected by invasive species or pests, but there is evidence of waste and litter along the forest edges adjacent to existing developments. The entire woodland is approximately 61.4 ha. Based on a review of historic aerial imagery, there are two areas that appear to meet the minimum age and size requirements to be considered significant. The significant areas are approximately 3.8 and 15.9 ha. The 3.8 ha section intersects the northwestern corner of the subject property.

Woodland B is located on the western boundary of the subject property adjacent to Spratt Road. This woodland is comprised of an FODM7-2 community and has also been highly disturbed by Emerald Ash Borer and invasive species. This woodland also contains abundant Manitoba Maple and other low-value native species. The total area of Woodland B is 9.1 ha, and historic aerial imagery indicates that it does not meet the minimum age requirement to be considered significant.

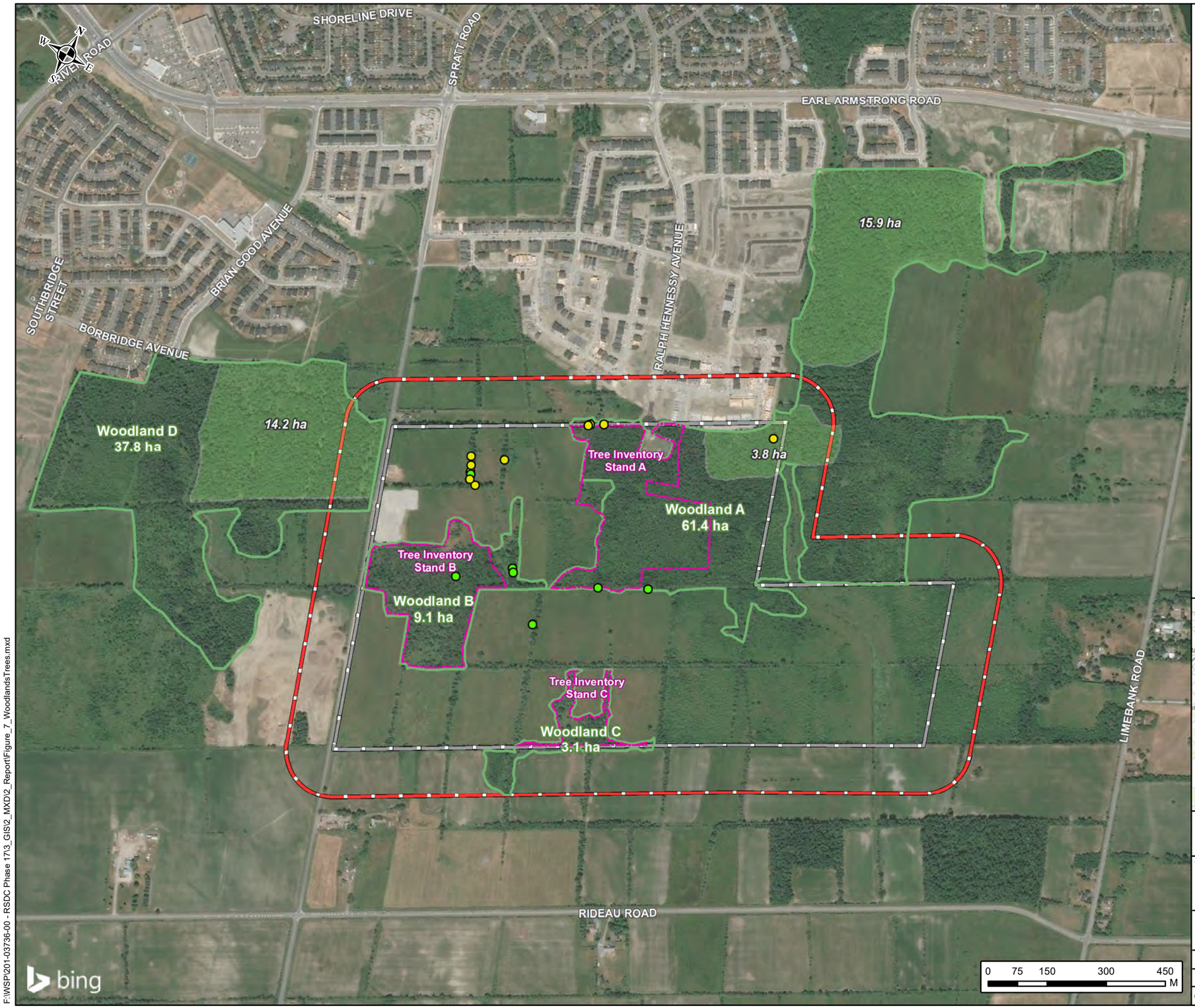
Woodland C is on the southern boundary of the subject property and was classified as a WODM5 community. This mid-aged woodland contains limited canopy and sub-canopy cover, as most of the Green Ash trees have been affected by Emerald Ash Borer. Glossy Buckthorn and European Buckthorn are prevalent throughout the woodland. Woodland C is approximately 3.1 ha and does not meet the minimum age requirement to be considered significant.

Woodland D is outside of the subject property, west of Spratt Road. This woodland contains a deciduous swamp community. Due to access restrictions, this woodland was not evaluated for health and characteristics. The woodland is approximately 37.8 ha. A review of historic aerial imagery indicates that a portion of this woodland meets the age requirement to be considered significant. The significant portion of Woodland D is approximately 14.2 ha and intersects the northwestern corner of the Study Area. This woodland is listed as the Spratt Road Woods Urban Natural Area (Brunton, 2005).

**There are significant woodlands located within the Study Area.**

**Table 6 Woodland evaluation**

| Woodland Name | Total Area (ha) | Estimated Age | Significance | Notes |
|---|---|---|---|---|
| **Woodland A** | 61.4 | >60 years | **Significant** | Significant areas measuring approximately 3.8 ha and 15.9 ha; smaller area intersects with northeastern corner of subject property. |
| **Woodland B** | 9.1 | <60 years | Not significant | n/a |
| **Woodland C** | 3.1 | <60 years | Not significant | n/a |
| **Woodland D** | 37.8 | >60 years | **Significant** | Significant area measuring approximately 14.2 ha; intersects with northwest corner of Study Area. |




Subject Property

Study Area

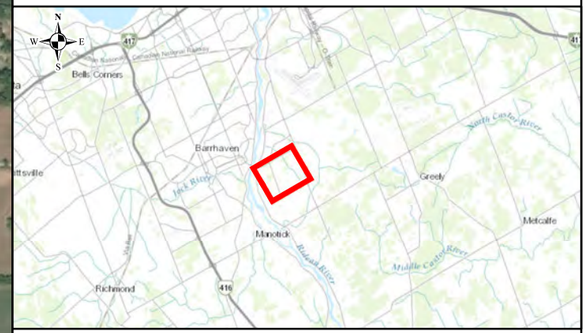
Significant Woodland (>60 years, >0.8 ha)

Woodland

Tree Inventory Stand

Distinctive Tree (>50 cm DBH)

Specimen Tree (>80 cm DBH)




Client:
**Riverside South Development Corporation**

Title:
**Woodlands and Tree Inventory**

Prepared By:

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| 201-03736-00 | 1:10,000 | Review: AZ |
| Date: August 2020 | **Figure: 7** | |
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### 5.3.4 SIGNIFICANT WILDLIFE HABITAT

The MNRF outlines the criteria for areas to be considered SWH in the *Ecoregion 6E Criterion Schedule* (MNRF, 2015). The results of the field surveys intended to identify candidate and/or confirmed SWH are detailed below.

#### AMPHIBIAN BREEDING SURVEYS

In accordance with the *Ecoregion 6E Criterion Schedule* (MNRF, 2015), amphibian breeding surveys were completed to determine the presence of Amphibian Breeding Habitat for woodlands and wetlands within the Study Area. Wetland Amphibian Breeding Surveys were conducted in a meadow adjacent to the Thomas Gamble Municipal Drain. Woodland Amphibian Breeding Surveys were conducted adjacent to vernal pools and headwater drainage features within wooded and thicket habitats in the north and western boundaries of the subject property. Survey locations are shown in **Figure 8**.

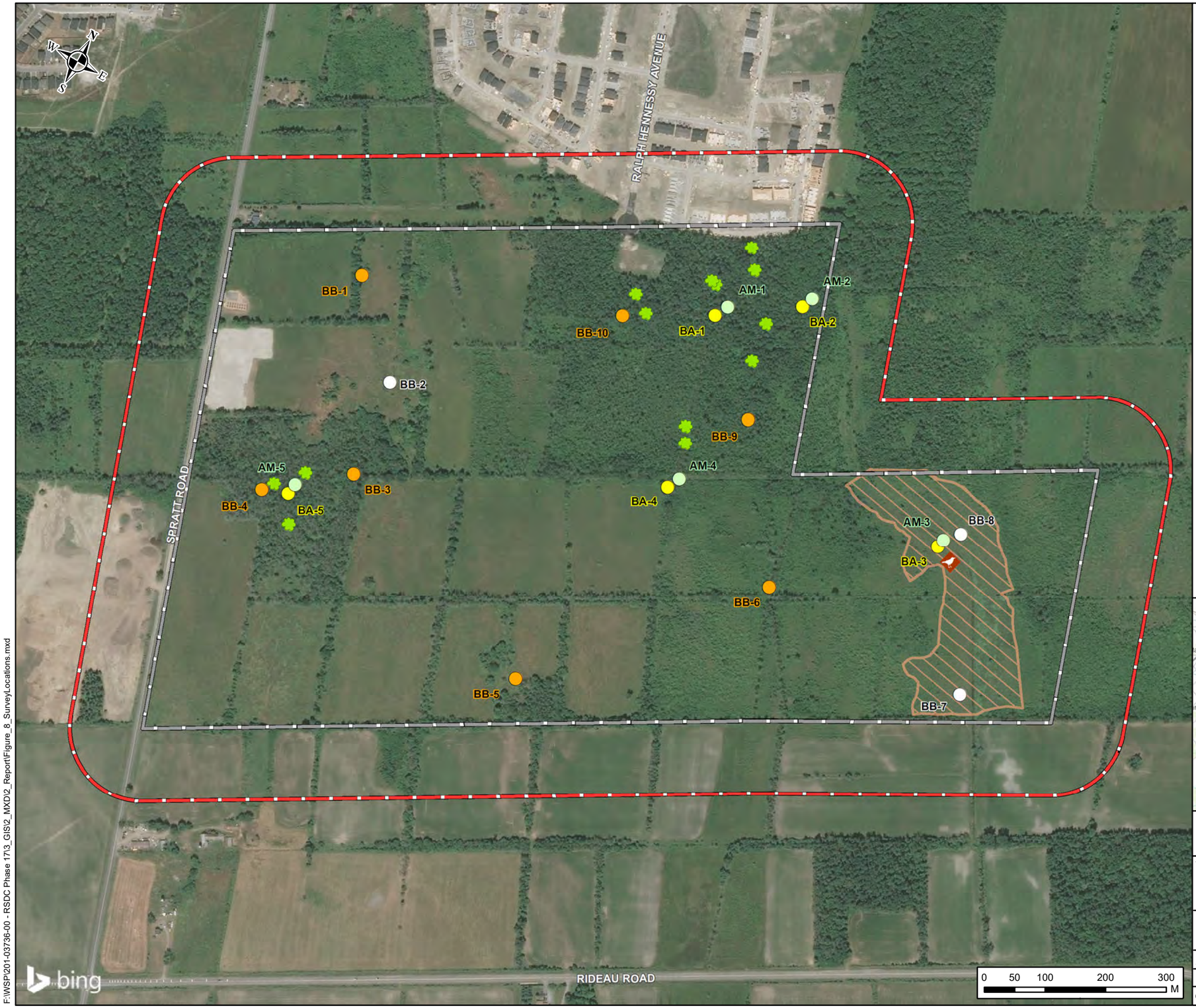
A total of three amphibian species were observed within the Study Area, although only two were recorded during survey counts. Four individual Gray Treefrogs (*Hyla versicolor*) were heard during the second visit, although were estimated to be outside of the 100-m survey radius. Three individual Spring Peepers (*Anaxyrus americanus*) were recorded, although again estimated to be outside of the 100-m survey radius. The Spring Peppers, plus one Chorus Frog species (*Pseudacris* sp). were recorded in a flooded area along the northern woodland edge, adjacent to existing residential development during the initial survey. The survey details are shown in **Table 7**.

**Based on the results, SWH for amphibians is absent from the Study Area.**

**Table 7 Amphibian breeding survey results**

| Scientific Name | Common Name | # of Observations[1] | S-Rank[2] | Comments |
|---|---|---|---|---|
| *Pseudacris* sp. | Chorus Frog | Code 1: 1 individual | --- | Located outside of subject property; in vernal pool adjacent to existing residential area. Recorded incidentally during initial amphibian survey. |
| *Hyla versicolor* | Gray Treefrog | Code 2: 4 individuals | S5 | Outside of 100 metre survey radius, |
| *Anaxyrus americanus* | Spring Peeper | Code 2: 3 individuals | S5 | Outside of 100 metres and Survey Area; on adjacent property |

*[1]Code 1: Calls not simultaneous, number of individuals can be accurately counted; Code 2: Some calls simultaneous, number of individuals can be reliably estimated; Code 3: Calls continuous and overlapping, number of individuals cannot be estimated. [2]S-Rank is an indicator of commonness in the Province of Ontario. A scale between 1 and 5, with 5 being very common and 1 being the least common.*




Subject Property

Study Area

Amphibian Breeding Survey Station

Bat Acoustic Survey Station

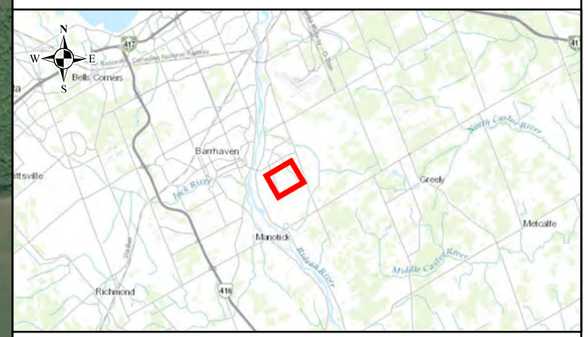
Breeding Bird Survey Station

Breeding Bird/Grassland SAR Survey Station

Candidate Bat Habitat Tree

Bobolink Observation

Suitable Bobolink Habitat




Client:
**Riverside South Development Corporation**

Title:
**Significant Wildlife Habitat and SAR Survey Locations and Results**

Prepared By: WSP

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| 201-03736-00 | 1:6,500 | Review: AZ |
| Date: August 2020 | **Figure: 8** | |
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## BREEDING BIRD SURVEYS

Two surveys were conducted to determine the presence and relative abundance of breeding birds within the Study Area. The survey results are shown below in **Table 8**. A total of 44 bird species were recorded during the surveys. Survey locations are shown in **Figure 8**.

Only four species were confirmed to be breeding within the Study Area, based on observations of recently fledged young, adults carrying food, or adults visiting nests. The species confirmed to be breeding are Bobolink, Clay-colored Sparrow (*Spizella pallida*), Common Yellowthroat (*Geothlypis trichas*), and Song Sparrow (*Melospiza melodia*).

Most species recorded during the surveys are generally common throughout Ontario and the Ottawa area. Ten species are considered area sensitive birds, requiring large areas of suitable habitat for long term population survival (MNR, 2000). These species are; American Redstart (*Setophaga ruticilla*), Black-and-White Warbler (*Mniotilta varia*), Bobolink, Hairy Woodpecker (*Picoides villosus*), Northern Harrier (*Circus hudsonius*), Ovenbird (*Seiurus aurocapilla*), Savannah Sparrow (*Passerculus sandwichensis*), Veery (*Catharus fuscescens*), White-breasted Nuthach (*Sitta carolinensis*), and Yellow-bellied Sapsucker (*Sphyrapicus* varius).

Bobolink is listed as Threatened under the provincial ESA, while Eastern Wood-Pewee and Wood Thrush are listed as Special Concern. Bobolink was confirmed to be breeding near the eastern boundary of the subject property. **Section 5.4** more thoroughly describes the results and evaluation of the Bobolink surveys.

Both Eastern Wood-Pewee and Wood Thrush evaluated as possibly breeding and were encountered in the FODM7-2 community near the northern boundary of the subject property.

It is likely that the variety of habitats, the presence of surface water features, and the size of the subject property and distance from immediate developments or disturbance all contribute to the overall quality of bird habitat within the Study Area.

**Based on the results of the breeding bird surveys, SWH for birds is absent from the Study Area. However, the results indicate SWH for Species of Conservation Concern is present within the Study Area (see Section 5.3.4)**

**Table 8 Breeding bird survey results**

| SCIENTIFIC NAME | COMMON NAME | S-RANK[1] | BREEDING STATUS | OBSERVATION |
|---|---|---|---|---|
| *Empidonax alnorum* | Alder Flycatcher | S5B | Possible | Singing males observed in suitable nesting habitat |
| *Corvus brachyrhyncho* | American Crow | S5B | Possible | Individual observed in suitable nesting habitat |
| *Spinus tristis* | American Goldfinch | S5B | Possible | Singing males observed in suitable nesting habitat |
| *Setophaga ruticilla* | American Redstart | S5B | Possible | Singing males observed in suitable nesting habitat |
| *Turdus migratorius* | American Robin | S5B | Probable | Species observed exhibiting territorial behaviour |
| *Icterus galbula* | Baltimore Oriole | S4B | Possible | Singing male observed in suitable nesting habitat |
| *Mniotilta varia* | Black-and-white Warbler | S5B | Possible | Singing males observed in suitable nesting habitat |
| *Poecile atricapillus* | Black-capped Chickadee | S5 | Probable | Territorial display |
| *Cyanocitta cristata* | Blue Jay | S5 | Probable | Pair observed |
| *Dolichonyx oryzivorus* | Bobolink | S4B | Confirmed | Pair observed, carrying food |

| SCIENTIFIC NAME | COMMON NAME | S-RANK[1] | BREEDING STATUS | OBSERVATION |
|---|---|---|---|---|
| *Toxostoma rufum* | Brown Thrasher | S4B | Possible | Singing male observed in suitable nesting habitat |
| *Bombycilla cedrorum* | Cedar Waxwing | S5B | Possible | Singing males observed in suitable nesting habitat |
| *Setophaga pensylvanica* | Chestnut-sided Warbler | S5B | Possible | Singing males observed in suitable nesting habitat |
| *Spizella pallida* | Clay-colored Sparrow | S4B | Confirmed | Fledged young observed |
| *Quiscalus quiscula* | Common Grackle | S5B | Probable | Territorial display observed |
| *Geothlypis trichas* | Common Yellowthroat | S5B | Confirmed | Adults carrying food |
| *Picoides pubescens* | Downy Woodpecker | S5 | Possible | Individual observed in suitable nesting habitat |
| *Tyrannus tyrannus* | Eastern Kingbird | S4B | Probable | Territorial display – mobbing Red-tailed Hawk |
| *Sayornis phoebe* | Eastern Phoebe | S5B | Possible | Singing male in suitable nesting habitat |
| *Contopus virens* | Eastern Wood-pewee | S4B | Possible | Singing males in suitable nesting habitat |
| *Sturnus vulgaris* | European Starling | SNA | Observed | Small group observed |
| *Spizella pusilla* | Field Sparrow | S4B | Possible | Singing male observed in suitable nesting habitat |
| *Myiarchus crinitus* | Great Crested Flycatcher | S4B | Possible | Singing male observed in suitable nesting habitat |
| *Picoides villosus* | Hairy Woodpecker | S5 | Possible | Species observed in suitable nesting habitat |
| *Troglodytes aedon* | House Wren | S5B | Possible | Singing males observed throughout Study Area |
| *Anas platyrhynchos* | Mallard | S5 | Observed | Species observed flying over Study Area |
| *Zenaida macroura* | Mourning Dove | S5 | Possible | Species observed in suitable nesting habitat |
| *Colaptes auratus* | Northern Flicker | S4B | Possible | Species observed in suitable nesting habitat |
| *Circus hudsonius* | Northern Harrier | S4B | Possible | Species observed foraging in suitable nesting habitat |
| *Parkesia noveboracensis* | Northern Waterthrush | S5B | Possible | Singing male in suitable nesting habitat |
| *Seiurus aurocapilla* | Ovenbird | S4B | Possible | Singing males in suitable nesting habitat |
| *Vireo olivaceus* | Red-eyed Vireo | S5B | Possible | Singing males observed in suitable nesting habitat |
| *Buteo jamaicensis* | Red-tailed Hawk | S5 | Probable | Pair observed |

| SCIENTIFIC NAME | COMMON NAME | S-RANK[1] | BREEDING STATUS | OBSERVATION |
|---|---|---|---|---|
| *Agelaius phoeniceus* | Red-winged Blackbird | S4 | Possible | Singing male in suitable nesting habitat |
| *Pheucticus ludovicianus* | Rose-breasted Grosbeak | S4B | Probable | Territorial display |
| *Passerculus sandwichensis* | Savannah Sparrow | S4B | Possible | Singing males in suitable nesting habitat |
| *Melospiza melodia* | Song Sparrow | S5B | Confirmed | Fledged young observed |
| *Tachycineta bicolor* | Tree Swallow | S4B | Observed | Individual observed flying through survey area |
| *Catharus fuscescens* | Veery | S4B | Probable | Territorial calls |
| *Sitta carolinensis* | White-breasted Nuthatch | S5 | Probable | Pair observed |
| *Hylocichla mustelina* | Wood Thrush | S4B | Possible | Singing male in suitable nesting habitat |
| *Setophaga petechia* | Yellow Warbler | S5B | Possible | Singing male observed in suitable nesting habitat |
| *Sphyrapicus varius* | Yellow-bellied Sapsucker | S5B | Possible | Species observed in suitable nesting habitat |
| *Setophaga coronata* | Yellow-rumped Warbler | S5B | Possible | Singing male observed in suitable nesting habitat |

*[1]S-Rank is an indicator of commonness in the Province of Ontario. A scale between 1 and 5, with 5 being very common and 1 being the least common.*

## BAT MATERNITY COLONIES

There were limited cavity trees were present in the woodlands of FODM7-2 and SWDM2-2 woodlands and swamp. Trees within the SWDM2-2 community and the FODM7-2 community on the southwestern subject property boundary were generally too small to support bat roosting. The FODM7-2 community near the northern boundary of the subject property contained more large trees with suitable cavities, but the overall density of suitable trees within all surveyed communities was very low.

The acoustic surveys detected a total of two species: Eastern Red Bat (*Lasiurus borealis*) and Silver-haired Bat (*Lasionycteris noctivagans*. Both species were only audibly recorded during the preliminary survey (May 5th, 2020) and at the same survey location (**BA-2** in **Figure 8)** in the northern woodland, near the eastern boundary of the subject property. There were no visual observations of bats during the surveys. The Eastern Red Bat was only recorded during a single pass, and the Silver-haired Bat had multiple passes during the survey.

Candidate habitat trees and acoustic survey locations are shown in **Figure 8**.

Neither species is listed under the provincial ESA, and both have S-ranks of S4, indicating they have stable populations in Ontario.

**Based on the results of habitat and acoustic surveys, SWH for bat maternity colonies is not present within the Study Area.**

## HABITAT FOR SPECIES OF CONSERVATION CONCERN

Confirmed habitat for three SCC (**Appendix A**) was confirmed during the ELC and wildlife surveys. Suitable habitat for three other SCC was recorded during the ELC survey. Results of suitable habitat and the presence/absence of SCC

within the Study Area include Eastern **Wood-Pewee, Purple Martin, Short-eared Owl, Wood Thrush, Eastern Milksnake,** and **Monarch.**

- **Eastern Wood-Pewee:** Suitable deciduous forests with open understorey and suitable forest edges and hedgerows present within Study Area. This species was observed during breeding bird surveys.
- **Purple Martin:** Meadow habitats and cavity trees in woodlands and hedgerows may provide suitable foraging and nesting habitat. This species was not observed during field surveys.
- **Short-eared Owl:** Thicket swamp and mixed meadow communities adjacent to Thomas Gamble Municipal Drain may provide suitable habitats. This species was not observed during field surveys.
- **Wood Thrush**: Suitable mature deciduous forests on the eastern boundary of the subject property. This species was observed during breeding bird surveys.
- **Eastern Milksnake:** Meadows, rock piles found near hedgerows, and anthropogenic structures (houses, construction equipment sheds and storage containers) within the Study Area may provide suitable habitat for this species. Eastern Milksnake was not observed during field surveys.
- **Monarch:** Milkweed plants were observed within the Study Area. Monarchs were observed at various locations throughout the Study Area.

**There is habitat for six SCC within the Study Area; three SCC were observed within the Study Area.**

### INCIDENTAL OBSERVATIONS OF SIGNIFICANT WILDLIFE HABITAT

No other observations of candidate SWH were identified to occur within the Study Area based on field survey results.

## 5.4 SPECIES AT RISK AND SPECIES AT RISK HABITAT

### BOBOLINK & EASTERN MEADOWLARK

Three targeted surveys following the MNRF protocols for Bobolink and Eastern Meadowlark were completed in June and July. Surveys were completed at the three separate locations where suitable habitat was found.

A male and female Bobolink were both observed visiting a potential nest during the first two surveys (June 3rd and 24th). The male Bobolink was also exhibiting territorial behaviour, and the female Bobolink was observed carrying food or nesting material. No Bobolink were observed on the third survey (July 6th).

Biologists recorded areas of suitable habitat conditions in the MEMM3 communities surrounding the Thomas Gamble Municipal Drain. The communities consist of dense grass cover with dense grass and forb litter for nest building. The SWTM3 and SWTM5 communities which border the meadows also contained pockets of suitable nesting habitat, as well as shrubs to provide singing perches.

No Eastern Meadowlark were observed during field surveys. The locations of the surveys, Bobolink observations, and suitable habitat are illustrated in **Figure 8**.

### BUTTERNUT

Butternut trees are present throughout the development footprint, including both large woodlands and within several of the hedgerows.

At the time of reporting, Butternut Health Assessments are still being completed. Approximately 40 Butternut trees had been inventoried and assessed, with at least approximately 30 Butternut trees identified and remaining to be assessed.

### SPECIES AT RISK BATS

No SAR bats were recorded during the acoustic bat surveys. Suitable roosting and foraging habitat (deciduous forest, deciduous swamp, meadows) is present, although given the limited density of candidate bat maternity roost trees, the overall quality of suitable habitat is likely minimal.

### INCIDENTAL SPECIES AT RISK AND SPECIES AT RISK HABITAT OBSERVATIONS

There were no incidental observations or SAR or SAR habitat during field surveys.

## 5.5 TREES

As per the TCR Guidelines (City of Ottawa, 2019) and in discussion with the City of Ottawa's Planning Forester, large stands of trees within the project footprint were inventoried and assessed as a group. Three stands were identified in the development footprint and were relatively consistent with ELC community boundaries. Additionally, biologists completed random tree sampling of four hedgerows to evaluate species diversity, abundance, and overall health condition within the hedgerows.

Healthy individual Distinctive (≥50 cm DBH) trees and healthy or unique specimen trees (≥80 cm DBH) with opportunity for retention were inventoried and mapped. Table

The location of the tree stands and individual Distinctive or specimen trees are shown in **Figure 7**. **Table 9** lists the species, condition, and location of Distinctive and specimen trees.

The overall tree survey of the subject property identified the following tree species:

- American Elm
- Basswood
- Bitternut Hickory (*Carya cordiformis*)
- Black Cherry (*Prunus serotina*)
- Black Walnut (*Juglans nigra*)
- Butternut
- Common Buckthorn
- Eastern Cottonwood (*Populus deltoids*)
- Eastern White Pine (*Pinus strobus*)
- Green Ash
- Manitoba Maple
- Paper Birch
- Red Maple (*Acer rubrum*)
- Silver Maple
- Sugar Maple
- Swamp White Oak (*Quercus bicolor*)
- Trembling Aspen
- White Ash (*Fraxinus americana*)
- Yellow Birch (*Betula alleghaniensis*)

Tree Stand A consists of both the FODM7-2 and SWDM2-2 communities located within the woodland on the northern half of the subject property. Tree density within this stand is varied. The northern part of this stand contains fewer trees, but generally larger in size with average DBH ranges between 15-25 cm. The southern part of this stand has higher density, although trees are on average much smaller with a DBH range of 10-15 cm. Comparatively, the northern portion of this stand has higher species diversity with ten species recorded, while only four species were documented in the southern area. Green Ash is prevalent throughout the stand, although severely affected by Emerald Ash Borer. Elm trees, which are also abundant throughout the stand, are in moderate health with evidence of dead branches, deadwood, and rot.

Tree Stand B consists of the FODM7-2 woodland along the western boundary subject property. This stand is relatively dense with small trees, averaging between 10-15 cm DBH. Only six species were recorded in this stand, which is dominated by Green Ash and American Elm. Manitoba Maple is also very abundant throughout. This stand has also

been severely affected by Emerald Ash Borer, with most Green Ash trees appearing to be in poor health. American Elm trees appear to be in moderate condition.

Tree Stand C is located at the southern boundary of the subject property and is classified as a WODM5 community. This stand has an overall low tree density with an average DBH range of 15-25. Only four species were documented in this stand, with American Elm and Green Ash being the most abundant species. Green Ash trees were in poor condition from Emerald Ash Borer.

Within the surveyed hedgerows, a total of nine species were recorded. Bur Oak, White Ash, and American Elm were most frequently encountered. Hedgerows within the northern portion of the subject property were generally comprised of large Bur Oak and Sugar Maple, with average DBH ranges of 20-30 cm. Tree health in these hedgerows is good, with most trees appearing to be healthy and in good form. Hedgerows within the southern portion of the subject property were primarily White Ash and American Elm. These southern hedgerows had a DBH range of 15-25 cm. Tree health was overall poor, with most White Ash exhibiting evidence of Emerald Ash Borer. Hedgerows throughout the subject property also contained a relatively high abundance of dead Ash trees.

**Table 10** summarizes the tree stand species, abundance, and general condition of trees within the three stands.

**Table 9 Tree Stand Assessment Results**

| Stand ID | ELC Communities | Species | Abundance | Average DBH Range (cm) | General Condition and Observations |
|---|---|---|---|---|---|
| A | FODM7-2<br>SWDM2-2 | American Elm | Dominant | 15-25 | Moderate; evidence of sickness throughout stand |
| | | Basswood | Occasional | 15-25 | Good; no evidence of injury or illness |
| | | Bur Oak | Occasional | 30-40 | Good; no evidence of injuries or illness |
| | | Black Cherry | Rare | 15-25 | Good; no evidence of injuries or illness |
| | | Butternut | Occasional | 10-20 | Poor; most dead or dying from Butternut canker |
| | | Green Ash | Dominant | 10-20 | Poor; affected by Emerald Ash Borer |
| | | Silver Maple | Rare | 15-25 | Good; no evidence of injury or illness |
| | | Sugar Maple | Frequent | 15-25 | Good; no evidence of injuries or illness |
| | | Swamp White Oak | Rare | 10-15 | Good; no injuries of evidence or illness |
| | | Trembling Aspen | Abundant | 30-40 | Moderate; trees with dead branches, cankers, and cavities |
| B | FODM7-2 | American Elm | Dominant | 10-20 | Moderate; branch dieback and deadwood |
| | | Butternut | Occasional | 10-20 | Poor; most dead or dying from Butternut canker |
| | | Green Ash | Dominant | 10-15 | Poor; affected by Emerald Ash Borer |
| | | Manitoba Maple | Abundant | 10-15 | Good; no evidence of injuries or illness |
| | | Silver Maple | Rare | 30-40 | Good; no evidence of injuries or illness |
| | | Trembling Aspen | Occasional | 20-30 | Moderate; trees with canker and dead branches |
| C | WODM5 | American Elm | Occasional | 20-30 | Good; no evidence of injuries or illness |

| | | | | | |
|---|---|---|---|---|---|
| | | Bur Oak | Rare | 30-40 | Good; no evidence of injuries or illness |
| | | Green Ash | Occasional | 15-25 | Poor; mostly dead due to Emerald Ash Borer |
| | | Malus species (*Malus* sp.) | Rare | 10-20 | Good; no evidence of injuries or illness |
| **Hedgerows** | HR | American Elm | Frequent | 15-25 | Good; limited evidence of injuries and illness |
| | | Basswood | Rare | 10-15 | Good; no evidence of injuries or illness |
| | | Bitternut Hickory | Rare | 15-20 | Good; no evidence of injuries or illness |
| | | Bur Oak | Abundant | 20-30 | Good; cavities present but no other evidence of injuries or illness |
| | | Green Ash | Occasional | 15-20 | Poor; evidence of Emerald Ash Borer |
| | | Malus species | Rare | 15-20 | Good; no evidence of injuries or illness |
| | | Sugar Maple | Frequent | 20-30 | Good; cavities present but no other evidence of injuries or illness |
| | | White Ash | Abundant | 15-25 | Poor; evidence of Emerald Ash Borer |

**Table 10 Distinctive and Specimen Tree Inventory**

| Tree ID | Scientific Name | Common Name | DBH (cm) | Condition | Notes | Easting | Northing |
|---|---|---|---|---|---|---|---|
| **01** | *Acer saccharinum* | Silver Maple | 100 | Good | | 447059.8 | 5013086.9 |
| **02** | *Quercus macrocarpa* | Bur Oak | 78 | Good | | 446496.1 | 5012698 |
| **03** | *Acer saccharinum* | Silver Maple | 50 | Good | | 446536.4 | 5012381 |
| **04** | *Quercus macrocarpa* | Bur Oak | 52 | Good | | 446651.6 | 5012469.9 |
| **05** | *Acer saccharum* | Sugar Maple | 55 | Good | Co-dominant stems | 446657.6 | 5012462.1 |
| **06** | *Quercus macrocarpa* | Bur Oak | 65, 20 | Good | | 446766 | 5012373.3 |
| **07** | *Tilia Americana* | Basswood | 45-55 | Good | Multi-stemmed (4), woodpecker damage and cavities | 446974.8 | 5012597.1 |
| **08** | *Quercus macrocarpa* | Bur Oak | 55, 55 | Good | | 446863.3 | 5012536.5 |
| **09** | *Acer saccharum* | Sugar Maple | 71 | Good | | 446435.9 | 5012629.5 |
| **10** | *Quercus macrocarpa* | Bur Oak | 64 | Good | | 446440.2 | 5012623.7 |
| **111** | *Acer saccharum* | Sugar Maple | 81 | Good | | 446463.4 | 5012605.4 |
| **12** | *Quercus macrocarpa* | Bur Oak | 130 | Good | | 446444 | 5012612.7 |
| **13** | *Quercus macrocarpa* | Bur Oak | 95 | Good | | 446429.6 | 5012644.3 |
| **14** | *Quercus macrocarpa* | Bur Oak | 92 | Good | | 446418.5 | 5012664 |
| **15** | *Acer saccharum* | Sugar Maple | 115 | Fair | Co-dominant stems, dead branches | 446639.1 | 5012885.4 |
| **16** | *Quercus macrocarpa* | Bur Oak | 81 | Good | | 446636.1 | 5012880.9 |
| **17** | *Juglans nigra* | Black Walnut | 89 | Good | | 446669.1 | 5012903 |

## 5.6 INCIDENTAL WILDLIFE

Biologists recorded direct observations or evidence of wildlife during the site visit, as described in **Table 11**. The table does not include species encountered during targeted wildlife surveys. All the species encountered are common to the Ottawa area, and none are listed under the provincial ESA.

These observations further suggest that the habitats within the Study Area, particularly in the northern FODM7-2 woodland and the meadow communities surrounding the Thomas Gamble Municipal Drain, are providing suitable habitat conditions for a variety of wildlife.

**Table 11 Incidental wildlife observations**

| Scientific Name | Common Name | S-Rank[1] | Observation Notes |
|---|---|---|---|
| *Scolopax minor* | American Woodcock | S4B | Heard singing and during flight display in MEMM3 community adjacent to the municipal drain |
| *Branta canadensis* | Canada Goose | S5 | Visual observation in MEMM3 meadow on western boundary of subject property |
| *Corvus corax* | Common Raven | S5 | Heard calling within Study Area |
| *Cardinalis cardinalis* | Northern Cardinal | S5 | Heard calling on northern edge of subject property |
| *Erethizon dorsatum* | Porcupine | S5 | Visual observation in northern FODM7-2 |
| *Regulus calendula* | Ruby-crowned Kinglet | S4B | Heard calling in northern FODM7-2 community |
| *Archilochus colubris* | Ruby-throated Hummingbird | S5B | Visual observation in MAMM1-3 meadow adjacent to municipal drain |
| *Bonasa umbellus* | Ruffed Grouse | S4 | Heard wingbeats in northern FODM7-2 community |
| *Melospiza georgiana* | Swamp Sparrow | S5B | Singing male in MAMM1-3 community adjacent to municipal drain |
| *Odocoileus virginianus* | White-tailed Deer | S5 | Visual observation |
| *Meleagris gallopavo* | Wild Turkey | S5 | Visual observations in meadows near northwestern corner of subject property |

*[1]S-Rank is an indicator of commonness in the Province of Ontario. A scale between 1 and 5, with 5 being very common and 1 being the least common.*

# 6 DESCRIPTION OF THE PROPOSED PROJECT

RSDC is proposing to develop a subdivision community within the subject properties at 4775 and 4875 Spratt Road. The development is expected to consist mainly of townhomes and single-family homes. The development is also expected to have development blocks for medium density and commercial uses, two park blocks, and one school block.

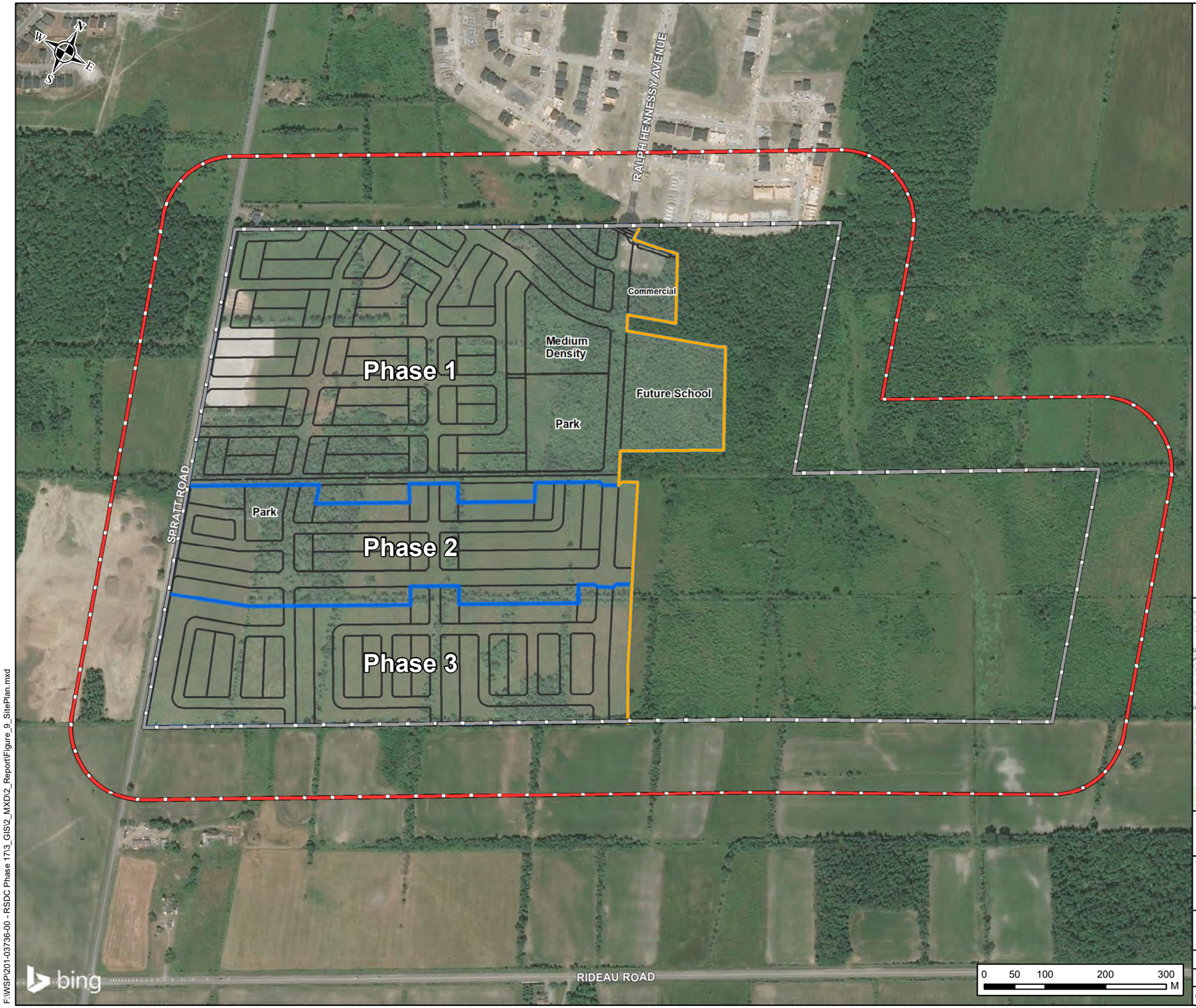
The development footprint area is approximately 63 ha. It is expected that the development is divided into three phases. The first phase will occur within the property parcel at 4775 Spratt Road, with the second and third phases in the 4875 Spratt Road property parcel.

The draft site plan illustrating the proposed layout of the development is shown in **Figure 9**.

## 6.1 CONSTRUCTION ACTIVITIES

It is assumed the development of this property will include the following major project components:

- Surveying and staking out the development;
- Clearing, excavation, and grading property to accommodate construction;
- Installation of stormwater drainage network and related infrastructure;
- Excavation to accommodate underground utilities including water, sewer, gas, and hydro;
- Construction of access roads;
- Construction of individual lots and homes;
- Landscaping and fencing; and,
- On-going usage and maintenance.




Subject Property

Study Area

Development Phasing Limits

Proposed Site Plan

Development Limit


Client:
**Riverside South Development Corporation**

Title:
**Proposed Site Plan**

Prepared By:
WSP

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# 7 IMPACT ASSESSMENT AND MITIGATION

The following sections describe the anticipated environmental impacts associated with the proposed development and the general measures that should be considered to mitigate the associated impacts. The impact assessment and associated mitigation considers both construction-related impacts and impacts associated with the occupation of the development. The anticipated impacts are illustrated in **Figure 10.**

## 7.1 AQUATIC ENVIRONMENT

The proposed development will have a direct impact on HDF-C3. Impacts to the other HDFs are not expected, as they are located outside of the Project footprint. As discussed in Section 5.2.1, the management recommendation for HDF-C3 was determined to be 'Mitigation.'

The Mitigation management recommendations include replicating or enhancing functions through lot level conveyance measures, replicate on-site flow and outlet flows at the top end of the system to maintain feature functions, and replicate functions by lot level conveyance measures connected to the natural heritage system (Toronto and Region Conservation Authority and Credit Valley Conservation, 2014).

Throughout the HDF assessment process, the RVCA was engaged with, with respect to results, impacts, mitigation and potential compensation. In review of the assessment results and site plan, the RVCA expressed that the headwater features in the Study Area provide limited functions and inputs to downstream features, and the removal of HDF-C3 can likely be permitted if hydrological flows are maintained within the Study Area.

Based on the site plan, it is expected that approximately 250 m of HDF-C3 will be permanently removed or disconnected from downstream features.

Generally, it is anticipated that construction activities will result in direct and indirect impacts to the aquatic environment and indirect fish habitat. The following impacts are expected:

- Permanent loss of approximately 250 m of existing watercourse and associated functions (indirect fish habitat, supporting amphibian habitat, flood storage);
- Potential impacts on the watercourse and other adjacent habitats resulting from spills and other contaminants;
- Sedimentation and erosion impacts resulting from potential dewatering activates that may be required during construction; and,
- Increased amount and rate of storm water runoff from the impermeable surfaces of the proposed development.

### Proposed Mitigation Measures – Planning and Design Stage

The following pre-construction mitigation measures are recommended to address impacts on the aquatic environment within and adjacent to the subject property:

- ✓ Detailed design of the stormwater management system should ensure that hydrological flows from HDF-C3 are maintained within the Study Area;

### Proposed Mitigation Measures – Construction Implementation

The following general mitigation measures are recommended to address impacts on the aquatic environment adjacent to the development area:

- ✓ Light-duty silt fencing (OPSD 219.110) and/or other equivalent erosion and sediment control measures should be installed round the perimeter of the work area to clearly demarcate the development area and prevent erosion and sedimentation into adjacent habitats. Erosion and sediment control measures should be monitored regularly to ensure they are functioning properly and if issues are identified should be dealt with promptly;
- ✓ Heavy duty silt fencing (OPSD 219.130) and/or other equivalent erosion and sediment control measures should be installed adjacent to the watercourse and associated wetland habitats to clearly demarcate the development area and prevent erosion and sedimentation into adjacent habitats. Erosion and sediment control measures should be monitored regularly to ensure they are functioning properly and if issues are identified should be dealt with promptly;
- ✓ Stockpiling of excavated material should not occur outside the delineated work area. If stockpiling is to occur outside of this area, silt fencing should be used to contain any spoil piles to prevent sedimentation into adjacent areas;
- ✓ A spill response plan should be developed and implemented as required;
- ✓ Avoid the use of heavy equipment in the wetland and watercourse during the winter when amphibians may be hibernating;
- ✓ It is recommended that dewatering ponds (OPSD219.240) or similar standards should be implemented to avoid sedimentation and erosion in adjacent areas. If dewatering requires more than 50,000 L of water to be pumped per day, appropriate permits must be obtained from the Ministry of the Environment, Conservation and Parks (MECP) prior to the dewatering;
- ✓ Promote use of permeable surfaces in design and construction of roads and homes to limit stormwater runoff.

**With the successful implementation of the mitigation measures outlined above, impacts from the proposed development on the aquatic environment and indirect fish habitat are expected to be negligible.**

# 7.2 NATURAL HERITAGE FEATURES

## *7.2.1 VEGETATION COMMUNITIES*

To accommodate project construction, most of the project footprint and associated vegetation communities will be cleared and graded. The impacts associated with this clearing will include:

The permanent loss of or disturbance to vegetation communities is approximately 47 ha (see **Figure 10),** which does not include areas that have already been cleared of top soil or have existing anthropogenic uses (residential, construction). This disturbance is directly associated with the clearing required to accommodate the Project. The area of vegetation planned for removal is separated below per ELC community:

- 19.7 ha of Dry – Fresh Mixed Meadow (MEMM3). However, most of the MEMM3 communities were previously cleared of top soil and have been regenerating with weedy species such as White Clover and Thistle during the growing season;
- 13.1 ha of Fresh – Moist Green Ash Hardwood Lowland Deciduous Forest (FODM7-2);
- 7.3 ha of Green Ash Mineral Deciduous Swamp (SWDM2-2);
- 4.8 ha Hedgerow (HR);
- 1.9 ha of Fresh – Moist Deciduous Woodland (WODM5);
- Accidental damage or loss of trees and other vegetation features because of site alteration or construction activities;

- The permanent loss of habitat for wildlife dependent upon the terrestrial communities;
- Changes in natural drainage;
- Decreased biodiversity, reduced number of species, or abundance of species;
- Erosion and sedimentation into adjacent vegetation communities; and,
- Permanent loss of native vegetation due to increased potential for non-native and invasive vegetation species after development.

The magnitude of these impacts is lessened by the presence of invasive species throughout the subject property. This includes Glossy Buckthorn and European Buckthorn, which are abundant throughout the subject property.

### Proposed Mitigation Measures – Construction Implementation

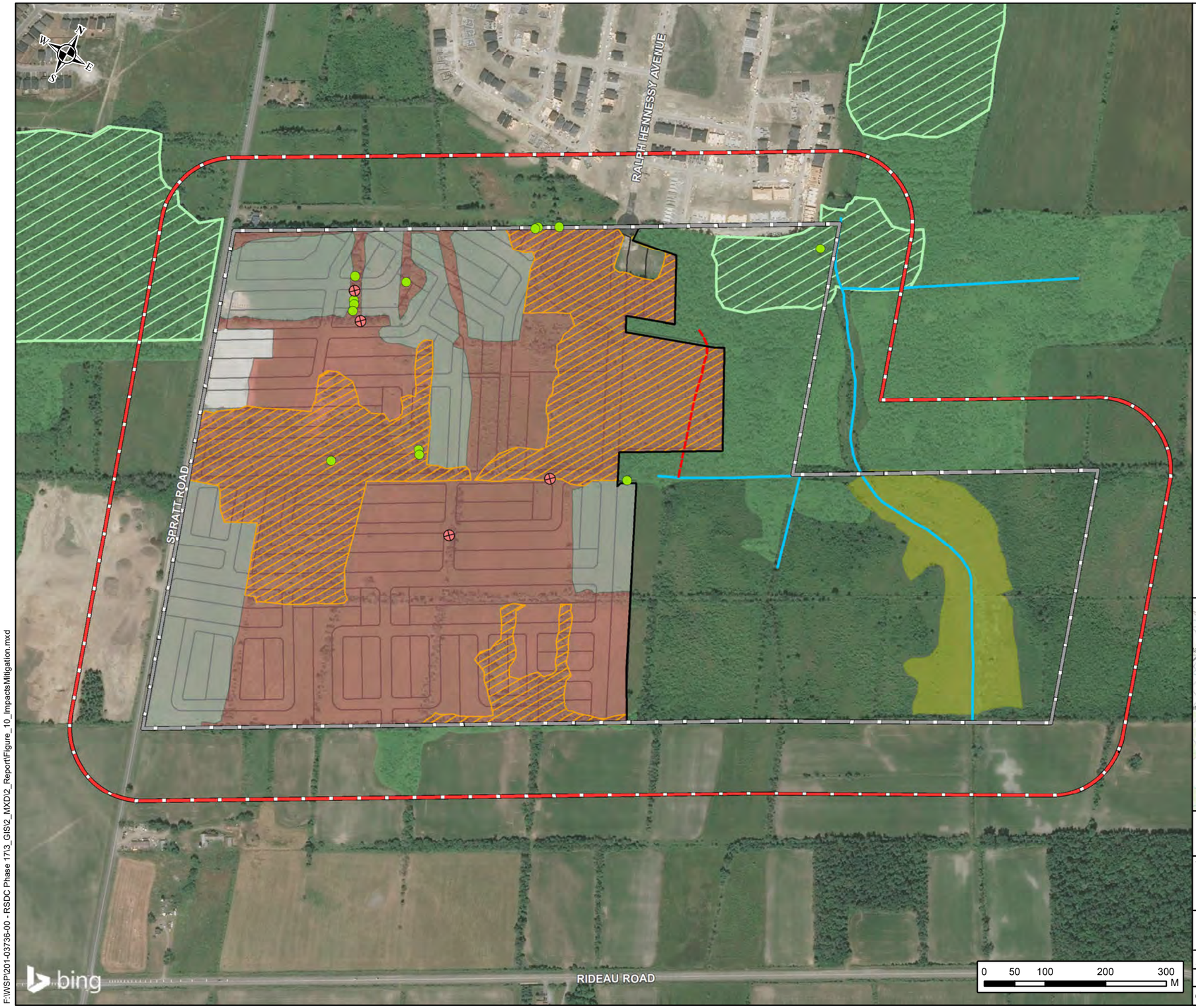
The following general mitigation measures are recommended to address impacts on the terrestrial environment within the project footprint:

- ✓ Orange snow fencing or other suitable security fencing should be used to delineate the construction limits from the adjacent habitat. This will prevent encroachment of construction activities into the adjacent natural features. This fencing should be monitored regularly to ensure it is functioning properly. Any deviancy in the fencing should be dealt with promptly;
- ✓ Erosion and sediment control plan should be implemented to prevent sedimentation outside of work areas;
- ✓ Machinery will arrive on site in a clean condition and will be free of fluid leaks, invasive species, and noxious weeds; and
- ✓ All excess construction material will be removed from site and the area restored with seeding of native species upon project completion as required.

### Proposed Mitigation Measures - After Construction

- ✓ Installation of garbage bins in public spaces is recommended to limit trash and litter being dumped into habitats adjacent to the development area
- ✓ 'No Littering' signage is recommended around the property to discourage littering

**With the successful implementation of the mitigation measures outlined above, a moderate decrease in low-quality native terrestrial vegetation is anticipated.**




Subject Property

Study Area

Proposed Site Plan

**Headwater Drainage Features**

Waterourse to be removed (approximately 250m)

Watercourse to be retained

**Vegetation and Tree Impacts**

Distinctive/specimen tree (to be removed)

Distinctive/specimen tree (potentially retainable)

Cleared land (no impact anticipated)

Removed/disturbed vegetation communities

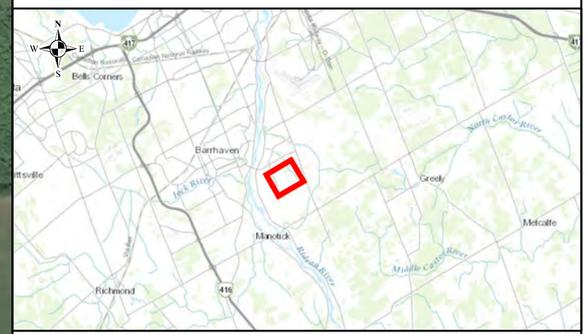
Woodland (not significant) to be removed

Significant woodland (to be retained)

Woodland (not significant) to be retained

**Wildlife Impacts**

Bobolink habitat to be retained




Client:
**Riverside South Development Corporation**

Title:
**Anticipated Impacts and Proposed Mitigation**

Prepared By: WSP

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### 7.2.2 WETLANDS

To accommodate construction, the Green Ash Mineral Deciduous Swamp (SWDM2-2) communities will be partially removed and disturbed.

Given the young to moderate age of these communities, the extent of disturbance from Emerald Ash Borer, the prevalence of invasive species, low biodiversity, and limited wildlife observations, these communities provide marginal ecological value and function.

It is anticipated that portions of these communities will be retained outside of the Project footprint. It is recommended that the landscaping plan for this development include removal of invasive species along the perimeter of the Project footprint and planting of native species within the perimeter. This will enhance a vegetated buffer between the future development and retained natural habitats, while also minimizing the risk of invasive species spreading further into the retained portion.

No direct impacts to wetland communities outside of the Project footprint are anticipated as a result of construction.

The following impacts to wetlands are expected:

- Removal of up to 7.3 ha of Green Ash Mineral Deciduous Swamp (SWDM2-2);
- Accidental damage or loss of trees and other vegetation features as a result of site alteration or construction activities;
- Loss or disturbance to habitat for wildlife dependent upon wetland habitat;
- Changes in natural drainage;
- Decreased biodiversity, reduced number of species, or abundance of species;
- Habitat fragmentation; and,
- Permanent loss of native vegetation due to increased potential for non-native and invasive vegetation species after development.

**Proposed Mitigation Measures – Planning and Design Stage**

- ✓ Development of a landscaping plan to address invasive species removals and native vegetation plantings along the perimeter of the Project footprint.

**Proposed Mitigation Measures - Construction Implementation**

- ✓ Orange snow fencing or other suitable security fencing should be used to delineate the construction limits from the adjacent habitat. This will prevent encroachment of construction activities into remaining adjacent natural features. This fencing should be monitored regularly to ensure it is functioning properly. Any deviancy in the fencing should be dealt with promptly;
- ✓ Erosion and sediment control plan should be implemented to prevent sedimentation outside of work areas;
- ✓ Machinery will arrive on site in a clean condition and will be free of fluid leaks, invasive species, and noxious weeds; and,
- ✓ All excess construction material will be removed from site and the area restored with seeding of native species upon project completion as required.

**Proposed Mitigation Measures – Post-Construction**

- ✓ Installation of garbage bins in public spaces is recommended to limit trash habitats adjacent to the development area; and,
- ✓ 'No Littering' signage is recommended around the property to discourage littering is also recommended.

**With the successful implementation of the recommended mitigation, a minor decrease to wetland habitat is expected.**

## 7.2.3 WOODLANDS

An area of 'Woodland A' along the northern boundary of the subject property were deemed significant based on the City of Ottawa's guidelines. However, the area is located outside of the Project footprint and vegetation removals or site alteration is not anticipated.

Non-significant portions of Woodland A, as well as Woodland B and Woodland C are located within the Project footprint and are anticipated to be permanently removed to accommodate construction activities.

The anticipated direct and indirect impacts include:

- The permanent loss of, or disturbance to, approximately 20.7 ha of non-significant woodlands within the Project footprint, including;
  - 9.6 ha of Woodland A (FODM7-2, SWDM2-2);
  - 9.1 ha of Woodland B (FODM7-2);
  - 1.9 ha of Woodland C (WODM5);
- Decreased biodiversity, reduced species abundance, and reduced urban canopy;
- Encroachment to the edges and interior of Woodland A;
- Increased risk of invasive species spread into retained areas of Woodland A;
- The permanent loss of habitat for wildlife dependent upon these woodlands; and,
- Changes in natural drainage.

### Proposed Mitigation Measures – Planning and Design Stage

The following general mitigation measures are recommended to address impacts on the woodlands within the proposed development area:

- ✓ Development of a landscaping plan to address invasive species removals and native vegetation plantings along the perimeter of the retained portion of Woodland A to reduce the impact of edge effects and limit risk of invasive species spread;

### Proposed Mitigation Measures – Construction Implementation

- ✓ Retention of healthy, mature and mid-aged trees should be prioritized where possible;
- ✓ Minimize clearing of woodlands to least extent possible;
- ✓ General vegetation mitigation as described in **Section 7.2.1**.

**With the successful implementation of the mitigation measures outlined above, it is anticipated there will be no direct impact to significant woodlands, and a moderate permanent loss of woodlands within the subject property. Tree-specific mitigation measures are described below in Section** Error! Reference source not found.**.**

## 7.2.4 SIGNIFICANT WILDLIFE HABITAT

**No direct or indirect impacts to SWH are anticipated as a result from the proposed development as no confirmed SWH was identified to occur within the Study Area.**

### 7.2.5 BREEDING BIRDS

Based on the results of the breeding bird surveys, it is expected that the removal and disturbance to vegetation communities within the Project footprint will result in a permanent loss of nesting and foraging habitat for birds. With the variety of habitats present in the project footprint, it is expected the loss of these areas will result in a moderate impact to breeding birds within the Study Area. However, approximately half of the subject property and associated habitats will be retained and continue to provide habitat for breeding birds.

The following direct and indirect impacts on breeding birds are anticipated:

- The permanent loss of nesting and foraging habitat from the clearing of vegetation within the development footprint;
- Potential physical harm to birds or bird nests during clearing and construction activities;
- Reduced diversity, distribution, and abundance of a bird species within the area;
- Predation by domestic cats during occupation; and,
- The increased potential for fatal bird collisions associated with building windows following construction.

**Proposed Mitigation Measures – Planning and Design Stage**

- ✓ "Bird-friendly" building design principals should be considered in the design of the development. Potential measures may include the following:
    - General building design should incorporate the Canadian Standards Association's '*Bird-friendly building design*' (Canadian Standards Association, 2019) guidelines. The City of Ottawa is in the process of finalizing its bird-friendly design guidelines. These guidelines should also be consulted and incorporated as they become available; and,
- ✓ Retention of native vegetation where appropriate (i.e. the park block) should be considered to maintain available nesting and foraging habitat for breeding birds.

**Proposed Mitigation Measures – Construction Implementation**

The following mitigation measures are intended to address potential impacts to breeding birds resulting from the proposed development:

- ✓ Clearing of vegetation should be avoided during the breeding bird season, between April 15th to August 15th. Should any clearing be required during the breeding bird season, nest searches conducted by a qualified person must be completed 48 hours prior to clearing activities. If nests are found, an appropriate setback will be established by the qualified professional. No work will be permitted within this setback in accordance with the federal Migratory Birds Convention Act (MBCA) (Government of Canada, 1994);
- ✓ A qualified bird rehabilitation centre should be contacted if any birds are injured or found injured during construction activity. Injured birds should be transported to a qualified facility for care, with a small donation of money to help pay for the care (a local facility is the *Ottawa Valley Wild Bird Care Centre*);
- ✓ The construction area should be pre-stressed prior to any vegetation clearing within the proposed development area; and,
- ✓ Other mitigation measures outlined in the *Protocol for Wildlife Protection during Construction* (City of Ottawa, 2015b) should be considered prior to construction of the proposed development.

**With the successful implementation of the recommended mitigation, a minor overall loss of breeding and foraging habitat for birds is expected.**

## 7.2.6 AMPHIBIANS

The removal of vegetation communities within the project footprint will result in a permanent loss of suitable woodland breeding habitat for amphibians. Areas with more suitable conditions, such as the meadows and swamp surrounding the Thomas Gamble Municipal Drain will be retained. Based on the results of surveys and the low number of amphibian observations within the project footprint, it's expected that this loss of habitat will be non-limiting.

The following impacts on amphibians is possible result from the proposed development:

- Permanent, but partial loss, of low-quality woodland amphibian habitat within the Project footprint from vegetation clearing and grading;
- Potential physical harm to amphibians during clearing and construction activities; and,
- Potential harm to amphibians resulting from sediments and pollutants transported into adjacent wetland habitats.

**Proposed Mitigation Measures – Construction Implementation**

- ✓ Silt fencing should be installed around the perimeter of the Project area prior to site activities as part of erosion and sediment control measures, to prevent amphibians and other wildlife from entering the site. Fencing should be maintained throughout the life cycle (until land is permanently stabilized) of the project and repaired if damaged by machinery;
- ✓ Fencing installation should be proceeded with a sweep for wildlife to ensure amphibians are safely removed from the anticipated construction areas.
- ✓ Avoid the use of heavy equipment in wetlands and watercourses during the winter when amphibians may be hibernating;
- ✓ A qualified biologist should conduct a sweep for amphibians in sections of the watercourse that is to be removed prior to de-watering; and,
- ✓ Other mitigation measures outlined in the 'Protocol for Wildlife Protection during Construction' should be considered prior to construction of the proposed development (City of Ottawa, 2015b).

**With the successful implementation of the mitigation measures above, impacts to amphibians from the proposed development is expected to be negligible.**

## 7.2.7 BAT MATERNITY COLONIES

It is anticipated that the removal of swamp, hedgerow, and meadow vegetation communities within the Project footprint will result in an overall permanent loss of available bat maternity and foraging habitat. Generally, the forested habitats that are expected to be impacted consist of predominately small to medium-sized Green Ash and American Elm trees that are too small or do not contain suitable cavities for bat roosting.

Furthermore, given the availability of suitable meadows and woodlands outside of the Project footprint, the loss of habitat is expected to be non-limiting. Additionally, light emitting from the residential dwellings and proposed streets will likely attract insects and provide foraging opportunities for bats. The following impacts on bat maternity roost habitat are anticipated:

- Permanent loss of candidate roost trees within swamp and hedgerow habitats within the project footprint due to vegetation removals; and,
- Accidental displacement, injury, or death of bats which may be using woodlands as temporary roosting habitat during roosting period.

**Proposed Mitigation Measures – Construction Implementation**

- ✓ Clearing of vegetation should be avoided during the general active and maternity roosting periods for bats (May 1st to October 15th); and,
- ✓ Installation of approximately eight large bat boxes, installed on four poles (two per pole); placed in appropriate open areas, adjacent to retained natural features outside of the project footprint, or within the proposed park on the eastern boundary of Phase 1.

**With the successful implementation of the mitigation measures outlined above, it is anticipated that the proposed development will result in a negligible impact to bats and bat habitat within the Study Area.**

## 7.2.8 HABITAT FOR SPECIES OF CONSERVATION CONCERN

Habitat for Eastern Wood-Pewee, Wood Thrush, and Monarch was confirmed during site surveys, and suitable habitat for Purple Martin, Short-eared Owl, and Eastern Milksnake was identified during ELC surveys.

Eastern Wood-Pewee and their habitat is associated with the FODM7-2 communities both within and outside of the Project footprint. Comparatively, the forested habitats within the Project footprint have a higher density of trees and shrubs within the sub-canopy and understorey, while the habitats outside of the Project footprint are more open and suitable for Eastern Wood-Pewee.

Wood Thrush and their habitat is associated with the FODM7-2 community on the northern boundary of the subject property, and the SWDM2-2 community located in the northeastern corner of the Study Area. This species was only observed outside of the Project footprint, although suitable conditions are present within Project footprint.

Milkweed was observed in meadows throughout the Study Area, including areas within and outside of the Project footprint. Monarchs were observed both within and outside the Project footprint as well. However, the habitats outside of the Project footprint have been less disturbed and have a generally higher abundance and diversity of Milkweed and other wildflowers.

Candidate habitat for Purple Martin is associated with forests and hedgerows within the Project footprint; although there is a higher amount of suitable cavity trees outside of the Project footprint. Candidate Short-eared Owl habitat is associated with the meadows and thicket swamps adjacent to the Thomas Gamble Municipal Drain and are located outside of the Project footprint. Eastern Milksnake candidate habitat is associated with the meadows throughout the Study Area, rockpiles that are found along numerous hedgerows, and with construction equipment storage containers and sheds in the CVC community.

Based on the proposed site plan, it is anticipated that there will be a permanent but partial loss of confirmed habitat for Eastern Wood-Pewee and Monarch, and a permanent and partial loss of candidate habitat for Purple Martin and Eastern Milksnake.

The following impacts to Species of Conservation Concern may occur:

- — Removal of habitat for Eastern Wood-Pewee, Wood Thrush, and Monarch;
- — Removal or disturbance to candidate habitat for Purple Martin and Eastern Milksnake; and,
- — Accidental harm or injury to Eastern Wood-Pewee, Purple Martin, Wood Thrush, Eastern Milksnake, and Monarch during construction activities.

**Proposed Mitigation Measures – Planning and Design Stage**

- ✓ Pollinator garden consisting of native vegetation plantings should be implemented into landscaping where possible (i.e. park and school blocks) to maintain suitable breeding and feeding habitat for Monarch.

**Proposed Mitigation Measures – Construction Implementation**

- ✓ Clearing of vegetation should be avoided between April 1st and September 15th, to avoid potential physical harm to Eastern Wood-Pewee, Purple Martin, and Monarch during breeding and foraging seasons;

- ✓ Minimize vegetation and habitat removals to the least extent possible; and,
- ✓ Construction areas should be pre-stressed during clearing to allow Species of Conservation Concern to safely leave the area.

### Proposed Mitigation Measures – Post-Construction

- ✓ Pesticide use should be limited, or avoided when possible, in landscape maintenance to reduce risk of exposure to Monarch.

**With the successful implementation of the mitigation measures outlined above, it is anticipated that there will be negligible impact to Species of Conservation Concern and SCC habitat.**

## 7.2.9 SPECIES AT RISK

The following subsection describes anticipated impacts and proposed mitigation to Bobolink and Butternut.

### BOBOLINK

Bobolink observations and behaviour during field surveys suggest that Bobolink are nesting within the meadow habitats associated with the Thomas Gamble Municipal Drain. Bobolink males compete for breeding territory, and since only two Bobolink (one male and one female) were observed during surveys, it is likely that the area of suitable habitat is only large enough to support individual breeding pairs.

As Bobolink is listed as a Threatened species in Ontario it receives general habitat protection. General habitat for Bobolink is divided into the following three categories: (MNRF, 2016)

- — Category 1: Bobolink nest and the area within 10m of the nest;
- — Category 2: The area between 10m and 60m of the nest or centre of approximate defended territory; and,
- — Category 3: The area of continuous suitable habitat between 60m and 300m of the nest or approximate centre of defended territory.

Based on the delineation of suitable habitat through the results of ELC and Bobolink surveys**,** there is no regulated habitat within 200m of the Project footprint.

Additionally, a review of the MECP's *Bobolink and Eastern Meadowlark habitats and land development* web page suggests that permitting is only required when development will affect more than 30 hectares of habitat, while registration of activities is required for developments of less than 30 hectares of habitat.

As Bobolink habitat within the Study Area will be retained (outside of the Project footprint), permitting or registration is not anticipated. The following mitigation is recommended:

### Proposed Mitigation Measures – Planning and Design Stage

- ✓ Consultation with MECP to discuss results of field surveys and to confirm that registration/permitting is not required.

### Proposed Mitigation Measures – Construction Implementation

- ✓ Construction awareness training package should be provided to contractors working on-site. The package will provide general information and mitigation for Bobolink and other natural heritage features that may be encountered directly or indirectly on site and standard procedures if encountered;
- ✓ Routine mowing or clearing of MEMM3 meadows within Project footprint (non-Bobolink habitat) prior to breeding bird season (April 15$^{th}$ – August 15$^{th}$) to limit the likelihood of vegetation colonizing the meadows and creating suitable Bobolink habitat; and,

- ✓ General mitigation measures for breeding birds as described in **Section 7.2.5**.

**With the successful implementation of the mitigation measures outlined above, it is anticipated that there will be no impacts to Bobolink or their habitat.**

### BUTTERNUT

Results from the on-going Butternut surveys of the Project footprint suggest that at least 100 Butternut trees and suitable habitat will likely be disturbed or permanently removed to accommodate construction. At the time of reporting, the category analysis of the surveyed trees has not been completed.

Registration of activities affecting Butternut will be required, and due to the abundance of Butternut trees on the property, it is likely that an ESA permit will also be required.

Upon completion of the Butternut Heath Assessments, the MECP will be informed of the results to determine the appropriate next steps for development approval.

The following mitigation is recommended, and may be revised pending the analysis of survey results and consultation with the MECP:

#### Proposed Mitigation Measures – Planning and Design Stage

- ✓ Submission of Butternut Health Assessment report to MECP and consultation to discuss next steps in the approvals process;
- ✓ Retention of Butternut trees within the Project footprint, plus a 50m buffer, until activities have been registered or a permit has been issued.

#### Proposed Mitigation Measures – Construction Implementation

- ✓ Construction awareness training package should be provided to contractors working on-site. The package will provide general information and mitigation for Butternut and other natural heritage features that may be encountered directly or indirectly on site and standard procedures if encountered.
- ✓ Butternut clearing should occur when construction activities (e.g. grading, excavation) are imminent to reduce the potential for new seedlings to regenerate.

**Based on the results of on-going surveys, MECP authorization (registration or permitting) will be required. Site alteration should be avoided until appropriate authorization is given.**

## 7.3 TREES

The proposed development will require tree clearing and grading within much of the Project footprint resulting in an overall negative impact on tree cover within the Study Area.

Sixteen Distinctive and/or specimen trees were identified within or on the border of the Project footprint. Based on the trees location in relation to the proposed site plan, there may be potential for retention of up to 12 of these trees. However, based on the size and design of lots, in addition to grading requirements and soil conditions, retention of several of these trees may not be feasible.

Where possible, healthy native trees should be retained in the proposed park and school blocks and supplemented with additional plantings to minimize the overall loss of tree cover within the Project footprint.

Anticipated impacts to Distinctive trees are shown in **Figure 10**.

### Proposed Mitigation Measures – Planning and Design Stage

- ✓ Tree planting and compensation plan should be developed in consultation with the City of Ottawa;
- ✓ The landscape plan should include tree planting recommendations consistent with the City of Ottawa's target for increased canopy cover to the extent possible within the property;
- ✓ Landscaping plans for areas adjacent to driveway should consider use of appropriate native species to offset loss of species and biodiversity from vegetation removals;
- ✓ Identification of healthy Distinctive and/or specimen trees to be retained following development of a grading plan and detailed site design;
- ✓ Prior to construction activities, overhanging limbs and any exposed tree roots of trees to be retained should be pruned in a manner that minimizes physical damage and promotes quick wound closure and regeneration. Maintenance of roots or limbs should be carried out by an ISA Certified Arborist or a tree care specialist under the supervision of an ISA Certified Arborist.

### Proposed Mitigation Measures – Construction Implementation

- ✓ Tree retention should be prioritized where possible;
- ✓ Trees to be removed should be clearly marked and work crews should be informed of the importance of only removed marked/approved trees;
- ✓ Tree protection fencing should be installed around all trees that will be retained within and around work areas;
- ✓ Protection fencing around trees shall be installed at the critical root zone (CRZ) to ensure no impacts to this area. The CRZ is calculated as the DBH x 10 cm:
  - Groups of trees can be fenced together if the fencing still meets the recommended placement described above;
  - Fencing should be installed following the City of Ottawa's Tree Protection Specification (City of Ottawa, 2019);
- ✓ Tree protection fencing should be inspected as required to ensure no deviancy from the intended location and to record any deficiencies;
- ✓ Do not place any material or equipment within the CRZ of any trees to be preserved;
- ✓ Do not attach any signs, notices, or posters to any tree;
- ✓ Do not raise or lower the existing grade within the CRZ of trees without approval;
- ✓ Do not tunnel or bore when digging within the CRZ of a tree;
- ✓ Excavation activities around trees shall not damage the root system, trunk or branches of any tree to be preserved;
- ✓ Exhaust fumes from all heavy machinery, vehicles, generators, and other equipment shall not be directed towards any trees for prolonged periods of time;
- ✓ Tree removals should be avoided during the breeding bird season (April 15th to August 15th) to limit disturbance to breeding birds, nests, or young and comply with the MBCA, 1994:
- ✓ If trees are to be removed during the breeding bird season, it should be preceded by a nest survey by a qualified avian biologist. Surveys should be undertaken a maximum of 48 hours prior to the commencement of removals. If nests are found during a survey, or during construction, an appropriate buffer must be applied and the nest must not be disturbed until the young have fledged. Due to the difficulty of locating nests, nest surveys should only be done in areas with limited tree cover (hedgerows) or for individual trees. Nest surveys are not recommended for large forested areas.

- ✓ All Green Ash trees removed should be treated as infected by the Emerald Ash Borer beetle and appropriately disposed of so not to infect other areas of the city.

### Proposed Mitigation Measures - After Construction

- ✓ Post-construction tree maintenance methods should be used to repair any damage caused to trees by construction activities. These may include, but is not limited to: treating trunk and crown injuries, irrigation and drainage, mulching, and aeration of root zone;
- ✓ Within 12 months of completion of construction, an assessment of preserved trees should be conducted. Trees that are dead, in poor health, or hazardous should be removed or pruned, as determined by an ISA Certified Arborist. Tree removal, if necessary, should occur promptly to avoid foreseeable risk of trees falling and causing damage or harm to people and/or property.

**With the successful implementation of the mitigation measures recommended above, it is anticipated that the proposed development will result in a moderate loss of healthy mature trees and tree cover within the Study Area.**

## 7.4 WILDLIFE

Based on the habitat identified on site and incidental observations recorded, the proposed development is expected to have negative impact on local wildlife due to the general loss of natural habitat and direct impacts related to construction activities. Potential impacts to wildlife resulting from the proposed development include the following:

- Displacement, injury, or death resulting from contact with heavy equipment during clearing and grading activities;
- Loss of general natural habitat suitable for the life processes of common urban and rural wildlife;
- Disturbance to wildlife resulting from noise associated with construction activities, particularly during breeding periods;
- Outdoor lighting may result in disturbance to wildlife within woodland habitats; and,
- Conflict between wildlife and humans following development, including mortality from vehicles.

### Proposed Mitigation Measures – Construction Implementation

The best practices outlined in the *Protocol for Wildlife Protection during Construction* (City of Ottawa, 2015b) should be followed during all construction activities associated with the development. The following measures are consistent with the protocol:

- ✓ Pre-stress the area on a regular basis leading up to construction to encourage wildlife to leave the area before construction starts. Other recommendations for pre-stressing are outlined in the *Protocol for Wildlife Protection During Construction* (City of Ottawa, 2015b);
- ✓ Orange snow fencing should be installed around the perimeter of the work area to clearly demarcate the development area and prevent wildlife from entering the construction zone. Fencing should be monitored regularly to ensure they are functioning properly and if issues are identified should be dealt with promptly;
- ✓ Perimeter fencing should not prevent wildlife from leaving the site during clearing activities by clearing the area prior to installing the fence;
- ✓ Wildlife located within the construction area will be relocated to an area outside of the development into an area of appropriate habitat by a qualified professional, as necessary;
- ✓ Avoid vegetation clearing during sensitive times of year for local wildlife (e.g. spring and early summer);
- ✓ Construction crews working on site should be educated on local wildlife and take appropriate measures for avoiding wildlife; and,

- ✓ A qualified wildlife rehabilitation centre should be contacted if any animals are injured or found injured during construction. Injured animals should be transported to an appropriate wildlife rehabilitation, such as the Rideau Valley Wildlife Sanctuary.

**With the mitigation measures outlined above, it is anticipated that the proposed development will result in a minor loss of wildlife habitat within the Study Area.**

## 7.5 CUMULATIVE IMPACTS

Cumulative impacts have been considered in the context of the local and regional environment in which the site is situated. The proposed development is located in Gloucester – South Nepean ward, and specifically within the Riverside South community, which has had increased residential development over the past two decades. The landscape surrounding the subject property consists of on-going development, agricultural fields, and remnant woodlands.

At the landscape scale, the subject property contains limited ecological linkages to the natural heritage system. The Thomas Gamble Municipal Drain flows through the eastern boundary of the subject property and likely provides a marginal aquatic linkage for fish and amphibians. However, the downstream reaches of the drain are within a highly developed area which likely interferes with the connectivity of the system. For the terrestrial landscape, there are significant woodlands, previously identified as Urban Natural Areas for the City of Ottawa, within and around the Study Area. However, these woodlands have become remnant parcels with limited or no connections to other natural heritage system features such as the Rideau River valley. Expansion of road networks has also likely further limited the connectivity between features.

Based on the results of field surveys and available information, the full or partial removal of natural heritage features (i.e. woodlands and wetlands) will reduce the overall abundance of natural heritage features within the greater landscape. Furthermore, it's anticipated that the removal of a large number of Butternuts from the development footprint will likely negatively affect the species abundance within the City of Ottawa and eastern Ontario landscape.

Potential cumulative impacts to the removal of natural heritage features include:

- General loss of biodiversity and available habitat;
- Fragmentation of natural heritage features;
- Loss of natural headwater feature (flow inputs to system to be maintained); and,
- Expansion of impervious surfaces will increase runoff potential.

### Proposed Mitigation Measures – Planning and Design Stage

In addition to the mitigation measures listed above, the following mitigation should be considered to address the cumulative impacts resulting from the proposed development:

- ✓ Promote the use of permeable landscaping materials and rain capture systems like rain barrels.

# 8 SUMMARY AND CONCLUSIONS

This report provides an evaluation of the anticipated environmental impacts associated with the construction and long-term occupation of the proposed Riverside South Phase 17 development **(Figure 1**). The anticipated environmental impacts are based on field surveys undertaken between April and August 2020, in addition to a desktop screening review.

The vegetation communities present within the subject property are comprised mainly of deciduous forest, deciduous swamp, mixed meadow, meadow marsh, and swamp thickets. Invasive species are prevalent throughout the vegetation communities.

Wetland communities are present throughout the subject property. These communities provide input into HDFs that are present in the eastern half of the subject property. The wetlands also provide foraging and breeding habitat for birds, amphibians, and mammals. However, based on the results of amphibian surveys, it is likely that these communities only provide marginal amphibian habitat.

Woodlands are present within the Study Area and Project footprint. This includes an area of significant woodland (FODM7-2), approximately 60m from the edge of the Project footprint. No direct impacts are anticipated, although indirect impacts may include the spread of invasive species and litter/waste from both existing and future developments.

The HDFs within the site consists of the Thomas Gamble Municipal Drain and two associated tributaries. The analysis of the HDF survey results indicates that these features provide supporting functions to the surrounding aquatic and terrestrial features. One reach (HDF-C3) is anticipated to require removal as a result of construction activities.

The tree community within the subject property consists of 19 species, although comprised mainly of Green Ash and American Elm. Trees within the subject property are generally young to mid-aged. Tree health of the Ash and Elm trees is generally poor to moderate condition. Evidence of Emerald Ash Borer is very prevalent throughout the Study Area. Tree health among other species is generally good. Sixteen Distinctive and/or specimen trees were identified within or on the border of the Project footprint. Based on the trees location in relation to the proposed site plan, there may be potential for retention of up to 12 of these trees. However, the feasibility of retention will be dependent on the size and design of lots, grading requirements, and soil conditions and compaction.

Two SAR were observed during the field surveys; Butternut and Bobolink. Butternut occurs throughout the Project footprint, and surveys are still on-going to identify and assess all trees. Following the completion of surveys, MECP will be consulted to determine the next steps for approvals. Bobolink was observed to be nesting in the eastern half of the subject property. However, their suitable habitat is located outside of the Project footprint, and no impacts or registration are expected. Confirmed habitat for three SCC (Eastern Wood-Pewee, Wood Thrush, and Monarch) was identified and confirmed during ELC and wildlife surveys. Suitable habitat for three other SCC (Purple Martin, Short-eared Owl, Eastern Milksnake) was identified during ELC surveys, although none of the species were observed during summer field investigations.

It is expected that the proposed development will result in a moderate loss of terrestrial and wetland vegetation and wildlife habitat. The key ecological feature identified within the Study Area is Butternut. As surveys to identify and assess their health is still on-going, it is recommended that no project activities (i.e. vegetation removals, grading) occur until consultation with MECP is completed, and appropriate approvals have been issued.

The mitigation measures described in this report, and summarized in **Table 12**Table 12**,** have been developed to avoid and/or minimize the environmental impacts associated with the Project.

**Based on the information available, it is our opinion that this proposed residential development can be accepted with the conditions that all remaining field surveys for Butternut are completed, and all mitigation measures recommended herein will be implemented.**

## 8.1 STANDARD OF CARE AND LIMITATIONS

In evaluating the Study Area, WSP has relied in good faith on information provided by others. WSP has assumed that the information provided is correct, and WSP assumes no responsibility for the accuracy, completeness or workmanship of any such information.

Field surveys have been carried out using investigation techniques and ecological methods consistent with those ordinarily exercised by WSP and other scientific practitioners, working under similar conditions and subject to the time, financial and physical constraints applicable to these investigations. Survey results presented in this report are based on work undertaken by trained professionals and technical staff and the reasonable and professional interpretation using acceptable scientific practices current at the time the work was performed.

The results and findings of this study have been reported without bias or prejudice. Thus, conclusions have been based on our own professional opinion, substantiated by the results of this study, and have not been influenced in any way.

**Table 12 Summary of Anticipated Impacts and Mitigation Recommendations**

| Natural Heritage Feature/Function | Summary of Potential Impacts | Constraint to Development | Summary of Proposed Mitigation | Residual Effect |
|---|---|---|---|---|
| **Aquatic Environment** | Loss of natural headwater drainage feature | Low | Maintain flows within development area | No residual effect anticipated. |
| | Loss of indirect fish habitat and supporting amphibian habitat | Low | None required | Minor permanent loss of contributing aquatic habitat for fish and amphibians. |
| | Erosion and sedimentation | Low | Erosion and sediment control measures should be implemented prior to construction. This typically involves the installation of silt fencing. | No residual effect anticipated. |
| | Spills and contamination | Low | Development of spill response plan and proper storage and work areas for potentially contaminating activities | No residual effect anticipated |
| | Increased amount and rate of stormwater runoff | Low | Implement permeable surfaces where possible into design and construction to limit runoff | No residual effect anticipated. |
| **Terrestrial Vegetation** | Loss of natural vegetation | Low | None required | Moderate permanent loss of native and non-native terrestrial vegetation. |
| | Loss of habitat for wildlife | Low | None required | Permanent loss of foraging or nesting habitat. |
| | Decreased biodiversity or species abundance | Low | Landscaping plans should consider use of appropriate native species to offset loss of species or general abundance | No residual effect anticipated |
| | Increased risk of invasive species | Low | Machinery should arrive on site in clean condition; site should be restored with native species where appropriate following construction | No residual effect anticipated |
| | Changes to natural drainage | Low | None required | Altered drainage patterns within and around the project footprint |
| | Erosion and sedimentation | Low | Erosion and sediment control measures should be installed prior to construction. This typically involves the installation of silt fencing | No residual effect anticipated |
| **Wetlands** | Loss of natural wetlands | Low | Minimize clearing and grading to least amount required. | Loss of natural wetland habitat within the subject property |
| | Loss of habitat for wildlife | Low | None required | Minor permanent loss of foraging and nesting habitat |
| | Changes to natural drainage | Low | None required | Altered drainage patterns within and around project areas |
| | Decreased biodiversity | Low | Landscaping plans should consider use of appropriate native species to offset loss of species or general abundance | No residual effect anticipated |

| Natural Heritage Feature/Function | Summary of Potential Impacts | Constraint to Development | Summary of Proposed Mitigation | Residual Effect |
|---|---|---|---|---|
| | Habitat fragmentation | Low | None required | No residual effect anticipated |
| | Increased risk of invasive species | Low | Machinery should arrive on site in clean condition; site should be restored with native species where appropriate following construction | No residual effect anticipated |
| **Woodlands** | Loss of forested habitat and vegetation | Low | Tree retention should be prioritized where possible | Moderate loss of woodlands within subject property. |
| | Decreased biodiversity or species abundance | Low | Landscaping plans should consider use of appropriate native species | No residual effect anticipated |
| | Loss of habitat for wildlife | Low | None required | Minor loss of available habitat |
| | Changes to natural drainage | Low | None required | Altered drainage patterns within and around project areas |
| | Increased risk of invasive species | Low | Landscaping plan should incorporate vegetated buffer between development and retained woodlands. Invasive species removal should be addressed within the plan. | No residual effect anticipated |
| **Breeding Birds** | Loss of nesting and foraging habitat | Low | Clearing of vegetation should be limited to a reasonable footprint to accommodate the proposed site plan | Minor loss of potential habitat |
| | Physical harm to birds or nests resulting from construction activities | Low | Clearing of vegetation should be avoided during the breeding bird period (April 1st – August 15th). Area should be pre-stressed prior to vegetation clearing. | No residual effect anticipated |
| | Reduced diversity or species abundance | Low | None required | Minor reduction in bird abundance and diversity |
| | Physical harm or displacement resulting from construction activities | Low | Clearing of vegetation should be avoided during the breeding bird period (April 1st – August 31st) | No residual effect anticipated |
| **Amphibians** | Loss of breeding and general habitat | Low | Clearing of vegetation should be limited to a reasonable footprint to accommodate the proposed site plan | Minor loss of woodland and wetland amphibian breeding habitat – non-limiting |
| | Physical harm or displacement resulting from construction activities | Low | Silt fencing should be installed around wetlands and watercourses. Avoid the use of heavy equipment in wetlands and watercourses | No residual effect anticipated |
| | Fragmentation of candidate amphibian movement corridors | Low | None required | Minor loss of potential habitat corridors |
| **Bat Maternity Colonies** | Physical harm or displacement resulting from construction activities | Low | Vegetation clearing should occur outside of the bat active season (March 15th to September 15th) | No residual effect anticipated |
| | Loss of maternity roosting and foraging habitat | Low | Installation of eight bat boxes (two per post) in appropriate areas near retained vegetation and habitat features | Minor loss of suitable maternity roost and foraging habitat (non-limiting) |

| Natural Heritage Feature/Function | Summary of Potential Impacts | Constraint to Development | Summary of Proposed Mitigation | Residual Effect |
|---|---|---|---|---|
| **Species of Conservation Concern** | Disturbance to or removal of SCC habitat | Low | Landscaping should consider use of native wildflowers such as Milkweed to compensate for loss of potential foraging habitat for Milkweed. | Minor permanent loss of Monarch habitat |
| | Physical harm or displacement resulting from construction activities | Low | Vegetation clearing should be avoided during breeding bird period (April 1st – August 15st). Area should be pre-stressed prior to vegetation clearing. | No residual effect anticipated |
| **Species at Risk – Butternut** | Removal of Butternut trees (total amount undetermined) | Moderate | Consultation with MECP; may require compensation | Permanent loss of Butternut within Project footprint |
| **Trees** | Removal of at least 4 Distinctive or specimen trees | Low | None required | Permanent loss of distinctive trees |
| | Injury or harm to retained trees | Low | Implementation of tree protection measures such as protection fencing and pruning | No residual effect anticipated |
| **Wildlife (General)** | Physical harm or displacement resulting from construction activities | Low | Perimeter fencing should be installed around the site to prevent wildlife from entering the work area. Work area should be pre-stressed to allow wildlife to safely flee the area. Avoid vegetation clearing during sensitive times of the year. | No residual effect anticipated |
| | Loss of general natural habitat for wildlife | Low | None required | Minor loss of available habitat |
| | Disturbance to wildlife resulting from noise and construction activities | Low | Perimeter fencing should be installed around the site to prevent wildlife from entering the work area. Work area should be pre-stressed to allow wildlife to safely flee the area. | No residual effect anticipated |
| | Conflict between wildlife and humans | Low | Safety and awareness training provided to construction staff | No residual effect anticipated |
| **Cumulative Impacts** | General loss of biodiversity and available habitat | Low | Landscaping plans should consider use of appropriate native species | No residual effect anticipated |
| | Increase in impervious surfaces | Low | Promote the use of permeable landscaping materials and rain capture systems | Net increase in impermeable surfaces |

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# APPENDIX

# A SPECIES AT RISK SCREENING

| Scientific Name | Common Name | General Habitat According to the MNRF Significant Wildlife Habitat Technical Guide (MNRF, 2000) | Conservation Status | | | Source[3] | Potential for habitat within Study Area (based on screening) | Rationale |
|---|---|---|---|---|---|---|---|---|
| | | | Federal (SARA, 2002) | Provincial (ESA, 2007) [1] | S-Rank[2] | | | |
| **Birds** | | | | | | | | |
| *Contopus virens* | Bank Swallow | Sand, clay, or gravel river banks or steep riverbank cliffs; lakeshore bluffs of easily crumbled sand or gravel; gravel pits. | THR | THR | S4B | OBBA | No | No cliffs or riverbanks present within Study Area. |
| *Hirundo rustica* | Barn Swallow | Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water. | THR | THR | S4B | OBBA | No | Suitable structures (storage containers) present on subject property, but no evidence of historical nests. |
| *Dolichonyx oryzivorus* | Bobolink | Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha. | THR | THR | S4B | OBBA | **Yes** | Mixed meadow communities within eastern half of Study Area may provide suitable conditions for this species.<br><br>**Species detected during field surveys.** |
| *Chaetura pelagica* | Chimney Swift | Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water. | THR | THR | S4B, S4N | OBBA | No | No structures or suitable chimneys identified during screening. |
| *Sturnella magna* | Eastern Meadowlark | Open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees; old orchards with adjacent, open grassy areas >10 ha in size. | THR | THR | S4B | OBBA | **Yes** | Mixed meadow communities within eastern half of Study Area may provide suitable conditions for this species.<br><br>**Species not observed during 2020 field surveys.** |
| *Contopus virens* | Eastern Wood-Pewee | Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks. | SC | SC | S4B | OBBA | **Yes** | Deciduous forest and hedgerow communities likely contain open understorey and clearing and provide suitable conditions for this species.<br><br>**Species detected during field surveys.** |
| *Ammodramus savannarum* | Grasshopper Sparrow | Well-drained grassland or prairie with low cover of grasses, taller weeds on sandy soil; hayfields or weedy fallow fields; uplands with ground vegetation of various densities; perches for singing; requires tracts of grassland > 10 ha | S4B | SC | SC | OBBA | No | Suitable patches of graminoid meadow are present, although contains high cover of grasses and tracts within Study Area are generally too small (<10 ha). |
| *Progne subis* | Purple Martin | Open, trees areas such as farmland, parks, yards, marshes; usually near large bodies of water; colonial; nests in tree cavities, cliff ledges; most common in nest boxes; requires open space for foraging; prefers trees >15 cm DBH. | --- | --- | S3, S4B | OBBA | **Yes** | Mature trees with cavities may be present in hedgerows and deciduous forests.<br><br>**Species not detected during field surveys.** |
| *Asio flammeus* | Short-eared Owl | Grasslands, open areas or meadows that are grassy or bushy; marshes, bogs or tundra; both diurnal and nocturnal habits; ground nester; destruction of wetlands by drainage for agriculture is an important factor in the decline of this species; home range 25 -125 ha; requires 75-100 ha of contiguous open habitat. | SC | SC | S2N, S4B | OBBA | **Yes** | Open grasslands and thicket communities on eastern side of Study Area may provide suitable conditions for Short-eared Owl.<br><br>**Species not detected during field surveys.** |
| *Hylocichla mustelina* | Wood Thrush | Carolinian and Great Lakes-St. Lawrence forest zones; undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges; must have some trees higher than 12 m. | THR | SC | S4B | OBBA | **Yes** | Large, mature deciduous forest with interior habitat present within the Study Area.<br><br>**Species detected during field surveys.** |
| **Herpetoza** | | | | | | | | |
| *Emydoidea blandingii* | Blanding's Turtle | Shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps, or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs; not readily observed. | THR | THR | S3 | ORAA | No | No suitable surface water features identified in screening; distant from suitable habitat. |

| Scientific Name | Common Name | General Habitat According to the MNRF Significant Wildlife Habitat Technical Guide (MNRF, 2000) | Conservation Status | | | Source[3] | Potential for habitat within Study Area (based on screening) | Rationale |
|---|---|---|---|---|---|---|---|---|
| | | | Federal (SARA, 2002) | Provincial (ESA, 2007) [1] | S-Rank[2] | | | |
| *Graptemys geographica* | Northern Map Turtle | Large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water; aquatic corridors (e.g. stream) are required for movement. | SC | SC | S3 | ORAA | No | No suitable surface water features identified in screening; distant from suitable habitat. |
| *Chelydra serpentina* | Snapping Turtle | Permanent, semi-permanent freshwater; marshes, swamps or bogs; rivers and streams with soft muddy banks or bottoms; often uses soft soil or clean dry sand on south-facing slopes for nest sites; may nest at some distance from water; often hibernate together in groups in mud under water; home range size ~28 ha. | SC | SC | S3 | ORAA, iNat | No | No suitable surface water features identified in screening; distant from suitable habitat. |
| **Lepidoptera** | | | | | | | | |
| *Danaus plexippus* | Monarch | The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest. Caterpillars eat exclusively milkweed and adults require the nectar of wildflowers to feed. | SC | SC | S2N, S4B | OBA | **Yes** | Milkweed likely occurs within meadow habitats throughout Study Area.<br><br>**Species detected during field surveys**. |
| **Mammals** | | | | | | | | |
| *Myotis leibii* | Eastern Small-footed Myotis | Roosts in caves, mine shafts, crevices or buildings that are in or near woodland; hibernates in cold dry caves or mines; maternity colonies in caves or buildings; hunts in forests. | --- | END | S2S3 | AMO | **Yes** | Deciduous woodlands may provide foraging habitat; residential homes and structures may provide roosting habitat.<br><br>**Species not observed during field surveys.** |
| *Myotis lucifugus* | Little Brown Myotis | Uses caves, quarries, tunnels, hollow trees or buildings for roosting; winters in humid caves; maternity sites in dark warm areas such as attics and barns; feeds primarily in wetlands, forest edges. | END | END | S3 | AMO | **Yes** | Deciduous woodlands communities may provide foraging habitats; forest communities and residential homes may provide roosting habitat.<br><br>**Species not observed during field surveys.** |
| *Myotis septentrionalis* | Northern Myotis | Hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, man-made structures but prefers hollow trees or under loose bark; hunts within forests, below canopy. | END | END | S3 | AMO | **Yes** | Deciduous woodlands may provide roosting and foraging habitats; residential homes may provide roosting habitat.<br><br>**Species not observed during field surveys.** |
| *Perimyotis subflavus* | Tri-colored Bat | Found in a variety of forested habitats during summer, forms day roosts and maternity colonies in older forest and occasionally in barns or other structures; forage over water and along forested streams; hibernates in a cave or underground structure and roost individually. | END | END | S3? | AMO | **Yes** | Deciduous woodlands may provide roosting and foraging habitats; residential homes may provide roosting habitat.<br><br>**Species not observed during field surveys.** |
| **Vegetation** | | | | | | | | |
| *Juglans cinerea* | Butternut | Grows alone or in small groups in deciduous forests; prefers moist, well-drained soil and is often found along streams, also occurs on well-drained gravel sites and rarely on dry rocky soil; does not grow well in shade and will often grow in sunny openings and near forest edges. | END | END | S3 | NHIC | **Yes** | Hedgerows and deciduous forests may contain suitable conditions.<br><br>**Species recorded during field surveys.** |

*[1]END = Endangered, THR = Threatened, SC = Special Concern, NAR = Not at Risk [2]S-Rank is an indicator of commonness in the Province of Ontario. A scale between 1 and 5, with 5 being very common and 1 being the least common. [3]Information sources include: NHIC = Natural Heritage Information Centre; OBBA = Ontario Breeding Bird Atlas; ORAA = Ontario Reptile and Amphibian Atlas; OBA = Ontario Butterfly Atlas; AMO = Atlas of the Mammals of Ontario; City of Ottawa: MacPherson, 2018; --- denotes no information or not applicable.*

# APPENDIX

# B CURRICULUM VITAE

# ALEXANDER ZELLER, M.Sc.

*Senior Ecologist, Environment*

## Areas of practice

*Environmental Impact Assessments*

*Environmental Policy and Approvals*

*Environmental Assessments*

*SAR Surveys and Permitting*

*Terrestrial and Aquatic Surveys*

*Spatial Ecology & GIS*

*Public Consultation*

*Indigenous Knowledge Consultation*

## Languages

*English*

## PROFILE

Alexander is a Project Manager and Senior Ecologist with over seventeen years of professional experience in terrestrial and aquatic ecology, open space planning, and natural heritage authorizations. Alex has led and managed many challenging natural heritage projects throughout eastern Ontario and across Canada, including; land development projects, regional planning studies, environmental monitoring programs, environmental assessments, indigenous knowledge studies, and renewable energy authorizations. His broad knowledge of ecology, environmental policy, and agency consultation has proved a successful complement to multi-disciplined and large-scale environmental planning projects.

## EDUCATION

| | |
|---|---|
| Masters of Science in Biology, Lakehead University | 2007 |
| Honours Bachelor Environmental Science, Lakehead University | 2003 |

## PROFESSIONAL DEVELOPMENT

| | |
|---|---|
| Supervisor/Management Training (University of Ottawa) | 2019 |
| Expert Witness Training (Gowlings, Toronto) | 2015 |
| Ecological Land Classification Certification (MNR) | 2010 |

## CAREER

| | |
|---|---|
| Senior Ecologist, Environment, WSP (Ottawa, ON) | 2018 – Present |
| Associate, Dillon Consulting Limited (Ottawa, ON) | 2013 – 2018 |
| Ecologist, Dillon Consulting Limited (Ottawa, ON) | 2006 – 2013 |
| Research Technician - Contract Positions, Ontario Ministry of Natural Resources and Forestry (Thunder Bay, ON) | 2001 – 2006 |
| Teaching Assistant – Geography and Biology Departments, Lakehead University (Thunder Bay, ON) | 2003 – 2005 |

## PROFESSIONAL EXPERIENCE

### INFRASTRUCTURE

- Energy Services Acquisition Program, PSPC (2019 – Now): Lead Project Ecologist responsible for overseeing all ecological studies, reporting requirements, agency consultation, and associated permitting and authorizations required to facilitate the design and construction of 14 kilometers of district heating/cooling pipeline and associated plants.
- Centre Block Rehabilitation Project, PSPC (2018 - now): Lead Project Ecologist responsible for; all ecological studies, development and management mitigation and compensation measures, reporting requirements, and agency consultation required to facilitate the Centre Block Rehabilitation project, on Parliament Hill in Ottawa.

- Confederation Line Extension light rail, City of Ottawa (2019 – now): Lead Ecologist responsible for the implementing the established management recommendations and facilitating the outstanding permitting requirements to accommodate detail design phase of the project.
- West Transitway Extension, Phase 11 – Stillwater Creek, City of Ottawa (2018): Project manager and lead ecologist for the post-construction monitoring for the realignment of Stillwater Creek required to accommodate the West Transitway Extension. This project included; a species at risk screening, amphibian breeding surveys, breeding bird surveys, vegetation community inventories, fish community sampling, aquatic habitat assessment, water quality parameters, fluvial geomorphology studies.
- Riverview to Overbrook: transmission line upgrade, Hydro One (2016): Lead Ecologist for an Class Environmental Assessment in support of a transmission line upgrade between Overbrook and Riverview facilities in Ottawa. Alexander was responsible for coordinating and undertaking field surveys, participating in public consultation, reporting writing, impact assessment, and developing mitigation and avoidance measures.
- Innes Road Reinforcement Pipeline Project: Environmental Monitoring and Environmental Awareness Training, Enbridge Gas Distribution Inc. (2014-2016): Project manager and lead biologist for the Environmental monitoring and environmental awareness in support of the 2.8 km pipeline installation along Innes Road in Ottawa. This installation included 580m of horizontal directional drilling of NPS12 steel pipe under Highway 417. The project included the development and delivery of a bespoke environmental awareness training program and the on-going environmental monitoring during construction.
- Innes Road Reinforcement Pipeline Project: Environmental Assessment, Enbridge Gas Distribution Inc. (2014): Lead biologist for the class environmental assessment for the 2.8 km Enbridge Gas Distribution pipeline installation along Innes Road in Ottawa. Alexander was responsible for coordinating and undertaking biophysical field surveys, reporting writing, impact assessment, and developing mitigation and avoidance measures.
- Ottawa West Reinforcement Pipeline Environmental Assessment, Enbridge Gas Distribution Inc. (2011-2013): The local biologist for a multidisciplinary team of biologists, planners and engineers working on environmental and cumulative effects assessment for the installation of 20 km of 24-inch natural gas pipeline in Western Ottawa. Took over project management role for the construction phase of the project. This phase included the more detailed biophysical surveys to support environmental authorizations, pre- and post-construction water well monitoring, and development of a detailed mitigation strategy. These mitigation measures included; physical mitigation measures, environmental awareness training, daily on-site environmental monitoring, environmental compensation; and an assessment of agricultural crop loss and associated compensation.
- GTA Reinforcement Pipeline Environmental Assessment, Enbridge Gas Distribution Inc. (2011): Acting as both an ecologist and spatial analyst for a multidisciplinary team of biologists, planners, and engineers working on an environmental and cumulative effects assessment for the pipeline reinforcement in the Greater Toronto Area. Responsibilities include managing a majority of the GIS mapping pertaining to the three large study areas, conducting terrestrial biology surveys, and liaising with the client when required.

- Infrastructure Master Plan, Town of Perth (2009-2010): Completed the ecological assessment and natural heritage inventory for an infrastructure master plan in the Town of Perth. This study involved a full vegetation survey of the study area, identification of soils, observations of wildlife and detailed mapping of the existing ecosystems within the study area. Additional responsibilities included maintaining the GIS library, consulting with stakeholders and producing GIS figures for report.
- Truck Inspection Station Assessment, Ministry of Transportation, Ontario (2008): Completed the ecological assessment and resource inventories for nine different truck inspection stations throughout northern Ontario. This study involved a full vegetation survey of the study areas, identification of soils, observations of wildlife, detailed mapping of the existing ecosystems within the study areas and publishing all mapping for reports. Additional responsibilities included maintaining the GIS library, consulting with stakeholders and producing GIS figures for report.

*LAND DEVELOPMENT*

- 760 River Road, Claridge Homes Group of Companies (2019); Project manager and lead ecologist for the environmental impact statement and an Environmental Impact Statement and Tree Conservation Study for a development in south Ottawa. This study was completed in support of plan of subdivision for a residential development.
- 323 Jockvaile Road, Minto Communities (2018); Project manager and lead ecologist for the environmental impact statement and tree conservation report for a proposed residential development in the Barhaven Community. These reports were completed following the City of Ottawa guidelines.
- Riverview Lane, Urbandale Construction (2018 to mow): Project manager and lead ecologist for natural heritage approvals associated with a residential subdivision in Kemptville, Ontario. Scope of work included SAR authorizations, Fisheries authorizations, wetland design and restoration plans; watercourse and fish habitat design and plans, and general agency consultation.
- SAR Permit Implementation and Monitoring, KNL Developments (2017 to now): Project manager and lead biologist for the management and implementation of one of the most complex Species at Risk (SAR) permits issued in Ontario. Responsible for; establishing habitat creation plans, negotiating revisions to permit, coordination of environmental monitoring and species surveys, fisheries authorizations, design of habitat compensation features, consultation with relevant agencies and stakeholders, and all associated reporting and documentation.
- 800 Eagleson Road EIS and TCR, Ironclad Developments (2018): Project manager and lead ecologist responsible for completing an Environmental Impact Statement and Tree Conservation Study for a development in west Ottawa. The proposed project will consist of a six-story rental apartment building with approximately 150 units with access from Eagleson Road.
- Barrhaven South Community Design Plan, Minto (2015-2017): Project manager and lead biologist on the multi-disciplined consulting team undertaking the Barrhaven South Community Design Plan. Responsible for managing the natural heritage related studies, reports, and public consultation contributions. Also responsible for consulting with stakeholders to ensure the community design plan meets their expectations and requirements.
- Phase 12, 14, 15, and 16; Environmental Impact Statement, Riverside South Development Corporation (2014-2017): Project manager and lead biologist for a series of Environmental Impact Statements and Tree Conservation Studies for a

several primarily residential developments in southern Ottawa. Terrestrial and aquatic environments were evaluated and impacts assessed for each development. Mitigation measures and management recommendations were developed to address the identified environmental impacts associated with the proposed development.

- McArthur Island Developments, Carleton Place, ON (2015-now): Project manager and lead biologist for the natural heritage compliance requirements supporting a multi-phase residential/retirement complex located on McArthur Island within the Mississippi River. This project will include the redevelopment of an historic woollen mill and the construction of several other multi-story buildings. The scope of environmental services provided included Environmental Impact Studies and associated field surveys, arborist reports, specific wildlife surveys, and environmental compensation design.
- Clark Lands Development, Environmental Impact Statement, Minto (2013-2017): Project manager and lead biologist for an Environmental Impact Statement and Tree Conservation Study for a development in west Ottawa. This study was completed in support of plan of subdivision for a residential development.
- Potter's Key Development, Environmental Impact Statement, Minto (2013 to now): Project manager and lead biologist for an Environmental Impact Statement, Tree Conservation Report, Species at Risk Permitting, Fisheries approvals, and on-going environmental monitoring for a development in Stittsville, Ontario (City of Ottawa). The study was completed as part of an application for residential development.
- Fernbank Lands Development Environmental Impact Statement, Richcraft (2013 - 2017): Project manager and lead biologist for an Environmental Impact Statement, Tree conservation Report, and Species at Risk Permitting for a development in Stittsville, Ontario (City of Ottawa). The study was completed as part of an application for residential development.
- Environmental Screening Study, Walton Developments (2012-2014): Project manager and terrestrial ecologist for a natural heritage screening study for Walton Developments. The project is aimed at identifying any natural heritage constraints that may affect the ability to develop a number of properties in southwest Ottawa. Responsibilities include project management, reporting, terrestrial field surveys, avian surveys and GIS mapping.
- Scoped Environmental Impact Statement, City of Ottawa (2011): Project manager for a scoped environmental impact statement. The project was scoped to specifically address the concern for the impact of a rural residential development in south Ottawa on Species at Risk. Responsibilities include managing budget, invoicing, field survey, report writing and communicating with the client.
- Chapman Mills Environmental Impact Statement Addendum, Minto (2011): Project manager for an addendum to an environmental impact statement assessing the impact of a residential development on trees and local hydrology within a small woodlot south of Ottawa. Responsibilities included managing budget, invoicing, field survey, report writing and communicating with the client.

### *NATURAL RESOURCES STUDIES*

- Kizell Wetland Trail - SAR Authorizations, City of Ottawa (2019): Project manager and lead ecologist for the Species at Risk authorizations required for the construction of a Pedestrian trail network within the conservation forest around the Kizell wetland in Kanata, ON.

- Goulbourn Wetland Re-delineation, City of Ottawa (2015-2016): Project manager for the re-delineation of the Goulbourn Provincially Significant Wetland, located in west Ottawa. The objective of this project was to undertake a boundary re-delineation of the provincially significant wetland (PSW) known as the Goulbourn Wetland Complex. Alexander was responsible for ensuring the quality of the re-delineation and associated report, consulting with land owners, and reviewing the approach and findings with the city and the Ontario Ministry of Natural resources.
- Feedmill Creek Species at Risk Screening, City of Ottawa (2017): Project manager and lead ecologist for a species at risk screening of Feedmill Creek in support of the proposed restoration efforts. Specific surveys included; bat habitat surveys, Blanding's turtle basking surveys, butternut Screening, and other incidental observations.
- Ecological Land Classification, National Capital Commission (NCC) (2015): Project manager and lead Biologist for project to map all the ecotypes within the NCC's urban and greenbelt lands. Ecological mapping was done using Ontario Ecological Land Classification and covers an area of approximately 62 km2. The mapping will be used to for various future ecological landscape management projects.
- Species at Risk Survey, Defence Construction Canada (DCC) – CFB Shilo Range Training Area (2014): GIS analyst and Biologist responsible for the species at risk habitat suitability modelling used in the Environmental Assessment Report. This modelling was used to establish the potential threats to SAR across the base and in turn recommend best management practices for training in SAR habitat.
- 2014 Species at Risk Screening, City of Ottawa (2014): Project manager and lead biologist for a Species at Risk screening study for the City of Ottawa's Infrastructure Branch. The objective of this study was to identify the potential threat various planned infrastructure projects had to Species at Risk. In total 489 projects were evaluated over the course of the project. A new risk assessment approach and a series of management tools were developed to aid City project managers. Many of these tools continue to be used by the city for subsequent SAR Screenings. These tools included; standardized risk categories, a suite of standardized mitigation recommendations, a GIS database of the screening results, a document summarizing and illustrating the Species at Risk that may be found within the city, and a SAR screening process flowchart to assist City project managers.
- Natural Heritage Study, County of Frontenac (2011-2012): Lead landscape ecologist for the County of Frontenac's Natural Heritage Study. This study will form the major piece of the county's Official Plan (OP) and will provide policy and zoning recommendations for future OP schedules. Marxan and corridor design modelling was done to assist in the development of ecologically sound natural heritage zoning. Responsibilities include public consultation, managing the GIS and spatial analysis, assisting with policy development, and managing GIS modelling.
- Rideau Canal Landscape Strategy, Parks Canada (2012): Lead ecologist for the Rideau Canal Landscape Strategy study being conducted to characterize the landscape and develop policy recommendations along the Rideau Canal in support on the UNESCO World Heritage Status. Personal responsibilities include public consultation, ecological characterization and recommendations, GIS mapping, field survey, report writing and communicating with the client.
- Birds Creek Secondary Plan, Municipality of Hastings Highlands (2011-2012): Working with the Municipality of Hastings Highlands to produce/develop a secondary plan for the community of Birds Creek, north of Bancroft. The plan will

promote a healthy living philosophy and promote sustainable development practices. Responsibilities include consultation with public and client, assessing the existing natural resources, assisting in incorporating natural heritage features into the plan and developing GIS mapping for study area.

- Solar Farm Site Assessment, SkyPower (2010): Assisting with the environmental impact evaluation of proposed solar farms as part of an environmental assessment for renewable energies. Duties included conducting and writing records review report, amphibian survey, Ecological Land Classification and general ecological field surveys.
- Regional Ecology Planning Framework, Regional Municipality of Wood Buffalo (RMWB) (2008): Working with RMWB to develop an ecological planning framework that will aid the municipality in balancing development pressures with municipal-specific environmental conservation goals. Responsible for developing the GIS-based ecological planning model and decision support tools created specifically for the municipality.
- Terry Fox Drive Environmental Construction Monitoring, City of Ottawa (2010-2012): Assisted with the on-going environmental monitoring of the Terry Fox Drive road construction project, to ensure compliance of environmental mitigation. Duties included water quality monitoring, sediment and erosion control recommendations, wildlife observations, species at risk monitoring and environmental awareness training.
- Terry Fox Drive Environmental Assessment, City of Ottawa (2007 – 2010): Completed the assessment of natural features along the future Terry Fox Drive corridor in west Ottawa. This included the electrofishing of aquatic habitat, salamander survey and general ecological observations. In addition to the field assessments, also coordinated the GIS analysis and map production for various environmental assessment reports.
- Yellowknife Smart Growth Plan: Ecological Preservation Study, City of Yellowknife (2007-2010): Working with a team of planners to advance Yellowknife's existing Ecological Resource Inventory which will allow for greater public engagement on the quality of life impacts of 40 natural sites. Personal duties include GPS data collection, GIS mapping, Remote Sensing Landcover Classification, and consultation with public and other stakeholders.
- Satellite Image Classification, Tsuu T'ina First Nation (2007): Conducted a satellite image classification to update outdated vegetation mapping. Landsat-7 TM data was classified using IDRISI Andes software. Training areas were delineated to represent the various vegetation communities in the image, and a maximum likelihood classification method was used to classify the image. The results of the image classification proved to be excellent and corresponded to ground-truth landcover classes very well.
- Tlicho Land Use Plan, Tlicho Government (2006-2009): Lead Ecologist for the Tlicho Land Use Plan in the Northwest Territories. Personal responsibilities include the development of the GIS database and spatial model within the GIS to aid in the production of the final land use plan. This model incorporates traditional indigenous knowledge and ecological features with economic and social influences to identify suitable land use zones. The emphasis of the Tlicho Land Use Plan is on mitigating the cumulative effects of development on the natural and social environment while still promoting sustainable economic development.

- Mathews Lake Habitat Restoration, Public Works Government Services Canada (2008): Assisted with the 2008 post-construction monitoring of the fish habitat enhancement in the Mathews Lake watershead in the Northwest Territories. This rehabilitation work was done to improve the fish habitat in the immediate vicinity of Salmita Mine and Tundra Mine. Duties included seine netting and fish identification, construction of new fish habitat structures, benthos and water quality assessments.
- Aquatic Habitat Assessment, Canadian Pacific Rail (2007): Assisting in aquatic habitat assessment for a water crossing along the CPR tracks in Peterborough, Ontario. The objective of the study is to improve habitat for native brook trout and other resident fish by providing in-stream habitat in the vicinity of the crossing.
- Westside Creek and Marsh Reconfiguration, St Mary's Cement (2006): Developed a GIS database to incorporate the annual environmental monitoring data for the reconfiguration of Westside Creek and Marsh. Produced a landcover classification from satellite imagery to assess the vegetation change within the marsh and the surrounding area.

## *OTHER RELEVANT EXPERIENCE*

- Masters of Biology thesis examined understory forest regeneration after wildfire in the boreal forest of northwestern Ontario. The thesis utilized GIS and remote sensing to model landscape characteristics related to species regeneration in the boreal forest.
- Undergraduate thesis utilized GIS to examine the impact of intensive harvesting on littoral deposition rates. A soil erosion model of an intensively harvested watershed was produced in GIS. The results from this model were correlated to measure deposition around the small inland lakes within the watershed.

## *PUBLICATIONS*

- Zeller,A., N.Stow, S.Young, S.Boudreau, B.Aird. 2019. Connectivity for Landscape (Re)Generation. Presentation and Panel discussion at the Canadian Institute of Planners (CIP) Annual Conference, July 2019. Ottawa, Ontario
- Gleeson, J., A.Zeller and J.W. McLaughlin. 2006. Peat as a Fuel Source in Ontario: A Preliminary Literature Review, Ontario Forest Research Institute, Forest Research Information Paper 161, Sault Ste. Marie, Ontario.
- Zeller, A.J. 2005. Using landscape indices to model environmental gradients within the Mixedwood Boreal Forests of northwestern Ontario, Canada. Poster Presentation at Ontario Ecology and Ethology Colloquium, 2005. Ottawa, Ontario

# CODY PYTLAK, B.A., PG(ER)

*Ecologist, Environment*

## Areas of practice

*Environmental Impact Assessment*

*Avian Surveys and Monitoring*

*Species at Risk Surveys*

*Terrestrial and Aquatic Surveys*

*Environmental Restoration*

*Geographic Information Systems*

*Spatial Analysis*

*Research and Communications*

## Languages

*English*

## PROFILE

Cody Pytlak, B.A., is an ecologist with five years of experience in the environmental sector and has developed a specialization in ornithology. Within the National Capital Region, Cody has performed wildlife surveys and habitat assessments for breeding birds, marsh birds, amphibians, reptiles, and mammals, as well as targeted Species at Risk surveys such as Bobolink, Eastern Meadowlark, Least Bittern, Barn Swallow, and Blanding's Turtle. He also has experience in evaluating Significant Wildlife Habitat and natural heritage features. Cody has led and contributed to tree inventories, aquatic habitat assessments and fish sampling, as well as construction monitoring. In addition to his field skills, Cody has experience producing Environmental Impact Statements and Tree Conservation Reports, habitat restoration plans as well as environmental management and monitoring plans.

He holds graduate certificates from Niagara College in Ecosystem Restoration and Geographic Information Systems: Geospatial Management, and a Bachelor of Arts degree in Journalism from Wilfrid Laurier University.

In addition to his experience with WSP, Cody has helped lead and participate in several provincial monitoring projects across Canada. This includes assessing wetland bird populations in Atlantic Canada and conducting biodiversity surveys in Alberta. He has used his GIS knowledge to perform suitability analysis for vegetation restoration opportunities and to develop interactive web applications for both data collection and presentation. He has also assisted in researching and delivering recommendations for environmental, agricultural, and land-use policies for the Ontario Greenbelt.

## EDUCATION

| | |
|---|---|
| Geographic Information Systems: Geospatial Management Graduate Certificate, Niagara College | 2018 |
| Ecosystem Restoration Graduate Certificate, Niagara College | 2014 |
| Bachelor of Arts - Journalism, Wilfrid Laurier University | 2011 |

## CAREER

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|---|---|
| Ecologist, Environment, WSP | 2018 – Present |
| Marsh Monitoring Technician, Bird Studies Canada | 2016, 2017 |
| Communications Assistant, The Friends of the Greenbelt Foundation | 2015 |
| Field Technologist, Alberta Biodiversity Monitoring Institute | 2014 |

## PROFESSIONAL EXPERIENCE

### *Land Development*

- Claridge Homes
  - 3252 Navan Road, Navan, Ontario, Canada (2019 to present): Technical ecology lead for an Environmental Impact Statement and Tree Conservation Report for a proposed residential development. Reviewed background resources completed tree inventories and wildlife surveys, and evaluated potential constraints and impacts. Developed mitigation recommendations and produced associated reporting and GIS mapping.

  - 1054 Hunt Club Road Retirement Residence, Ottawa, Ontario, Canada (2019): Project lead for carrying out bird nesting surveys to ensure project construction compliance with Migratory Birds Convention Act (1994) and providing mitigation recommendations to limit disturbance to nearby wildlife.
- 530 Tremblay Road, Ottawa, Ontario, Canada (2019): Ecologist for an Environmental Impact Statement for a proposed residential development located in Ottawa. Organized and completed initial field surveys for vegetation communities, wetlands, and Significant Wildlife Habitat. Identified preliminary natural heritage impacts, developed mitigation measures, and produced GIS mapping. Client: CLC Canada Lands Company.
- Lioness Development - Kemptville, Ontario, Canada (2019): Ecologist supporting the development of a wetland compensation plan. Reviewed background studies, identified compensation requirements and suitable habitat features, and produced associated reporting. Client: Lioness Developments Inc.
- Azur Health Spa, Orleans, Ontario, Canada (2019): Ecologist for an Environmental Impact Statement and Tree Conservation Report for a development located in Cumberland. Organized and carried out surveys for breeding birds and Species at Risk birds, amphibian surveys, and acoustic bat monitoring and habitat assessments. Identified and evaluated natural heritage impacts and proposed mitigation. Reports were produced following the City of Ottawa guidelines. Client: Azur Resort & Spa.
- Riverside South Phase 12, Ottawa, Ontario, Canada (2019): Lead field ecologist for an Environmental Impact Statement addendum for a residential development property in southern Ottawa. Surveys for Species at Risk (Bobolink, Blanding's Turtle) were completed and impacts were evaluated. Mitigation measures and management recommendations were developed to address the identified environmental impacts with the proposed development. Client: Riverside South Development Corporation.
- Minto Communities
  - Minto Harmony Mion Parcel, Ottawa, Ontario, Canada (2019): Ecologist for the Environmental Impact Statement and Tree Conservation Report for a proposed residential development in Barrhaven. Completed terrestrial and aquatic field surveys and assessed impacts based on anticipated project design. Proposed recommendations and mitigation to limit adverse impacts. Prepared technical report and figures for submission to client. Reports were completed following the City of Ottawa guidelines.
  - SAR Permit Implementation and Monitoring, Potter's Key Development, Stittsville, Ontario, Canada (2018 to Present): Ecologist for environmental monitoring required under a Species at Risk Overall Benefits Permit for Blanding's Turtle. Daily responsibilities include monitoring of mitigation measures, habitat enhancement monitoring, species surveys, environmental awareness training, species relocations, and associated reporting.
- SAR Permit Implementation and Monitoring, Ottawa, Ontario, Canada (2018 to Present): Ecologist responsible for the environmental monitoring required under a Species at Risk Overall Benefits Permit for Blanding's Turtle, Least Bittern, and Butternut. Daily responsibilities include monitoring of mitigation measures, habitat enhancement monitoring, species surveys, environmental awareness training, species relocations, and associated reporting. Client: KNL Developments.

- Environmental Impact Statement, 800 Eagleson Road Development, Kanata, Ontario, Canada (2018): Ecologist for an Environmental Impact Statement for a proposed development in Kanata. Responsible for conducting avian and amphibian field surveys, GIS mapping, and contributing to reporting. Client: Ironclad Developments Inc.
- EIS Addendum, Carleton Place, Ontario, Canada (2018): Ecologist assisting primarily with development of field data mapping and producing required reporting for the natural heritage compliance requirements supporting a multi-phase residential/retirement complex located on McArthur Island within the Mississippi River. Client: McArthur Island Developments.
- SAR Habitat Assessment, Kingston Provincial Campus, Kingston, Ontario, Canada (2018): Ecologist for a SAR habitat assessment for SAR Bats and Barn Swallow for Kingston Provincial Campus buildings. Responsibilities include field survey coordination, conducting habitat assessments and surveys for SAR, field data mapping, and report writing. Client: Colliers Project Leaders Inc.

*Transportation*

- National Road Ecology Guidelines, Ottawa, Ontario, Canada (2019 to Present): Ecologist for the development of national road ecology standards and guidelines. Responsible for literature review of case studies pertaining to wildlife passages, collision avoidance and mitigation, ice road maintenance, and roadside pollinator habitats. Client: Transportation Association of Canada.
- Highway 17 Culvert Replacements, Renfrew, Ontario, Canada (2019): Lead field biologist for terrestrial and aquatic habitat assessments surrounding 45 non-structural culverts along Highway 17. Assessments included documenting vegetation communities, identifying candidate Species at Risk habitat, and evaluating aquatic and fish habitat conditions. Client: Ontario Ministry of Transportation.

*Infrastructure*

- Ottawa Light Rail Transit Confederation Line Extension, Ontario, Canada (2019 to Present): Ecologist for City of Ottawa's LRT Confederation Line extension. Produced tree inventories, carried out migratory bird nest searches, assisted with tree protection implementation, and contributed to Environmental Impact Statements. Client: City of Ottawa in Public-Private Partnership.
- Public Services and Procurement Canada
  - Energy Services Acquisitions Program/Energy Services Modernization Project, Ottawa, Ontario, Canada (2018 to Present): Led background screening searches and reporting for Species at Risk and natural heritage features and produced natural heritage inventory mapping.
  - Centre Block Rehabilitation, Ottawa, Ontario, Canada (2018) Performed ecological surveys for wildlife and vegetation, and Species-at-Risk habitat assessments at Centre Block and surrounding area. Assisted with field survey coordination, report writing, environmental awareness training, construction monitoring, and mitigation implementation
- Hydro One HPFF Cable Replacement, Ottawa, Ontario, Canada (2019): Ecologist for existing conditions and arborist reports for the replacement of underground cables in the Lincoln Fields area. Field assessments include documenting vegetation communities, inventorying trees, and identifying Species at Risk habitat and other natural heritage feature constraints. Client: Hydro One Networks Inc.

- Sir John A. Macdonald Parkway Ramp-E Replacement, Ottawa, Ontario, Canada (2019): Ecologist for ecological assessment and environmental approvals required for the replacement of a bridge on the Sir John A. Macdonald Parkway. Responsible for coordinating field surveys, conducting field surveys for SAR (Butternut, Barn Swallow, Snapping Turtle, and Eastern Milksnake) and natural heritage features, organizing digital field data collection tools and methods, GIS mapping, and report writing. Client: National Capital Commission.
- West Transitway Extension – Phases I & II, Ottawa, Ontario, Canada (2018 to Present): Ecologist for post-construction monitoring of the Stillwater Creek realignment required for the West Transitway Extension project. Responsible for conducting avian and amphibian surveys, ELC and vegetation transect surveys, aquatic habitat monitoring, field scheduling, producing annual monitoring reports, and associated mapping. Client: City of Ottawa.

*Natural Resources Studies*

- Kizell Wetland Trail - SAR Authorizations, Ottawa, Ontario, Canada (2019): Ecologist for the Species at Risk authorizations required for the construction of a pedestrian trail network within the conservation forest around the Kizell wetland in Kanata. Responsibilities include spatial analysis of Species at Risk habitats and the proposed trail network. Client: City of Ottawa.
- Guelph Christmas Bird Count: Interactive Web Map, Niagara-on-the-Lake, Ontario, Canada (2018): Project manager for a professional development project with Niagara College and Environment Canada. The project was aimed at developing an interactive web application to allow users to access and view historical Christmas Bird Count data from the Guelph region. Responsibilities included proposal development, budget and schedule management, client meetings, data collection and management, the development of the web application, and report writing. Client: Canadian Wildlife Service.
- Maritimes Marsh Monitoring Program, Sackville, New Brunswick, Canada (2016, 2017): Served as a field technician for the Maritimes Marsh Monitoring Program. This program is used to track and monitor the status and health of wetland birds and wetland habitat in Atlantic Canada. Led avian field surveys in freshwater and saltwater wetlands, deployed automatic recording units, conducted habitat assessments, and reported data and findings to the program manager. Client: Bird Studies Canada.
- Alberta Biodiversity Monitoring Program, Grande Prairie, Alberta, Canada (2014): Served as a field technologist for completing biodiversity surveys in boreal and prairie ecosystems in northern and central Alberta. Client: Alberta Biodiversity Monitoring Institute.

# ANDREA ORR, B.Sc.

*Terrestrial Ecologist, Environment - Ecology*

**Areas of practice**

*Forest and Plant Ecology*

*Ornithology*

*Wetland Evaluation*

*Wildlife Habitat Assessment*

*Species at Risk legislation*

## PROFILE

Andrea Orr is a Terrestrial Ecologist who has gained experience and knowledge of ecosystem monitoring techniques and natural heritage field investigations for multiple projects across a variety of development sectors including; transportation, renewable energy, and oil/gas.

As Terrestrial Lead for many projects, Andrea is adept with the ecological components necessary to complete Class Environmental Assessments, Environmental Impact Statements, and Renewable Energy Approvals. She has demonstrated knowledge and experience of federal and provincial acts: *Species at Risk Act*, *Endangered Species Act*, and *Migratory Bird Convention Act*.

Andrea specializes in forest and plant ecology, ornithology, and wildlife habitat assessments. Andrea is certified in the Ontario Ministry of Natural Resources and Forestry (MNRF) Ecological Land Classification (ELC), Ontario Wetland Evaluation System (OWES) and is a certified Butternut Health Assessor (BHA). Her experience ranges from conducting various forestry practices; botanical inventories; soil analysis; entomological surveys; bat habitat assessments and acoustic monitoring; migratory and avian surveys; as well as various Species at Risk (SAR) target surveys and permitting applications.

## EDUCATION

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| Biology and Environmental Studies, B.Sc., Trent University | 2008 |
| Forestry Technician, Diploma, Sir Sandford Fleming College | 2003 |

## PROFESSIONAL DEVELOPMENT

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| CPR and First Aid, St. John Ambulance | 2019 |
| Butternut Health Assessor, Ministry of the Environment, Conservation and Parks | 2019 |
| Ontario Wetland Evaluation System, Ministry of Natural Resources and Forestry | 2018 |
| Ecological Land Classification, Ministry of Natural Resources and Forestry | 2012 |

## PROFESSIONAL ASSOCIATIONS

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|---|---|
| Mississippi Valley Field Naturalists | MVFN |
| Field Botanists of Ontario | FBO |
| Ontario Field Ornithologists | OFO |

## CAREER

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|---|---|
| Terrestrial Ecologist, Environment - Ecology, WSP | 2019 – Present |
| Senior Environmental Scientist, Planning, Parsons Corporation, Ottawa, Ontario, Canada | 2017 – 2019 |

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| Terrestrial Ecologist, Ecology, Stantec Inc., Stoney Creek, Ontario, Canada | 2012 - 2017 |
| Natural Areas Inventory Assistant. Credit Valley Conservation, Mississauga, Ontario, Canada | 2011 - 2012 |
| Biologist, Renewable Energy, M.K. Ince and Associates Ltd., Dundas, Ontario, Canada | 2008 - 2009 |

## *PROFESSIONAL EXPERIENCE*

### *Renewable Energy*

- Energy Services Modernization Project: Energy Services Acquisition Program, Ottawa, Ontario, Canada (2019): Terrestrial Ecology Lead. Coordinated and scheduled natural heritage field program, which included Ecological Land Classification (ELC), tree inventory, wildlife habitat assessment, breeding bird survey, amphibian breeding survey. Author to the Natural Environment Existing Conditions and Impact Assessment Report that included data analysis and interpretation. Liaised with government agencies on a municipal, provincial, and federal level. Also coordinated and executed permitting applications related to Species at Risk. Client: Public Services and Procurement Canada.
- Port Dover and Nanticoke Wind Project, Haldimand and Norfolk County, Ontario, Canada (2015): Terrestrial Ecologist. Conducted post-construction monitoring of tundra swan migration, amphibian call counts, Bald Eagle (SAR) nest monitoring, and mortality monitoring at turbines (i.e. searcher efficiency trials). Client: Capital Power Corporation.
- Amherst Island Wind Energy Project, Lennox and Addington County, Ontario, Canada (2014): Terrestrial Ecologist. Conducted pre-construction field investigations as part of the Natural Heritage Assessment process. Corresponding field surveys included; weekly winter raptor searches that consisted of driving surveys with point counts, walking surveys with transects to detect Short-eared Owl roosts, and dusk surveys to target active Short-eared Owls. Client: Algonquin Power/Windlectric.
- Boralex
  - Port Ryerse Wind Farm, Haldimand and Norfolk County, Ontario, Canada (2014): Terrestrial Ecologist. Conducted pre-construction field investigations as part of the Natural Heritage Assessment process. Corresponding field surveys included; Bald Eagle (SAR) nest monitoring throughout the breeding and brood rearing process.
  - Niagara Region Wind Corporation, Niagara Region and Haldimand County, Ontario, Canada (2013): Terrestrial Ecologist. Conducted pre-construction field investigations as part of the Natural Heritage Assessment process. Corresponding field surveys included, snake hibernacula observations and Species at Risk identification, bat maternity colony assessments, landbird fall migration surveys, and turtle overwintering habitat assessment for Species at Risk.
- Grand Valley Wind Project, Phase 3, Dufferin County, Ontario, Canada (2013): Terrestrial Ecologist. Conducted and coordinated various aspects of the Natural Heritage Assessment process. Including field program coordination, data analysis and contributing author to the Natural Heritage Assessment/Environmental Impact

Study report. Author to the Evaluation of Significance Addendum report. Field surveys included; ELC and mapping, significant wildlife habitat assessment, waterfowl migration and nesting, Species at Risk Butler's Gartersnake cover-board surveys, Species at Risk Bobolink and Eastern Meadowlark breeding bird surveys, and bat maternity colony surveys. Aboriginal consultation and relations with Saugeen-Ojibway Nation was also provided during site-walk visit. Client: Veresen Inc.

- Napier Wind Project, Middlesex County, Ontario, Canada (2012): Terrestrial Ecologist. Agency liaison with MNR included provision of comments regarding Species at Risk report, with focus on wildlife biology and habitat assessment. Client: wpd Canada Corporation.
- Grand Renewable Energy Park, Haldimand County, Ontario, Canada (2012): Terrestrial Ecologist. Managed and conducted terrestrial field surveys which included wetland delineation and mapping, and spring/fall landbird migration surveys. Author to the subsequent Pre-Construction Monitoring Bird Report, which included field data analysis and interpretation. In 2014, participated in environmental monitoring and bird nest sweeps during construction. Client: Samsung Renewable Energy.

*Transportation*

- Confederation Line Extension Light Rail Transit Project, Ottawa, Ontario, Canada (2019): Terrestrial Ecologist. This second phase is to extend the 26-km light rail service under construction from Tunney's Pasture Station to two terminal stations, Moodie and Baseline on two different branches in the West, and Blair Station to a new station, Trim Terminal in the East. Conducted tree inventory, bird nest searches and bat acoustic monitoring while provided subsequent memos of survey results and mitigation measures. Client: City of Ottawa in Public-Private Partnership.
- City of Ottawa
  - Barrhaven Light Rail Transit and Rail Grade-Separations Environmental Assessment, Ottawa, Ontario, Canada (2019): Senior Environmental Scientist. Coordinated and performed field investigations of ELC and breeding bird surveys. Author to the Natural Environment Existing Conditions Report. Analyzed and incorporated field data into the above report, while providing an assessment for potential impacts to Species at Risk and mitigation measures.
  - Leitrim Road Realignment and Widening Environmental Assessment, Ottawa, Ontario, Canada (2018): Senior Environmental Scientist. Contributing author to the Natural Sciences Existing Conditions Report. Provided an assessment of significant wildlife habitat based on previous field studies.
  - Kanata Light Rail Transit Environmental Assessment, Ottawa, Ontario, Canada (2018): Senior Environmental Scientist. Coordinated and performed field investigations of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification, analysis of habitat suitability and mitigation measures. Contributing author to the Natural Environment Existing Conditions Report. Analyzed and incorporated field data into the above report, while providing an assessment for potential impacts to Species at Risk and mitigation measures.
  - Baseline Road Bus Rapid Transit Corridor, Ottawa, Ontario, Canada (2017): Senior Environmental Scientist. Coordinated and performed field investigations

for Species at Risk screening, which included identification, analysis of habitat suitability and mitigation measures. Co-author to the Natural Environment Overview Report. Analyzed and incorporated field data into the above report, while providing an assessment for potential impacts to Species at Risk and mitigation measures.

  - Slater/Albert/Bronson Street Renewals, Ottawa, Ontario, Canada (2017): Senior Environmental Scientist. Performed field investigations of ELC and mapping, tree inventory, and Species at Risk identification, analysis of habitat suitability and mitigation measures. Author to the Natural Environment Existing Conditions Report. Analyzed and incorporated field data into the above report, while providing an assessment for potential impacts to Species at Risk and mitigation measures.
  - Earl Armstrong Road Extension Environmental Assessment, Ottawa, Ontario, Canada (2018): Senior Environmental Scientist. Coordinated and performed field investigations of ELC, soil analysis, and delineation mapping; amphibian call surveys; breeding bird and marsh bird call-back surveys to identify sensitive species; significant wildlife habitat assessment; and Species at Risk identification and habitat suitability assessment. Author to the Natural Environment Overview Report, with a subsequent technical memorandum summarizing field investigation methodologies and results.

- Metrolinx
  - Metrolinx Regional Express Rail – Lakeshore West Infrastructure Improvements, Greater Toronto Area, Ontario, Canada (2018): Coordinated and performed field investigations of ELC and delineation mapping; tree inventories; amphibian call surveys; breeding bird surveys; significant wildlife habitat assessment; and Species at Risk identification and habitat suitability analysis. Contributing author to numerous Natural Environment Screening Memorandums. Analyzed and incorporated field data into the above reports where Species at Risk impacts were also assessed, and mitigation measures developed if applicable.
  - GO Transit Hamilton Expansion – CN Yard Track Expansion, Hamilton, Ontario, Canada (2014): Terrestrial Ecologist. Contributing author to the Environmental Evaluation Report and performed the corresponding field investigations of ELC, mapping, and significant wildlife habitat assessments. Background information, identification, and mitigation for Species at Risk was also provided and incorporated into the above report.
- Dundas Street (Regional Road 5) Widening, Brant Street to Bronte Road, City of Burlington/Town of Oakville, Ontario, Canada (2017): Lead Terrestrial Ecologist. Coordinated and performed field investigations of bat habitat assessment for significant wildlife habitat and Species at Risk habitat using accepted MNRF protocols for cavity tree presence and acoustic monitoring. Client: City of Burlington.
- Ministry of Transportation Ontario (MTO)
  - Highway 401 Reconstruction Chatham-Kent Part B, Contract 2, Southwestern Ontario, Canada (2015): Lead Terrestrial Ecologist. Coordinated and performed field investigations of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation for detailed design. Author to the corresponding report of Terrestrial Ecosystems Existing Conditions and

Impact Assessment. Author to the Species at Risk Mitigation Plan required by policy under the *Endangered Species Act*.

- Highway 400 North Canal Rehabilitation, Holland Marsh, Simcoe County, Ontario, Canada (2015): Terrestrial Ecologist. Coordinated and performed field investigations of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation.
- Mega Culverts Rehabilitation/Replacement Contract 3, Southwestern Ontario, Canada (2014): Lead Terrestrial Ecologist. Coordinated and performed field investigations of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation. Author to the Terrestrial Ecosystems Existing Conditions and Impact Assessment Report. Analyzed and incorporated field data into the above report, while providing an assessment for habitat suitability for species at risk occurring within the study area.
- Highway 17 and Highway 101 Rehabilitation, Wawa, Ontario, Canada (2014): Lead Terrestrial Ecologist. Author to the Terrestrial Ecosystems Existing Conditions and Impact Assessment Report – Detail Design. Coordinated the corresponding field program and performed field surveys of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation. Field data was then analyzed and incorporated into the above report.
- Highway 3 from Carter Road to John Road, Elgin and Oxford County, Ontario, Canada (2014): Lead Terrestrial Ecologist. Author to the Terrestrial Ecosystems Existing Conditions and Impact Assessment Report – Detailed Design. Coordinated the corresponding field program and performed field surveys of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation. Field data was then analyzed and incorporated into the above report.
- Highway 401 from Hespeler Road to Townline Road, Cambridge, Ontario, Canada (2014): Lead Terrestrial Ecologist. Coordinated and performed field investigations of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation for detailed design.
- Highway 401 Reconstruction Chatham-Kent Part A, Contract 1, Southwestern Ontario, Canada (2014): Lead Terrestrial Ecologist. Coordinated and performed field investigations of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation for detailed design. Author to the corresponding report of Terrestrial Ecosystems Existing Conditions and Impact Assessment. Author to the Species at Risk Mitigation Plan required by policy under the *Endangered Species Act.*
- Mega Culverts Rehabilitation/Replacement Contract 2, Southwestern Ontario, Canada (2013): Lead Terrestrial Ecologist. Author to the Terrestrial Ecosystems Existing Conditions and Impact Assessment Report. Analyzed and incorporated field data into the above report, while providing an assessment for habitat suitability for species at risk occurring within the study area.
- Highway 17B CNR Overhead Bridge and Highway 17B Resurfacing, North Bay, Ontario, Canada (2013): Terrestrial Ecologist. Author to the Terrestrial Ecosystems Existing Conditions and Impact Assessment Report. Performed the corresponding field surveys of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation. Field data was then analyzed and incorporated into the above report. Consultation and

engagement to Nipissing First Nations was also provided at time of field investigations.

- Highway 11 Chippewa Creek Bridge and Duchesnay Creek Bridge Replacement/Rehabilitation, North Bay, Ontario, Canada (2013): Terrestrial Ecologist. Author to the Terrestrial Ecosystems Existing Conditions and Impact Assessment Report. Performed the corresponding field surveys of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation. Field Data was then analyzed and incorporated into the above report.
- Holland Drain Canal Bridge Replacement on Highway 9, Ontario, Canada (2012): Terrestrial Ecologist. Contributing author to Existing Conditions and Impact Assessment reports. Performed ELC community classification and mapping, and Species at Risk identification and mitigation, as well as field data analysis and reporting.
- Highway 7 and 35 Structure Replacement/Rehabilitation, Ontario, Canada (2012): Terrestrial Ecologist. Contributing author to Existing Conditions and Impact Assessment reports. Performed ELC community classification and mapping, and Species at Risk identification and mitigation, as well as field data analysis and reporting.
- Highway 6/10 from Chatsworth to Owen Sound, Ontario, Canada (2012): Terrestrial Ecologist. Contributing author to Existing Conditions and Impact Assessment reports. Performed ELC community classification and mapping, and Species at Risk identification and mitigation, as well as field data analysis and reporting.

- New North Oakville Transportation Corridor, Halton Region, Ontario, Canada (2013). Terrestrial Ecologist. Assessed Species at Risk Bobolink and Eastern Meadowlark breeding habitat and created survey protocol based on findings. Bobolink and Eastern Meadowlark surveys were conducted with subsequent data analysis and mapping. Client: Town of Oakville.

*Restoration, Remediation and Redevelopment*

- Kizell Wetland Trail: Species at Risk Authorizations, Kanata, Ontario, Canada (2019): Terrestrial Ecologist. Conducted field work to identified Species at Risk (SAR) Butternut trees that may be impacted/avoided by a pedestrian trail network. Client: City of Ottawa.
- Georgia Pacific
  - Restoration and Vegetation Monitoring of Former Spill Pond, Thorold, Ontario, Canada (2016): Terrestrial Ecologist. Author to the 2016 Vegetation Monitoring and Adaptive Management report. Survivorship data of vegetation was analyzed and incorporated into the above report recommendations of a watering and tending program.
  - Annual Monitoring and Adaptive Management of Beaverdams Channel, Thorold, Ontario, Canada (2013): Terrestrial Ecologist. Author to the 2013 Annual Monitoring and Adaptive Management Report and performed the corresponding field investigations of spring and summer vegetation restoration monitoring. Survivorship data of vegetation was collected, analyzed, and incorporated into the above report with invasive species management recommendations.

*Utilities, Oil and Gas Pipelines*

- Utility Line Rebuilt: Boundary Road and Highway 401, Cornwall, Ontario, Canada (2019): Terrestrial Ecologist. Coordinated and conducted ecological wildlife habitat assessment to identify the potential for Species at Risk. Author to the subsequent Species at Risk Screening report. Client: Cornwall Electric.
- Energy East Pipeline, Ontario, Canada (2015): Terrestrial Ecologist. Coordinated and prepared field packages/itinerary for vegetation and wildlife surveys from Kenora to Cornwall, Ontario. Performed gap analysis of ELC using ArcGIS and aerial photography to determine survey locations, level of effort, and species at risk analysis. Client: TransCanada Corporation.
- Enbridge Inc.
  - Spencer Creek Pipeline Repair, Flamborough, Ontario, Canada (2014): Terrestrial Ecologist. Conducted field investigations of summer botanical inventory, with a subsequent technical memo. This involved data collected, mitigation measures for regionally rare species, and restoration.
  - Integrity Digs – Line 9 between Hilton and Westover, Mississauga, Pickering, Hamilton, Oakville, Ontario, Canada (2013): Terrestrial Ecologist. Conducted tree inventory surveys in various locations along the Line 9 Pipeline. Identified Species at Risk (SAR) Butternut trees and any mid-age to mature trees that may be impacted. Also conducted significant wildlife habitat and turtle habitat assessments. Complete botanical inventories were also conducted at some sites with emphasis on locating regionally rare plant species within the construction area. Technical memos were then created based on findings and mitigation measures were provided as needed. Mitigation measures performed involved transplanting rare plants and ensuring their survival.
- Woodbine and Cedar Ridge Road Exposure, Gormley, Ontario, Canada (2013): Terrestrial Ecologist. Conducted field investigations of ELC and mapping, significant wildlife habitat assessment, and Species at Risk identification and mitigation. A technical memo was then prepared. Client: Union Gas Limited.

*Land Development*

- Potter's Key Development, Stittsville, Ontario, Canada (2019): Terrestrial Ecologist. Conducted annual spring and summer vegetation restoration monitoring. Survivorship data of vegetation was collected by following a modified version of the Ecological Monitoring and Assessment Network (EMAN) protocol. Client: The Minto Group Inc.
- 760 River Road Residential Development Project, Ottawa, Ontario, Canada (2019): Terrestrial Ecologist. Coordinated and performed natural heritage field program, which consisted of ELC, tree inventory, breeding bird survey, amphibian breeding survey, bat acoustic monitoring, and wildlife habitat assessments. Author to the Environmental Impact Statement and Tree Conservation Report, which included data analysis and interpretation, significant wildlife habitat assessment, Species at Risk screening, impact assessment and mitigation measures. Client: Claridge Homes.
- 3596 Old Montreal Road: Orleans Spa Development Project, Ottawa, Ontario, Canada (2019): Terrestrial Ecologist. Conducted ELC and tree inventory. Senior reviewer of the Environmental Impact Statement and Tree Conservation Report. Client: Azur Resort and Spa.

– Kanata North Lands Development, Kanata, Ottawa, Ontario, Canada (2019): Terrestrial Ecologist. Terrestrial Ecologist. Conducted Least Bittern call back survey and Butternut Health Assessment (BHA). Author to the subsequent BHA report. Client: KNL Developments Inc.

# ANDREW ROUS, M.Sc.

*Aquatic Ecologist, Environment*

## Areas of practice

*Aquatic Ecology*

*Fisheries Ecology*

*Aquatic Habitat Assessment*

*Fish and Fish Habitat Surveys*

*Environmental Impact Assessments*

*Environmental Policy and Approvals*

*DFO Permitting*

*Aquatic Species at Risk (SAR) Permitting*

*Fish and Wildlife Tracking*

## PROFILE

Andrew is an Aquatic Ecologist with 10 years of professional and academic experience performing fisheries and aquatic habitat research and monitoring, including field surveys and reporting across a variety of aquatic systems in Ontario. His understanding of aquatic species and habitats helps him identify impacts and apply mitigation and protection measures to avoid or minimize project impacts on natural heritage features. Andrew's experience consulting with all levels of regulatory agencies (municipal, provincial, and federal) positions him well to effectively prepare permit applications and liaise with agencies reviewing projects. As the Aquatic Ecology Lead on a variety of transportation design, land development and infrastructure projects, Andrew has contributed technical specialist input to multi-disciplinary design teams on a variety of projects, including bridge and culvert replacements.

## EDUCATION

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|---|---|
| Doctorate of Philosophy, Biology, Carleton University | (anticipated) 2020 |
| Masters of Science, Integrative Biology, University of Guelph | 2014 |
| Bachelors of Science, Ecology, University of Guelph | 2010 |

## PROFESSIONAL DEVELOPMENT

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|---|---|
| Standard First Aid CPR C + AED (St. John Ambulance) | 2020 |
| Class 2 Electrofishing Certification (Rideau Valley CA) | 2019 |
| Ontario Benthic Biomonitoring Network (Rideau Valley CA) | 2019 |
| R Statistics for Fisheries Professionals (Michigan State University) | 2014 |
| Freshwater Fishes of Ontario Identification (Royal Ontario Museum) | 2009; 2014 |

## AWARDS

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|---|---|
| Ontario Graduate Scholarship ($15,000) | 2017 |
| Carleton University Departmental Scholarship ($27,540) | 2014-2018 |

## CAREER

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|---|---|
| Aquatic Ecologist, Environment, WSP, Ottawa, Ontario, Canada | 2019 – Present |
| Ecological Restoration Advisor, Parks Canada, Gatineau, Ontario, Canada | 2016 – 2018 |
| Research Ecologist, Fish Ecology and Conservation Physiology Lab, Carleton University, Ottawa, Ontario, Canada | 2014 – 2019 |
| Research Ecologist, Sea Lamprey Behavioural Ecology Lab, University of Guelph, Guelph, Ontario, Canada | 2011 – 2014 |
| Resource Management Technician, Ontario Ministry of Natural Resources and Forestry, Kemptville, Ontario, Canada | 2010 – 2011 |

## PROFESSIONAL EXPERIENCE

### *Aquatic Habitat Assessment*

- Energy Services Modernization Project, Ottawa, Ontario, Canada (2019 – Ongoing): Aquatic Ecology Technical Specialist. Provided desktop screening and local aquatic ecology knowledge of existing conditions to project team, including information requests from OMNRF; Completed field-based aquatic habitat assessment and fish habitat characterization of project location in the Ottawa River. Client: Public Services and Procurement Canada.
- Limoges Water-Wastewater Alignment EA Study, Ottawa, ON, Canada (2019 – Ongoing): Aquatic Ecology Technical Specialist. Provided desktop screening of aquatic species at risk (SAR) and SAR habitat. Completed field-based aquatic habitat assessments on watercourses. Contributed aquatic field results, identified potential impacts, developed mitigation recommendations in Natural Environment Assessment Report to support Municipal Class Environmental Assessment. Client: Township of Russell.
- West Transitway Extension – Phase II, Ottawa, ON, Canada (2020 – Ongoing): Aquatic ecologist for post-construction effectiveness monitoring of the Stillwater Creek realignment required for transitway extension project. Responsible for conducting aquatic surveys, including: water quality, habitat assessment, benthic macroinvertebrates, and fish community; and writing monitoring reports. Client: City of Ottawa.

### *Impact Assessment*

- Energy Services Modernization Project, Ottawa, ON, Canada (2019 – Ongoing): Aquatic Ecology Technical Specialist. Leading fish and fish habitat impact assessment of river water supply and discharge pipes in the Ottawa River. Contributed to aquatic habitat existing conditions and impact assessment section of Natural Environment Assessment Report for Federal Environmental Assessment. Client: Public Services and Procurement Canada.
- Limoges Water-Wastewater Alignment EA Study, Ottawa, ON, Canada (2019 – Ongoing): Aquatic Ecology Technical Specialist. Prepared aquatic impact assessment and recommendations for mitigation measures to avoid and minimize project impacts. Impact assessment study program included aquatic habitat assessments of several creek and river crossings. Client: Township of Russell.

### *Environmental Approvals*

- Ottawa Light Rail Transit (LRT) Confederation Line Extension, Client: Kiewit Eurovia Vinci (KEV) City of Ottawa Partnership.
    - Sir John A. Macdonald Parkway Reconfiguration, Ottawa, Ontario, Canada (2019 – Ongoing): Aquatic Ecology Technical Lead. Led the ecological constraints assessment for the replacement of stormwater outfalls along the Ottawa River. Led consultation with DFO for fish and fish habitat (Request for Review under Fisheries Act and Species at Risk Act), MECP for Species at Risk (Endangered Species Act), MNRF for projects on Crown Land, and RVCA for alteration to shorelines.
    - Stillwater Creek Bridges, Ottawa, Ontario, Canada (2019 – Ongoing): Aquatic Ecology Technical Lead. Led the aquatic scope of ecological constraints assessment for the design of two new bridges over Stillwater Creek to carry

LRT alignment to Light Maintenance and Storage Facility. Reviewed environmental mitigation measures throughout preliminary and detailed design stages. Led permit applications, including liaising with design team and technical specialists from Water Resources and Hydrology.

  - Green's Creek Culvert Replacement, Ottawa, Ontario, Canada (2019 – Ongoing): Aquatic Ecology Technical Lead. Led the aquatic scope of ecological constraints assessment for the design of temporary culvert extensions and ultimate design of culvert replacement at Green's Creek under OR174 to carry East Segment of LRT alignment. Responsibility to review environmental mitigation measures throughout preliminary and detailed design stages. Led permit applications, including liaising with design team and technical specialists

- Energy Services Modernization Project, Client: Public Services and Procurement Canada.

  - River Water Supply and Discharge Pipe Network, Ottawa, Ontario, Canada (2019 – Ongoing): Aquatic Ecology Technical Lead. Coordination of project review by Fisheries and Oceans Canada (DFO) under the Fisheries Act and Species at Risk Act for aquatic SAR.

### *Aquatic Research and Habitat Restoration*

- Spatial Ecology of the Toronto Harbour Fish Community, Toronto, Ontario, Canada (2014 – 2019): Research Scientist. Led a long-term, field-based research program investigating the habitat use behaviour of the fish community in response to aquatic habitat enhancement and restoration. Responsibilities included: coordination of field research with partners organizations, installation and maintenance of acoustic telemetry receivers, data analysis, and publication of research in scientific journals.
- Habitat Connectivity in the Rideau River, Ottawa, Ontario, Canada (2016): Research Scientist. Responsibility to perform field-based surgical implantation of radio tracking transmitters into Muskellunge in the Rideau River.
- Invasive Species Management and Flow Manipulations from a Hydroelectric Generating Station, Sault Ste. Marie, Ontario, Canada (2011 – 2014): Research Scientist. Led field-based research program investigating the response of invasive sea lamprey to flow regime manipulation to improve trapping control program.

## *PUBLICATIONS AND PRESENTATIONS*

### *Publications (selected)*

- Cooke, S.J., **Rous, A.M**., … and J. R. Bennett. 2018. Evidence-based restoration in the Anthropocene – from acting with purpose to acting for impact. Restoration Ecology 26: 201 – 205.
- **Rous, A.M.,** … and R. L. McLaughlin. 2017. Spatial mismatch between sea lamprey behaviour and trap location explains low success at trapping for control. Canadian Journal of Fisheries and Aquatic Sciences 74: 2085 – 2097.
- Brooks, J.L., … **Rous, A.M.**, … and S.J. Cooke. 2017. Use of fish telemetry in rehabilitation planning, management, and monitoring in Areas of Concern in the Laurentian Great Lakes. Environmental Management 60: 1139 – 1154.
- **Rous, A.M.,** …and S.J. Cooke. 2017. Telemetry-determined habitat use informs multi-species habitat management in an urban harbour. Environmental Management 59: 118 – 128.

# APPENDIX

# C SITE PHOTOGRAPHS

**Photo 1 -** July 16, 2020
**Notes:** Fresh – Moist Green Ash – Hardwood Lowland Deciduous Forest (FODM7-2); near northern boundary of subject property

**Photo 2 -** August 6, 2020
**Notes:** Fresh – Moist Green Ash – Hardwood Lowland Deciduous Forest (FODM7-2); near western boundary of subject property

**Photo 3 -** July 16, 2020
**Notes:** Green Ash Mineral Deciduous Swamp (SWD2-2)

**Photo 4 -** July 16, 2020
**Notes:** Dry – Fresh Mixed Meadow (MEMM3); previously cleared of top soil and regenerating.

**Photo 5-** June 3, 2020
**Notes:** Cleared land (CL) patches within development footprint.

**Photo 6** - June 3, 2020
**Notes:** Fresh – Moist Deciduous Woodland (WODM5) on southern boundary of subject property.

**Photo 7 -** July 22, 2020
**Notes**: Mineral Deciduous Thicket Swamp (SWTM5).

**Photo 8 -** July 22, 2020
**Notes:** Willow Mineral Deciduous Thicket Swamp (SWTM3).

**Photo 9 -** July 22, 2020
**Notes:** Maple Mineral Deciduous Swamp (SWDM3)

**Photo 10 -** July 6, 2020
**Notes:** Dry – Fresh Mixed Meadow (MEMM3) and Reed-canary Grass Mineral Meadow Marsh (MAMM1-3); Bobolink observed nesting in this area.

**Photo 11 -** July 22, 2020
**Notes:** Poplar Mineral Deciduous Swamp (SWDM4-5).

**Photo 12 -** June 3, 2020
**Notes:** Hedgerow (HR).

**Photo 13 –** April 7, 2020
**Notes:** HDF-A1 facing downstream (first visit)

**Photo 14 –** April 7, 2020
**Notes:** HDF-A1 facing upstream (first visit)

**Photo 15 –** April 7, 2020
**Notes:** HDF-B1 facing downstream (first visit)

**Photo 16 –** April 7, 2020
**Notes:** HDF-B1 facing upstream (first visit)

**Photo 17 –** April 7, 2020
**Notes:** HDF-C1 facing downstream (first visit)

**Photo 18 –** April 7, 2020
**Notes:** HDF-C1 facing upstream (first visit)

**Photo 19 –** April 7, 2020
**Notes:** HDF-C3 facing downstream (first visit)

**Photo 20 –** April 7, 2020
**Notes:** HDF-C1 facing upstream (first visit)

**Photo 21 –** May 27, 2020
**Notes:** HDF-A1 facing downstream (second visit)

**Photo 22 –** May 27, 2020
**Notes:** HDF-A1 facing upstream (second visit)

**Photo 23 –** May 27, 2020
**Notes:** HDF-B1 facing downstream (second visit)

**Photo 24 –** May 27, 2020
**Notes:** HDF-B1 facing upstream (second visit)

**Photo 25 –** May 27, 2020
**Notes:** HDF-C1 facing downstream (second visit)

**Photo 26 –** May 27, 2020
**Notes:** HDF-C1 facing upstream (second visit)

**Photo 27 –** May 27, 2020
**Notes:** HDF-C2 facing downstream (second visit)

**Photo 28 –** May 27, 2020
**Notes:** HDF-C2 facing upstream (second visit)

**Photo 29 –** May 27, 2020
**Notes:** HDF-C3 facing downstream (second visit)

**Photo 30 –** May 27, 2020
**Notes:** HDF-C3 facing upstream (second visit)

**Photo 31 –** May 6, 2020
**Notes:** Vernal pool in FODM7-2 woodland

**Photo 32 –** August 6, 2020
**Notes:** Mature Sugar Maple and Bur Oak trees within hedgerow on western side of subject property.

# APPENDIX

# D

# HEADWATER DRAINAGE FEATURE ASSESSMENT DATA

# Unconstrained Headwater Drainage Feature Assessment

Date: April 7, 2020 Project #: 201-03736-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Thomas Gamble Drain Stream Code: Unknown Site Code: HDF-A1

Site Limits: Upstream WP# _____ Field Assessment: ☑ Sample 1 Unconnected HDF:

Downstream WP# _____ ☐ Sample 2 ☐ Not connected

Direction of Assessment: ☑ Upstream ☐ Downstream ☐ Sample 3 to downstream network

**Flow Influence** ☑ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

**Flow Condition** ☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☑ Minimal Flow (4)

**Feature Type** ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☑ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

**Riparian Vegetation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| 1.5 - 10 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| 10 - 30 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LiDAR (6)

Distance (m): ____ ____ ____ Elevation (cm): ____ ____ ____ Gradient (°): -0.1

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| **Dominant Substrate (S2.M3)** | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Sub-Dominant Substrate (S2.M3)** | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☐ 10 - 40% Moderate (2) ☑ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 4.1 Bankfull Depth (mm) 950

**Entrenchment** Total: ☐ > 40 m ☑ < 40 m Left Bank 4.0 m Right Bank 4.0 m Total width 12.1 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☑ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) 1 2 3 | Hydraulic head (mm) 1 2 3 | Volume (L) 1 2 3 | Distance (m) 1 2 3 | Time (s) 1 2 3 |
|---|---|---|---|---|---|
| 1.5m | | | | 2 / 2 / 2 | 17.7 / 17.2 / 24.6 |

**Sediment Transport**

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

**Sediment Deposition** Measures (mm): ____ ____ ____ ____ ____

☑ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment

Date: Apr 17, 20 Project #: 201-03736-00 Field Assessment: ☑ Sample # 1 ☐ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____

Fish Collection ☐ Absent ☐ Present Comment: No sampling

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
| – | – | K | 5 | Culvert; poor condition; unknown purpose |
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**Additional Notes:**

Site Break ☐ Feature Type ☐ Feature Modifier ☐ Flow Conditions ☐ Feature Vegetation ☑ Riparian Vegetation

Trigger ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1); Historic Evidence (2); Reported but No Evidence (3); No Evidence (4); Unknown (5)

**POINT DATA KEY:**

A Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp
B Seepage area - measure or estimate length of bank where seepage occurs
C Watercress - estimate total surface area occupied
D Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature.
E Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec.
F Beaver dam - measure perched height and jumping height
G Manmade dam - measure perched height and jumping height
H Other barrier to fish movement
I Potential contamination source (storm sewer outlet or industrial discharge pipe).
J Channel hardening - indicated by rip-rap, armour stone, or gabion baskets.
K Culvert - note type, size and whether or not perched. If perched record perched height and jumping height.
L Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break
M Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break
N Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break
O Fish observed during non-fish sampling activities
P Potential nutrient source
Q Dredging of channel
R Offline pond
S Other

# Unconstrained Headwater Drainage Feature Assessment

Date: Apr. 17, 2020 Project #: 201-03736-00 Recorder/Crew: A. Rais / C. Pytlak

Stream Name: unnamed watercourse Stream Code: unknown Site Code: HDF-B1

Site Limits: Upstream WP# _____ Field Assessment: ☑ Sample 1 ☐ Sample 2 ☐ Sample 3 Unconnected HDF: ☐ Not connected to downstream network

Downstream WP# _____

Direction of Assessment: ☑ Upstream ☐ Downstream

**Flow Influence**
☑ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

**Flow Condition**
☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☑ Standing Water (2) ☐ Minimal Flow (4)

**Feature Type**
☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☑ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

**Riparian Vegetation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| 1.5 - 10 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| 10 - 30 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LiDAR (6)

Distance (m): _____ Elevation (cm): _____ Gradient (°): -0.3

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| Dominant Substrate (S2.M3) | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Sub-Dominant Substrate (S2.M3) | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☑ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 3.1 Bankfull Depth (mm) 450

**Entrenchment** Total: ☐ > 40 m ☑ < 40 m Left Bank 3.5 m Right Bank 3.0 m Total width 9.5 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) 1 2 3 | Hydraulic head (mm) 1 2 3 | Volume (L) 1 2 3 | Distance (m) 1 2 3 | Time (s) 1 2 3 |
|---|---|---|---|---|---|
| 1.55 | | | | | |

**Sediment Transport**

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

**Sediment Deposition** Measures (mm): 10 7 9 — —

☐ None (1) ☐ Minimal: < 5 mm (2) ☑ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment

Date: Apr. 17/20 Project #: 201-03736-00 Field Assessment: ☑ Sample # 1 ☐ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____

Fish Collection ☐ Absent ☐ Present Comment: No Sampling

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
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**Additional Notes:**

Site Break ☐ Feature Type ☐ Feature Modifier ☑ Flow Conditions ☐ Feature Vegetation ☐ Riparian Vegetation

Trigger ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1); Historic Evidence (2); Reported but No Evidence (3); No Evidence (4); Unknown (5)

**POINT DATA KEY:**

A Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp
B Seepage area - measure or estimate length of bank where seepage occurs
C Watercress - estimate total surface area occupied
D Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature.
E Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec.
F Beaver dam - measure perched height and jumping height
G Manmade dam - measure perched height and jumping height
H Other barrier to fish movement
I Potential contamination source (storm sewer outlet or industrial discharge pipe).
J Channel hardening - indicated by rip-rap, armour stone, or gabion baskets.
K Culvert - note type, size and whether or not perched. If perched record perched height and jumping height.
L Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break
M Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break
N Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break
O Fish observed during non-fish sampling activities
P Potential nutrient source
Q Dredging of channel
R Offline pond
S Other

# Unconstrained Headwater Drainage Feature Assessment

Date: April 7, 2020 Project #: 201-03736-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed Watercourse Stream Code: Unknown Site Code: HDF-C1

Site Limits: Upstream WP# _____ Field Assessment: ☑ Sample 1 Unconnected HDF:

Downstream WP# _____ ☐ Sample 2 ☐ Not connected

Direction of Assessment: ☑ Upstream ☐ Downstream ☐ Sample 3 to downstream network

**Flow Influence**
☑ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

**Flow Condition**
☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☑ Minimal Flow (4)

**Feature Type**
☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☑ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

**Riparian Vegetation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☑ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☑ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| 1.5 - 10 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| 10 - 30 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LiDAR (6)

Distance (m): ___ ___ ___ Elevation (cm): ___ ___ ___ Gradient (°): -0.4

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| Dominant Substrate (S2.M3) | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Sub-Dominant Substrate (S2.M3) | ☐ | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☑ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 1.6 Bankfull Depth (mm) 450

**Entrenchment** Total: ☐ > 40 m ☑ < 40 m Left Bank 2.0 m Right Bank 1.0 m Total width 4.6 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☑ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) 1 2 3 | Hydraulic head (mm) 1 2 3 | Volume (L) 1 2 3 | Distance (m) 1 2 3 | Time (s) 1 2 3 |
|---|---|---|---|---|---|
| 0.45 | | | | 1 / 1 / 1 | 9.5 / 6 / 5.9 |

**Sediment Transport**

Adjacent Feature

| | Adjacent | Feature |
|---|---|---|
| None (1) | ☐ | ☐ |
| Rill (2) | ☐ | ☐ |
| Rill and Gully (3) | ☐ | ☐ |
| Gully (4) | ☐ | ☐ |
| Outlet Scour (5) | ☐ | ☐ |
| Sheet Erosion (6) | ☑ | ☑ |
| Instream Bank Erosion (7) | ☐ | ☐ |
| Other (8) | ☐ | ☐ |

**Sediment Deposition** ☐ None (1) ☑ Minimal: < 5 mm (2) Measures (mm): <1 <1 <1 ___ ___

☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment

Date: April 7, 20 Project #: 201-03936-00 Field Assessment: ☑ Sample # 1 ☐ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____

Fish Collection ☐ Absent ☐ Present Comment: No Sampling

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
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**Additional Notes:**

Site Break Trigger ☐ Feature Type ☐ Feature Modifier ☐ Flow Conditions ☐ Feature Vegetation ☑ Riparian Vegetation ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1); Historic Evidence (2); Reported but No Evidence (3); No Evidence (4); Unknown (5)

**POINT DATA KEY:**

| | |
|---|---|
| A | Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp |
| B | Seepage area - measure or estimate length of bank where seepage occurs |
| C | Watercress - estimate total surface area occupied |
| D | Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature. |
| E | Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec. |
| F | Beaver dam - measure perched height and jumping height |
| G | Manmade dam - measure perched height and jumping height |
| H | Other barrier to fish movement |
| I | Potential contamination source (storm sewer outlet or industrial discharge pipe). |
| J | Channel hardening - indicated by rip-rap, armour stone, or gabion baskets. |
| K | Culvert - note type, size and whether or not perched. If perched record perched height and jumping height. |
| L | Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break |
| M | Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break |
| N | Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break |
| O | Fish observed during non-fish sampling activities |
| P | Potential nutrient source |
| Q | Dredging of channel |
| R | Offline pond |
| S | Other |

# Unconstrained Headwater Drainage Feature Assessment

Date: April 7, 2020 Project #: 201-03736-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed Watercourse Stream Code: Unknown Site Code: HDF-C2

Site Limits: Upstream WP# _____ Field Assessment: ☑ Sample 1 Unconnected HDF:

Downstream WP# _____ ☐ Sample 2 ☐ Not connected

☐ Sample 3 to downstream network

Direction of Assessment: ☑ Upstream ☐ Downstream

**Flow Influence** ☑ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

**Flow Condition** ☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☑ Standing Water (2) ☐ Minimal Flow (4)

**Feature Type** ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☐ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☑ Forest (7)

**Riparian Vegetation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| 1.5 - 10 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| 10 - 30 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LiDAR (6)

Distance (m): _____ _____ _____ Elevation (cm) : _____ _____ _____ Gradient (°): -0.02

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| Dominant Substrate (S2.M3) | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Sub-Dominant Substrate (S2.M3) | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☐ 10 - 40% Moderate (2) ☑ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 2.1 Bankfull Depth (mm) 150

**Entrenchment** Total: ☐ > 40 m ☑ < 40 m Left Bank 0.5 m Right Bank 0.5 m Total width 3.1 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) | | | Hydraulic head (mm) | | | Volume (L) | | | Distance (m) | | | Time (s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 1.05 | | | | | | | | | | | | | | | |

**Sediment Transport**

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

**Sediment Deposition** Measures (mm): _____ _____ _____ _____ _____

☑ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment

Date: Apr 17, 20 Project #: 201-03736-00 Field Assessment: ☑ Sample # 1 ☐ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____

Fish Collection ☐ Absent ☐ Present Comment: No Sampling

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
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**Additional Notes:**

Site Break ☐ Feature Type ☐ Feature Modifier ☑ Flow Conditions ☐ Feature Vegetation ☐ Riparian Vegetation

Trigger ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1) Historic Evidence (2) Reported but No Evidence (3) No Evidence (4) Unknown (5)

**POINT DATA KEY:**

| | |
|---|---|
| A | Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp |
| B | Seepage area - measure or estimate length of bank where seepage occurs |
| C | Watercress - estimate total surface area occupied |
| D | Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature. |
| E | Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec. |
| F | Beaver dam - measure perched height and jumping height |
| G | Manmade dam - measure perched height and jumping height |
| H | Other barrier to fish movement |
| I | Potential contamination source (storm sewer outlet or industrial discharge pipe). |
| J | Channel hardening - indicated by rip-rap, armour stone, or gabion baskets. |
| K | Culvert - note type, size and whether or not perched. If perched record perched height and jumping height. |
| L | Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break |
| M | Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break |
| N | Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break |
| O | Fish observed during non-fish sampling activities |
| P | Potential nutrient source |
| Q | Dredging of channel |
| R | Offline pond |
| S | Other |

# Unconstrained Headwater Drainage Feature Assessment

Date: April 7, 2020 Project #: 20-03736-00 Recorder/Crew: A. Rous / C. Aylak

Stream Name: Unnamed Watercourse Stream Code: Unknown Site Code: HDF-C3

Site Limits: Upstream WP# _____ Field Assessment: ☑ Sample 1 Unconnected HDF:

Downstream WP# _____ ☐ Sample 2 ☐ Not connected

Direction of Assessment: ☑ Upstream ☐ Downstream ☐ Sample 3 to downstream network

**Flow Influence** ☑ Freshet (1) ☐ Spate (2) ☐ Baseflow (3)

**Flow Condition** ☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☑ Standing Water (2) ☐ Minimal Flow (4)

**Feature Type** ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☐ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☑ Forest (7)

**Riparian Vegetation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| 1.5 - 10 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| 10 - 30 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LiDAR (6)

Distance (m): _____ Elevation (cm): _____ Gradient (°): -0.2

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| Dominant Substrate (S2.M3) | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Sub-Dominant Substrate (S2.M3) | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☑ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 2.1 Bankfull Depth (mm) 150

**Entrenchment** Total: ☐ > 40 m ☐ < 40 m Left Bank 1.0 m Right Bank 1.0 m Total width 3.1 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) | | | Hydraulic head (mm) | | | Volume (L) | | | Distance (m) | | | Time (s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| 1.9 | | | | | | | | | | | | | | | |

**Sediment Transport**

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

**Sediment Deposition** Measures (mm): _____

☑ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment

Date: April 7, 20 Project #: 201-03736-00 Field Assessment: ☑ Sample # 1 ☐ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____

Fish Collection ☐ Absent ☐ Present Comment: No Sampling

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
| | | | | |
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**Additional Notes:**

Site Break ☐ Feature Type ☐ Feature Modifier ☑ Flow Conditions ☐ Feature Vegetation ☐ Riparian Vegetation

Trigger ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1) Historic Evidence (2) Reported but No Evidence (3) No Evidence (4) Unknown (5)

**POINT DATA KEY:**

A Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp
B Seepage area - measure or estimate length of bank where seepage occurs
C Watercress - estimate total surface area occupied
D Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature.
E Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec.
F Beaver dam - measure perched height and jumping height
G Manmade dam - measure perched height and jumping height
H Other barrier to fish movement
I Potential contamination source (storm sewer outlet or industrial discharge pipe).
J Channel hardening - indicated by rip-rap, armour stone, or gabion baskets.
K Culvert - note type, size and whether or not perched. If perched record perched height and jumping height.
L Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break
M Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break
N Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break
O Fish observed during non-fish sampling activities
P Potential nutrient source
Q Dredging of channel
R Offline pond
S Other

# Unconstrained Headwater Drainage Feature Assessment

Date: May 27, 2020 Project #: 201-03936-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Thomas Gamble Drain Stream Code: unknown Site Code: HDF-A1

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☑ Sample 2 ☐ Not connected

Direction of Assessment: ☑ Upstream ☐ Downstream ☐ Sample 3 to downstream network

**Flow Influence** ☐ Freshet (1) ☐ Spate (2) ☑ Baseflow (3)

**Flow Condition** ☐ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☑ Minimal Flow (4)

**Feature Type** ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☑ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

**Riparian Vegetation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| 1.5 - 10 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| 10 - 30 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LiDAR (6)

Distance (m): _____ Elevation (cm): _____ Gradient (°): -0.1

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| **Dominant Substrate (S2.M3)** | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Sub-Dominant Substrate (S2.M3)** | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☐ 10 - 40% Moderate (2) ☑ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 4.1 Bankfull Depth (mm) 950

**Entrenchment** Total: ☐ > 40 m ☑ < 40 m Left Bank 4.0 m Right Bank 4.0 m Total width 12.1 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☑ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) 1 2 3 | Hydraulic head (mm) 1 2 3 | Volume (L) 1 2 3 | Distance (m) 1 2 3 | Time (s) 1 2 3 |
|---|---|---|---|---|---|
| 0.79 | | | | 0.5 / 0.5 / 0.5 | 14.5 / 13.4 / 18.5 |

**Sediment Transport**

Adjacent ☐ None (1) ☐ Rill (2) ☑ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

**Sediment Deposition** Measures (mm): 5 4 30 _____ _____

☐ None (1) ☐ Minimal: < 5 mm (2) ☑ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment



Date: May 27, 20 Project #: 201-03736-00 Field Assessment: ☐ Sample # 1 ☑ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____

Fish Collection ☑ Absent ☐ Present Comment: Visual Observation

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
| — | — | K | 5 | culvert; poor condition; unknown purpose dry in centre. |
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**Additional Notes:**

Site Break ☐ Feature Type ☐ Feature Modifier ☐ Flow Conditions ☐ Feature Vegetation ☑ Riparian Vegetation

Trigger ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1); Historic Evidence (2); Reported but No Evidence (3); No Evidence (4); Unknown (5)

POINT DATA KEY:

A Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp
B Seepage area - measure or estimate length of bank where seepage occurs
C Watercress - estimate total surface area occupied
D Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature.
E Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec.
F Beaver dam - measure perched height and jumping height
G Manmade dam - measure perched height and jumping height
H Other barrier to fish movement
I Potential contamination source (storm sewer outlet or industrial discharge pipe).
J Channel hardening - indicated by rip-rap, armour stone, or gabion baskets.
K Culvert - note type, size and whether or not perched. If perched record perched height and jumping height.
L Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break
M Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break
N Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break
O Fish observed during non-fish sampling activities
P Potential nutrient source
Q Dredging of channel
R Offline pond
S Other

# Unconstrained Headwater Drainage Feature Assessment

Date: May 27, 2020 Project #: 201-03736-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed Watercourse Stream Code: unknown Site Code: HDF - B1

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☑ Sample 2 ☐ Not connected

Direction of Assessment: ☑ Upstream ☐ Downstream ☐ Sample 3 to downstream network

**Flow Influence**
☐ Freshet (1) ☐ Spate (2) ☑ Baseflow (3)

**Flow Condition**
☑ Dry (1) Dry Segments ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☑ Standing Water (2) ☐ Minimal Flow (4)

**Feature Type**
☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☑ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

**Riparian Vegetation**

| | | None (1) | Lawn (2) | Cropped (3) | Meadow (4) | Scrubland (5) | Wetland (6) | Forest (7) |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ | ☐ | ☐ | ☑ | ☐ | ☐ | ☐ |
| | Right Bank | ☐ | ☐ | ☐ | ☑ | ☐ | ☐ | ☐ |
| 1.5 - 10 m | Left Bank | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ |
| | Right Bank | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ |
| 10 - 30 m | Left Bank | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ |
| | Right Bank | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LIDAR (6)

Distance (m): ____ ____ ____ Elevation (cm): ____ ____ ____ Gradient (°): -0.3

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| Dominant Substrate (S2.M3) | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Sub-Dominant Substrate (S2.M3) | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☑ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 3.1 Bankfull Depth (mm) 450

**Entrenchment** Total: ☐ > 40 m ☑ < 40 m Left Bank 3.5 m Right Bank 3.0 m Total width 9.5 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) 1 2 3 | Hydraulic head (mm) 1 2 3 | Volume (L) 1 2 3 | Distance (m) 1 2 3 | Time (s) 1 2 3 |
|---|---|---|---|---|---|
| 1.50 | | | | | |

**Sediment Transport**

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|---|---|---|---|---|---|---|
| Adjacent | ☐ None (1) | ☐ Rill (2) | ☐ Rill and Gully (3) | ☐ Gully (4) | ☐ Outlet Scour (5) | |
| | ☑ Sheet Erosion (6) | | ☐ Instream Bank Erosion (7) | | ☐ Other (8) | |
| Feature | ☐ None (1) | ☐ Rill (2) | ☐ Rill and Gully (3) | ☐ Gully (4) | ☐ Outlet Scour (5) | |
| | ☑ Sheet Erosion (6) | | ☐ Instream Bank Erosion (7) | | ☐ Other (8) | |

**Sediment Deposition** Measures (mm): 50 40 45 ____ ____

☐ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☑ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment

Date: May 27, 20 Project #: 201-03736-00 Field Assessment: ☐ Sample # 1 ☑ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____

Fish Collection ☑ Absent ☐ Present Comment: Visual Observation

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
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**Additional Notes:**

Site Break ☐ Feature Type ☐ Feature Modifier ☑ Flow Conditions ☐ Feature Vegetation ☐ Riparian Vegetation

Trigger ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1) | Historic Evidence (2) | Reported but No Evidence (3) | No Evidence (4) | Unknown (5)

**POINT DATA KEY:**

A Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp
B Seepage area - measure or estimate length of bank where seepage occurs
C Watercress - estimate total surface area occupied
D Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature.
E Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec.
F Beaver dam - measure perched height and jumping height
G Manmade dam - measure perched height and jumping height
H Other barrier to fish movement
I Potential contamination source (storm sewer outlet or industrial discharge pipe).
J Channel hardening - indicated by rip-rap, armour stone, or gabion baskets.
K Culvert - note type, size and whether or not perched. If perched record perched height and jumping height.
L Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break
M Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break
N Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break
O Fish observed during non-fish sampling activities
P Potential nutrient source
Q Dredging of channel
R Offline pond
S Other

# Unconstrained Headwater Drainage Feature Assessment

Date: May 24, 2020 Project #: 201-03736-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed Watercourse Stream Code: Unknown Site Code: HDF-C1

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☑ Sample 2 ☐ Not connected

Direction of Assessment: ☐ Upstream ☐ Downstream ☐ Sample 3 to downstream network

**Flow Influence** ☐ Freshet (1) ☐ Spate (2) ☑ Baseflow (3)

**Flow Condition** ☑ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☐ Minimal Flow (4)

**Feature Type** ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☑ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☐ Forest (7)

**Riparian Vegetation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☑ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☑ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| 1.5 - 10 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| 10 - 30 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☑ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☐ Forest (7) |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LiDAR (6)

Distance (m): _____ Elevation (cm) : _____ Gradient (°): -0.4

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| **Dominant Substrate (S2.M3)** | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Sub-Dominant Substrate (S2.M3)** | ☐ | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☑ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 1.6 Bankfull Depth (mm) 450

**Entrenchment** Total: ☐ > 40 m ☑ < 40 m Left Bank 2.0 m Right Bank 1.0 m Total width 4.6 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☑ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) 1 2 3 | Hydraulic head (mm) 1 2 3 | Volume (L) 1 2 3 | Distance (m) 1 2 3 | Time (s) 1 2 3 |
|---|---|---|---|---|---|
| | | | | | |

**Sediment Transport**

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

**Sediment Deposition** Measures (mm): _____

☑ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment

Date: May 27, 20 Project #: 201-03736-00 Field Assessment: ☐ Sample # 1 ☑ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____
Fish Collection ☑ Absent ☐ Present Comment: visual observation

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
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**Additional Notes:**

Site Break ☐ Feature Type ☐ Feature Modifier ☐ Flow Conditions ☐ Feature Vegetation ☑ Riparian Vegetation
Trigger ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1) Historic Evidence (2) Reported but No Evidence (3) No Evidence (4) Unknown (5)

POINT DATA KEY:

A Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp
B Seepage area - measure or estimate length of bank where seepage occurs
C Watercress - estimate total surface area occupied
D Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature.
E Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec.
F Beaver dam - measure perched height and jumping height
G Manmade dam - measure perched height and jumping height
H Other barrier to fish movement
I Potential contamination source (storm sewer outlet or industrial discharge pipe).
J Channel hardening - indicated by rip-rap, armour stone, or gabion baskets.
K Culvert - note type, size and whether or not perched. If perched record perched height and jumping height.
L Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break
M Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break
N Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break
O Fish observed during non-fish sampling activities
P Potential nutrient source
Q Dredging of channel
R Offline pond
S Other

# Unconstrained Headwater Drainage Feature Assessment

Date: May 27, 2020 Project #: 201-03736-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed Watercourse Stream Code: Unknown Site Code: HDF-C2

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☑ Sample 2 ☐ Not connected

Direction of Assessment: ☑ Upstream ☐ Downstream ☐ Sample 3 to downstream network

**Flow Influence** ☐ Freshet (1) ☐ Spate (2) ☑ Baseflow (3)

**Flow Condition** ☑ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☐ Minimal Flow (4)

**Feature Type** ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☐ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☑ Forest (7)

**Riparian Vegetation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| 1.5 - 10 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| 10 - 30 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LiDAR (6)

Distance (m): _____ Elevation (cm): _____ Gradient (°): -0.02

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| **Dominant Substrate (S2.M3)** | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Sub-Dominant Substrate (S2.M3)** | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☐ 10 - 40% Moderate (2) ☑ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 2.1 Bankfull Depth (mm) 150

**Entrenchment** Total: ☐ > 40 m ☑ < 40 m Left Bank 0.5 m Right Bank 0.5 m Total width 3.1 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) | | | Hydraulic head (mm) | | | Volume (L) | | | Distance (m) | | | Time (s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| | | | | | | | | | | | | | | | |

**Sediment Transport**

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

**Sediment Deposition** Measures (mm): _____

☑ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment



Date: May 27, 20 Project #: 201-03736-00 Field Assessment: ☐ Sample # 1 ☑ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____

Fish Collection ☑ Absent ☐ Present Comment: Visual Observation

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
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**Additional Notes:**

Site Break ☐ Feature Type ☐ Feature Modifier ☑ Flow Conditions ☐ Feature Vegetation ☐ Riparian Vegetation

Trigger ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1) Historic Evidence (2) Reported but No Evidence (3) No Evidence (4) Unknown (5)

**POINT DATA KEY:**

A Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp
B Seepage area - measure or estimate length of bank where seepage occurs
C Watercress - estimate total surface area occupied
D Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature.
E Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec.
F Beaver dam - measure perched height and jumping height
G Manmade dam - measure perched height and jumping height
H Other barrier to fish movement
I Potential contamination source (storm sewer outlet or industrial discharge pipe).
J Channel hardening - indicated by rip-rap, armour stone, or gabion baskets.
K Culvert - note type, size and whether or not perched. If perched record perched height and jumping height.
L Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break
M Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break
N Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break
O Fish observed during non-fish sampling activities
P Potential nutrient source
Q Dredging of channel
R Offline pond
S Other

# Unconstrained Headwater Drainage Feature Assessment

Date: May 27, 2020 Project #: 201-03736-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed Watercourse Stream Code: Unknown Site Code: HDF-C3

Site Limits: Upstream WP# _____ Field Assessment: ☐ Sample 1 Unconnected HDF:

Downstream WP# _____ ☑ Sample 2 ☐ Not connected

Direction of Assessment: ☑ Upstream ☐ Downstream ☐ Sample 3 to downstream network

**Flow Influence** ☐ Freshet (1) ☐ Spate (2) ☑ Baseflow (3)

**Flow Condition** ☑ Dry (1) ☐ Interstitial Flow (3) ☐ Substantial Flow (5)
☐ Standing Water (2) ☐ Minimal Flow (4)

**Feature Type** ☐ Defined Natural Channel (1) ☐ No Defined Feature (4) ☐ Swale (7)
☑ Channelized or Constrained (2) ☐ Tiled Feature (5) ☐ Roadside Ditch (8)
☐ Multi-thread (3) ☐ Wetland (6) ☐ Pond (9)

**Feature Vegetation** ☐ None (1) ☐ Lawn (2) ☐ Cropped (3) ☐ Meadow (4) ☐ Scrubland (5) ☐ Wetland(6) ☑ Forest (7)

**Riparian Vegetation**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 - 1.5 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| 1.5 - 10 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| 10 - 30 m | Left Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |
| | Right Bank | ☐ None (1) | ☐ Lawn (2) | ☐ Cropped (3) | ☐ Meadow (4) | ☐ Scrubland (5) | ☐ Wetland (6) | ☑ Forest (7) |

**Channel Gradient (S4.M7)** ☐ Visual (1) ☐ Clinometer (2) ☐ Laser Level (3) ☐ Survey Level (4) ☐ Other (5) ☑ LiDAR (6)

Distance (m): _____ Elevation (cm) : _____ Gradient (°): -0.2

| | Clay (Hard Pan) | Silt | Sand (0.06-2 mm) | Gravel (22-66 mm) | Cobble (67-249 mm) | Boulder (250 mm) | Bedrock |
|---|---|---|---|---|---|---|---|
| **Dominant Substrate (S2.M3)** | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| **Sub-Dominant Substrate (S2.M3)** | ☐ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Feature Roughness** ☐ < 10% Minimal (1) ☑ 10 - 40% Moderate (2) ☐ 40 - 60% High (3) ☐ > 60% Extreme (4)

**Width Measurement** ☐ Can't Measure (1) ☑ Bankfull (2) ☐ Mean Width (3) ☐ Estimated (4) ☐ GIS (5) ☐ Measure/GIS (6)

**Channel Dimensions** Feature Width (m): 2.1 Bankfull Depth (mm) 150

**Entrenchment** Total: ☐ > 40 m ☑ < 40 m Left Bank 1.0 m Right Bank 1.0 m Total width 4.1 m

**Surface Flow Method** ☐ Perched Culvert (1) ☐ Hydraulic Head (2) ☐ Distance by Time (3) ☐ Estimated (4)

| Wetted Width (m) | Wetted Depth (mm) | | | Hydraulic head (mm) | | | Volume (L) | | | Distance (m) | | | Time (s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| | | | | | | | | | | | | | | | |

**Sediment Transport**

Adjacent ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

Feature ☐ None (1) ☐ Rill (2) ☐ Rill and Gully (3) ☐ Gully (4) ☐ Outlet Scour (5)
☑ Sheet Erosion (6) ☐ Instream Bank Erosion (7) ☐ Other (8)

**Sediment Deposition** Measures (mm): _____

☑ None (1) ☐ Minimal: < 5 mm (2) ☐ Moderate: 5-30 mm (3) ☐ Substantial: 31-80 mm (4) ☐ Extensive: > 80 mm (5)

# Unconstrained Headwater Drainage Feature Assessment

Date: May 27, 20 Project #: 201-03436-00 Field Assessment: ☐ Sample # 1 ☑ Sample # 2 ☐ Sample # 3

## POINT FEATURE DATA

Fish Barrier Measurements: WP# Perched Height (mm): Jumping Height (mm):
WP# Perched Height (mm): Jumping Height (mm):

Groundwater Indicators ☑ None ☐ Watercress ☐ Seepage ☐ Bubbling ☐ Stained ☐ Other: _____

Fish Collection ☑ Absent ☐ Present Comment: Visual Observation

| WP# | Photo # | Code | Category | Description |
|---|---|---|---|---|
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**Additional Notes:**

Site Break Trigger ☐ Feature Type ☐ Feature Modifier ☑ Flow Conditions ☐ Feature Vegetation ☐ Riparian Vegetation ☐ Other: Comments _____

Point Data Category: Ongoing and Active (1); Historic Evidence (2); Reported but No Evidence (3); No Evidence (4); Unknown (5)

POINT DATA KEY:

A Spring/upwelling - estimate <0.5 l/sec or >0.5 l/sec; measure temp
B Seepage area - measure or estimate length of bank where seepage occurs
C Watercress - estimate total surface area occupied
D Outlet (tile or other) - record flow status as per feature flow. Estimate volume <0.5 l/sec or >0.5 l/sec. Measure temperature.
E Inlet (tile or other) - record flow status as per feature flow. Estimate volume to be <0.5 l/sec or >0.5 l/sec.
F Beaver dam - measure perched height and jumping height
G Manmade dam - measure perched height and jumping height
H Other barrier to fish movement
I Potential contamination source (storm sewer outlet or industrial discharge pipe).
J Channel hardening - indicated by rip-rap, armour stone, or gabion baskets.
K Culvert - note type, size and whether or not perched. If perched record perched height and jumping height.
L Flow transition point D/S - flow condition changes from dry to standing water, independent of segment break
M Flow transition point M/S- flow condition changes from minimal to substantial surface flow, independent of segment break
N Flow transition point D-S/IF- flow condition changes from dry/standing water to interstitial flow, independent of segment break
O Fish observed during non-fish sampling activities
P Potential nutrient source
Q Dredging of channel
R Offline pond
S Other

# APPENDIX

# E VEGETATION AND TREE INVENTORY

| Scientific Name | Common Name | CC [1] | CW[1] | Conservation Status | | | | ELC Community | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | S-Rank[2] | SARA (2012)[3] | ESA, (2007)[4] | City of Ottawa[5] | FODM7-2 | MEMM3 | SWDM2-2 | SWDM4-5 | MAMM1 | MEGM3 | WODM5 | SWTM3 | SWDM3 | THDM2 | HR |
| *Acer negundo* | Manitoba Maple | 0 | 0 | S5 | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Acer platanoides* | Norway Maple | - | 5 | SNA | - | - | UC | - | X | - | - | - | - | - | - | - | - | - |
| *Acer rubrum* | Red Maple | 4 | 0 | S5 | - | - | C | - | - | - | - | - | - | - | - | X | - | - |
| *Acer saccharinum* | Silver Maple | 5 | -3 | S5 | - | - | C | X | - | - | - | - | - | - | - | X | - | - |
| *Acer saccharum* | Sugar Maple | 4 | 3 | S5 | - | - | C | X | X | - | - | - | - | - | - | - | - | X |
| *Achillea millefolium* | Common Yarrow | - | 3 | SNA | - | - | C | - | X | - | X | - | - | - | - | - | - | - |
| *Actaea rubra* | Red Baneberry | 6 | 3 | S5 | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Agrimonia eupatoria* | European Agrimony | - | 0 | SNA | - | - | - | X | - | - | - | - | - | - | - | - | - | - |
| *Amelanchier sp.* | Serviceberry sp. | - | - | - | - | - | - | X | - | - | - | - | - | - | - | - | - | - |
| *Arctium minus* | Common Burdock | - | 3 | SNA | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Arisaema triphyllum* | Jack-in-the-pulpit | 5 | -3 | S5 | - | - | C | - | - | X | - | - | - | - | - | - | - | - |
| *Asarum canadense* | Canada Wild Ginger | 6 | 5 | S5 | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Asclepias incarnata* | Swamp Milkweed | 6 | -5 | S5 | - | - | C | X | - | - | X | - | - | - | - | - | - | - |
| *Asclepias syriaca* | Common Milkweed | 0 | 5 | S5 | - | - | C | - | X | - | - | - | - | - | - | - | X | - |
| *Athyrium filix-femina var. angustum* | Northeastern Lady Fern | 4 | 0 | S5 | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Betula alleghaniensis* | Yellow Birch | 6 | 0 | S5 | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Betula papyrifera* | Paper Birch | 2 | 3 | S5 | - | - | C | - | - | X | - | - | - | - | - | - | X | - |
| *Bidens sp.* | Beggarticks sp. | - | - | - | - | - | - | - | - | X | - | - | - | - | - | - | - | - |
| *Bromus inermis* | Smooth Brome | - | 5 | SNA | - | - | C | - | X | - | X | - | X | - | - | - | - | - |
| *Carex gracillima* | Graceful Sedge | 4 | 3 | S5 | - | - | C | X | - | X | - | - | - | - | - | - | - | - |
| *Carex hystericina* | Porcupine Sedge | 5 | -5 | S5 | - | - | C | - | - | X | - | - | - | - | - | - | - | - |
| *Carex lupulina* | Hop Sedge | 6 | -5 | S5 | - | - | C | - | - | - | X | - | - | - | - | - | - | - |
| *Carex pedunculata* | Long-stalked Sedge | 5 | 3 | S5 | - | - | C | X | - | X | - | - | - | - | - | - | - | - |
| *Carex sp.* | Sedge sp. | - | - | - | - | - | - | - | - | X | X | - | - | - | - | - | - | - |
| *Carex vulpinoidea* | Fox Sedge | 3 | -5 | S5 | - | - | C | - | - | - | X | - | - | - | - | - | - | - |
| *Carya cordiformis* | Bitternut Hickory | 6 | 0 | S5 | - | - | C | - | - | - | - | - | - | - | - | - | - | X |

| Scientific Name | Common Name | CC [1] | CW[1] | Conservation Status | | | | ELC Community | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | S-Rank[2] | SARA (2012)[3] | ESA, (2007)[4] | City of Ottawa[5] | FODM7-2 | MEMM3 | SWDM2-2 | SWDM4-5 | MAMM1 | MEGM3 | WODM5 | SWTM3 | SWDM3 | THDM2 | HR |
| *Cichorium intybus* | Wild Chicory | - | 5 | SNA | - | - | C | - | X | - | - | - | - | - | - | - | - | - |
| *Circaea sp.* | Enchanter's Nightshade sp. | - | - | - | - | - | - | X | - | - | - | - | - | - | - | X | - | - |
| *Circaea x sterilis* | Intermediate Enchanter's Nightshade | - | 0 | SNA | - | - | - | X | - | - | - | - | - | - | - | - | - | - |
| *Cirsium arvense* | Canada Thistle | - | 3 | SNA | - | - | C | X | | - | - | - | X | X | - | - | - | - |
| *Cornus alternifolia* | Alternate-leaved Dogwood | 6 | 3 | S5 | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Cornus racemosa* | Grey Dogwood | 2 | 0 | S5 | - | - | UC | - | - | X | - | - | - | - | - | - | - | - |
| *Cornus sericea* | Red-osier Dogwood | 2 | -3 | S5 | - | - | C | X | X | - | X | - | X | X | X | - | X | X |
| *Crataegus sp.* | Hawthorn sp. | - | - | - | - | - | - | X | X | - | - | - | - | X | X | - | X | - |
| *Dactylis glomerata* | Orchard Grass | - | 3 | SNA | - | - | C | - | X | - | - | - | - | - | - | - | - | - |
| *Daucus carota* | Wild Carrot | - | 5 | SNA | - | - | C | X | X | - | - | - | X | - | - | - | - | - |
| *Dianthus armeria* | Deptford Pink | - | 5 | SNA | - | - | C | - | - | - | - | - | - | - | - | - | - | X |
| *Equisetum arvense* | Field Horsetail | 0 | 0 | S5 | - | - | C | X | - | X | X | - | - | - | - | - | - | - |
| *Equisetum fluviatile* | Water Horsetail | 7 | -5 | S5 | - | - | C | X | - | - | - | - | - | - | - | X | - | - |
| *Erigeron annuus* | Annual Fleabane | 0 | 3 | S5 | - | - | C | - | X | - | - | - | - | - | - | - | - | - |
| *Erigeron sp.* | Fleabane sp. | - | - | - | - | - | - | - | - | - | X | - | - | - | - | - | - | - |
| *Euthamia graminifolia* | Grass-leaved Goldenrod | 2 | 0 | S5 | - | - | C | - | X | - | - | - | - | - | - | - | X | - |
| *Fragaria virginiana* | Wild Strawberry | 2 | 3 | S5 | - | - | - | X | - | - | - | - | - | - | - | - | - | - |
| *Frangula alnus* | Glossy Buckthorn | - | 0 | SNA | - | - | C | X | X | X | X | - | X | X | - | - | - | X |
| *Fraxinus americana* | White Ash | 4 | 3 | S4 | - | - | C | X | - | - | - | - | - | - | - | - | - | X |
| *Fraxinus pennsylvanica* | Green Ash | 3 | -3 | S4 | - | - | C | X | - | X | X | - | X | X | X | X | X | X |
| *Galium triflorum* | Three-flowered Bedstraw | 4 | 3 | S5 | - | - | C | - | X | - | X | - | X | X | - | - | X | - |
| *Geum sp.* | Avens sp. | - | - | - | - | - | - | X | - | X | - | - | - | - | - | - | - | - |
| *Hemerocallis fulva* | Orange Daylily | - | 5 | SNA | - | - | C | - | X | - | - | - | - | - | - | - | - | - |
| *Hypericum sp.* | St. John's-wort | - | - | - | - | - | - | X | X | - | - | - | - | - | - | - | - | - |
| *Impatiens capensis* | Spotted Jewelweed | 4 | -3 | S5 | - | - | C | X | - | - | - | - | - | - | - | X | - | - |
| *Inula helenium* | Elecampane | - | 3 | SNA | - | - | C | - | X | - | - | - | - | - | - | - | - | - |

| Scientific Name | Common Name | CC [1] | CW[1] | Conservation Status | | | | ELC Community | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | S-Rank[2] | SARA (2012)[3] | ESA, (2007)[4] | City of Ottawa[5] | FODM7-2 | MEMM3 | SWDM2-2 | SWDM4-5 | MAMM1 | MEGM3 | WODM5 | SWTM3 | SWDM3 | THDM2 | HR |
| *Juglans cinerea* | Butternut | 6 | 3 | S2? | END | END | C | X | - | X | - | - | - | - | - | - | - | X |
| *Juglans nigra* | Black Walnut | 5 | 3 | S4? | - | - | R | X | - | - | - | - | - | - | - | - | - | - |
| *Juniperus communis* | Common Juniper | 4 | 3 | S5 | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Leucanthemum vulgare* | Oxeye Daisy | - | 5 | SNA | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Lotus corniculatus* | Garden Bird's-foot Trefoil | - | 3 | SNA | - | - | C | - | X | - | X | - | - | - | - | - | - | - |
| *Lythrum salicaria* | Purple Loosestrife | - | -5 | SNA | - | - | C | - | X | - | X | X | - | - | X | - | X | - |
| *Malus sp.* | Apple sp. | - | - | - | - | - | - | X | X | - | - | - | - | X | X | - | - | X |
| *Malva sp.* | Cheeseweed sp. | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | X | - |
| *Matteuccia struthiopteris* | Ostrich Fern | 5 | 0 | S5 | - | - | C | X | - | - | - | - | - | - | - | X | - | - |
| *Onoclea sensibilis* | Sensitive Fern | 4 | -3 | S5 | - | - | C | X | - | X | - | - | - | - | - | - | - | - |
| *Oxalis sp.* | Wood-sorrel sp. | - | - | - | - | - | - | X | - | X | - | - | - | - | - | X | - | - |
| *Panicum capillare* | Common Panicgrass | 0 | 0 | S5 | - | - | C | - | - | - | - | - | X | - | - | - | - | - |
| *Parthenocissus vitacea* | Thicket Creeper | 4 | 3 | S5 | - | - | C | X | - | X | X | - | - | - | - | - | - | - |
| *Pastinaca sativa* | Wild Parsnip | - | 5 | SNA | - | - | C | - | X | - | - | - | X | X | - | - | - | - |
| *Phalaris arundinacea var. arundinacea* | Reed Canarygrass | 0 | -3 | S5 | - | - | C | - | X | - | X | X | X | X | X | - | X | - |
| *Phleum pratense* | Common Timothy | - | 3 | SNA | - | - | C | X | X | - | X | - | - | X | - | - | - | - |
| *Picea glauca* | White Spruce | 6 | 3 | S5 | - | - | C | - | X | - | - | - | - | - | - | - | - | X |
| *Pilea pumila* | Dwarf Clearweed | 5 | -3 | S5 | - | - | UC | X | - | - | - | - | - | - | - | - | - | - |
| *Poa pratensis* | Kentucky Bluegrass | - | 3 | S5 | - | - | - | X | X | - | X | - | X | - | X | - | - | - |
| *Populus deltoides* | Eastern Cottonwood | 4 | 0 | S5 | - | - | - | - | - | X | - | - | - | - | - | - | - | - |
| *Populus tremuloides* | Trembling Aspen | 2 | 0 | S5 | - | - | C | X | - | - | X | - | X | X | - | - | - | - |
| *Prunella vulgaris* | Common Self-heal | - | 0 | S5 | - | - | - | X | - | - | - | - | - | - | - | - | - | - |
| *Prunus serotina* | Black Cherry | 3 | 3 | S5 | - | - | C | X | - | - | - | - | - | - | - | - | - | X |
| *Prunus virginiana* | Chokecherry | 2 | 3 | S5 | - | - | C | X | - | - | X | - | - | - | - | - | - | - |
| *Quercus bicolor* | Swamp White Oak | 8 | -3 | S4 | - | - | - | - | - | X | - | - | - | - | - | - | - | - |
| *Quercus macrocarpa* | Bur Oak | 5 | 3 | S5 | - | - | C | X | X | X | - | - | - | - | - | - | - | X |

| Scientific Name | Common Name | CC [1] | CW[1] | Conservation Status | | | | ELC Community | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | S-Rank[2] | SARA (2012)[3] | ESA, (2007)[4] | City of Ottawa[5] | FODM7-2 | MEMM3 | SWDM2-2 | SWDM4-5 | MAMM1 | MEGM3 | WODM5 | SWTM3 | SWDM3 | THDM2 | HR |
| *Rhamnus cathartica* | European Buckthorn | - | 0 | SNA | - | - | C | X | - | X | - | - | - | X | X | - | X | X |
| *Ribes cynosbati* | Eastern Prickly Gooseberry | 4 | 3 | S5 | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Rosa sp.* | Rose sp. | - | - | - | - | - | - | - | X | - | - | - | - | - | - | - | - | - |
| *Rubus idaeus* | Red Raspberry | 2 | 3 | S5 | - | - | - | X | X | X | X | - | X | - | - | - | - | - |
| *Rubus occidentalis* | Black Raspberry | 2 | 5 | S5 | - | - | UC | - | X | - | - | - | - | - | - | - | X | - |
| *Rubus pubescens* | Dwarf Raspberry | 4 | -3 | S5 | - | - | C | X | - | - | X | - | - | - | - | - | - | - |
| *Rumex crispus* | Curly Dock | - | 0 | SNA | - | - | C | - | X | - | - | - | - | - | - | - | - | - |
| *Salix bebbiana* | Bebb's Willow | 4 | -3 | S5 | - | - | C | - | X | - | - | - | - | X | X | - | X | - |
| *Salix daphnoides* | Violet Willow | - | 0 | SNA | - | - | - | - | - | - | - | - | - | - | X | - | - | - |
| *Salix interior* | Sandbar Willow | 1 | -3 | S5 | - | - | C | - | X | - | X | - | - | X | - | - | X | - |
| *Salix petiolaris* | Meadow Willow | 3 | -3 | S5 | - | - | C | - | - | - | - | - | - | X | X | - | X | - |
| *Salix sp.* | Willow sp. | - | - | - | - | - | - | - | - | X | - | - | - | - | - | - | - | - |
| *Scirpus atrovirens* | Dark-green Bulrush | 3 | -5 | S5 | - | - | C | - | X | X | - | - | - | - | - | - | X | - |
| *Scirpus sp.* | Bulrush sp. | - | - | - | - | - | - | - | - | - | - | - | - | - | X | - | - | - |
| *Solanum dulcamara* | Climbing Nightshade | - | 0 | SNA | - | - | C | X | - | - | - | - | - | - | - | - | - | - |
| *Solidago altissima* | Tall Goldenrod | 1 | 3 | S5 | - | - | C | X | X | - | X | - | - | X | - | - | X | - |
| *Solidago canadensis* | Canada Goldenrod | 1 | 3 | S5 | - | - | - | - | X | - | - | - | - | X | - | - | - | - |
| *Symphyotrichum sp.* | Aster sp. | - | - | - | - | - | - | X | - | - | - | - | - | - | - | - | - | - |
| *Syringa vulgaris* | Common Lilac | - | 5 | SNA | - | - | C | - | X | - | - | - | - | - | - | - | - | - |
| *Taraxacum officinale* | Common Dandelion | - | 3 | SNA | - | - | C | - | X | - | - | - | - | - | - | - | - | - |
| *Tilia americana* | Basswood | 4 | 3 | S5 | - | - | C | X | - | X | - | - | - | - | - | X | - | X |
| *Toxicodendron radicans* | Poison Ivy | 2 | 0 | S5 | - | - | - | X | X | X | - | - | - | - | - | X | - | - |
| *Trifolium pratense* | Red Clover | - | 3 | SNA | - | - | C | - | - | - | - | - | - | - | - | - | X | - |
| *Typha latifolia* | Broad-leaved Cattail | 1 | -5 | S5 | - | - | C | - | - | - | - | X | - | - | - | - | - | - |
| *Ulmus americana* | American Elm | 3 | -3 | S5 | - | - | C | X | X | X | X | - | - | X | - | X | X | X |
| *Viburnum lentago* | Nannyberry | 4 | 0 | S5 | - | - | C | - | - | - | - | - | - | - | - | - | X | - |

| Scientific Name | Common Name | CC [1] | CW[1] | Conservation Status | | | | ELC Community | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | S-Rank[2] | SARA (2012)[3] | ESA, (2007)[4] | City of Ottawa[5] | FODM7-2 | MEMM3 | SWDM2-2 | SWDM4-5 | MAMM1 | MEGM3 | WODM5 | SWTM3 | SWDM3 | THDM2 | HR |
| *Vicia cracca* | Tufted Vetch | - | 5 | SNA | - | - | C | - | X | - | X | - | X | - | - | - | - | - |
| *Vincetoxicum rossicum* | European Swallowwort | - | 5 | SNA | - | - | UC | - | - | - | - | - | - | - | - | - | - | X |
| *Viola sp.* | Violet sp. | - | - | - | - | - | - | X | - | - | - | - | - | - | - | - | - | - |
| *Vitis riparia* | Riverbank Grape | 0 | 0 | S5 | - | - | C | X | X | - | X | - | - | - | - | - | X | X |

## PLANT LIST LEGEND

### Scientific Name, Common Name, and Family

*Based on Vascan (Dec. 2017) and NHIC (Dec. 16 2018)*

Vascan: http://data.canadensys.net/vascan/search

NHIC: http://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/ProvincialServices/Ontario_Vascular_Plants.xlsx

### [1] Coefficient of Conservatism, Coefficient of Wetness, Weediness, and Physiology/Habit

*Oldham, M. J., W. D. Bakowsky and D. A. Sutherland. 1995. Floristic Quality Assessment System for Southern Ontario. Natural Heritage Information Centre, Ministry of Natural Resources. Peterborough, Ontario.*

CC and CW values reflect updates by NHIC, current as of Dec. 16, 2018).

CC: Coefficient of Conservatism. Rank of 0 to 10 based on plants degree of fidelity to a range of synecological parameters: (0-3) Taxa found in a variety of plant communities; (4-6) Taxa typically associated with a specific plant community but tolerate moderate disturbance; (7-8) Taxa associated with a plant community in an advanced successional stage that has undergone minor disturbance; (9-10) Taxa with a high fidelity to a narrow range of synecological parameters.
CW: Coefficient of Wetness. Value between 5 and –5. A value of –5 is assigned to Obligate Wetland (OBL) and 5 to Obligate Upland (UPL), with intermediate values assigned to the remaining categories.

### [2]S-Rank (Provincial)

*Provincial Status from the NHIC (Dec. 16, 2018)*

NHIC: http://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/ProvincialServices/Ontario_Vascular_Plants.xlsx

Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario.

*Provincial/Sub-national (S) Conservation Status Ranks*

S1: Critically Imperiled – At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
S2: Imperiled – At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
S3: Vulnerable – At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
S4: Apparently Secure – At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or Secure – At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.
S#S#: Range Rank – A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
SX: Presumed Extirpated – Species or ecosystem is believed to be extirpated from the jurisdiction (province). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered. [equivalent to “Regionally Extinct” in IUCN Red List terminology]
SH: Possibly Extirpated (Historical) – Known from only historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.
SNR: Unranked – Nation of state/province conservation status not yet assessed.
SU: Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA: Not Applicable – A conservation status rank is not applicable because the species is not a suitable target for conservation activities (e.g., long distance aerial and aquatic migrants, hybrids without conservation value, and non-native species.
?: Inexact or Uncertain - Denotes inexact or uncertain numeric rank.
T#: Infraspecific Taxon (trinomial) - The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the subnational rank of a critically imperiled subspecies of an otherwise widespread and common species would be S5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species, for example, a S1T2 subrank should not occur. A vertebrate animal population may be tracked as an infraspecific taxon and given a T rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status

### [3] SARA (Species at Risk Act, 2012) Status and Schedule

*Federal status from the Government of Canada's Species at Risk Public Registry (Status as of Feb. 2018)*

http://www.registrelep-sararegistry.gc.ca/

The Act establishes Schedule 1, as the official list of species at risk in Canada. It classifies those species as being either Extirpated, Endangered, Threatened, or a Special Concern. Once listed, the measures to protect and recover a listed species are implemented. However, please note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to species of special concern.

*SARA Conservation Status Ranks*

EXT: Extinct – A species that no longer exists.
EXP: Extirpated – A species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
END: Endangered – A species that is facing imminent extirpation or extinction.
THR: Threatened – A species likely to become endangered if limiting factors are not reversed.
SC: Special Concern – A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

**[4] ESA, 2007 (Ontario Endangered Species Act, 2007)**

*Provincial status from MNRF (Status as of Dec. 2018)*

https://www.ontario.ca/environment-and-energy/species-risk-ontario-list

The provincial review process is implemented by the MNR's Committee on the Status of Species at Risk in Ontario (COSSARO). COSSARO is an independent advisory panel to the Ontario Ministry of Natural Resources and Forestry that assesses the status of species at risk of extinction.

*MNRF Conservation Status Ranks*
EXP: Extirpated – Extirpated – Lives somewhere in the world, and at one time lived in the wild in Ontario, but no longer lives in the wild in Ontario.
END: Endangered – Lives in the wild in Ontario but is facing imminent extinction or extirpation.
THR: Threatened – Lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it.
SC: Special Concern – Lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats.

**[5] Regional Status - City of Ottawa**

*Brunton, D.F. 2005. City of Ottawa - Urban Natural Areas Environmental Evaluation Study: Appendix A – Vascular Plant List of the City of Ottawa, with the Identification of Significant Species. A report prepared for the Environmental Management Division, Planning and Growth Management Department, City of Ottawa.*

Codes are defined as follows:
RS: Regionally Significant – known from 10 or fewer contemporary populations (post 1969) in the city of Ottawa. Pre 1970 records are annotated as Rare (Historic).
R: Rare – known from a small number of contemporary records, typically 5 or fewer populations.
UC: Uncommon – known from 11-20 populations. A bracketed numeral following the code indicates the number of sites the species is found. Seen infrequently in the City of Ottawa, occurring in small numbers but over a relatively large area of the municipality
C: Common – present in large numbers in a least a substantial portion of the City of Ottawa