CLARIDGE HOMES

SPRING VALLEY TRAILS - PHASE 5 & 6

ENVIRONMENTAL IMPACT STATEMENT AND TREE CONSERVATION REPORT

Project No.: 191-15659-00

OCTOBER 01, 2020 FINAL

SPRING VALLEY TRAILS - PHASE 5 & 6

ENVIRONMENTAL IMPACT STATEMENT AND TREE CONSERVATION REPORT

CLARIDGE HOMES

FINAL

PROJECT NO.: 191-15659-00
DATE: OCTOBER 01, 2020

WSP
SUITE 300
2611 QUEENSVIEW DR.
OTTAWA (ONTARIO) K2B 8K2
CANADA

T: +1 613 690-3833
WSP.COM

October 01, 2020

FINAL

Vincent Denomme
CLARIDGE HOMES
210 Gladstone Avenue
Ottawa, Ontario K2P 0Y6

Subject: Spring Valley Trails Phase 5 & 6 – Environmental Impact Statement and Tree Conservation Report

Dear: Vincent,

The following Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) for the proposed Spring Valley Trails Phase 5 & 6 subdivision development in Ottawa, Ontario, has been prepared in accordance with the City of Ottawa's EIS and TCR guidelines. This report is an update to the preliminary EIS/TCR submitted in January 2020.

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.

A few natural heritage features were identified and evaluated during the spring/summer season of 2020. Such features and their associated wildlife and/or vegetation surveys have been further 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.: 191-15659-00

SUITE 300
2611 QUEENSVIEW DR.
OTTAWA (ONTARIO) K2B 8K2
CANADA

T: +1 613 690-3833
wsp.com

REVISION HISTORY

FIRST ISSUE

August 28th, 2020	Draft for client review			
Prepared by	Reviewed by	Approved By		
Cody Pytlak, Ecologist	Andrea Orr, Terrestrial Ecologist	Alex Zeller, Project Ecologist		

SECOND ISSUE

October 1st, 2020	Final for submission to City of Ottawa			
Prepared by	Reviewed and approved by			
Cody Pytlak, Ecologist	Alex Zeller, Project Ecologist			

SIGNATURES

PREPARED BY

Cody Pytlak, B.A.
Ecologist

REVIEWED BY

Andrea Orr, B.Sc.
Terrestrial Ecologist

Alex Zeller, M.Sc.
Project Ecologist

This report was prepared by WSP Canada Inc. for the account of CLARIDGE HOMES, in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP Canada Inc's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of 10 years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

Claridge Homes retained WSP Canada Inc. to undertake an Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) for the proposed Spring Valley Trails Phase 5 & 6 residential development, located at 3252 Navan 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 winter 2019 and spring/summer of 2020. Field investigations consisted of: Headwater Drainage Feature (HDF) assessment, Ecological Land Classification (ELC), wetland delineation, significant woodland evaluation, tree inventory, Significant Wildlife Habitat (SWH) identification and evaluation, amphibian breeding surveys, breeding bird 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) Mer Bleue Provincially Significant Wetland (PSW) and Mer Bleue Bog Area of Natural and Scientific Interest (ANSI) are located within the Study Area. However, the proposed development footprint is approximately 100 metres (m) from these features and buffered by deciduous swamp and meadow marsh vegetation communities. Additionally, the proposed development area does not directly conflict with the Rideau Valley Conservation Authority's (RVCA) regulation limit.

2) An HDF is located within the development footprint and will require realignment to maintain flows between the upstream headwaters and downstream fish habitat. It is expected that part of the realigned stream will be located within the RVCA's regulation limit and will likely require a permit for construction works.

3) The forest and swamp communities within the subject property are not considered locally or provincially significant.

4) The vegetation communities recorded during field investigations are commonly found throughout Ottawa and eastern Ontario, and consist mainly of deciduous swamp, thicket swamp, and graminoid meadow marsh. Vegetation species within these communities are considered very common throughout Ontario and no provincially or rare vegetation species occurred. Non-native/invasive species were abundant throughout the Study Area.

5) Four separate wetland communities were identified within the Study Area. Three of these communities are within the project footprint and will require removal for development. These communities provide marginal habitat for amphibians, birds, and mammals, and function mainly as local flood storage.

6) Forest communities within the subject property occurred throughout, with young to mid-aged trees and shrubs, representing native and invasive species. Mature trees occurred occasionally throughout. Fourteen trees were identified to be 'Distinctive' [≥ 50 cm diameter at breast height (DBH)]. Overall, tree health was in good condition, although there was evidence of Emerald Ash Borer and the invasive Common Buckthorn (*Rhamnus cathartica*) was abundant throughout the forest communities. Tree mitigation and protection measures have been recommended to limit the number of Distinctive trees requiring removal and to provide suitable protection techniques for trees being retained.

7) No SAR were observed within the Study Area during field surveys. Suitable habitat is present, although generally low quality or in limited abundance. Impacts on SAR habitat can be mitigated using general vegetation and wildlife mitigation measures.

8) 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

Claridge Homes retained WSP Canada Inc. (WSP) to complete an Environmental Impact Statement (EIS) and Tree Conservation Report (TCR) for the proposed Spring Valley Trails Phase 5 & 6 subdivision development at 3252 Navan Road (herein known as "the Project"). This property is located on a parcel of land with frontage on Navan Road, in the City of Ottawa, Ontario (**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 property, plus a 120m buffer from this area (see **Figure 1).** In addition, specific Species at Risk (SAR) and natural heritage 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

Claridge Homes is submitting a Zoning By-law Amendment and a Plan of Subdivision application for the development located at 3252 Navan Road in Navan, Ottawa, Ontario. The Project will consist of 48 stacked townhouse dwelling units, 44 (back-to-back) townhouse dwellings, 218 townhouse dwellings, and 11 single-family dwellings. An open space block will be retained at the southern edge of the subject property.

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 (OP) (City of Ottawa, 2003), is proposed or adjacent to environmentally designated lands or other features of the City's Natural Heritage System (NHS). This site is located adjacent to the Mer Bleue Provincially Significant Wetland (PSW), which is also part of the City's NHS. In addition to these features, woodlands and unevaluated wetlands are also present within the property.

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

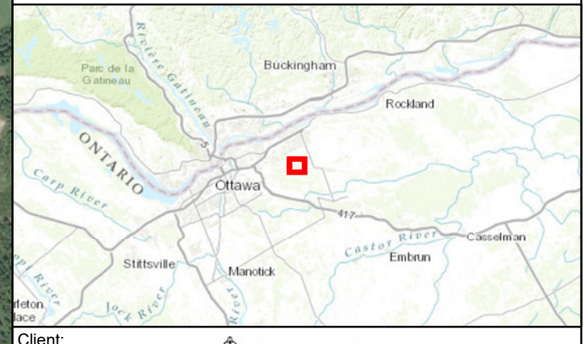
In addition, this report has been prepared to support the Project in the following ways: 1) to not contravene the *Endangered Species Act, 2007* (ESA); 2) to evaluate environmental impacts; and, 3) to develop a mitigation plan addressing potential impacts.

1.2.1 STUDY UPDATES

Due to the application submission timelines, a preliminary EIS/TRC was completed in January 2020. The initial report described ecological conditions and anticipated impacts based on a preliminary site visit undertaken in December 2019. This report has been updated with the results of field surveys completed in the spring and summer of 2020. A tracking sheet detailing report updates has been included in **Appendix A**.

Subject Property

Study Area



Client: CLARIDGE HOMES

Title: **Spring Valley Trails - Phase 5 & 6 Study Area**

Prepared By: WSP

191-15659-00	1:10,000	Review: AO
Date: August 2020	**Figure: 1**	
© Queen's Printer for Ontario		

F:\WSP\GIS\Ecology\3252 Navan Road\2_MXD\Figure_1_StudyArea.mxd

1.3 PROPERTY INFORMATION

Owner:	Claridge Homes
Address:	3252 Navan Road, Ottawa, Ontario
Lot and concession:	Part of Lot 4, Concession 4 & Part of Lots 5 and 6, Concession 4
Property Identification Number(s):	043522512, 043520307
Zoning:	DR – Development Reserve Subzone (Sections 237-238)
Official Plan designation (Schedule B):	General Urban Area
Existing Land Uses:	Industrial/Commercial, Forested Land, 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 to 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: • *Distribution of Aquatic Species at Risk mapping (Accessed: 19/12/2019)*
***Fisheries Act* (1985) (R.S.C., 1985, c. F-14)**	Fisheries and Oceans Canada – online resources
Province of Ontario	
Provincial Policy Statement (PPS, 2014), under *Planning Act*, R.S.O. (1990) c. P.13 **AND** **Ontario *Endangered Species Act* (ESA, 2007) (S.O. 2007, c. 6)**	Ministry of Natural Resources and Forestry (MNRF) – Kemptville District
	MNRF Natural Heritage Information Centre (NHIC) – Online (Accessed: 19/12/2019): • *Species at Risk occurrence records* • *Species of Conservation Concern* • *Natural Heritage Features*
	Natural Heritage Reference Manual (NHRM) (MNR, 2010)
	Significant Wildlife Habitat Technical Guide (MNR, 2000): — *Significant Wildlife Habitat Eco-region 6E Criterion Schedule* (MNRF, 2015)
	Ministry of the Environment, Conservation and Parks (MECP): — *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: 19/12/2019)
	Ontario Reptile and Amphibian Atlas (ORAA) – Online (Accessed: 19/12/2019)
	Ontario Butterfly Atlas (OBA) – Online (Accessed: 19/12/2019)
	iNaturalist Observation Records – Online (Accessed: 18/12/2019)
	Atlas of the Mammals of Ontario (AMO) (Dobbyn, 1994)
City of Ottawa	
	Official Plan; Schedules B (Urban Policy Plan), K (Environmental Constraints), and L1 (Natural Heritage System Overlay (East) – Online (Accessed: 06/12/2019)
	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: 06/112/2019)
	Site Alteration By-Law (2018) – Online (Accessed: 06/12/2019)
	Protocol for Wildlife Protection During Construction (City of Ottawa, 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: 06/12/2019)

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 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, 2019) (**Figure 2**). From this review, the landscape has been predominantly agricultural and industrial land use dating back to 1976. Residential developments to the west of the Study Area have expanded beginning around 2005 to the present day. Within the 3252 Navan Road property parcel, the northern half of the property has been largely used for soil and aggregate storage. The southern half of the property was an agricultural field prior to 1976 and has regenerated into a successional woodland habitat. A multi-use path is present just beyond the southern limit of the property parcel and was formerly a rail corridor.

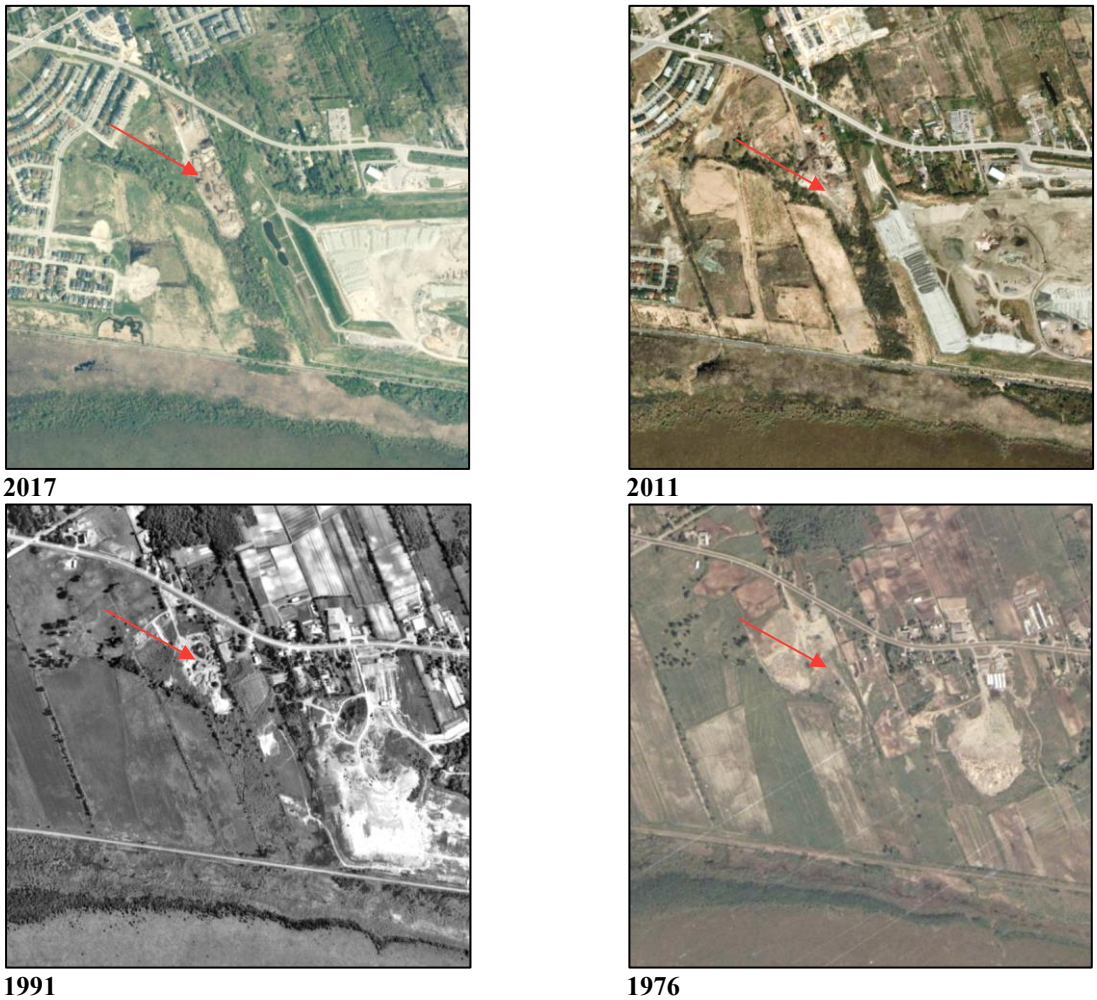


Figure 2 Land Use Change

3.2 LANDFORM, GEOLOGY AND SOILS

The Study Area is situated within the Ottawa Valley Clay Plains physiographic region (Ministry of Northern Development and Mines, 2017). The northern half of the Study Area lies within a Sand Plains physiographic landform, and the southern half of the Study Area is within a Clay Plains physiographic landform (Ministry of Northern Development and Mines, 2017).

The surficial geology of the Study Area is divided between an area of coarse-textured glaciomarine deposits (sand, gravel, minor silt and clay) in the northern half of the Study Area, fine-textured glaciomarine deposits (silt and clay, minor sand and gravel) in the southern half of the Study Area, and a pocket of colluvial deposits (boulders, scree, talus) in the middle of the Study Area (Ministry of Northern Development and Mines, 2017).

The underlying bedrock of the Study Area is part of the Ottawa Formation, consisting of limestone with some shale partings, and some sandstone in the basal part (Natural Resources Canada, 2016).

Based on the soil and physiographic conditions of the Study Area, it is likely that the southern half of the Study Area has lower rates of infiltration with damp to wet soils, therefore providing suitable conditions for vegetation with a preference for wet soils. The northern half of the Study Area likely has higher rates of infiltration and is more likely to support vegetation communities with a preference for dry conditions.

3.3 AQUATIC ENVIRONMENT

The Study Area is within the Rideau Valley watershed. More specifically, the Study Area is located within the Ottawa River East sub-watershed and Mud Creek catchment (Rideau Valley Conservation Authority, 2018). This catchment area contains warm water recreational and baitfish fishery with 19 fish species. Mud Creek is a major tributary to Green's Creek as headwaters begin within the Mer Bleue PSW.

3.3.1 FLOODPLAIN AND REGULATED LIMIT

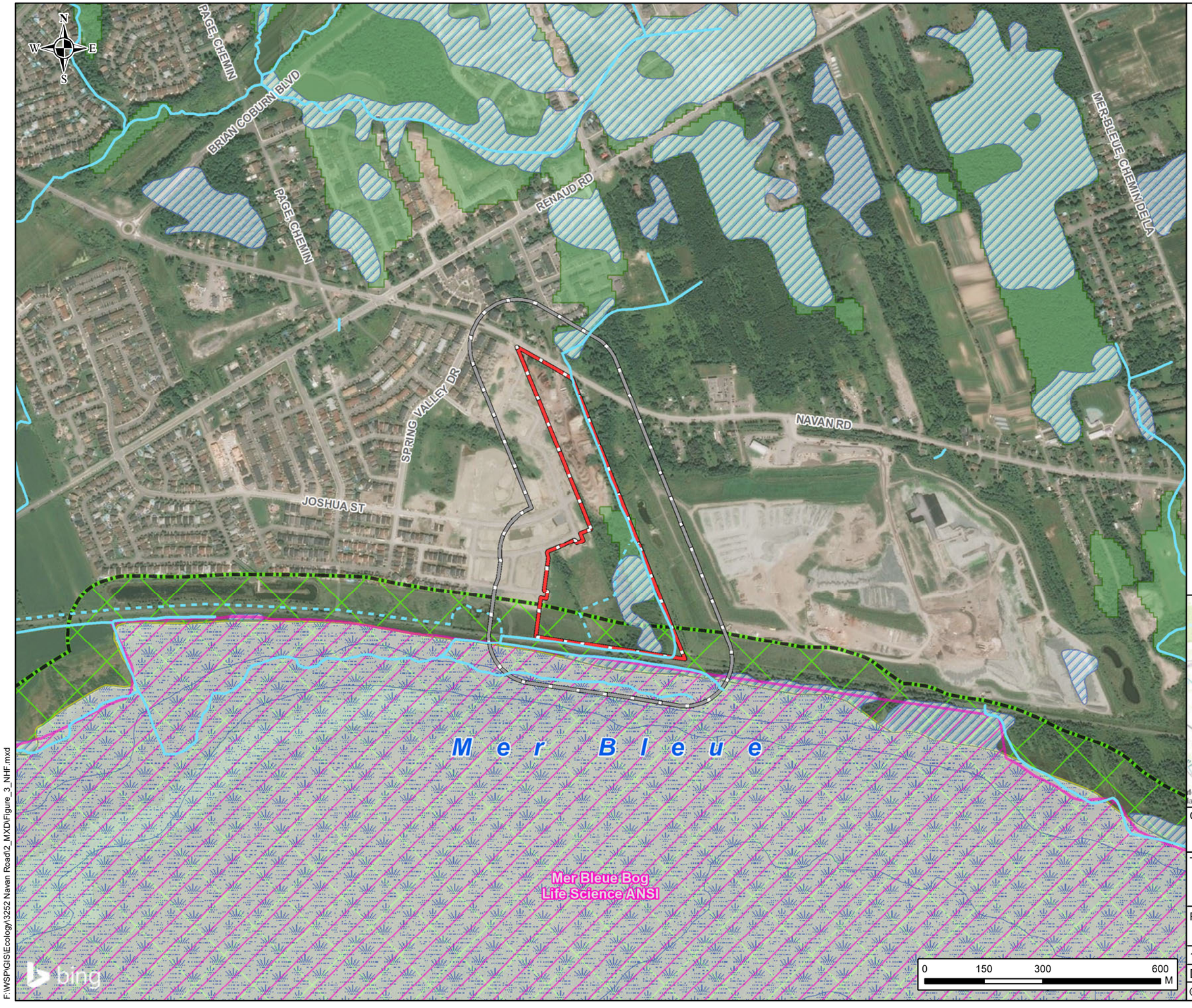
The RVCA is the governing body that regulates flood potential, protects natural heritage features, and enhances the ecosystems within the Rideau Valley watershed. Development within regulated areas is governed by O. Reg. 174/06 *Development, Interference with Wetlands, and Alterations to Shorelines and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

The RVCA has identified Regulated Limits areas throughout the Study Area and bordering the southern limit of the Project footprint (Rideau Valley Conservation Authority, 2019). The Regulation Limit is shown in **Figure 3**.

3.3.2 HEADWATER DRAINAGE FEATURES

Mapping by both the RVCA (Rideau Valley Conservation Authority, 2019) and the City of Ottawa (City of Ottawa, 2019) indicates the presence of a watercourse in the subject property. The two mapping sources have discrepancies, as the RVCA mapping indicates a channelized watercourse runs along the eastern and southern subject property boundaries; whereas, the City of Ottawa mapping shows the watercourse flowing southwest across the southern half of the subject property. The watercourse flows west into a pond that has been created as compensation for adjacent developments (pers.comm. Jennifer Lamoureux, May 22, 2020). The watercourse alignments are illustrated in **Figure 3**.

The 2018 RVCA report for Mud Creek indicates that an HDF assessment was completed on this watercourse, around the northern limit of the property parcel, where it crosses Navan Road (Rideau Valley Conservation Authority, 2018). The assessment results found that this watercourse is a natural feature with intermittent flows and no channel modifications.



Subject Property

Study Area

Watercourse (City of Ottawa)

Watercourse (MNRF, 2011)

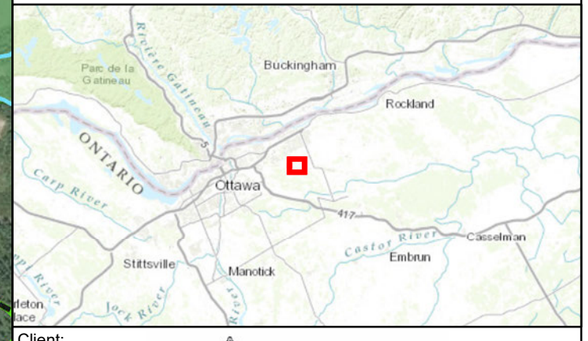
Area of Natural and Scientific Interest (MNRF, 2007)

Significant Woodland (MNRF, 2013)

Unevaluated Wetland (MNRF, 2013)

Provincially Significant Wetland (MNRF, 2013)

RVCA Regulation Limit



Client: CLARIDGE HOMES

Title: **Spring Valley Trails - Phase 5 & 6**
Natural Heritage Screening

Prepared By: WSP

191-15659-00	1:10,000	Review: AO
Date: August 2020	**Figure: 3**	
© Queen's Printer for Ontario		

F:\WSP\GIS\Ecology\3252 Navan Road\2_MXD\Figure_3_NHF.mxd

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 records 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, 2019) and provincial natural heritage mapping accessed through the NHIC (MNRF, 2019) indicates the presence of the Mer Bleue PSW within the Study Area and an unevaluated wetland present within the forested southern half of the subject property.

Mer Bleue PSW is a 7,700-year-old bog, which has been recognized as having international significance under the Ramsar Convention (National Capital Commission, n.d.). The wetland complex provides a habitat for many wildlife species and contains regionally rare plants. The Mer Bleue wetland is part of the National Capital Commission's (NCC) Greenbeltand is managed by the NCC (National Capital Commission, n.d.).

3.4.2 WOODLANDS

Provincial NHIC mapping and aerial photos indicate the presence of wooded areas and potential significant woodlands within the subject property and the Study Area. However, a review of historical imagery suggests that this forest community is likely too young (<60 years) to be considered significant under the City of Ottawa's Significant Woodlands policy guidelines (City of Ottawa, 2019).

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

The Mer Bleue Bog Life Science and Earth Science ANSIs are present within the southern limit of the Study Area, outside of the subject property.

3.4.5 SIGNIFICANT WILDLIFE HABITAT

No SWH features were identified in NHIC or Land Information Ontario (LIO).

3.4.6 FISH HABITAT

No fish community assessments have been conducted within the watercourse located in the Study Area. However, based on its connection to Mud Creek and the compensation habitat feature downstream, it is likely that this watercourse provides indirect fish habitat.

3.5 SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN

Background data was collected and reviewed to identify SAR and Species of Conservation Concern (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-Rank 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 imperiled) designations and are 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 B – Species at Risk Screening**.

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

Common Name	Scientific Name	S-Rank[1]	SARA (Schedule 1)[2]	ESA[2]	Info. Source[3]
Vascular Plants					
Northern Long Sedge	*Carex folliculata*	S3	---	---	NHIC
Butternut	*Juglans cinerea*	S3?	END	END	City of Ottawa
Lepidoptera					
Monarch	*Danaus plexippus*	S2N, S4B	SC	SC	OBA
Herpetoza					
Blanding's Turtle	*Emydoidea blandingii*	S3	THR	THR	ORAA
Eastern Milksnake	*Lampropeltis triangulum*	S4	SC	NAR	ORAA
Eastern Musk Turtle	*Sternotherus odoratus*	S3	SC	SC	ORAA
Northern Map Turtle	*Graptemys geographica*	S3	SC	SC	ORAA
Snapping Turtle	*Chelydra serpentina*	S3	SC	SC	ORAA, iNat
Western Chorus Frog	*Pseudacris triseriata*	S3	THR	NAR	ORAA
Birds					
Bank Swallow	*Contopus virens*	S4B	THR	THR	OBBA
Barn Swallow	*Hirundo rustica*	S4B	THR	THR	OBBA
Black Tern	*Chlidonias niger*	S3B	---	SC	OBBA
Bobolink	*Dolichonyx oryzivorus*	S4B	THR	THR	OBBA
Canada Warbler	*Cardellina canadensis*	S4B	THR	SC	OBBA
Chimney Swift	*Chaetura pelagica*	S4B, S4N	THR	THR	OBBA
Common Nighthawk	*Chordeiles minor*	S4B	THR	SC	OBBA
Eastern Meadowlark	*Sturnella magna*	S4B	THR	THR	OBBA
Eastern Whip-poor-will	*Antrostomus vociferus*	S4B	THR	THR	OBBA
Eastern Wood-pewee	*Contopus virens*	S4B	SC	SC	OBBA

Common Name	Scientific Name	S-Rank[1]	SARA (Schedule 1)[2]	ESA[2]	Info. Source[3]
Evening Grosbeak	*Coccothraustes vespertinus*	S4B	---	SC	OBBA
Least Bittern	*Ixobrychus exilis*	S4B	THR	THR	OBBA
Purple Martin	*Progne subis*	S3, S4B	---	---	OBBA
Short-eared Owl	*Asio flammeus*	S2N, S4B	SC	SC	OBBA
Wood Thrush	*Hylocichla mustelina*	S4B	THR	SC	OBBA
Mammals					
Eastern Small-footed Myotis	*Myotis leibii*	S2S33	END	END	AMO
Little Brown Myotis	*Myotis lucifugus*	S3	END	END	AMO
Northern Myotis	*Myotis septentrionalis*	S3	END	END	AMO
Tri-colored Bat	*Perimyotis subflavus*	S3?	END	END	AMO

[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 southern half of the subject property contains a deciduous forest community, approximately 3.5 hectares (ha) in area. Woodland communities are also present within the Study Area, north of the proposed subject property. Additionally, the subject property's eastern and western boundaries appear to contain hedgerows with trees and shrubs. A review of the City of Ottawa's Urban Tree By-law (No. 2009-200) indicates that this property is located within the urban boundary and, therefore, a tree removal permit is likely to be required.

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*), Red Fox (*Vulpes vulpes*), Eastern Coyote (*Canis latrans* var.), among others.
- **Reptiles & Amphibians:** Eastern Gartersnake (*Thamnophis sirtalis*), Green Frog (*Rana clamitans*), Gray Tree Frog (*Hyla versicolor*), among others.

- **Birds:** American Crow (*Corvus brachyrhynchos*), Black-capped Chickadee (*Poecile atricapillus*), Downy Woodpecker (*Picoides pubescens*), Song Sparrow (*Melospiza melodia*), among others.

3.8 OTHER DEVELOPMENT CONSTRAINTS

The proposed Project footprint is located approximately 100 m north of NCC Greenbelt lands. Due to the proximity to a protected area, consultation with the NCC may be required. Furthermore, a landfill is located in the adjacent property to the east, approximately 200 m from the proposed Project footprint, and may require additional considerations from the City of Ottawa.

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. Such surveys followed industry-standard protocols and were performed in order to establish baseline conditions. 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, including rare plants
  - Wetland delineation
  - Woodland delineation
- Identification of potential SWH, including:
  - Amphibian breeding surveys
  - Breeding bird surveys
  - Bat acoustic surveys
  - General habitat assessment for SCC
  - Incidental SWH observations

SPECIES AT RISK

- Breeding bird survey
- Bobolink and Eastern Meadowlark surveys
- SAR Bat Acoustic Survey
- Search for Butternut
- Incidental SAR and SAR habitat observations

TREES

- Inventory of trees within the subject property:
  - Distinctive tree assessment

INCIDENTAL WILDLIFE

— Visual and auditory observations of wildlife

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). The HDF assessment surveys were completed on April 7th and May 27th, 2020.

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. The vegetation community survey was completed on July 23rd, 2020.

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 its 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 INVENTORY

A vegetation inventory was completed in conjunction with the ELC survey, 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 WETLAND DELINEATION

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 were 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

The evaluation of wildlife habitat used the Ontario provincial guidelines and criteria for the identification of Significant Wildlife Habitat are described in the SWH Technical Guide (MNR, 2000) and the *SWH Criteria Schedules for Ecoregion 6E* (MNRF, 2015).

SWH is described under four main categories:

- Seasonal concentration areas of animals;
- Rare vegetation communities or specialized habitat for wildlife;
- Habitat for species of conservation concern (excluding Endangered or Threatened Species);
- Animal movement corridors.

Candidate SWH refers to those natural features that are potentially significant based on the presence of suitable habitat in the criteria outlined in MNRF (2015). For those habitat features that qualify as candidate SWH, targeted field surveys were carried out to confirm significance and are described below. Defining criteria to determine confirmed significance is also outlined in MNRF (2015).

To determine other candidate SWH within the Study Area, wildlife habitat assessments recorded the presence of features that are not easily identifiable via aerial photography. This included; the presence of candidate reptile hibernacula, seeps/springs/vernal pools, turtle nesting and wintering areas, and stick nests. Results from ELC was also used to determine the presence of candidate SWH.

AMPHIBIAN BREEDING SURVEYS

Amphibian monitoring to evaluate and confirm candidate Amphibian Breeding SWH followed the *Marsh Monitoring Program - Participant's Handbook for Surveying Amphibians* (Bird Studies Canada, 2008). In accordance with the survey protocol, three separate surveys were conducted on April 28th, May 28th, and June 16th, 2020. 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 suitable candidate habitat features (vernal pools, surface water features) within the Study Area.

Each amphibian survey involved standing at a predetermined station for three minutes and listening for frog calls. The calling activity of individuals estimated to be within 100 m of the observation point was documented. All individuals beyond 100 m will be recorded as outside the count circle, and calling activity was not recorded. Calling activity was ranked using one of the three abundance code categories:

Code 1: Calls not simultaneous, number of individuals can be accurately counted;

Code 2: Some calls simultaneous, number of individuals can be reliably estimated; and,

Code 3: Calls continuous and overlapping, number of individuals cannot be estimated.

In areas where candidate amphibian habitat exists, vernal pools (if present) were visually examined for egg masses and amphibian larvae in conjunction with other day-time surveys. These searches occurred between April and June when amphibians are concentrated around the 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 methods outlined in the *Ontario Breeding Bird Atlas Guide for Participants* (Bird Studies Canada, 2001). These surveys were completed on June 2nd and June 22nd, 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, wandering transect searches noting all individual bird species and their corresponding breeding evidence were also completed while traversing the habitat on foot.

BAT MATERNITY COLONIES

The preliminary site survey in December 2019 identified low potential for candidate bat maternity colonies within the Study Area. Treed areas were generally young and lacked suitable numbers of candidate cavity trees to be used as maternity roost habitat for bats. Therefore, a snag/cavity tree count was determined to be unnecessary.

However, to evaluate the presence of bats within the Study Area, three acoustic surveys for bats were conducted using a Wildlife Acoustics Echo Meter Touch 2 Pro ultrasonic module. Surveys were completed concurrently with the amphibian breeding surveys. The surveys consisted of listening for bat calls for ten minutes throughout the Study Area. Surveys were conducted a half-hour after sunset when bats typically emerge from roosts to forage. Results of the acoustic surveys 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 within the Project's Study Area (**Appendix B**). They include **Black Tern, Eastern Wood-Pewee, Purple Martin, Short-eared Owl, Eastern Musk Turtle, Northern Map Turtle, Snapping Turtle, Western Chorus Frog, Monarch,** and **Northern Long Sedge.** The habitat for most of these species is associated with the Mer Bleue cattail marsh, located outside of the subject property.

Due to accessibility restrictions, the vegetation inventory and wildlife 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 B**).

INCIDENTAL OBSERVATIONS OF SIGNFICANT 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.

4.4 SPECIES AT RISK AND SPECIES AT RISK HABITAT

ELC and wildlife surveys were used to identify candidate habitat for SAR with the potential to occur within the Study Area.

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 B – Species at Risk Screening**.

BREEDING BIRD SURVEYS

The breeding bird surveys described in **Section 4.3.4** were used to determine the presence or absence of SAR bird species with the potential to occur within the Study Area (**Appendix B**).

BOBOLINK AND EASTERN MEADOWLARK

Field surveys to determine the presence or absence of Bobolink and Eastern Meadowlark were completed by a qualified biologist, using the MNRF's Bobolink and Eastern Meadowlark Survey Protocol (MNR, 2011). The surveys consist of establishing transects across the meadow habitat and survey stations along the transect at a 250 m intervals. The target surveys for Bobolink and Eastern Meadowlark were appended to the two breeding bird surveys described above (June 2nd and June 22nd, 2020), with a third visit occurring on July 2nd, 2020.

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 and Eastern Meadowlark observations when travelling between point count stations.

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

SPECIES AT RISK BATS

The acoustic monitoring of bat activity described in **Section 4.3.4** was used to evaluate the presence or absence of SAR bats within the Study Area, which includes Northern Myotis, Little Brown Myotis, Northern Long-eared Myotis, and Tricolored Bat.

BUTTERNUT

A search for Butternut (*Juglans cinerea*) trees 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 UTM 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.

INCIDENTAL SPECIES AT RISK AND SPECIES AT RISK HABITAT OBSERVATIONS

In addition to the habitat for the species noted in **Appendix B**, 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.

4.5 TREES

Following the City of Ottawa's *Tree Conservation Report Guidelines* (City of Ottawa, 2019), trees ≥ 10 cm DBH were surveyed within the subject property. Large stands of trees were assessed as a group based on species composition and density as per standard protocols. All Distinctive trees (≥ 50 cm DBH) were surveyed by an approved professional as outlined in the City guidelines. Species, DBH, health condition, height, and UTM location were recorded for each Distinctive tree encountered.

The tree survey was completed on December 17th, 2019. A follow-up survey to confirm tree conditions during the growing season was conducted on July 28th, 2020.

4.6 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. The survey results are discussed below.

5.1 SITE INVESTIGATIONS

As required, resumes of key staff involved in the project have been included in **Appendix C**. A total of one site visit was made to assess for the ecological features and functions identified in the background records review. The dates, times, surveyor names, and weather conditions for all surveys are listed in **Table 3.** Photographs from field surveys are included in **Appendix D.**

Table 3 Field Survey Details

Date	Surveyor	Start Time	End Time	Weather Conditions	Purpose
December 17, 2019	A.Orr C. Pytlak	08:30	15:00	-3°C, variable clouds, light snow in afternoon, slight breeze	General Field Evaluation Tree Survey
April 7, 2020	A. Rous C. Pytlak	9:00	12:15	7°C, sunny and clear, gentle wind	HDF Assessment #1
April 28, 2020	C. Pytlak	20:15	21:30	10°C, clear skies, no wind	Amphibian Breeding Survey #1 Bat Acoustic Survey #1
May 27, 2020	A. Rous C. Pytlak	8:00	10:30	34°C, sunny and clear, light wind	HDF Assessment #2
May 28, 2020	C. Pytlak	20:30	21:45	25°C, overcast, drizzle, no wind	Amphibian Breeding Survey #2 Bat Acoustic Survey #2
June 2, 2020	C. Pytlak	7:00	8:30	10°C, scattered clouds, slight breeze	Breeding Bird Survey #1 Grassland SAR Bird Survey #1
June 16, 2020	C. Pytlak	21:15	22:30	22°C, clear, no wind	Amphibian Breeding Survey #3 Bat Acoustic Survey #3
June 22, 2020	C. Pytlak	6:30	8:15	22°C, scattered clouds, light wind	Breeding Bird Survey #2 Grassland SAR Bird Survey #2

Date	Surveyor	Start Time	End Time	Weather Conditions	Purpose
July 2, 2020	C. Pytlak	7:00	7:30	22°C, scattered clouds, light wind	Grassland SAR Bird Survey #3
July 23, 2020	A. Orr	8:00	14:00	27°C, overcast, no wind	ELC Survey Vegetation Survey
July 28, 2020	C. Pytlak	10:0	12:00	28°C, sunny, no wind	Tree Survey

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 feature located within the subject property. Four separate reaches were identified, based on distinct changes to riparian and terrestrial habitat, or channel modifiers such as road crossings and culverts.

The following sections describe the characteristics and conditions of the four reaches. Classification and management recommendations for the reaches are detailed in **Table 4**. 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 E.**

REACH HDF1-A

This reach enters the subject property from a culvert under Navan Road and flows south along the eastern boundary of the subject property. The reach has a moderately sloping gradient towards the downstream limit. This channelized reach had minimal surface flow during the initial site visit and was mainly dry during the second visit. This reach had an approximate bankfull width of 2.2 m and a bankfull depth of 700 mm.

The feature does not have any in-stream vegetation. The riparian habitat is dominated by forest on the right upstream bank and active aggregate use on the left upstream bank. The dominant substrate is silt, with sand as the subdominant substrate. There was evidence of substantial sediment deposition from sheet erosion and in-stream bank erosion, as well as gullies from the adjacent soil stockpiling on the left bank.

No fish were observed during field surveys.

REACH HDF1-B

This channelized reach continues along the eastern boundary of the subject property and is marked by distinct changes in the riparian and terrestrial vegetation. This reach is bordered by meadow on the right upstream bank and forest on the left upstream bank. This feature had minimal surface flow during both site visits. This reach has an approximate bankfull width of 6.6 m and a bankfull depth of 600 mm.

The dominant substrate within this reach is comprised of silt, with lesser amounts of sand. There was evidence of sediment transport from sheet erosion, and sediment deposition was evaluated as moderate. This reach has a gentle gradient.

No fish were observed during field surveys.

REACH HDF1-C

The limits of this reach were marked by distinct changes to the riparian and terrestrial vegetation, as well as a change in channel form. This reach is directed west and flows into a deciduous swamp, transitioning into a multi-threaded channel with occasional wetland pools. During both visits, this reach had minimal surface flow.

Due to the watercourse characteristics, the bankfull width could not be measured. However, the mean width of the channel is approximately 1.9 m, with a depth of approximately 150 mm. The dominant substrate is silt, with sand as the subdominant. There was no evidence of sediment transport within this reach. Sediment deposition was evaluated to be moderate. The gradient within this reach is generally flat.

No fish were observed during field surveys.

REACH HDF1-D

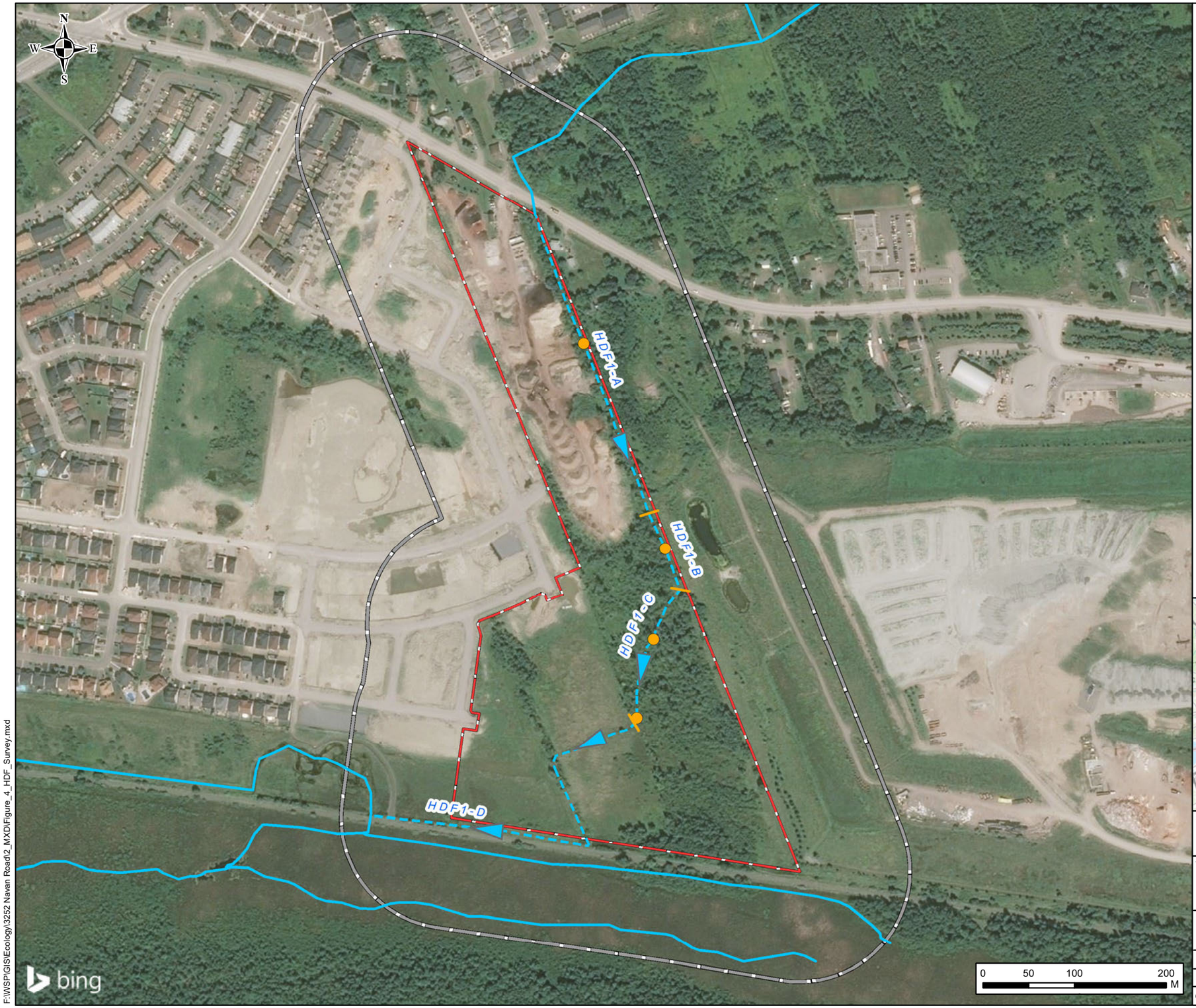
The fourth reach is marked by changes to the riparian and terrestrial vegetation, as this reach is generally surrounded by meadow or scrubland on both banks. This feature returns to a channelized form that flows west across a meadow, and then south through a hedgerow. The end of this reach is defined by the subject property limit, although conditions along the watercourse outside of the subject property remain consistent.

Minimal surface flow was observed during the initial visit, and only standing water was observed during the second visit. The bankfull width was measured to be approximately 1.8 m, with a bankfull depth of 450 mm. The dominant substrate is silt with lesser amounts of sand. Sheet erosion was noted as the sole source of sediment transport, and sediment deposition was evaluated to be minimal. The gradient within this reach is generally flat.

No fish were observed within this reach during the HDF surveys. However, fish were incidentally observed downstream of this reach during a breeding bird survey.

Table 4 Headwater Drainage Feature Assessment Management Recommendations

Drainage Feature Segment	Step 1		Step 2	Step 3	Step 4	Management Recommendation
	Hydrology	Modifiers	Riparian	Fish Habitat	Terrestrial Habitat	
HDF1-A	Valued functions: Contains intermittent flows fed by upstream headwaters and a defined connection downstream.	- Upstream culvert at Navan Road - Degraded habitat (soil stockpiling) in riparian and terrestrial areas	Important function: Forest	Contributing functions	Contributing functions	**Conservation**
HDF1-B	Valued functions: Contains intermittent flows fed by upstream headwaters and a defined connection downstream.	- Change in riparian habitat	Valued function: Meadow and forest	Contributing functions	Contributing functions	**Conservation**
HDF1-C	Valued functions: Multi-threaded channel contains intermittent flows fed by upstream headwaters and surrounding wetland, with a defined connection downstream.	- Change in riparian and terrestrial habitats - Defined channel transitions into multi-threaded channel	Important function: Wetland and forest	Contributing functions	Valued functions: Wetland habitat present, although no evidence of amphibian breeding	**Conservation**
HDF1-D	Valued functions: Contains intermittent flows fed by upstream headwaters and wetland, with a defined downstream connection	- Change in riparian and terrestrial habitats - Returns to a defined channelized watercourse (similar to HDF1-A & HDF1-B)	Valued function: Meadow	Valued functions: Fish observed at downstream end during other field surveys	Contributing functions	**Conservation**



Subject Property

Study Area

Headwater Drainage Feature Sampling Location

Sampled Headwater Drainage Feature and Flow Direction

Watercourse (MNRF, City of Ottawa)

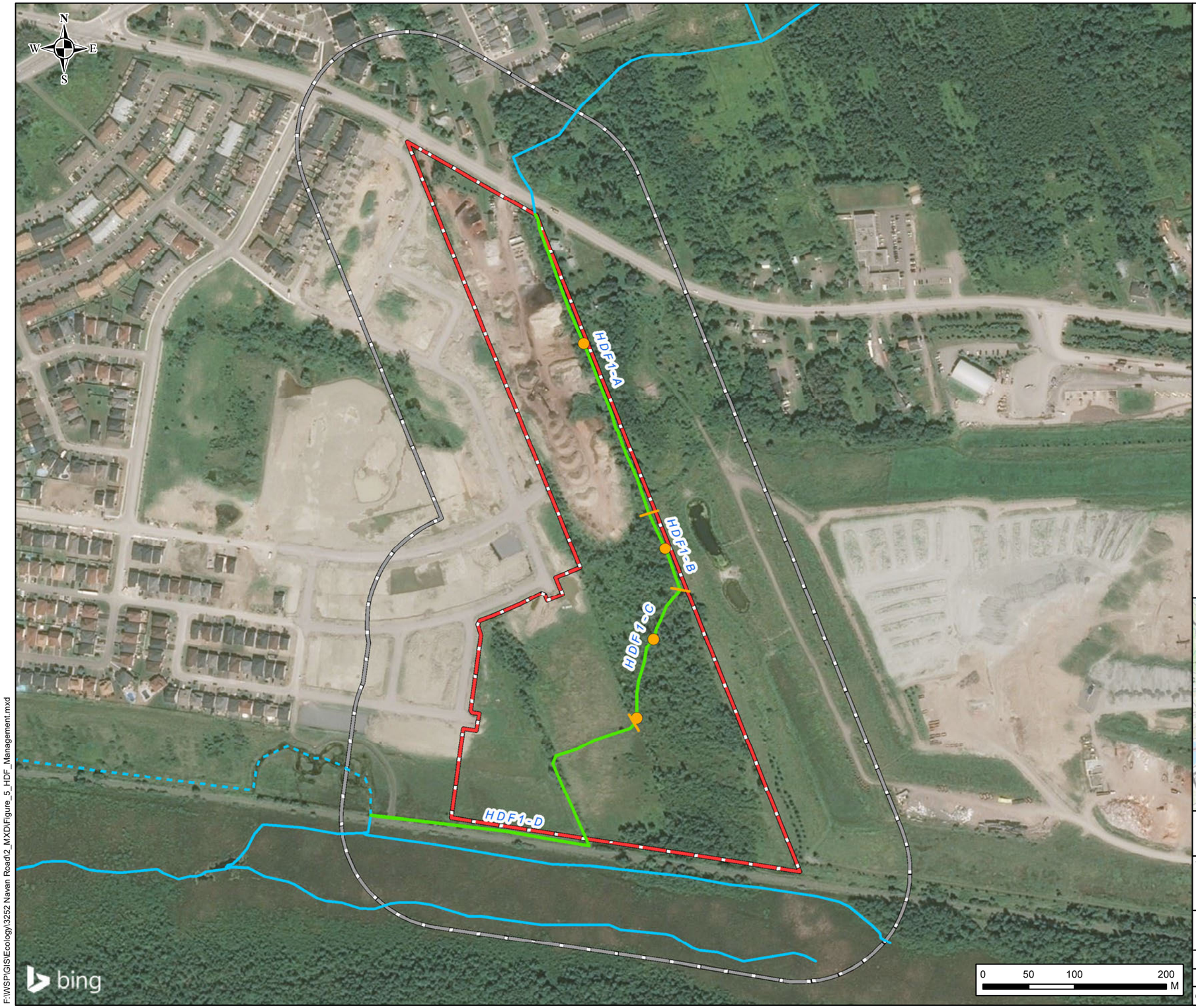
Client: CLARIDGE HOMES

Title: **Spring Valley Trails - Phase 5 & 6**
Headwater Drainage Feature Assessment Survey

Prepared By: WSP

191-15659-00	1:4,300	Review: AO
Date: August 2020	**Figure: 4**	
© Queen's Printer for Ontario		

F:\WSP\GIS\Ecology\3252 Navan Road\2_MXD\Figure_4_HDF_Survey.mxd



Subject Property

Study Area

Watercourse (MNRF, 2011)

Management Recommendation

Conservation

Client: CLARIDGE HOMES

Title: **Spring Valley Trails - Phase 5 & 6**
Headwater Drainage Feature Management

Prepared By: WSP

191-15659-00	1:4,300	Review: AO
Date: August 2020	**Figure: 5**	
© Queen's Printer for Ontario		

F:\WSP\GIS\Ecology\3252 Navan Road\2_MXD\Figure_5_HDF_Management.mxd

5.3 NATURAL HERITAGE FEATURES

5.3.1 VEGETATION COMMUNITIES

The ELC survey identified a total of 10 vegetation communities within the Study Area, including areas with residential or commercial development. The communities surveyed within the Study Area are considered common within Ontario. **Table 5** outlines the communities documented during the ELC survey 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 D**.

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. Invasive species such as Purple Loosestrife (*Lythrum salicaria*), Glossy Buckthorn (*Rhamnus frangula)*, and Common Buckthorn (*Rhamnus cathartica*) were common throughout the Study Area. Biologists also recorded evidence of pests and disease for Green Ash (*Fraxinus pennsylvanica*) (i.e. Emerald Ash Borer) and Trembling Aspen (*Populus tremuloides*) (i.e. Hypoxylon canker) within the Study Area.

VEGETATION SURVEY

The vegetation survey identified 69 species throughout the subject property. Twenty-eight species were documented within the Reed-canary Grass Graminoid Meadow Marsh (MAMM1-3) communities, 48 species within the Poplar Mineral Deciduous Swamp (SWDM4-5) community, 12 species in the Willow Mineral Deciduous Thicket Swamp (SWTM3) community, and 14 species in the Dry-Fresh Deciduous Woodland (WODM5) community.

Approximately 60% 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 1.6. This suggests that the majority of plant species recorded during the survey are tolerant to a variety of habitat conditions and disturbance.

Nearly all the plants and trees identified during the survey are considered common within Ontario and the City of Ottawa. Black Walnut (*Juglans nigra*) and Black Locust (*Robinia pseudoacacia*) were recorded during the vegetation survey – both trees are considered to be 'Rare' within the City of Ottawa (Brunton, 2005). **No provincial or federal SAR were recorded during the inventory**.

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

Table 5 Ecological Land Classification Results

ELC Type	Total Area (ha)	Community Description
Commercial and Institutional (CVC)		
CVC_1 Business Sector	3.5	This community occurs within the northern portion of the subject property and is occupied by an active sand and gravel storage and supply business. This community is mainly cleared land with piles of soil, sand, and other materials located within the business area. An office building with frontage to Navan Road is located in this community.
Deciduous Swamp (SWD)		

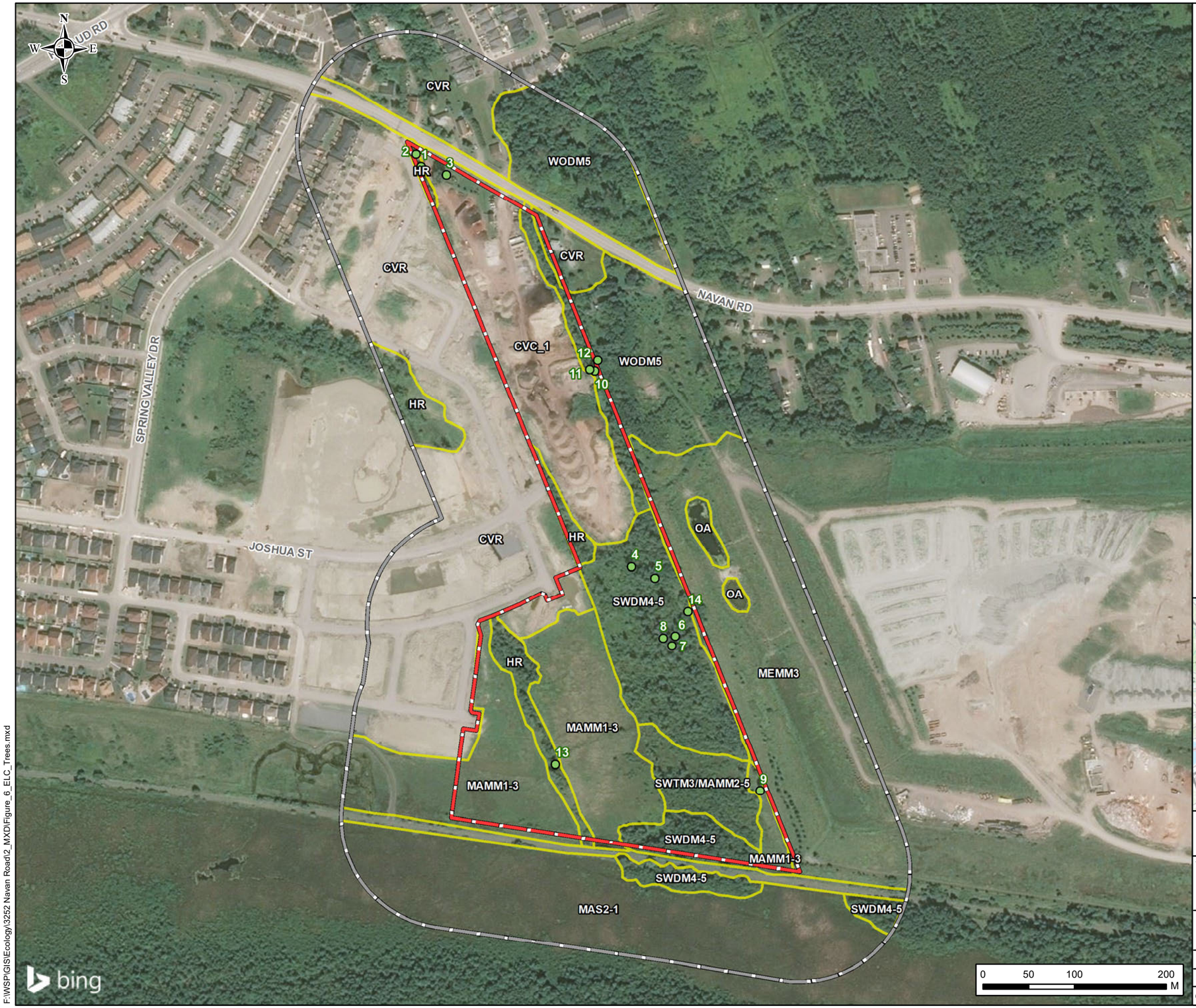
ELC Type	Total Area (ha)	Community Description
SWDM4-5 Poplar Mineral Deciduous Swamp Type	3.5	This community occurs within the southern portion of the subject property and consists mainly of young, regenerating vegetation. The canopy and sub-canopy is dominated by Trembling Aspen, Eastern Cottonwood (*Populus deltoides*), Willow species (*Salix sp.*), and Green Ash. The understorey is mainly dominated by dense Common Buckthorn, and Willow species. Purple Loosestrife and Narrow-leaved Meadowsweet (*Spiraea alba*) are also present throughout the understorey. The ground layer is comprised of Field Horsetail (*Equisetum arvense*), Green Ash seedlings, Dwarf Raspberry (*Rubus pubescens*), and Thicket Creeper (*Parthenocissus inserta*). This community has evidence of dumping and erosion from the adjacent commercial property, disease and pest damage to Trembling Aspen and Green Ash trees, and invasive species are prevalent throughout. This community forms a complex with the **SWTM3 (Willow Mineral Deciduous Thicket Swamp Ecosite)** community described below.
Deciduous Woodland (WOD)		
WODM5 Dry-Fresh Deciduous Woodland Ecosite	4.7	This community is represented by two polygons; one bordering the eastern limit of the subject property, and the other located adjacent to the subject property off Navan Road. The woodland community is dominated by Manitoba Maple (*Acer negundo*), Trembling Aspen, and Green Ash in the canopy and sub-canopy. This community had evidence of disturbance due to fill and dumping from the adjacent commercial property.
Hedgerow (HR)		
HR Hedgerow	1.2	Hedgerow communities are located throughout the Study Area and consist mainly of young to mid-aged groups of Trembling Aspen and Manitoba Maple.
Meadow (MEMM)		
MEMM3 Dry - Fresh Mixed Meadow Ecosite	6.0	This community is located primarily outside of the subject property's eastern boundary. It is dominated by Reed-canary Grass (*Phalaris arundinacea*) with Common Burdock (*Arcticum minus ssp. minus*), Canada Goldenrod (*Solidago canadensis*) and Thistle species (*Sonchus sp.*) present throughout.
Meadow Marsh (MAMM)		
MAMM1-3 Reed-canary Grass Graminoid Mineral Meadow Marsh Type	4.8	This community is present throughout much of the western portion of the subject property. This community is dominated by Reed-canary Grass, Purple Loosestrife, Narrow-leaved Meadowsweet, and Tall Goldenrod (*Solidago altissima var. altissima*) in the understorey. The ground layer consists mainly of Reed-canary Grass, Purple Vetch (*Vicia americana*), Kentucky Blue Grass (*Poa pratensis ssp. pratensis*), and Common Dandelion (*Taraxacum officinale*).

ELC Type	Total Area (ha)	Community Description
		This community has evidence of disturbance from soil stockpiling from the adjacent residential development.
Open Water (OA)		
OA Open Aquatic	0.24	This community is represented by two small constructed ponds located on the eastern edge of the Study Area.
Residential (CVR)		
CVR Residential	11.4	This community is associated with multiple residential developments located within the Study Area. It consists of low-density housing units.
Shallow Marsh (MAS)		
MAS2-1 Cattail Mineral Shallow Marsh Type	5.2	This feature is associated with Mer Bleue and is located outside of the subject property. It is dominated by Cattail species (*Typha* sp.).
Swamp Thicket (SWT)		
SWTM3 Willow Mineral Deciduous Thicket Swamp Ecosite Inclusion: **MAMM2-5** Purple Loosestrife Forb Mineral Meadow Marsh	0.9	This thicket swamp community is located near the southern boundary of the subject property. It is dominated in the understorey by Glossy Buckthorn, Sandbar Willow (*Salix exigua*), Bebb's Willow (*Salix bebbiana*), and Pussy Willow (*Salix discolor*). This community contains a **MAMM2-5 (Purple Loosestrife Forb Mineral Meadow Marsh Type)** inclusion, consisting mainly of Purple Loosestrife, Spotted Joe-Pye-weed (*Eupatorium maculatum ssp. maculatum*) and Water-Horehound species (*Lycopus sp.*).

5.3.2 WETLANDS

Three wetland communities (MAMM1-3, MAS2-1, SWDM4-5, SWTM3) were identified and delineated within the Study Area. The MAMM1-3, SWDM4-5, and SWTM3 communities were associated with the headwater drainage feature that flows through the property. The MAS2-1 community is associated with Mer Bleue PSW, outside of the subject property.

Provincially Significant Wetlands (PSW) are present within the Study Area, although located outside of the subject property and development footprint.



F:\WSP\GIS\Ecology\3252 Navan Road\2_MXD\Figure_6_ELC_Trees.mxd

Subject Property

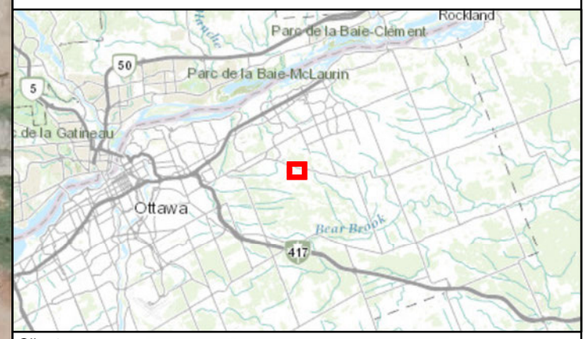
Study Area

Vegetation Community

Distinctive Tree (>50 cm DBH)

Ecological Land Classification

CVC_1- Business Sector
CVR- Residential
HR- Hedgerow
MAMM1-3- Reed-canary Grass Graminoid Mineral Meadow Marsh Type
MAMM2-5- Purple Loosestrife Mineral Meadow Marsh Type
MAS2-1- Cattail Mineral Shallow Marsh Type
MEMM3- Dry - Fresh Mixed Meadow Ecosite
OA- Open Aquatic
SWDM4-5- Poplar Mineral Deciduous Swamp Type
SWTM3- Willow Mineral Deciduous Thicket Swamp Ecosite
WODM5- Dry - Fresh Deciduous Woodland Ecosite



Client: CLARIDGE HOMES

Title: **Spring Valley Trails - Phase 5 & 6**
Ecological Land Classification & Distinctive Trees

Prepared By: WSP

191-15659-00	1:4,300	Review: AO
Date: August 2020	**Figure: 6**	

5.3.3 WOODLANDS

The deciduous swamp (SWDM4-5) and deciduous woodland (WODM5) that occurs within the Study Area all meet the woodland definition as per the Forestry Act, R.S.O 1990, c.F.26.

The Poplar Mineral Deciduous Swamp (SWDM4-5) located in the centre of the subject property is 2.4 ha in size, which meets the size criteria for significance. However, a review of aerial imagery from 1976 (see **Figure 2**) shows this area was cleared for agricultural use and does not meet the minimum age requirement of 60 years old. Therefore, this woodland is not significant.

The Dry-Fresh Deciduous Woodland (WODM5) communities outside of the subject property are approximately 4.3 ha and 6.5 ha in size, which meets the minimum size criteria for significance. However, they are not present on aerial imagery approximately 44 years ago (i.e. 1976) and, therefore, do not meet the minimum age requirement of 60 years old to be considered significant.

There are no significant woodlands located within the Study Area.

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. The locations of wildlife surveys are illustrated in **Figure 7**.

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 Survey Area. Surveys were conducted within the meadow marsh and deciduous swamp communities, adjacent to areas with surface water features or vernal pools.

A total of four amphibian species were observed within the Study Area (**Table 6**). A full chorus of Spring Peepers (*Anaxyrus americanus*) was heard during the second visit, located within the Mer Bleue cattail marsh, but outside of the100 m survey radius.

Gray Treefrogs (*Hyla versicolor*) were relatively abundant within and around the subject property, with multiple individuals recorded within the deciduous swamp community.

American Toad (*Pseudacris crucifer*), Gray Treefrog, and Spring Peeper were also heard calling from the two open water pond areas on the eastern edge of the Study Area. These ponds were located outside of the 100m survey radius and subject property.

No SAR or SCC was identified during amphibian surveys. Based on the results, SWH for amphibians is absent from the Study Area.

Table 6 Amphibian breeding survey results

Common Name	Scientific Name	# of Observations[1]	S-Rank[2]	Comments
American Toad	*Pseudacris crucifer*	Code 1: 1individual	S5	Outside of 100 metres; in Mer Bleue marsh, and in open water ponds on adjacent property to the east.
Gray Treefrog	*Hyla versicolor*	Code 2: 5individuals	S5	Individuals heard scattered throughout deciduous swamp and open water ponds on adjacent property to the east.

Common Name	Scientific Name	# of Observations[1]	S-Rank[2]	Comments
Spring Peeper	*Anaxyrus americanus*	Code 3: Full Chorus	S5	Full chorus heard on Survey #2 (May 28th) from Mer Bleue marsh, outside of 100 m.
Wood Frog	*Lithobates sylvaticus*	Code 1: 1 individual	S5	Outside of 100 metres and Survey Area; in Mer Bleue marsh.
[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				

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 7**. A total of 30 bird species were r ecorded during the surveys.

Six 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 Black-capped Chickadee, Common Yellowthroat, Northern Harrier, Song Sparrow, Swamp Sparrow, and Yellow Warbler.

All species recorded during the surveys are generally common throughout Ontario and the Ottawa area. It is likely that the variety of habitats, the presence of surface water features, and proximity to both a protected natural area and a landfill all contribute to the diversity of birds recorded during the surveys.

No SAR or SCC was identified to occur within the Study Area. Based on results, SWH for breeding bird species is absent for the Study Area.

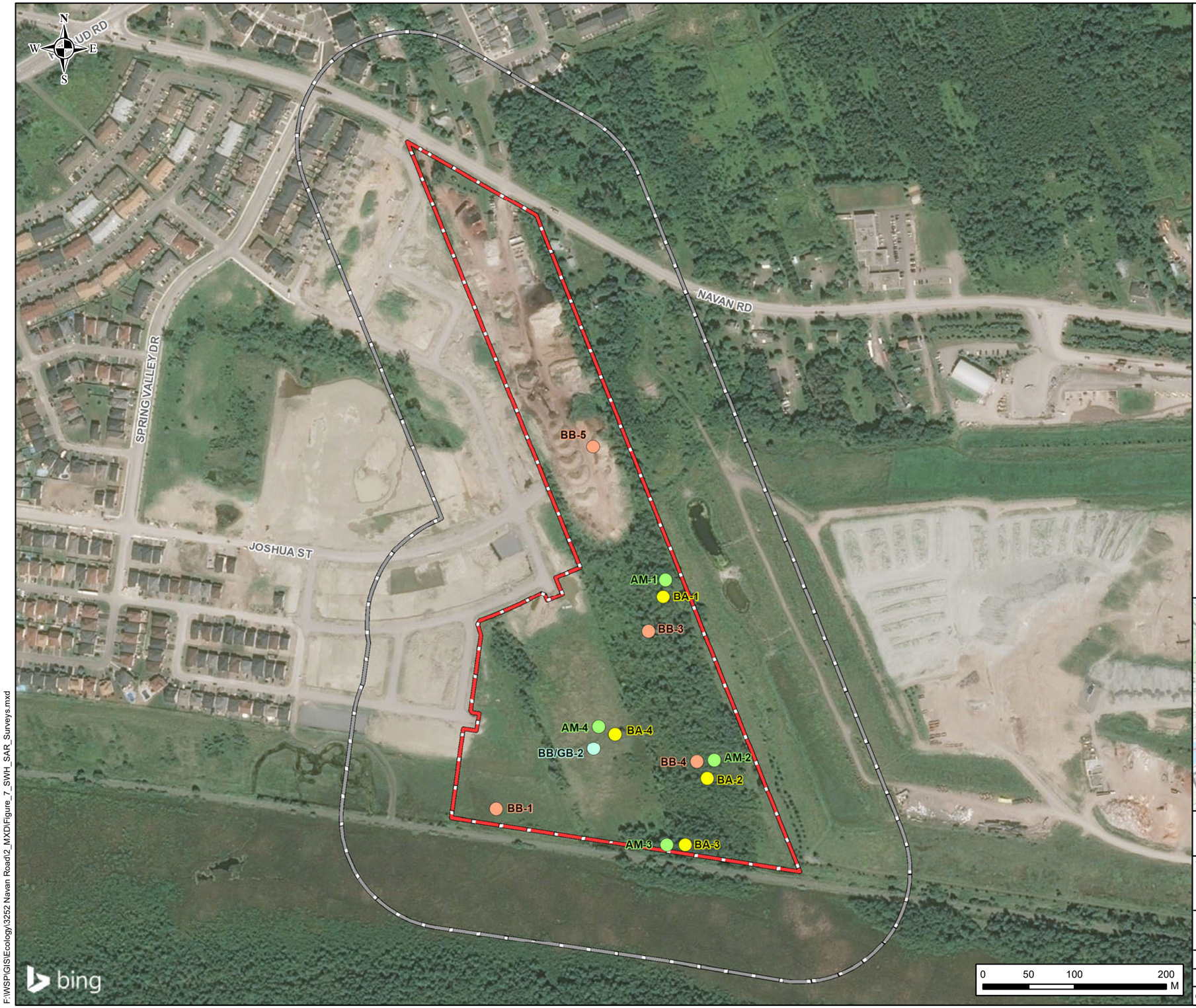
Table 7 Breeding bird survey results

Common Name	Scientific Name	S-Rank[1]	Breeding Status	Observation
Alder Flycatcher	*Empidonax alnorum*	S5B	Possible	Singing males observed in suitable nesting habitat
American Bittern	*Botaurus lentiginosus*	S4B	Possible	Species observed in suitable nesting habitat
American Crow	*Corvus brachyrhyncho*	S5B	Possible	Individual observed in suitable nesting habitat
American Goldfinch	*Spinus tristis*	S5B	Possible	Singing males observed in suitable nesting habitat
American Redstart	*Setophaga ruticilla*	S5B	Possible	Singing males observed in suitable nesting habitat
American Robin	*Turdus migratorius*	S5B	Probable	Species observed exhibiting territorial behaviour
Black-and-white Warbler	*Mniotilta varia*	S5B	Possible	Singing males observed in suitable nesting habitat
Black-capped Chickadee	*Poecile atricapillus*	S5	Confirmed	Observed carrying food and exhibiting anxiety behaviour

Common Name	Scientific Name	S-Rank[1]	Breeding Status	Observation
Brown Thrasher	*Toxostoma rufum*	S4B	Possible	Singing male observed in suitable nesting habitat
Cedar Waxwing	*Bombycilla cedrorum*	S5B	Possible	Singing males observed in suitable nesting habitat
Chestnut-sided Warbler	*Setophaga pensylvanica*	S5B	Possible	Singing males observed in suitable nesting habitat
Common Grackle	*Quiscalus quiscula*	S5B	Probable	Territorial display observed
Common Yellowthroat	*Geothlypis trichas*	S5B	Confirmed	Fledged young observed
Downy Woodpecker	*Picoides pubescens*	S5	Possible	Individual observed in suitable nesting habitat
European Starling	*Sturnus vulgaris*	SNA	Possible	Individuals observed in suitable nesting habitat
Gray Catbird	*Dumetella carolinensis*	S4B	Possible	Singing males observed in suitable nesting habitat
Great Blue Heron	*Ardea herodias*	S4	Observed	Species observed flying over Study Area
Mallard	*Anas platyrhynchos*	S5	Observed	Species observed flying over Study Area
Nashville Warbler	*Oreothlypis ruficapilla*	S5B	Possible	Singing males observed in suitable nesting habitat
Northern Harrier	*Circus hudsonius*	S5B	Confirmed	Observed carrying food; territorial and anxiety behaviour around cultural meadow habitats
Red-winged Blackbird	*Agelaius phoeniceus*	S4	Probable	Species observed in pairs; exhibiting territorial and anxiety behaviour
Ring-billed Gull	*Larus delawarensis*	S5B, S4N	Observed	Species observed
Song Sparrow	*Melospiza melodia*	S5B	Confirmed	Fledged young observed
Swamp Sparrow	*Melospiza georgiana*	S5B	Confirmed	Fledged young

Common Name	Scientific Name	S-Rank[1]	Breeding Status	Observation
Tree Swallow	*Tachycineta bicolor*	S4B	Possible	Individual observed foraging near suitable nesting habitat
Veery	*Catharus fuscescens*	S4B	Probable	Anxiety calls heard
Warbling Vireo	*Vireo gilvus*	S5B	Possible	Singing male observed in suitable nesting habitat
Yellow Warbler	*Setophaga petechia*	S5B	Confirmed	Species observed visiting nest
Yellow-bellied Sapsucker	*Sphyrapicus varius*	S5B	Possible	Individual observed in suitable nesting habitat
Yellow-rumped Warbler	*Setophaga coronata*	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



Subject Property

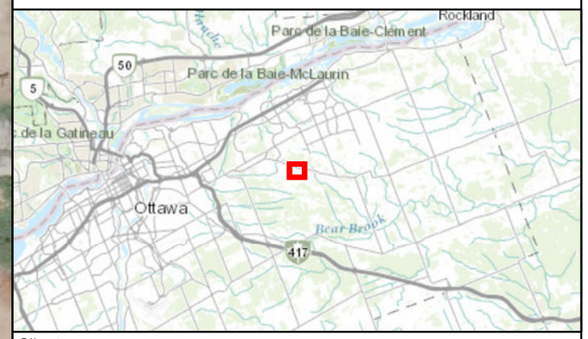
Study Area

Amphibian Breeding Survey Station

Bat Acoustic Survey Station

Breeding Bird Survey Station

Breeding Bird/Grassland Survey Station



Client: CLARIDGE HOMES

Title: **Spring Valley Trails - Phase 5 & 6**
Significant Wildlife Habitat & SAR Survey Locations

Prepared By: WSP

191-15659-00	1:4,300	Review: AO
Date: August 2020	**Figure: 7**	
© Queen's Printer for Ontario		

F:\WSP\GIS\Ecology\3252 Navan Road\2_MXD\Figure_7_SWH_SAR_Surveys.mxd

BAT MATERNITY COLONIES

During the preliminary site visit in December 2019, biologists identified minor amounts of candidate roost trees (>25 cm DBH with cavities and/or peeling bark) within the deciduous swamp community (SWDM4-5). Based on these observations, the swamp does not meet the habitat criteria to be considered significant (>10 suitable wildlife trees per hectare) (MNRF, 2015).

The acoustic surveys detected a total of three species. They included; Big Brown Bat (*Eptesicus fuscus*), Hoary Bat (*Lasiurus cinereus*), and Silver-haired Bat (*Lasionycteris noctivagans*). Both Big Brown Bat and Silver-haired Bat are indicator species for Bat Maternity Colony SWH (MNRF, 2015). Bat detections were recorded most frequently within and around the deciduous swamp community. Only one individual bat was visually observed on the eastern edge of the deciduous swamp, performing multiple passes during the second survey (May 28th, 2020).

Based on survey results, SWH for bat maternity colonies could not be confirmed due to a low abundance of bats on-site and the absence of maternity colonies in cavity trees.

HABITAT FOR SPECIES OF CONSERVATION CONCERN

Potential habitat for five SCC (**Appendix B**) was confirmed during the ELC assessment and wildlife surveys. Results of suitable habitat and the presence/absence of SCC within the Study Area include:

- **Short-eared Owl:** Meadow and cattail marsh habitats within the Study Area may provide suitable conditions. This species was not observed during field surveys.
- **Purple Martin:** Meadow habitats may provide suitable foraging habitat. This species was not observed during field surveys.
- **Eastern Milksnake:** Meadow habitats with adjacent Aspen hedgerows and swamps are present within the Study Area. This species was not observed during field surveys.
- **Monarch:** Milkweed plants were observed within the Study Area and Project footprint. However, there were no direct observations of Monarch caterpillars and/or butterflies during field surveys.
- **Snapping Turtle:** Cattail marsh located in the southern limit of Study Area. No observations or evidence of Snapping Turtles occurred within the Study Area during field surveys.

Based on survey results, SWH for SCC could not be confirmed due to the absence of species within the Study Area at the time of field investigations.

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 AND EASTERN MEADOWLARK

Three targeted surveys for Bobolink and Eastern Meadowlark were completed in June and July. No Bobolink or Eastern Meadowlark was observed during the surveys. Neither species were observed incidentally during surveys for vegetation and trees. The location of the Bobolink and Eastern Meadowlark surveys is shown in **Figure 7**.

Biologists recorded suitable habitat conditions, consisting of dense grassland cover with dense plant litter and thatch for nest building, and occasional shrub cover for singing perches. However, it is likely that the combination that the limited area of suitable habitat (<10 ha), and nearby residential development and construction has limited the overall suitability for both species.

SPECIES AT RISK BATS

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

BUTTERNUT

No Butternuts were encountered during the vegetation or tree surveys.

INCIDENTAL SPECIES AT RISK AND SPECIES AT RISK HABITAT

Biologists detected two Eastern Whip-poor-will calling from the Mer Bleue wetland during an evening amphibian survey on May 28th. The individuals were estimated to be 200m south of the Study Area boundary. Furthermore, no suitable habitat for Eastern Whip-poor-will was identified within the Study Area.

5.5 TREES

The ELC and tree surveys recorded 20 tree species within the Study Area. The following species were encountered during the survey:

- American Basswood (*Tilia americana*)
- American Elm (*Ulmus americana*)
- Bebb's Willow
- Black Cherry (*Prunus serotina*)
- Black Locust
- Black Walnut (*Juglans nigra*)
- Common Buckthorn
- Crack Willow (*Salix fragilis*)
- Eastern Cottonwood
- Eastern White Cedar (*Thuja occidentalis*)
- Eastern White Pine (*Pinus strobus*)
- Green Ash
- Manitoba Maple
- Paper Birch (*Betula papyrifera*)
- Red Maple (*Acer rubrum*)
- Silver Maple (*Acer saccharinum*)
- Swamp White Oak (*Quercus bicolor*)
- Trembling Aspen
- White Poplar (*Populus alba*)
- White Willow (*Salix alba*)

A general tree count within the subject property estimated approximately 569 trees (≥10 cm DBH), with a majority of trees measuring between 15-25 cm DBH.

The tree community within the SWDM4-5 community is comprised mainly of Trembling Aspen (43%) and Eastern Cottonwood (31%), with lesser amounts of American Elm, Buckthorn, Green Ash, Manitoba Maple, and White Willow. Trees within this community are generally in a healthy condition. Pest and disease damage was prevalent to Green Ash and Trembling Aspen. Furthermore, some trees near the northern boundary of this community were in poor condition as a result of soil stockpiling and erosion from the adjacent commercial property.

The WODM5 community is generally dominated by Manitoba Maple (68%) and Trembling Aspen (32%). Green Ash, Black Walnut, Eastern White Pine, and Eastern White Cedar are also present. Trees in this community appear to be healthy. Due to property access restrictions, only the trees within the subject property were inventoried and evaluated.

The hedgerow communities within the subject property consist of Trembling Aspen (40%), Manitoba Maple (45%) and lesser amounts of White Willow, American Elm, and Basswood. Trees within the hedgerows are in good health and have an overall smaller DBH range (10-20 cm) than trees within the swamp and woodland communities. Dead Green Ash trees were present within the hedgerows.

Fourteen distinctive trees were encountered during the survey, while 11 of the trees were located within the subject property, and one Eastern White Pine was located immediately outside of the subject property. The distinctive trees were mainly in good health, except for two Silver Maple, evaluated as in Moderate condition due to dieback, dead branches, and large cavities.

The locations of distinctive trees are shown in **Figure 6**. **Table 8**, below, lists the species, DBH, condition, general observations, and coordinates of distinctive trees (>50 cm DBH) within the subject property. **Appendix G** contains a list of tree species and estimated counts for individuals within the subject property.

Table 8 Distinctive Tree Inventory

Tree ID	Scientific Name	Common Name	DBH (cm)	Condition	Notes	Easting	Northing
01	*Acer sachharinum*	Silver Maple	61	Moderate	Dead branches, large cavities present, fungus growth along trunk.	460020	5030739
02	*Acer saccharinum*	Silver Maple	68	Moderate	Fused trunks, some dieback.	460015	5030753
03	*Populus deltoides*	Eastern Cottonwood	70	Good	Good form.	460048	50303730
04	*Populus deltoides*	Eastern Cottonwood	52, 32, 35	Good	Slight lean, multi-stemmed.	460249	5030303
05	*Populus deltoides*	Eastern Cottonwood	71	Good	Minimal dead branches.	460275	5030290
06	*Salix alba*	White Willow	57	Good	Minor number of dead branches.	460297	5030227
07	*Salix alba*	White Willow	53	Good	n/a	460293	5030217
08	*Salix alba*	White Willow	53, 20	Good	Slight lean, multi-stemmed.	460284	5030225
09	*Populus deltoides*	Eastern Cottonwood	52	Good	n/a	460390	5030058
10	*Populus deltoides*	Eastern Cottonwood	60	Good	n/a	460206	5030519
11	*Populus deltoides*	Eastern Cottonwood	55	Good	Moderate lean, some dead branches.	460204	5030518
12	*Pinus strobus*	Eastern White Pine	55	Good	Outside of property parcel.	460213	5030527
13	*Ulmus americana*	American Elm	50	Good	Co-dominant stems, broken branches	460166	5030086
14	*Salix alba*	White Willow	51, 52, 46, 49, 53	Good	Multi-stemmed, lean	460311	5030253

5.6 INCIDENTAL WILDLIFE

Biologists recorded direct observations or evidence of wildlife during all site visits, as described in **Table 9**. All the species encountered are common to the Ottawa area, and none are listed under the provincial ESA.

Observations from both the winter, spring, and summer field visits suggest that the Study Area provides suitable year-round wildlife habitat for mammal and bird species.

Table 9 Incidental wildlife observations

Common Name	Scientific Name	Observation Notes
American Kestrel	*Spizella arborea*	Observed flying over adjacent landfill property (outside of Study Area)
American Tree Sparrow	*Spizella arborea*	Visual observation on western edge of subject property
Belted Kingfisher	*Megaceryle alcyon*	Visual observation at ponds adjacent to landfill property
Blue Jay	*Cyanocitta cristata*	Heard calling
Common Raven	*Corvus corax*	Heard calling to east of subject property
Eastern Whip-poor-will	*Caprimulgus vociferus*	Heard calling from Mer Bleue (outside of Study Area)
Green Heron	*Butorides virescens*	Observed flying away from ponds adjacent to landfill property
Groundhog	*Marmota monax*	Visual observation in hedgerow on eastern boundary of subject property
Hairy Woodpecker	*Leuconotopicus villosus*	Visual observation on eastern edge of deciduous poplar swamp
House Finch	*Haemorhous mexicanus*	Visual observation on western edge of subject property
Mourning Dove	*Zenaida macroura*	Visual observation near northern boundary of subject property
Pileated Woodpecker	*Dryocopus pileatus*	Large cavities observed on mature Willow trees
Raccoon	*Procyon lotor*	Tracks observed in deciduous swamp
Wilson's Snipe	*Gallinago delicata*	Heard calling from Mer Bleue during amphibian surveys
White-breasted Nuthatch	*Sitta carolinensis*	Heard calling in SWD community
White-tailed Deer	*Odocoileus virginianus*	Tracks observed on edge of deciduous poplar swamp

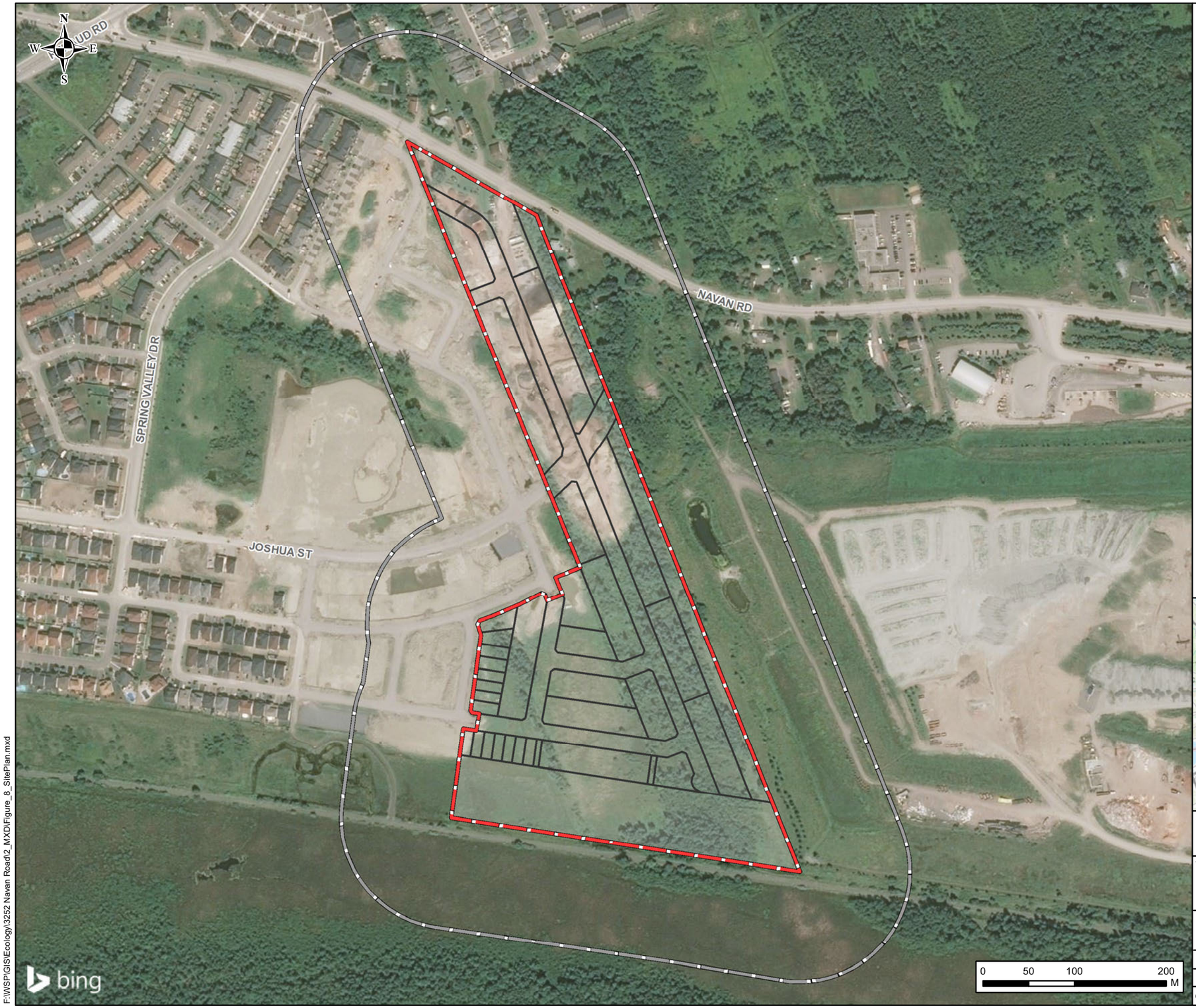
6 DESCRIPTION OF THE PROPOSED PROJECT

Claridge Homes is proposing to develop a residential subdivision at 3252 Navan Road, namely Spring Valley Trails 5 and 6, which consists of 48 stacked townhouse dwelling units, 44 (back-to-back) townhouse dwellings, 218 townhouse dwellings, and 11 single-family dwellings. An open space block will be retained at the southern edge of the subject property. The total site area is approximately 12.9 ha. The draft site plan illustrating the proposed layout of the development is shown in **Figure 8**.

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;
- Site grading and earthworks;
- Construction of individual lots and homes, driveways, and residential roads;
- Landscaping and fencing; and,
- On-going usage and maintenance.



Subject Property

Study Area

Site Plan

Client: CLARIDGE HOMES

Title: **Spring Valley Trails Phase 5 & 6**
Proposed Site Plan

Prepared By: WSP

191-15659-00	1:4,300	Review: AO
Date: August 2020	**Figure: 8**	
© Queen's Printer for Ontario		

F:\WSP\GIS\Ecology\3252 Navan Road\2_MXD\Figure_8_SitePlan.mxd

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 (i.e. temporary) and impacts associated with the occupation of the development (i.e. permanent). The anticipated impacts and proposed mitigation are illustrated in **Figure 9.**

7.1 AQUATIC ENVIRONMENT

The proposed development will have a direct impact on headwater feature located within the subject property. As discussed in **Section 5.2**, the HDF assessment identified four reaches that occur within the Project footprint and evaluated their management recommendation as 'Conservation' for all four.

Conservation management recommendations include maintaining, relocating, and/or enhancing drainage features and riparian corridors, restoring lost functions resulting from catchment drainage alterations or removals, maintaining or replacing on-site flows using mitigation or wetland creation, maintaining or replacing external flows using natural channel design techniques to enhance overall productivity, and maintaining connectivity to downstream reaches (Toronto and Region Conservation Authority and Credit Valley Conservation, 2014).

Throughout the HDF assessment process, the RVCA was engaged with respect to results, impacts, mitigation and potential compensation. In review of the assessment results and site plan, the RVCA expressed the need to realign the watercourse to maintain connectivity between upstream headwaters and downstream fish habitat. Furthermore, the RVCA identified that the new channel should function primarily as localized flood storage and amphibian habitat, and follow natural channel design principles.

Based on the site plan, it is expected that approximately 155 m of Reach HDF1-C and 115 m of Reach HDF1-D will be removed, and approximately 35 m of Reach HDF1-A will likely require to be directed into a culvert to accommodate a future right-of-way extension to Navan Road.

It is understood that to maintain flows and connectivity between the upstream and downstream reaches a re-aligned channel will be built. The realigned channel will connect HDF1-B on the eastern boundary of the subject property and flow towards the southern boundary of the site. The watercourse will then be diverted west, through the RVCA regulation limit setback, and connect to the existing HDF1-D reach. This new channel will be approximately 515 m. Part of this channel will be within the RVCA's regulation limit setback and will require a permit for works to be completed.

To meet these targets, it is recommended that the riparian and terrestrial habitat surrounding the realigned watercourse be restored through the removal of invasive species and re-planting of appropriate native species. Healthy native trees and vegetation within this area should be retained where possible to provide shading for the realigned watercourse. Hydric soils should be used during the construction and restoration of the watercourse and surrounding habitats – preferably if suitable soils already exist within the site. To maintain adequate flows and inputs into the headwater system, it is recommended to direct surface flows from yards that are adjacent to the watercourse on the eastern and southern boundaries of the Project footprint. Furthermore, the new channel should be deep enough to support aquatic amphibian habitat.

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

- Permanent loss of approximately 270 m of the existing watercourse and associated functions (indirect fish habitat, supporting amphibian habitat, flood storage);

- Overland transport of sediment into the watercourse and associated habitats resulting from construction activities;
- 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;
- Transport of sediment and other pollutants into the watercourse from the proposed development;
- 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:

- ✓ Design plan for natural channel creation and development of a restoration and monitoring plan for aquatic and riparian habitat enhancements.
- ✓ Further consultation with RVCA for application of permit for works within the regulation limit.

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 around 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 fish, amphibians and reptiles 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;
- ✓ Direct backyard surface flows from adjacent houses into the watercourse
- ✓ Promote use of permeable surfaces in the design and construction of roads and homes to limit stormwater runoff.

Proposed Mitigation Measures – After Construction

- ✓ Implementation of an environmental monitoring program to evaluate the functionality of the realigned watercourse and habitat restoration.

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 8.7 ha (see **Figure 9).** 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:
  - 0.04 ha of Fresh-Moist Deciduous Woodland (WODM5);
  - 1.9 ha of Poplar Mineral Deciduous Swamp (SWDM4-5);
  - 0.5 ha of Willow Mineral Deciduous Thicket Swamp (SWTM3);
  - 2.2 ha of Reed-canary Grass Graminoid Mineral Meadow Marsh (MAMM1-3);
  - 0.5 ha of Hedgerow (HR);
  - 3.4 ha of Business Sector (CVC_1) – predominately unvegetated.
- 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 Purple Loosestrife, which are abundant throughout the subject property.

Proposed Mitigation Measures – Planning and Design Stage

- ✓ Development of restoration and landscaping plan to address invasive species removal and should consider the use of appropriate native species to offset the loss of species and biodiversity from vegetation removals.

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 another suitable security fencing should be used to delineate the construction limits from the adjacent habitat. This will prevent the encroachment of construction activities into the adjacent

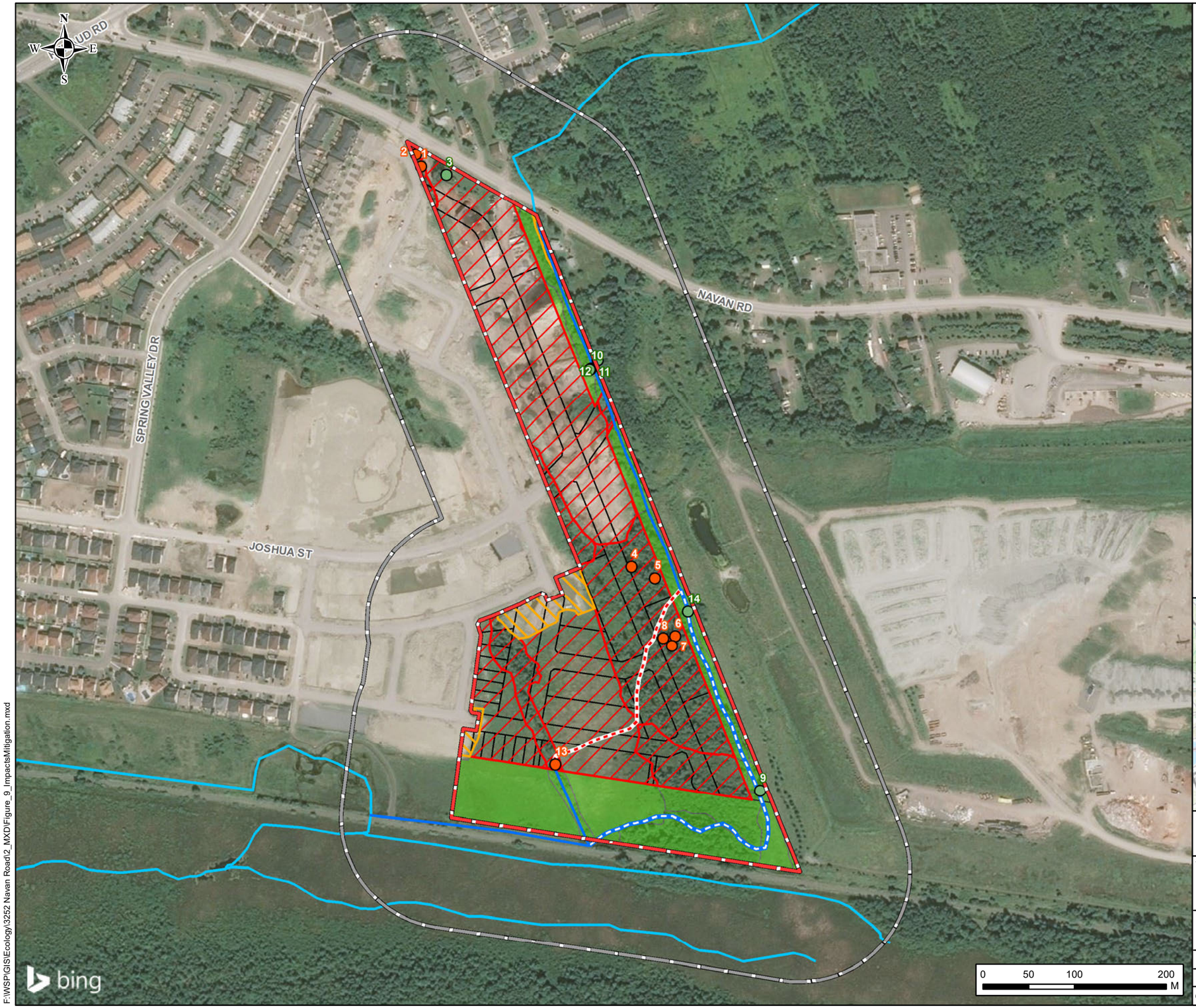
natural features. This fencing should be monitored regularly to ensure it is functioning properly. Any deviancy in the fencing should be dealt with promptly;

- ✓ 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 the 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 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
Site Plan
Vegetation removals (approximately 8.7 ha)
Existing residential development (approximately 0.4 ha)
Retained/restored vegetation (approximately 3.7 ha)
Distinctive Tree (Removed)
Distinctive Tree (Potentially Retainable)
Watercourse removal (approximately 270 m)
Retained watercourse (approximately 770 m)
Proposed watercourse realignment (approximately 515 m)
Existing watercourse (outside of subject property)

Client: CLARIDGE HOMES

Title: **Spring Valley Trails - Phase 5 & 6**
Anticipated Environmental Impacts & Mitigation

Prepared By: WSP

191-15659-00	1:4,300	Review: AO
Date: August 2020	**Figure: 9**	
© Queen's Printer for Ontario		

F:\WSP\GIS\Ecology\3252 Navan Road\2_MXD\Figure_9_ImpactsMitigation.mxd

7.2.2 WETLANDS

To accommodate construction, the Poplar Mineral Deciduous Swamp (SWDM4-5), Willow Mineral Deciduous Thicket (SWTM3), and Reed-canary Grass Graminoid Mineral Meadow Marsh (MAMM1-3) communities will be removed or disturbed.

Given the young age of these communities, the extent of disturbance, the prevalence of invasive species, and low biodiversity, it is likely that these communities provide marginal ecological value and function, with the exception of providing flows into the headwater features present within the Study Area.

Furthermore, it is anticipated that portions of these communities will be retained in the southern extent of the subject property. It is recommended that as part of the watercourse realignment that a landscape and restoration plan be designed and implemented to address the loss of wetland vegetation and functions and support the removal of invasive species such as Buckthorn and Purple Loosestrife.

As the watercourse realignment and recommended landscape and restoration plan will occur within the RVCA's regulation limit, it is likely that a permit under the RVCA's *Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses* policy will be required.

No direct impacts to surrounding wetland communities in Mer Bleue are anticipated as a result of construction.

The following impacts to wetlands are expected:

- Disturbance or removal of up to 4.6 ha wetland habitat;
- 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 restoration and landscaping plan to address wetland habitat restoration in areas along the realigned watercourse. The plan should address wetland functions, native vegetation plantings, invasive species removal, and habitat feature construction (e.g. vernal pools).

Proposed Mitigation Measures - Construction Implementation

- ✓ Orange snow fencing or another 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 fromthe 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 moderate decrease in wetland habitat is expected.

7.2.3 WOODLANDS

The swamp (SWDM4-5) and deciduous woodland (WODM5) within the Project footprint were deemed not significant based on the City of Ottawa's guidelines. However, it is anticipated that site clearing for construction of the residential dwellings, driveways, and access roads will still result in negative impacts to the swamp and woodland within the Project footprint. The impacts include:

- The permanent loss of, or disturbance to, approximately 1.94 ha of woodlands within the proposed project footprint, including;
  - 1.9 ha of Poplar Mineral Deciduous Swamp (SWDM4-5);
  - 0.04 ha of Fresh-Moist Deciduous Woodland (WODM5);
- Decreased biodiversity, reduced species abundance, and reduced urban canopy;
- 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:

- ✓ Retention of healthy, mature and mid-aged trees should be prioritized where possible; particularly along the subject property boundary, and in the realigned watercourse corridor;

With the successful implementation of the mitigation measures outlined above, it is anticipated that there will be a moderate permanent loss of woodlands within the subject property. Tree-specific mitigation measures are described below in Section 7.4.

7.2.4 SIGNIFICANT WILDLIFE HABITAT

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

7.2.5 AMPHIBIANS

The realignment of the watercourse through the south end of the Project footprint will result in the retention of swamp and thicket habitats that provide general amphibian habitat and maintain a movement corridor to other suitable habitats. Furthermore, amphibians were most frequently observed in areas south and west of the Project footprint, which will not be directly impacted by construction activities.

Based on the survey results and habitat retention, the proposed development is expected to have a non-limiting impact on amphibians within the Study Area.

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

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

Proposed Mitigation Measures – Planning and Design Stage

- ✓ Realigned watercourse and riparian habitat enhancement should be designed to create functional amphibian habitat. A qualified biologist should be consulted on the design and implementation of habitat features.

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 the 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 the 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 are expected to be negligible.

7.2.6 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 on breeding birds within the Study Area. However, the availability of similar habitats in the surrounding landscape will help mitigate the overall loss.

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 property;
- 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 along the realigned watercourse should be prioritized 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 the 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.

7.2.7 BAT MATERNITY COLONIES

It is anticipated that the removal of swamp and meadow vegetation communities will result in a minor overall loss of available bat maternity and foraging habitat. However, given the availability of suitable meadows and woodlots in the surrounding landscape, it is anticipated that the loss of habitat will 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 as a result of the Project:

- Permanent loss of candidate roost trees within swamp and hedgerow habitats 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 four large bat boxes, placed on two poles; placed in appropriate open areas, adjacent to the retained natural areas near the eastern and southern boundaries of the subject property to enhance potential roosting habitat for resident bats.

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

7.2.8 HABITAT FOR SPECIES OF CONSERVATION CONCERN

No SCC and their habitat are present within the Study Area; therefore, no impacts are anticipated.

7.3 SPECIES AT RISK AND SPECIES AT RISK HABITAT

No SAR or SAR habitat is present within the Study Area; therefore, no impacts are anticipated.

7.4 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.

Fourteen distinctive trees were identified during field surveys, and it is anticipated that most will be removed due to the grade raise required for the development. There may be potential for retention of up to six distinctive trees along the perimeter of the subject property, particularly on the eastern boundary where the watercourse will be retained and realigned. However, the feasibility of retention is dependent on grading requirements.

Healthy, mid-aged trees with a sufficient setback from the development footprint are recommended to be preserved and would require protection measures due to their proximity to construction activities. Trees within the RVCA setback at the southern boundary of the subject property are recommended to be retained to maintain a natural buffer between the development and Mer Bleue PSW and will also provide shading for the realigned watercourse.

Anticipated impacts on distinctive trees are shown in **Figure 9**.

Proposed Mitigation Measures – Planning and Design Stage

- ✓ The City of Ottawa's 2015-2018 Strategic Plan (City of Ottawa, 2015a) recommends that a 2:1 ratio (or greater) between trees planted and trees removed annually should be followed where possible. Furthermore, the Official Plan (City of Ottawa, 2003) policies 2.4.5 (7) for Green Space and policies 2.7.2 for Protection of Vegetation Cover recommend reaching the City's target of 30% tree cover for the entire City;
- ✓ 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 the use of appropriate native species to offset the loss of species and biodiversity from vegetation removals;
- ✓ 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, particularly along the eastern and southern boundaries;
- ✓ 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 as 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 minimal impacts to trees within the Study Area.

7.5 WILDLIFE

The proposed development is expected to have a minor 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 retained natural areas and adjacent wetland; 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 the 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 facility, such as the Rideau Valley Wildlife Sanctuary.

With the mitigation measures outlined above, it is anticipated that the proposed development will result in a negligible impact on wildlife within the Study Area.

7.6 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 the Innes ward in eastern Ottawa, which has had moderate residential growth over the past two decades. Much of the land surrounding the proposed development area consists of ongoing development, agricultural fields, and remnant woodland communities. The Project area itself is a remnant parcel from the existing Spring Valley Trails development phases to the west and an active landfill present to the west. Additional developments are existing and on-going to the north of the subject property.

At the landscape scale, the subject property is adjacent to the Mer Bleue PSW complex. The Mer Bleue PSW is a highly valuable ecological area for flora and fauna in the region, as well as other ecological benefits and services. Based on field surveys and mapping, there appears to be a direct aquatic linkage with Mer Bleue, through a culvert located downstream from the subject property. Aside from the downstream aquatic connection, the subject property is relatively fragmented from surrounding natural heritage features as a result of surrounding developments or infrastructure (roads and the Prescott-Russell trail).

It is understood that the Spring Valley Trails development to the west has incorporated and constructed a wetland as compensation for habitat loss due to watercourse removals. This compensation feature is connected to the watercourse that is present within the subject property and relies on upstream flows to maintain water levels. It is expected that the

realignment of the watercourse to accommodate development will not negatively affect the connection between the compensation wetland and upstream inputs.

Based on the results of field surveys, the removal of natural heritage features within the subject property may have a marginal negative impact on the natural heritage system due to the overall low ecological value and function of vegetation communities and wildlife habitat.

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

- General loss of biodiversity and available habitat;
- Loss of natural headwater feature (to be offset by a realigned channel);
- 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:

- ✓ Retention and enhancement of the vegetation within the setback between the proposed development and the Mer Bleue PSW;
- ✓ 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 Spring Valley Trails Phase 5 & 6 development located at 3252 Navan Road **(Figure 1**). The anticipated environmental impacts are based on field visits completed between December 2019 and April to August 2020, as well as a desktop screening review.

The vegetation communities present within the subject property are comprised mainly of deciduous poplar swamp, deciduous willow thicket, and Reed-canary meadow marsh. The vegetation predominately consists of invasive/non-native species throughout. The northern half of the subject property contains an active soil and aggregate stockpiling business.

Wetland communities are present throughout the subject property. These communities likely provide input into a headwater drainage feature that flows through the property. Additionally, 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 compared to wetland features in the surrounding landscape.

The headwater drainage feature within the site enters in from Navan Road and flows south along the eastern boundary before diverting southwest through the deciduous swamp and across the Reed-canary meadow marsh. This feature is connected to a downstream fish compensation wetland.

The tree community within the subject property consists of 20 species, although comprised mainly of Trembling Aspen, Eastern Cottonwood, Green Ash, Manitoba Maple, and American Elm. Trees within the subject property are mid-aged and in moderate to good condition, depending on the species. Evidence of pests and disease are present for Green Ash, Trembling Aspen, and American Elm. Fourteen distinctive trees (> 50 cm DBH) were recorded within the subject property. Based on their condition and location, it may be possible to retain six of the trees, although it has been understood that grading requirements on the site may affect the feasibility of retention.

No Species at Risk were observed during the field surveys. Suitable habitat conditions for three Species of Conservation Concern (Monarch, Eastern Milksnake, and Snapping Turtle) were identified during ELC surveys, although none of these species were observed during field surveys.

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 during field surveys is the watercourse, which will be realigned along the eastern boundary of the subject property, and then diverted through the regulation limit setback along the southern boundary of the subject property. The realigned watercourse will connect into the existing watercourse, maintaining flows and connectivity between upstream and downstream reaches.

The mitigation measures described in this report, and summarized in **Table 10** 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 condition that 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 10 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 watercourse	Moderate	Realignment of watercourse and enhancement/restoration of riparian and terrestrial habitat.	No residual effect anticipated
	Loss of habitat for aquatic wildlife	Low	Restoration plan to address aquatic habitat plantings and features	No residual effect anticipated.
	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	Minor permanent loss of native and non-native swamp and meadow marsh vegetation
	Loss of habitat for wildlife	Low	None required	Permanent loss of foraging and 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	Consultation with RVCA for permitting requirements and compensation	Loss of overall 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 wit 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	Minor permanent loss of trees within swamp and woodland communities
	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
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 nesting and foraging habitat (non-limiting)
	Physical harm to birds or nests resulting from construction activities	Low	Clearing of vegetation should be avoided during the breeding bird period (April 15th – 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
Amphibians	Minor 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
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 and foraging habitat	Low	Installation of four bat boxes (two per post) in appropriate areas near realigned watercourse. Clearing of vegetation should be limited to a reasonable footprint to accommodate the proposed site plan	Minor loss of suitable maternity roost and foraging habitat (non-limiting)
Species of Conservation Concern	Disturbance to or removal of suitable 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 suitable habitat
	Physical harm or displacement resulting from construction activities	Low	Silt fencing should be installed around project areas, vegetation clearing should be avoided during breeding bird period (April 15th – August 15th). Area should be pre-stressed prior to vegetation clearing.	No residual effect anticipated.

Natural Heritage Feature/Function	Summary of Potential Impacts	Constraint to Development	Summary of Proposed Mitigation	Residual Effect
Species at Risk	Loss of suitable habitat for Bobolink & Eastern Meadowlark	Low	Clearing of vegetation should be limited to a reasonable footprint to accommodate the proposed site plan.	Minor loss of suitable habitat
	Loss of candidate roost trees for SAR bats	Low	Installation of four bat boxes (two per post) in appropriate areas along realigned watercourse	Permanent loss of native habitat – Non-limiting
	Physical harm or displacement to SAR resulting from construction activities	Low	Clearing of vegetation should be avoided during bat general active and maternity roosting periods (March 15th to September 15th)	No residual effect anticipated
Trees	Removal of at least eight Distinctive 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
	Loss of natural headwater feature	Moderate	Realignment of channel and enhancement of vegetation buffer along watercourse	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

9 REFERENCES

Bird Studies Canada. (2001). *Ontario Breeding Bird Atlas: Guide for Participants.* Guelph: University of Guelph. Retrieved from http://www.birdsontario.org

Bird Studies Canada. (2008, March). *Amphibian Surveys Overview*. Retrieved from http://www.birdscanada.org/volunteer/glmmp/index.jsp?targetpg=glmmpfrog

Brunton, D. F. (2005). *Urban Natural Areas Environmental Evaluation Study - Appendix A: Vascular Plants of the City of Ottawa, with Identification of Significant Species.* Ottawa: City of Ottawa.

Canadian Standards Association. (2019). *Bird-friendly building design (CSA A460:19).* Retrieved from https://www.scc.ca/en/standardsdb/standards/29805

City of Ottawa. (2003). Retrieved 2019, from Official Plan and master plans: https://ottawa.ca/en/business/planning-and-development/official-plan-and-master-plans

City of Ottawa. (2003). Retrieved 2019, from Official Plan and master plans: https://ottawa.ca/en/business/planning-and-development/official-plan-and-master-plans

City of Ottawa. (2015a). *City of Ottawa 2015-2018 Strategic Plan.* City of Ottawa. Retrieved from http://documents.ottawa.ca/sites/documents.ottawa.ca/files/documents/2015_2018_strategic_plan_en.pdf

City of Ottawa. (2015b, August). *City of Ottawa Protocol for Wildlife Protection during Construction.* Retrieved January 07, 2020, from http://ottwatch.ca/meetings/file/309612/_Document_1_Protocol_for_Wildlife_Protection_During_Construction_pdf_Item_PROTOCOL_FOR_WILDLIFE_PROTECTION_DURING_CONSTRUCTION_UPDATED_Meeting_Planning_Committee_Date_2015_09_22_09_30_00

City of Ottawa. (2015c, October). *Environmental Impact Statement Guidelines.* Retrieved from Guide to preparing studies and plans: http://documents.ottawa.ca/sites/documents.ottawa.ca/files/documents/eis_guidelines2015_en.pdf

City of Ottawa. (2019). Retrieved 2019, from geoOttawa Webmap Portal: http://maps.ottawa.ca/geoottawa/

City of Ottawa. (2019). *Significant Woodlands: Guidelines for Identification, Evaluation, and Impact Assessment.* Retrieved from City of Ottawa.

City of Ottawa. (2019). *Tree Conservation Report Guidelines.* Retrieved from City of Ottawa: https://ottawa.ca/en/residents/water-and-environment/trees-and-community-forests/tree-protection#tree-conservation-report-guidelines

Dobbyn, J. S. (n.d.). *Atlas of the Mammals of Ontario.* 1994: Federation of Ontario Naturalists. Retrieved April 2019

Government of Canada. (1994). *Migratory Birds Convention Act.* Retrieved from Justice Laws Website: http://laws.justice.gc.ca/eng/acts/M-7.01/

iNaturalist. (2019, December). Retrieved December 2019, from https://www.inaturalist.org

Lee, H., Bakowsky, W., Riley, J., Bowles, J., Puddister, M., Uhlig, P., & McMurray, S. (1998). *Ecological Land Classification for Southern Ontario: First Approximation and its Application.* North Bay, Ontario, Canada: Ontario Ministry of Natural Resources.

Macnaughton, A., Layberry, R., Cavasin, R., Edwards, B., & Jones, C. (n.d.). Ontario Butterfly Atlas. Toronto. Retrieved April 25, 2019, from http://www.butterfly.ontarioinsects.org/atlas/

Ministry of Municipal Affairs and Housing. (2014). *Provincial Policy Statement.* Toronto: Queen's Printer for Ontario. Retrieved from http://www.mah.gov.on.ca/Page10679.aspx

Ministry of Northern Development and Mines. (2017). *OGSEarth*. Retrieved January 2020, from https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth

MNR. (2000). *Significant Wildlife Habitat Technical Guide.* Peterborough: Queen's printer for Ontario. Retrieved from https://www.ontario.ca/document/guide-significant-wildlife-habitat

MNR. (2010). *Natural Heritage Reference Manual for Natural Heritage Policies of the Povincial Policy Statement, 2005* (Second ed.). Toronto: Queen's Printer for Ontario.

MNR. (2011). *Survey Methodology under the Endangered Species Act, 2007: Dolichonyx oryzivorus (Bobolink).* Policy Division - Species at Risk Branch.

MNRF. (2015, January). *Significant Wildlife Habitat Criteria Schedules For Ecoregion 6E.* Retrieved from https://www.ontario.ca/document/significant-wildlife-habitat-ecoregional-criteria-schedules-ecoregion-6e

MNRF. (2019, December 10). *Natural Heritage Information Centre*. Retrieved December 19, 2019, from https://www.ontario.ca/page/natural-heritage-information-centre

National Capital Commission. (n.d.). *Mer Bleue*. Retrieved from https://ncc-ccn.gc.ca/places/mer-bleue

Natural Resources Canada. (2016, November 30). *Generalized Bedrock Geology , Ottawa-Hull, Ontario and Quebec*. doi:https://doi.org/10.4095/109223

Oldham, M. J. (1995). *Floristic Quality Assessment System for Southern Ontario.* Natural Heritage Information Centre, . Peterborough, Ontario: Ministry of Natural Resources.

Ontario Nature. (2019, June 5). Herp Atlas. Toronto, Ontario. Retrieved April 24, 2019, from https://ontarionature.org/oraa/maps/

Rideau Valley Conservation Authority. (2018). *Mud Creek 2018 Catchment Report.* Manotick: Rideau Valley Conservation Authority. Retrieved from https://www.rvca.ca/media/k2/attachments/CSW2018_MUD.pdf

Rideau Valley Conservation Authority. (2019). GeoPortal. Manotick, Ontario, Canada. Retrieved December 09, 2019, from https://gis.rvca.ca/html5/?viewer=rvcageoportal

Stanfield, L. (2017). *Ontario Stream Assessment Protocol Version 10.0.* Peterborough, Ontario: Ontario Ministry of Natural Resources.

Toronto and Region Conservation Authority and Credit Valley Conservation. (2014). *Evaluation, Classification and Management of Headwater Drainage Features Guideline.* Retrieved April 15, 2019

APPENDIX

A EIS UPDATE TRACKING SHEET

Section	Revision Notes
Entire Report	Updated references to project name (Spring Valley Trails Phase 5 & 6)
Executive Summary	Updated to reflect study results, impacts, mitigation
Section 1.2.1 – Study Updates	Added section to note report is an updated version of preliminary EIS.
Section 1.3 – Property Information	Updated to include property information for Phase 5.
Section 3.3.2 – Headwater Drainage Features	Updated based on new information pertaining to headwater drainage features within and around the subject property.
Section 4.0 – Methodology	Updated to reflect survey methodologies for work completed in 2020.
Section 5.1 – Site Investigations	Updated with 2020 field investigation dates
Section 5.2 – Aquatic Environment (Results)	Summarized findings from Headwater Drainage Feature Assessment report.
Section 5.3.1 – Vegetation Communities (Results)	Updated ELC communities based on summer field season and expanded Study Area Added vegetation inventory.
Section 5.3.2 – Wetlands (Results)	Updated based on expanded Study Area.
Section 5.3.3 – Woodlands (Results)	Updated based on expanded Study Area and survey results
Section 5.3.4 – Significant Wildlife Habitat (Results)	Added results for SWH surveys; removed screening table of candidate SWH from preliminary EIS.
Section 5.4 – Species at Risk and Species at Risk Habitat (Results)	Updated based on results of 2020 surveys.
Section 5.5 – Trees (Results)	Updated based on tree confirmation survey results (2020)
Section 5.6 – Incidental Wildlife (Results)	Added new incidental observations of wildlife from 2020 field surveys.
Section 6 – Description of Proposed Project	Updated based on site plan revisions and additional information about housing units and blocks.
Section 7.1 – Aquatic Environment (Impacts and Mitigation)	Updated to reflect revised impacts to headwater drainage features and associated mitigation and realignment
Section 7.2 – Natural Heritage Features (Impacts and Mitigation)	Revised impacts to natural heritage features based on results of surveys and revisions to site plan; updated mitigation accordingly.
Section 7.3 – Species at Risk (Impacts and Mitigation)	Revised based on absence of SAR and SAR habitat; no impacts anticipated.

Section	Revision Notes
Section 7.4 – Trees (Impacts and Mitigation)	Revised impacts and mitigation measures based on additional tree inventory and changes to site design.
Section 7.6 – Cumulative Impacts	Updated based on expanded Study Area and survey results; particularly with respect to the headwater drainage feature impacts.
Figures – All	Figures 1, 3-9 have been updated to reflect the expanded Study Area, new site plan, survey locations, results, and anticipated impacts and mitigation

APPENDIX

B 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 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	Sand and gravel piles present on subject property; however, no evidence of nesting recorded and regular activity around these piles likely to deter nesting.
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. No other candidate habitat features observed.
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**	Reed-canary meadow within subject property may provide suitable habitat for this species. **Suitable habitat confirmed in subject property. Species not observed during targeted 2020 field surveys.**
Chlidonias niger	Black Tern	Wetlands, coastal or inland marshes; large cattail marshes, marshy edges of rivers, lakes or ponds, wet open fens, wet meadows; returns to same area to nest each year in loose colonies; must have shallow (0.5 to 1 m deep) water and areas of open water near nests; requires marshes >20 ha in size; feeds over adjacent grasslands for insects; also feeds on fish, crayfish and frogs.	---	SC	S3B	OBBA	**Yes**	Shallow cattail marsh in Mer Bleue PSW may provide suitable foraging and nesting conditions. **Species not observed during 2020 field surveys. Cattail marsh does not have adequate areas of open water for nesting.**
Cardellina canadensis	Canada Warbler	An interior forest species; dense, mixed coniferous, deciduous forests with closed canopy, wet bottomlands of cedar or alder; shrubby undergrowth in cool moist mature woodlands; riparian habitat; usually requires at least 30 ha.	THR	SC	S4B	OBBA	No	No interior forest or expansive woodlands present in Study Area.
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 suitable buildings or hollow trees observed within Study Area.
Chordeiles minor	Common Nighthawk	Open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs.	THR	SC	S4B	OBBA	No	No suitable open woodlands or forest clearings identified within Study Area.
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**	Reed canary grass meadow may provide suitable habitat for this species. No suitable habitat identified within the subject property. **Species not observed during 2020 field surveys. Generally unsuitable habitat conditions identified during field surveys.**
Antrostomus vociferus	Eastern Whip-poor-will	Dry, open, deciduous woodlands with small to medium trees; oak or beech with lots of clearings and shaded leaf-litter; wooded edges, forest clearings with little herbaceous growth; pine plantations; associated with >100 ha forests; may require 500 to 1000 ha to maintain population.	THR	THR	S4B	OBBA	No	No dry open deciduous woodlands encountered within Study Area. **Species observed incidentally during field surveys – audible observation outside of Study Area.**
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 swamp and hedgerow communities may provide marginal foraging and nesting habitat for this species. **Species not observed during field surveys. Swamp understorey and sub-canopy generally too dense for this species.**
Coccothraustes vespertinus	Evening Grosbeak	Coniferous or mixed forests; deciduous tree stands; parks, orchards.	---	SC	S4B	OBBA	No	No coniferous or mixed forests present within Study Area.

Scientific Name	Common Name	General Habitat According to the MNRF Significant Wildlife Habitat Technical Guide (MNRF, 2000)	Conservation Status			Source[3]	Potential Habitat within Study Area (Based on screening)	Rationale
			Federal (SARA, 2002)	Provincial (ESA, 2007) [1]	S-Rank[2]			
Ixobrychus exilis	Least Bittern	Deep marshes, swamps, bogs; marshy borders of lakes, ponds, streams, ditches; dense emergent vegetation of cattail, bulrush, sedge; nests in cattails; intolerant of loss of habitat and human disturbance.	THR	THR	S4B	OBBA	**Yes**	Large cattail marsh in Mer Bleue PSW may provide suitable foraging and nesting conditions. **Species not detected during 2020 field surveys. Cattail marsh does not have adequate areas of open water.**
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**	Cattail marsh and reed canary grass meadow may provide suitable foraging habitat for this species. **Species not detected during 2020 field surveys. Suitable meadow habitat recorded 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**	Cattail marsh and reed canary grass meadows may provide adequate foraging habitats; marginal nesting habitat within Study Area. **Species not detected during 2020 field surveys. Suitable meadow habitat recorded 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	No	No suitable large, mature deciduous forests present within Study Area.
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	**Yes**	Cattail marsh in Mer Bleue PSW may provide suitable habitat for this species. **Species not observed during field surveys. Limited aquatic habitat within Study Area.**
Lampropeltis triangulum	Eastern Milksnake	Habitat generalists, prefer open habitats including outcrops and meadows; require suitable microhabitats for egg laying, hibernation and thermoregulation; well known for occupying barns, sheds, and houses in rural landscapes; abundance of species appears to correlate with regions where forest cover is relatively high.	SC	NAR	S4	ORAA	**Yes**	Meadow marsh and residential homes and structures may provide suitable habitat for this species. **Species not observed during field surveys. Reed canary grass meadow may provide marginal habitat.**
Sternotherus odoratus	Eastern Musk Turtle	Aquatic, except when laying eggs; shallow slow-moving water of lakes, streams, marshes and ponds; hibernate in underwater mud, in banks or in muskrat lodges; eggs are laid in debris or under stumps of fallen logs at waters edge; often share nest sites; sometimes congregate at hibernation sites; not readily observed.	SC	SC	S3	ORAA	**Yes**	Cattail marsh in Mer Bleue PSW may provide suitable habitat for this species. **Species not observed during field surveys. Limited aquatic habitat within Study Area.**
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	**Yes**	Cattail marsh in Mer Bleue PSW may provide suitable habitat for this species. **Species not observed during field surveys. Limited aquatic habitat within Study Area.**
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	**Yes**	Cattail marsh in Mer Bleue PSW may provide suitable habitat for this species. **Species not observed during field surveys. Marginal habitat may be present in shallow marsh in Mer Bleue PSW.**

Scientific Name	Common Name	General Habitat According to the MNRF Significant Wildlife Habitat Technical Guide (MNRF, 2000)	Conservation Status			Source[3]	Potential Habitat within Study Area (Based on screening)	Rationale
			Federal (SARA, 2002)	Provincial (ESA, 2007) [1]	S-Rank[2]			
Pseudacris triseriata	Western Chorus Frog	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools.	THR	NAR	S3	ORAA	**Yes**	Deciduous swamp, meadow marshes, and channelized watercourses may provide suitable breeding and foraging habitat for this species. **Species not observed during field surveys.**
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 present in meadow marsh on eastern edge of subject property. **Species not observed 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 swamp may provide foraging habitat; residential homes and structures may provide roosting habitat. **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**	Swamp and wetland communities may provide foraging habitats; forest communities and residential homes may provide roosting habitat. **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**	Swamp communities may provide roosting and foraging habitats; residential homes may provide roosting habitat. **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**	Swamp communities may provide roosting and foraging habitats; residential homes may provide roosting habitat. **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	No	Hedgerows and swamp edges may contain suitable conditions; however, this species was not encountered during the tree inventory.
Carex folliculata	Northern Long Sedge	Damp meadows and forests, marshes, bogs, and swamps.	---	---	S3	NHIC	**Yes**	Cattail marsh and other wet areas may provide suitable conditions for this species. **Species not observed 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

C 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

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

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

PROFESSIONAL DEVELOPMENT

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

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

CAREER

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

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.

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

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.

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

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

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

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

CAREER

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

D SITE PHOTOGRAPHS

Photo 1 June 22, 2020 **Notes:** Business Sector (CVC_1)	
Photo 2 June 2, 2020 **Notes:** Reed-canary Grass Graminoid Meadow Marsh (MAMM1-3)	

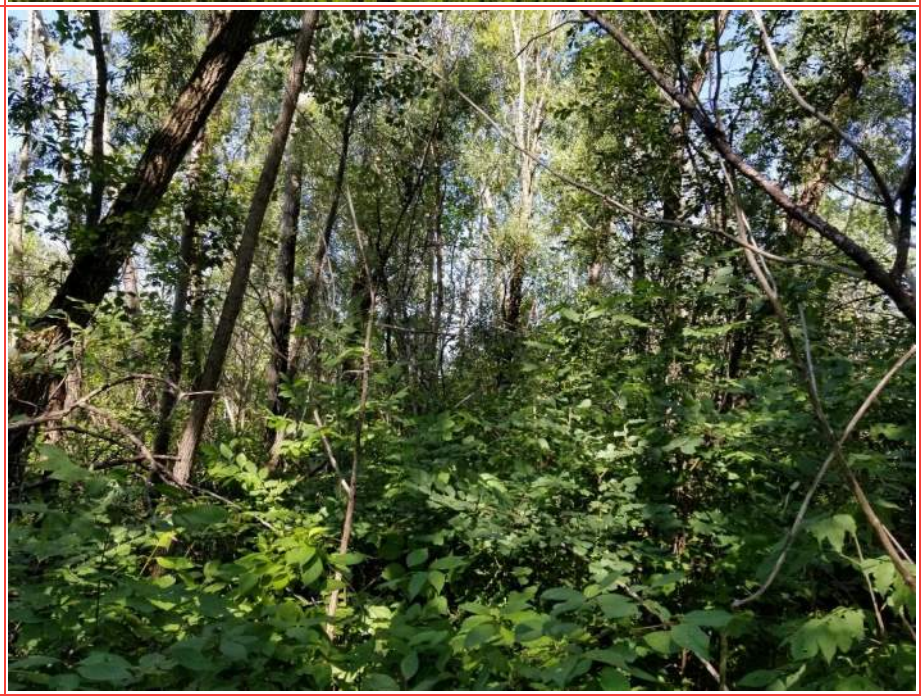
Photo 3 June 22, 2020 **Notes:** Reed-canary Grass Graminoid Meadow Marsh (MAMM1-3)	
Photo 4 July 28, 2020 **Notes:** Poplar Mineral Deciduous Swamp (SWD4-5)	

Photo 5 July 23, 2020 **Notes:** Willow Mineral Deciduous Thicket Swamp (SWTM3) and inclusion of Purple Loosestrife Meadow Marsh (MAMM2-5)	
Photo 6 June 2, 2020 **Notes:** Dry - Fresh Mixed Meadow (MEMM3)	

Photo 7 July 23, 2020 Notes: Mer Bleue PSW - Cattail Mineral Shallow Marsh (MAS2-1)	
Photo 8 July 23, 2020 **Notes:** Dry-Fresh Deciduous Woodland (WODM5)	

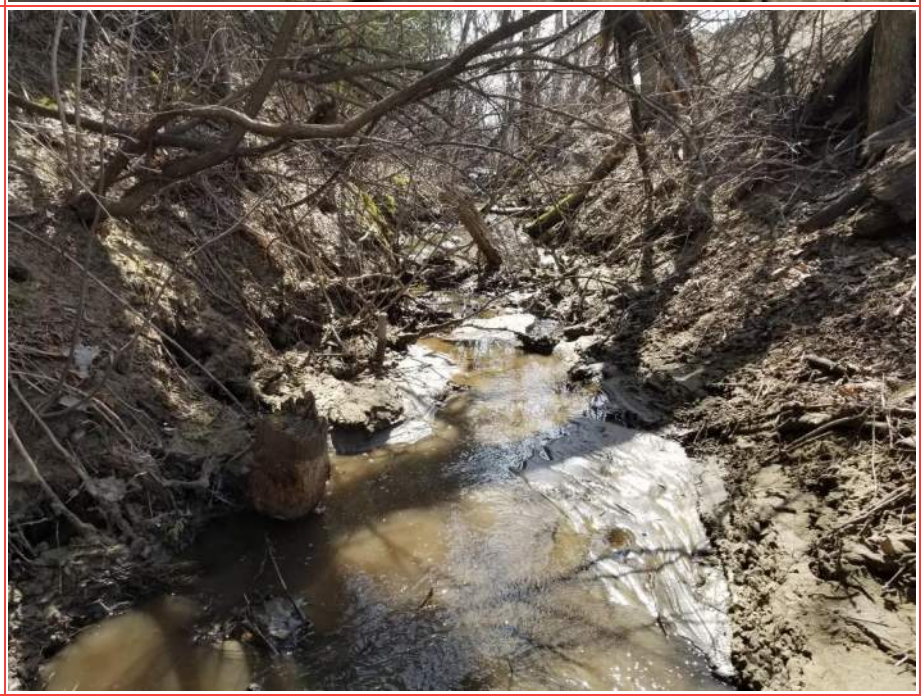
Photo 9 April 7, 2020 **Notes:** HDF1-A facing upstream	
Photo 10 April 7, 2020 **Notes:** HDF1-A facing downstream	

Photo 11 April 7, 2020 **Notes:** HDF1-B facing upstream	
Photo 12 April 7, 2020 **Notes:** HDF1-B facing downstream	

Photo 13 April 7, 2020 **Notes:** HDF1-C facing upstream	
Photo 14 April 7, 2020 **Notes:** HDF1-C facing downstream	

Photo 15 April 7, 2020 **Notes:** HDF1-D facing upstream	
Photo 16 April 7, 2020 **Notes:** HDF1-D facing downstream	

Photo 17 May 27, 2020 **Notes:** HDF1-A facing upstream	
Photo 18 May 27, 2020 **Notes:** HDF1-A facing downstream	

Photo 19 June 2, 2020 **Notes:** HDF1-B facing upstream	
Photo 20 June 2, 2020 **Notes:** HDF1-B facing downstream	

Photo 21 June 2, 2020 **Notes:** HDF1-C facing upstream	
Photo 22 June 2, 2020 **Notes:** HDF1-C facing downstream	

Photo 23 May 27, 2020 **Notes:** HDF1-D facing upstream	
Photo 24 May 27, 2020 **Notes:** HDF1-D facing downstream	

Photo 25 May 27, 2020 **Notes:** Fish compensation wetland, downstream of subject property	

APPENDIX

E HEADWATER DRAINAGE FEATURE ASSESSMENT DATA

Unconstrained Headwater Drainage Feature Assessment

Date: April 7, 2020 Project #: 191-15659-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed watercourse Stream Code: Unknown Site Code: HDF1-A

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 (°): -0.3

	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): 2.20 Bankfull Depth (mm) 70

Entrenchment Total: ☐ > 40 m ☑ < 40 m Left Bank 1.0 m Right Bank 0.8 m Total width 4.0 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
1.10				3 / 3 / 3	15.2 / 16.6 / 14.2

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 Measures (mm): 10 / 10 / 6 / — / —

☐ 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 #: 191-15659-00 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

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: Apr. 17, 2020 Project #: 191-15659-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed watercourse Stream Code: Unknown Site Code: HDF1-B

Site Limits: Upstream WP# _____ Downstream WP# _____

Direction of Assessment: ☑ Upstream ☐ Downstream

Field Assessment: ☑ Sample 1 ☐ Sample 2 ☐ Sample 3

Unconnected HDF: ☐ Not connected to downstream network

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

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

Feature Type
☐ Defined Natural Channel (1) ☑ Channelized or Constrained (2) ☐ Multi-thread (3) ☐ No Defined Feature (4) ☐ Tiled Feature (5) ☐ Wetland (6) ☐ Swale (7) ☐ Roadside Ditch (8) ☐ 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 (°): -1.7

	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): 6.64 Bankfull Depth (mm) 600

Entrenchment Total: ☐ > 40 m ☑ < 40 m Left Bank 1.10 m Right Bank 6.65 m Total width 13.9 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
				2.5 / 2.5 / 2.5	24.8 / 16.5 / 22.5

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 2 4 — —

☐ 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 #: 191-15659-00 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

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 #: 191-15659-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed watercourse Stream Code: Unknown Site Code: HDF1 - C

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 (°): -0.7

	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): 1.51 / 3.60 / 0.87 Bankfull Depth (mm) 150

Entrenchment Total: ☑ > 40 m ☐ < 40 m Left Bank — m Right Bank — m Total width 41 m *see radial

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
				3 / 3 / 3	33 / 25 / 29.5

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): <1 <1 <1 — —

☐ 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 #: 191-15659-00 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

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 #: 191-15659-00 Recorder/Crew: A. Bous / C. Pythe

Stream Name: Unnamed watercourse Stream Code: unknown Site Code: HDF1-D

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): 1.8 Bankfull Depth (mm) 450

Entrenchment Total: ☐ > 40 m ☐ < 40 m Left Bank ____ m Right Bank ____ m Total width ____ 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
0.95				2 / 2 / 2	20.5 / 20.4 / 34

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): <1 <1 <1 ____ ____

☐ 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 #: 191-15659-00 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

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: May 27, 2020 Project #: 191-15659-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed watercourse Stream Code: Unknown Site Code: HDF1-A

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 (%): -0.3

	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): 2.20 Bankfull Depth (mm) 70

Entrenchment Total: ☐ > 40 m ☑ < 40 m Left Bank 1.0 m Right Bank 0.8 m Total width 4.0 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
0.47				too shallow for float	

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): 100 mm 70 mm 15 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 #: 191-15659-00 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

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 #: 191-15659-00 Recorder/Crew: A. Pous / C. Pytlak

Stream Name: Unnamed watercourse Stream Code: unknown Site Code: HDF 1-B

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 (%): -1.7

	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): 6.64 Bankfull Depth (mm) 600

Entrenchment Total: ☐ > 40 m ☒ < 40 m Left Bank 1.10 m Right Bank 6.5 m Total width 13.9 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
0.57				0.5 / 0.5 / 0.5	23 / 25 / 18

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 5 5 — —

☐ 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 #: 191-15659-00 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

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 #: 191-15659-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed watercourse Stream Code: Unknown Site Code: HDF1-C

Site Limits: Upstream WP# ____ Downstream WP# ____

Direction of Assessment: ☒ Upstream ☐ Downstream

Field Assessment: ☐ Sample 1 ☒ Sample 2 ☐ Sample 3

Unconnected HDF: ☐ Not connected to downstream network

Flow Influence ☐ Freshet (1) ☐ Spate (2) ☒ Baseflow (3)

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

Feature Type ☐ Defined Natural Channel (1) ☐ Channelized or Constrained (2) ☒ Multi-thread (3) ☐ No Defined Feature (4) ☐ Tiled Feature (5) ☒ Wetland (6) ☐ Swale (7) ☐ Roadside Ditch (8) ☐ 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 (°): -0.7

	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): 1.51 / 3.60 / 087 Bankfull Depth (mm) 150

Entrenchment Total: ☒ > 40 m ☐ < 40 m Left Bank ____ m Right Bank ____ m Total width 41 m *see module

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
0.42 / 0.35 / 0.45										too shallow for float					

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 10 6 ____ ____

☐ 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 #: 191-15659-00 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

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: May 27, 2020 Project #: 191-15659-00 Recorder/Crew: A. Rous / C. Pytlak

Stream Name: Unnamed watercourse Stream Code: Unknown Site Code: HDF1 - D

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): 1.8 Bankfull Depth (mm) 450

Entrenchment Total: ☐ > 40 m ☐ < 40 m Left Bank — m Right Bank — m Total width — 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
0.75				No Flow	

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 5 5 — —

☐ 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 #: 191-15659-00 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
	—	H	1	Barrier to Fish movement @ low water surface elevation
	—	O	1	Fish observed during non-Fish sampling activities on different date - see note's

Additional Notes: Fish observed at d/s culvert outlet in wetland compensation feature to the west of study area; species unknown

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

APPENDIX

F

VEGETATION INVENTORY

Scientific Name	Common Name	CC [1]	CW[1]	Conservation Status				ELC Community			
				S-Rank[2]	Federal (SARA, 2012)[3]	Provincial (ESA, 2007)[4]	City of Ottawa[5]	MAMM1-3	SWDM4-5	SWTM3	WODM5
Acer negundo	Manitoba Maple	0	0	S5	-	-	C	-	X	-	X
Acer saccharinum	Silver Maple	5	-3	S5	-	-	C	-	X	-	-
Acer rubrum	Red Maple	4	0	S5	-	-	C	-	X	-	-
Alnus incana	Speckled Alder	6	-3	S5	-	-	C	-	X	-	-
Aralia nudicaulis	Wild Sarsaparilla	4	3	S5	-	-	C	-	X	-	-
Arctium minus	Common Burdock	-	3	SNA	-	-	C	X	-	-	-
Artemisia vulgaris	Common Wormwood	-	5	SNA	-	-	C	X	-	-	-
Asclepias incarnata	Swamp Milkweed	6	-5	S5	-	-	C	-	X	-	-
Asclepias syriaca	Common Milkweed	0	5	S5	-	-	C	X	X	-	-
Betula papyrifera	Paper Birch	2	3	S5	-	-	C	-	X	-	-
Carex vulpinoidea	Fox Sedge	3	-5	S5	-	-	C	X		-	-
Cirsium arvense	Canada Thistle	-	3	SNA	-	-	C	-	X	-	-
Cornus sericea	Red-osier Dogwood	2	-3	S5	-	-	C	-	X	X	-
Daucus carota	Wild Carrot	-	5	SNA	-	-	C	X		-	-
Diervilla lonicera	Northern Bush-honeysuckle	5	5	S5	-	-	C	-	X	-	-
Equisetum arvense	Field Horsetail	0	0	S5	-	-	C	X	X	X	-
Eurybia macrophylla	Large-leaved Aster	5	5	S5	-	-	C	-	X	-	-
Euthamia graminifolia	Grass-leaved Goldenrod	2	0	S5	-	-	C	X	-	-	-
Eutrochium maculatum	Spotted Joe Pye Weed	3	-5	S5	-	-	-	X	-	X	-
Frangula alnus	Glossy Buckthorn	-	0	SNA	-	-	C	-	X	X	-
Fraxinus pennsylvanica	Green Ash	3	-3	S4	-	-	C	X	X	-	X
Juglans nigra	Black Walnut	5	3	S4?	-	-	R	-	-	-	X
Leersia oryzoides	Rice Cutgrass	3	-5	S5	-	-	C	-	X	-	-
Leucanthemum vulgare	Oxeye Daisy	-	5	SNA	-	-	C	X	-	-	-
Lotus corniculatus	Garden Bird's-foot Trefoil	-	3	SNA	-	-	C	-	X	-	-
Lycopus sp.	Water-horehound sp.	-			-	-	-	-	-	X	-
Lythrum salicaria	Purple Loosestrife	-	-5	SNA	-	-	C	X	X	-	-
Matteuccia struthiopteris	Ostrich Fern	5	0	S5	-	-	C	-	X	-	-
Melilotus albus	White Sweet-clover	-	3	SNA	-	-	C	X	-	-	-
Onoclea sensibilis	Sensitive Fern	4	-3	S5	-	-	C	-	X	-	-
Parthenocissus vitacea	Thicket Creeper	4	3	S5	-	-	C	-	X	-	X
Pastinaca sativa	Wild Parsnip	-	5	SNA	-	-	C	X	-	-	-
Phalaris arundinacea	Reed Canary Grass	0	-3	S5	-	-	-	X	X	-	-
Phleum pratense	Common Timothy	-	3	SNA	-	-	C	X	-	-	-
Pinus strobus	Eastern White Pine	4	3	S5	-	-	C	-	-	-	X
Poa pratensis	Kentucky Bluegrass	-	3	S5	-	-	-	X	X	-	-

Scientific Name	Common Name	CC [1]	CW[1]	Conservation Status				ELC Community			
				S-Rank[2]	Federal (SARA, 2012)[3]	Provincial (ESA, 2007)[4]	City of Ottawa[5]	MAMM1-3	SWDM4-5	SWTM3	WODM5
Populus alba	White Poplar	-	5	SNA	-	-	C	-	-	-	X
Populus balsamifera	Balsam Poplar	4	-3	S5	-	-	C	-	X	-	-
Populus deltoides	Eastern Cottonwood	4	0	S5	-	-	-	-	X	-	-
Populus tremuloides	Trembling Aspen	2	0	S5	-	-	C	-	X	-	X
Prunus serotina	Black Cherry	3	3	S5	-	-	C	-	X	-	-
Pteridium aquilinum	Bracken Fern	2	3	S5	-	-	C	-	X	-	-
Quercus bicolor	Swamp White Oak	8	-3	S4	-	-	-	-	X	-	-
Rhamnus cathartica	European Buckthorn	-	0	SNA	-	-	C	-	X	-	-
Rhus typhina	Staghorn Sumac	1	3	S5	-	-	C	-	X	-	X
Ribes cynosbati	Eastern Prickly Gooseberry	4	3	S5	-	-	C	-	X	-	-
Robinia pseudoacacia	Black Locust	-	3	SNA	-	-	R	-	X	-	-
Rubus idaeus	Red Raspberry	2	3	S5	-	-	-	X	X	-	-
Rubus pubescens	Dwarf Raspberry	4	-3	S5	-	-	C	-	X	X	-
Salix alba	White Willow	-	-3	SNA	-	-	UC	-	X	X	-
Salix bebbiana	Bebb's Willow	4	-3	S5	-	-	C	X	X	X	X
Salix discolor	Pussy Willow	3	-3	S5	-	-	C	-	X	X	-
Salix euxina	Crack Willow	-	0	SNA	-	-	-	-	X	-	-
Salix interior	Sandbar Willow	1	-3	S5	-	-	C	-	X	X	-
Salix petiolaris	Meadow Willow	3	-3	S5	-	-	C	X	X	-	-
Solidago altissima	Tall Goldenrod	1	3	S5	-	-	C	X	X	-	X
Sonchus sp.	Sow-thistle sp.	-			-	-	-	X	-	-	X
Spiraea alba	White Meadowsweet	3	-3	S5	-	-	C	X	X	X	-
Symphyotrichum sp.	Aster sp.	-			-	-	-	X	-	-	-
Taraxacum officinale	Common Dandelion	-	3	SNA	-	-	C	X	-	-	-
Thalictrum sp.	Meadow-rue sp.	-			-	-	-	X	-	-	-
Tilia Americana	American Basswood	4	3	S5	-	-	C	-	-	-	-
Thuja occidentalis	Eastern White Cedar	4	-3	S5	-	-	C	-	-	-	X
Tussilago farfara	Coltsfoot	-	3	SNA	-	-	UC	-	X	-	X
Typha angustifolia	Narrow-leaved Cattail	-	-5	SNA	-	-	C	X	-	X	-
Typha latifolia	Broad-leaved Cattail	1	-5	S5	-	-	C	X	X	-	-
Ulmus americana	White Elm	3	-3	S5	-	-	C	-	X	-	-
Vicia cracca	Tufted Vetch	-	5	SNA	-	-	C	X	-	-	-
Vitis riparia	Riverbank Grape	0	0	S5	-	-	C	-	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

APPENDIX

G TREE INVENTORY

Table G1 Tree Inventory Count Estimates

Common Name	Scientific Name	Total
American Basswood	*Tilia americana*	8
American Elm	*Ulmus americana*	25
Bebb's Willow	*Salix bebbiana*	3
Black Cherry	*Prunus serotina var. serotina*	4
Black Locust	*Robinia pseudoacacia*	4
Black Walnut	*Juglans nigra*	2
Common Buckthorn	*Rhamnus cathartica*	16
Crack Willow	*Salix fragilis*	8
Eastern Cottonwood	*Populus deltoides*	176
Eastern White Cedar	*Thuja occidentalis*	5
Eastern White Pine	*Pinus strobus*	4
Green Ash	*Fraxinus pennsylvanica*	15
Manitoba Maple	*Acer negundo*	45
Paper Birch	*Betula papyrifera*	4
Red Maple	*Acer rubrum*	15
Silver Maple	*Acer saccharinum*	4
Swamp White Oak	*Quercus bicolor*	1
Trembling Aspen	*Populus Tremuloides*	217
White Poplar	*Populus alba*	3

Common Name	Scientific Name	Total
White Willow	*Salix alba*	10
TOTAL		**569**

Table G2 Distinctive Tree Inventory

Tree ID	Scientific Name	Common Name	DBH (cm)	Condition	Notes	Easting	Northing	Status
01	*Acer saccharinum*	Silver Maple	61	Moderate	Dead branches, large cavities present, fungus growth along trunk.	460020	5030739	Non-retainable
02	*Acer saccharinum*	Silver Maple	68	Moderate	Fused trunks, some dieback.	460015	5030753	Non-retainable
03	*Populus deltoides*	Eastern Cottonwood	70	Good	Good form.	460048	50303730	Potentially retainable
04	*Populus deltoides*	Eastern Cottonwood	52, 32, 35	Good	Slight lean, multi-stemmed.	460249	5030303	Non-retainable
05	*Populus deltoides*	Eastern Cottonwood	71	Good	Minimal dead branches.	460275	5030290	Non-retainable
06	*Salix alba*	White Willow	57	Good	Minor number of dead branches.	460297	5030227	Non-retainable
07	*Salix alba*	White Willow	53	Good	n/a	460293	5030217	Non-retainable
08	*Salix alba*	White Willow	53, 20	Good	Slight lean, multi-stemmed.	460284	5030225	Non-retainable

Tree ID	Scientific Name	Common Name	DBH (cm)	Condition	Notes	Easting	Northing	Status
09	*Populus deltoides*	Eastern Cottonwood	52	Good	n/a	460390	5030058	Potentially retainable
10	*Populus deltoides*	Eastern Cottonwood	60	Good	n/a	460206	5030519	Potentially retainable
11	*Populus deltoides*	Eastern Cottonwood	55	Good	Moderate lean, some dead branches.	460204	5030518	Potentially retainable
12	*Pinus strobus*	Eastern White Pine	55	Good	Outside of property parcel.	460213	5030527	Potentially retainable
13	*Ulmus americana*	American Elm	50	Good	Co-dominant stems, broken branches	460166	5030086	Non-retainable
14	*Salix alba*	White Willow	51, 52, 46, 49, 53	Good	Multi-stemmed, lean	460311	5030253	Potentially retainable