

Natural Heritage Impact
Assessment Report for the
Salem Secondary Plan
Development Area, City of
Barrie

Final Report

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Sign-off Sheet

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Table of Contents

ABBREVIATIONS	I
GLOSSARY	III
1.0 INTRODUCTION	1.1
2.0 LEGISLATION AND POLICY OVERVIEW	2.1
2.1 FEDERAL CONTEXT	2.1
2.1.1 Migratory Birds Convention Act, 1994	2.1
2.1.2 Species at Risk Act, 2002	2.1
2.1.3 Fisheries Act	2.2
2.2 PROVINCIAL CONTEXT	2.2
2.2.1 Endangered Species Act, 2007	2.2
2.2.2 Conservation Authorities Act, 1990	2.3
2.2.3 Environmental Assessment Act, 1990	2.3
2.3 MUNICIPAL CONTEXT	2.3
2.3.1 Official Plan Amendment No. 38 to the City of Barrie Official Plan: Salem Secondary Plan (Draft, February 2013)	2.3
3.0 METHODS	3.1
3.1 BACKGROUND REVIEW AND AGENCY CONSULTATION	3.1
3.1.1 Terrestrial Environment	3.1
3.1.2 Aquatic Environment	3.2
3.2 FIELD INVESTIGATIONS	3.2
3.2.1 Terrestrial Environment	3.4
3.2.2 Aquatic Environment	3.5
3.3 EVALUATION OF SIGNIFICANCE	3.7
3.3.1 Natural Heritage Features and Areas	3.7
3.3.2 Species at Risk and Species of Conservation Concern	3.7
4.0 EXISTING CONDITIONS	4.1
4.1 DESIGNATED NATURAL AREAS	4.1
4.2 TERRESTRIAL ENVIRONMENT	4.1
4.2.1 Vegetation	4.1
4.2.2 Breeding Birds	4.3
4.2.3 Mammals	4.5
4.2.4 Amphibians	4.5
4.2.5 Reptiles	4.6
4.2.6 Insects	4.6
4.3 AQUATIC ENVIRONMENT	4.7
4.3.1 Fish Habitat	4.7
4.3.2 Fluvial Geomorphology	4.9
5.0 SUMMARY OF SIGNIFICANT NATURAL FEATURES	5.1

NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT
AREA, CITY OF BARRIE

6.0	EVALUATION OF ALTERNATIVES.....	6.1
6.1	DESCRIPTION OF ALTERNATIVES	6.1
6.2	TERRESTRIAL ENVIRONMENT	6.2
6.2.1	Vegetation	6.2
6.2.2	Wetlands	6.2
6.2.3	Wildlife and Wildlife Habitat	6.3
6.2.4	Species at Risk	6.3
6.3	AQUATIC ENVIRONMENT	6.3
6.3.1	Watercourses/Fisheries/Aquatic Impacts	6.3
6.4	ENVIRONMENTAL IMPROVEMENTS.....	6.4
6.5	CONCLUSION	6.5
7.0	IMPACT ASSESSMENT AND MITIGATION RECOMMENDATIONS	7.1
7.1	TERRESTRIAL ENVIRONMENT	7.1
7.1.1	Potential Impacts to Vegetation and Wetlands.....	7.1
7.1.2	Potential Impacts to Wildlife and Wildlife Habitat	7.3
7.1.3	Potential Impacts to Species at Risk	7.4
7.2	AQUATIC ENVIRONMENT	7.5
7.2.1	Potential Impacts to Fish Habitat and Fluvial Geomorphology.....	7.5
7.2.2	Mitigation Recommendations.....	7.5
7.3	BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL.....	7.7
8.0	REGULATORY APPROVAL REQUIREMENTS.....	8.1
8.1	SPECIES AT RISK ACT, 2002	8.1
8.1	FISHERIES ACT	8.1
8.2	ENDANGERED SPECIES ACT, 2007.....	8.1
8.3	CONSERVATION AUTHORITY REGULATED AREAS	8.1
9.0	SUMMARY.....	9.1
10.0	REFERENCES.....	10.1

LIST OF TABLES

Table 1 Summary of Field Investigation Effort	3.3
Table 2 Plant SAR and SOCC with the Potential to Occur in the Study Area	4.2
Table 3 Summary of ELC Community Coverage	4.3
Table 4 Avian SAR and SOCC with the Potential to Occur in the Study Area	4.4
Table 5 Mammalian SAR and SOCC with the Potential to Occur in the Study Area	4.5
Table 6 Amphibian SAR and SOCC with the Potential to Occur in the Study Area	4.5
Table 7 Reptilian SAR and SOCC with the Potential to Occur in the Study Area	4.6
Table 8 Insect SAR and SOCC with the Potential to Occur in the Study Area	4.7
Table 9 Summary of Significant Natural Features in the Study Area	5.1
Table 10 Alternatives Proposed for the Project	6.1

LIST OF APPENDICES

Appendix A	Figure 1 Project Components and Natural Heritage Features
	Figure 2 Terrestrial Field Survey Locations
	Figure 3 Aquatic Field Survey Locations
	Figure 4-1 to 4-12 ELC Delineation
	Figure 5 SAR and SOCC Birds Identified during the NHIA
	Figure 6 Candidate and Confirmed Significant Wildlife Habitat
Appendix B	Agency Correspondence
Appendix C	Field Data Forms and Maps
Appendix D	Schedule 8B: Natural Heritage Components of the Salem Secondary Plan Draft Amendment (OPA)
Appendix E	Vegetation Results
Appendix F	Significant Wildlife Habitat Matrix
Appendix G	Wildlife and Wildlife Habitat Survey Results
Appendix H	Aquatic Habitat Survey Results
Appendix I	Alternatives Evaluation Matrix

Abbreviations

CAA	<i>Conservation Authorities Act, 1990</i>
BSC	Bird Studies Canada
CEA	Class Environmental Assessment
DFO	Fisheries and Oceans, Canada
DNA	Designated Natural Area
EAA	<i>Environmental Assessment Act, 1990</i>
ESA	<i>Endangered Species Act, 2007</i>
LIO	Land Information Ontario
LSRCA	Lake Simcoe Region Conservation Authority
MBCA	<i>Migratory Birds Convention Act, 1994</i>
MNRF	Ministry of Natural Resources and Forestry; formerly Ministry of Natural Resources (MNR)
MOECC	Ministry of the Environment and Climate Change; formerly Ministry of Environment (MOE)
ND	No date
NHFA	Natural Heritage Features and Areas
NHIA	Natural Heritage Impact Assessment
NHIC	Natural Heritage Information Centre
NHRM	Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement (MNR, 2010)
NVCA	Nottawasaga Valley Conservation Authority
O. Reg.	Ontario Regulation

NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT
AREA, CITY OF BARRIE

OBBA	Ontario Breeding Bird Atlas
OPA	Amendment No. 38 to the City of Barrie Official Plan: Salem Secondary Plan (Draft, February 2013) (OPA)
PNP	Primary Nesting Period
PPS	Provincial Policy Statement
PSW	Provincially Significant Wetland
ROW	Right-of-Way
SAR	Species at Risk
SARA	<i>Species at Risk Act</i> , 2002
SARO	Species at Risk in Ontario
SOCC	Species of Conservation Concern
SWH	Significant Wildlife Habitat
SWHMST	Significant Wildlife Habitat Mitigation Support Tool (MNRF 2014)
SWHTG	Significant Wildlife Habitat Technical Guide (MNR 2000)

Glossary

Development Area	The area designated under the Infrastructure Master Plans as the Salem Secondary Plan Development Area.
Natural Heritage Feature and Area (NHFA)	According to the <i>Provincial Policy Statement</i> (MMAH, 2014) (PPS): <i>“features and areas, including significant wetlands, significant coastal wetlands, other coastal wetlands in Ecoregions 5E, 6E and 7E, fish habitat, significant woodlands and significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River), habitat of endangered species and threatened species, significant wildlife habitat, and significant areas of natural and scientific interest, which are important for their environmental and social values as a legacy of the natural landscapes of an area.”</i>
Existing Right-of-Way (ROW)	The existing ROW widths for roads within the Study Area are as defined in OPA No. 38: <ul style="list-style-type: none">• Essa Road: 30 m north of Athabaska Road, 20 m south of Athabaska Road.• Salem Road: 20 m• McKay Road West: 20 m• McKay Road East: 20 m• Veterans Drive: 36 m north of Salem Road, 20 m south of Salem Road• Huronia Road: 30 m north of Lockhart Road, 20 m south of Lockhart Road• Lockhart Road: 26 m
Proposed Right-of-Way (ROW)	All roads assessed as part of this NHIA are identified as Arterial Roads by OPA Schedule 8D-2. The maximum road width (Right-of-Way) for these roads is 41 m as per S. 8.6.3.1 of the OPA. Precise road widths will be determined following the current CEA process.

Species at Risk (SAR) This report uses the ESA definition of SAR, which includes species listed as *Extirpated*, *Endangered* or *Threatened* (and are thereby afforded protection) under the act.

Species of Conservation Concern (SOCC) This report uses the *Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement* (NHRM) (MNR, 2010) definition of SOCC, as follows:

- Special Concern species identified under the ESA on the SARO List
- Species identified as nationally endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada or SARA, which are not protected in regulation under Ontario's ESA

Provincial ranks (S-ranks) are used by the NHIC to set protection priorities for rare species and vegetation communities. They are based on the number of occurrences in Ontario and are not legal designations. Species with provincial ranks of S1 to S3 are tracked by the MNRF and considered Species of Conservation Concern (SOCC). Provincial S-ranks are defined as follows:

S1: Critically imperiled; usually fewer than 5 occurrences

S2: Imperiled; usually fewer than 20 occurrences

S3: Vulnerable; usually fewer than 100 occurrences

S4: Apparently secure; uncommon but not rare, usually more than 100 occurrences

S5: Secure, common, widespread and abundant

S?: An S rank followed by a "?" indicates the rank is still uncertain

Study Area The area used to consider potential impacts to natural heritage features. Includes all lands within 120 m of the ROW where infrastructure improvements are proposed

The Project Any part of the proposed works that has the potential to impact terrestrial and aquatic ecosystems or NHFA.

Introduction
July 27, 2017

1.0 INTRODUCTION

On January 1, 2010, *The Barrie-Innisfil Boundary Adjustment Act, 2009 (Bill 196)* extended the southern boundary of Barrie to include 2,350 hectares of land previously in the Town of Innisfil. Subsequently, the City of Barrie initiated the preparation of six Infrastructure Master Plans for the Salem Secondary Plan Development Area (the Development Area), which includes the newly annexed lands and lands within the previous city boundary (Figure 1, Appendix A). The City proposes to upgrade existing infrastructure in the Development Area, including road widenings and expansions to the sanitary sewers and trunk watermains along several existing road corridors (the Project). Stantec Consulting Ltd. (Stantec) was retained by the City of Barrie (the City) to complete a Transportation Class Environmental Assessment (CEA) for these works. The assessments performed address Phases 3 and 4 of the CEA process for the Schedule C road widenings and grade separations projects within the Development Area as required by the *Environmental Assessment Act, 1990 (EAA)*.

This Natural Heritage Impact Assessment (NHIA) should be reviewed in conjunction with the standalone drainage and stormwater management report (in preparation), also submitted as part of the CEA package, and includes:

- A summary of legislation and policies related to Natural Heritage Features and Areas (NHFA) and Species at Risk (SAR) that could apply to the Project
- A description of the methods used to describe the natural environment and assign significance to existing natural environment features
- A description of the existing natural environment based on a review of available background data and field investigations conducted in 2016
- A preliminary impact assessment for the Project on identified natural environment features
- Recommendations for standard and site-specific mitigation measures to protect natural environment features

2.0 LEGISLATION AND POLICY OVERVIEW

This section summarizes the natural environment legislation and policies related to NHFA and SAR that could apply to the Project. The summaries contained in this section are provided for information purposes only, and the reader should refer to the current legislation and policies for the complete text.

2.1 FEDERAL CONTEXT

2.1.1 Migratory Birds Convention Act, 1994

The federal *Migratory Birds Convention Act* (MBCA) is intended to conserve and protect migratory birds and their nests (S.4). Section 6 of the Migratory Bird Regulations (C.R.C., c. 1035) prohibits the disturbance, destruction or taking of a nest, egg, or nest shelter of a migratory bird. Nest disturbance during the course of vegetation clearing may be considered as “incidental take”, and could be seen as a contravention of the MBCA.

Recommendations for mitigation that addresses the risk of MBCA contravention are provided in Section 7.1.2.1.

2.1.2 Species at Risk Act, 2002

The federal *Species at Risk Act* (SARA) protects wildlife species listed as extirpated, endangered or threatened under Schedule 1 of the act from harm, harassment, killing or capture (S.32(1)) or collection (S.32(2)). S.33 of the Act prohibits the damage or destruction of the residence of the listed species, and S.58(1) prohibits the destruction of their critical habitat. SARA applies to projects on federally owned lands, projects that require federal financing and projects where federal approvals are required.

S.34 of the SARA states that the prohibitions outlined in S.32 & S.33 do not apply to non-aquatic species or species that are not protected under MBCA on non-federal lands unless an order is made under S.34(2). Under S.34(3), the Minister of the Environment must issue this order if of the opinion that the species is not adequately protected under provincial laws. No such orders were known to apply to the Project at the time of this report.

Recommendations for mitigation that addresses the risk of SARA contravention are provided in Section 7.1.2.1 and 7.2.2.

2.1.3 Fisheries Act

The federal *Fisheries Act* prohibits causing serious harm to fish unless authorized by the Minister of Fisheries and Oceans, Canada (DFO). This applies to activities in or near waterbodies that support fish that are part of or that support a commercial, recreational, or Aboriginal (CRA) fishery. Effective November 25, 2013, proponents can assess projects under the Self-Assessment process. If culvert repair and/or replacements meet the following Self-Assessment criteria, DFO review will not likely be required (DFO 2016):

- No temporary or permanent increase in existing footprint below the High Water Mark
- No new temporary or permanent fill placed below the High Water Mark
- Channel realignment is not required
- No narrowing of the channel
- Any obstruction to fish passage will respect timing windows
- Provides for fish passage
- Work can be done in isolation of flowing water

As per DFO's website, Self-Assessments should be conducted by a 'qualified professional' using final project design information. If the Self-Assessment criteria cannot be met, the proponent should contact DFO for a formal review and possible Authorization under the *Fisheries Act*.

Recommendations for mitigation that addresses the risk of ESA contravention are provided in Section 7.1.2.1.

2.2 PROVINCIAL CONTEXT

2.2.1 Endangered Species Act, 2007

The provincial *Endangered Species Act* (ESA) prohibits the killing, harming, harassing, capturing or taking of a living member of a species listed as Threatened, Endangered or Extirpated by the Species at Risk in Ontario (SARO) list (O. Reg 230/08) (S. 9), and damage to habitat of protected species (S. 10). Permits for prohibited activities may be issued under S. 17(2) of the ESA.

O. Reg 242/08 of the ESA establishes, among other things, the Species at Risk Registry (the Registry), which allows proponents to register limited prescribed activities that might otherwise contravene the ESA. O. Reg 242/08 provides a regulatory framework for the registry process, which exempts activities that meet a defined set of criteria, as outlined within the regulation, from the ESA S.17(2) permit process. Not all species or activities are eligible for the Registry.

Recommendations for mitigation that addresses the risk of ESA contravention are provided in Section 7.1.2.1.

2.2.2 Conservation Authorities Act, 1990

The *Conservation Authorities Act (CAA)* grants each of Ontario's 36 Conservation Authorities (CA) the authority to make regulations within the areas under their respective jurisdictions (S. 28).

The Development Area falls within the regulation limits of two CAs, the Lake Simcoe Region Conservation Authority (LSRCA) and the Nottawasaga Valley Conservation Authority (NVCA). The LSRCA and NVCA operate under O. Regs. 179/06 and 172/06, respectively, to regulate the lands under their jurisdiction.

Section 1 and S.2 of these regulations prohibit development on lands within the CA's jurisdiction, including lands adjacent to the Great Lakes-St Lawrence River system and inland lakes; river or stream valleys (with or without an apparent watercourse); hazardous lands; wetlands and adjacent lands; and lands delineated as "Regulation Limit" under O. Reg. 97/04 maps. Work in regulated areas will require a permit from the relevant CA.

Recommendations for mitigation that will support the CA permit process are provided in Sections 7.1.1.1 and 7.2.2. CA regulated areas are shown on Figure 1, Appendix A.

2.2.3 Environmental Assessment Act, 1990

The *Environmental Assessment Act (EAA)* S.13 makes allowance for various classes of activities to be approved under the authority of a CEA. The CEA for municipal infrastructure projects allows municipalities to plan, design, construct, maintain, rehabilitate and/or retire municipal road, water, wastewater and transit projects without obtaining project-specific approval from the Ministry of the Environment and Climate Change (MOECC).

This NHIA addresses Phases 3 and 4 of the CEA process for the Schedule C road widenings and grade separations projects within the Development Area as required by the EAA.

2.3 MUNICIPAL CONTEXT

2.3.1 Official Plan Amendment No. 38 to the City of Barrie Official Plan: Salem Secondary Plan (Draft, February 2013)

The Official Plan Amendment No. 38 to the City of Barrie Official Plan: Salem Secondary Plan (Draft, February 2013) (OPA) identifies the following natural environment features that were considered in this NHIA:

NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT AREA, CITY OF BARRIE

Legislation and Policy Overview
July 27, 2017

Natural Core Area: natural heritage, hydrological and hydrogeological features and their associated adjacent land buffers. The limits of this designation are intended to protect said features by encompassing both the feature and its recommended setback (OPA S.8.3.2.1). Natural Core Areas will generally be maintained in accordance with the designations on Schedule 8B; however minor modifications to their boundaries may be made where they do not impact the natural heritage system (OPA S.8.3.3.1).

Natural Linkage Area: connects two Natural Core Areas within the OPA, or connects a Natural Core Area to habitats located outside the OPA (OPA S.8.3.2.2). Natural Core Areas will generally be maintained in accordance with the designations on Schedule 8B; however minor modifications to their boundaries may be made where they do not impact the natural heritage system (OPA S.8.3.3.1).

Low, Medium and High Constraint Stream Corridor Area: watercourses, associated riparian lands, and buffers measured from the stable top-of-bank. These features are located in Natural Core Areas and Natural Linkage Areas (OPA S.8.3.2.3, S.8.3.2.4, and S.8.3.2.5).

Low and Medium Constraint Stream Corridor Areas will generally be maintained in accordance with the designations on Schedule 8B; however minor modifications to their boundaries may be made where they do not impact the natural heritage system (OPA S.8.3.3.2). High Constraint Stream Corridor Areas will be protected in their existing locations (OPA S.8.3.2.3).

Methods
July 27, 2017

3.0 METHODS

The area used to consider potential impacts to natural environment features includes all lands within 120 m of the ROW where infrastructure improvements are proposed (the Study Area) (Figure 1, Appendix A).

3.1 BACKGROUND REVIEW AND AGENCY CONSULTATION

Letters requesting background information on natural environment features were sent to the Midhurst District Ministry of Natural Resources and Forestry (MNRF), LSRCA and NVCA. LSRCA and MNRF provided a response, including geospatial datasets for the Development Area. Agency correspondence is included in Appendix B.

In support of the Secondary Plan for the City of Barrie Annexed Lands (including the Development Area), natural heritage studies were undertaken by Natural Resource Solutions Inc. (NRSI) in 2012. The NRSI study included a background review of previous studies and literature, desktop analysis and field surveys to document and assess existing ecological conditions within the Study Area. Two corresponding reports, *City of Barrie Annexed Lands Natural Heritage Characterization Report* (NRSI 2012a) and *City of Barrie Annexed Lands Natural Heritage Systems Report* (NRSI 2012b) are referenced throughout this NHIA. These reports covered the Development Area in addition to another parcel located to the east, and some results were presented holistically for the two units. As a result, some historic records cited by NRSI (2012a and 2012 b) may originate from lands to the east of the Development Area.

Additional background documents and information sources reviewed for the terrestrial and aquatic environment assessment are summarized below.

3.1.1 Terrestrial Environment

Stantec performed a preliminary background review of natural environment features, including potential SAR and Species of Conservation Concern (SOCC), for the Development Area. Sources reviewed included:

- City of Barrie Annexed Lands Natural Heritage Characterization Report (NRSI 2012a)
- Natural Heritage Information Centre (NHIC) Biodiversity Explorer database (MNRF 2015B)
- Species At Risk In Ontario List (database) (MNRF 2016b)
- Atlas of the Mammals of Ontario (Dobbyn 1994)
- Atlas of the Breeding Birds of Ontario, 2001-2005 (Cadman et al. 2007)
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2016)

Methods

July 27, 2017

- Land Information Ontario (LIO) database (MNRF n.d.)
- The OPA, including Schedule 8B

3.1.2 Aquatic Environment

Stantec obtained and reviewed information from the following reports and agencies to summarize available background data with respect to fish and fish habitat and fluvial geomorphology:

- LIO database (MNRF n.d.)
- City of Barrie Annexed Lands Natural Heritage Characterization Report (NRSI 2012a)
- City of Barrie Annexed Lands Natural Heritage Systems Report (NRSI 2012b)
- Intensification and Annexed Lands Drainage and Stormwater Management Master Plan Final Report (AMEC 2013)
- Barrie Creeks, Lovers Creek, and Hewitt's Creek Subwatershed Plan (LSRCA 2012)
- Personal communication with Midhurst District MNRF (MNRF 2016a)
- DFO Species at Risk Distribution Maps (DFO 2015a; DFO 2015b)
- Lake Simcoe Region Conservation Authority Lovers Creek and Hewitt Creek Master Watershed Plans (LSRCA 1995)

3.2 FIELD INVESTIGATIONS

Field Investigations were conducted on nine (9) dates in 2016 (Table 1). Investigations were conducted from the road right-of-way (ROW) due to access restrictions on privately owned lands. The existing ROW widths for roads within the Study Area are as defined in the OPA:

- Essa Road: 30 m north of Athabaska Road, 20 m south of Athabaska Road.
- Salem Road: 20 m
- McKay Road West: 20 m
- McKay Road East: 20 m
- Veterans Drive: 36 m north of Salem Road, 20 m south of Salem Road
- Huronia Road: 30 m north of Lockhart Road, 20 m south of Lockhart Road
- Lockhart Road: 26 m

NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT AREA, CITY OF BARRIE

Methods
July 27, 2017

Investigations included surveys for vegetation, wildlife, and aquatic habitat and fluvial geomorphology. Methods for the different survey types are discussed under separate headers below.

Table 1 Summary of Field Investigation Effort

Date	Survey(s) Conducted	Surveyor(s)	Time (24 hr)	Person Hours	Weather Information
November 25, 2015	Trout spawning/redd survey and rapid geomorphic assessments/fluvial geomorphology	M. Faiella, T. Chandler	0950-1500	10	2°C, no precipitation
April 20, 2016	Turtle habitat assessments, wildlife habitat, reptile basking	L. Uskov	1330-2032	7	17°C, sunny, no precipitation
	Amphibian call monitoring	L. Uskov	2043-2211	1.5	16°C, clear, low wind
May 27, 2016	ELC, wildlife habitat assessment, reptile basking	L. Uskov	1515-2044	5.5	28°C, sun/cloud mix, no precipitation
	Eastern Whip-poor-will point count, amphibian call monitoring stations	L. Uskov	2105-2340	2.5	27°C, 40% cloud, no wind
June 1, 2016	Breeding bird point count, grassland bird point count, reptile basking	J. Ball	0537-1043	5	15°C – 20°C, low wind, no precipitation
	ELC, wildlife habitat assessment	J. Ball	1100-1300	2	20°C, low wind, no precipitation
June 7, 2016	ELC, wildlife habitat assessment, reptile basking	L. Uskov	1402-1838	4.5	15°C, low wind, sun/cloud mix, no precipitation
	Eastern Whip-poor-will point count	L. Uskov	2127-2215	1	14°C, low wind, clear, no precipitation
June 16, 2016	Breeding bird point count, grassland bird point count	J. Ball	0614-0938	3.5	17°C, low wind, no precipitation
	ELC, wildlife habitat assessment	J. Ball	0940-1230	3	17°C, low wind, no precipitation
June 22, 2016	Wildlife habitat assessment	L. Uskov	1815-2108	3	16°C, low wind, clear, no precipitation
	Eastern Whip-poor-will point count, amphibian call monitoring stations	L. Uskov	2130-0111	3	15°C, low wind, clear, no precipitation
July 7, 2016	Grassland bird point counts	J. Ball	0522-1035	4	22°C – 30°C, partly cloudy, low wind
July 18, 2016	Fish habitat inventory and fish community sampling	M Faiella, D Cameron	1100-1515	8	Sunny and hot (23 °C to 29°C), no precipitation

Methods
July 27, 2017

3.2.1 Terrestrial Environment

3.2.1.1 Vegetation

Vegetation communities were classified using the Ecological Land Classification System (ELC) (Lee et al. 1998). For accessible lands, ELC assessments were performed in the field. These assessments included recording plant species composition and community structure. ELC data sheets were completed for vegetation units identified and are included in Appendix C. ELC communities on lands that were not accessible were delineated using aerial photograph interpretation.

All vegetation was identified to the lowest taxonomic level possible from the ROW. Searches were conducted for vegetation SAR with the potential to occur in the Study Area (Section 4.2.1) where suitable habitat was present in accessible areas. Scientific nomenclature of plant species followed the Database of Vascular Plants of Canada (VASCAN) (Brouillet et al. 2010+).

3.2.1.2 Breeding Birds

Three types of breeding bird surveys were conducted to meet species and habitat-specific targets:

- Breeding bird point counts were performed on two dates in June 2016 following the Ontario Breeding Bird Atlas protocol (OBBA 2001) at representative habitats in the Study Area
- Grassland bird point counts were performed on three dates in June and July 2016 as per MNR established protocol (MNR 2012) in suitable grassland habitats in the Study Area
- Eastern Whip-poor-will point counts were performed on three dates in May and June 2016 as per MNR established protocol (MNR 2013a) in suitable open habitats

Breeding bird point count stations are illustrated in Figure 2, Appendix A. On each survey date, point count stations were set up in the ROW and calls were monitored for 10 minutes. All calls heard from the station were recorded, including an estimate of distance and direction of origin. A breeding bird point count data form was completed for each visit. The forms are included in Appendix C. In addition, area searches for birds and bird nests were conducted in the ROW. All species of birds that were heard or seen were recorded.

3.2.1.3 Mammals

Targeted surveys were conducted to detect candidate bat maternity roost habitats in the ROW, following established MNR protocol (MNR 2011). Candidate trees connected to woodlands or grouped in the ROW were assessed, including a search for suitable cavities and assessment of decay class.

Methods
July 27, 2017

Incidental mammals or mammal habitat features (burrows, nests) observed during the NHIA were also documented. Data forms can be found in Appendix C.

3.2.1.4 Amphibians

Amphibian call monitoring stations were assessed in May, June and July as per the Marsh Monitoring Program protocol (BSC 2009) (Figure 2, Appendix A). At each station, all calling toads and frogs were identified and recorded over a three minute time period. Call levels were described using values of 1, 2, or 3. Level 1 indicated that individuals could be counted and calls were not simultaneous. Level 2 indicated that calls were distinguishable with some simultaneous calling. Level 3 indicated a full chorus where calls were continuous and overlapping. The distance and direction from the monitoring station was estimated and recorded for each individual or chorus detected. Amphibian call monitoring survey data forms were filled out for each station, and are included in Appendix C.

3.2.1.5 Reptiles

Surveys included documentation of candidate turtle wintering areas, turtle nesting sites, snake hibernacula and suitable turtle aquatic habitat for species identified as potentially occurring during the background review. Basking surveys were conducted at suitable turtle habitat features in May and early June, when ambient air temperatures were warmer than water temperatures. Warm, sunny days were selected to increase the likelihood of encountering basking reptiles. All reptile observations were recorded. Turtle habitat survey locations are shown on Figure 2, Appendix A. Habitat assessment data forms were filled out for each candidate feature, and are included in Appendix C.

3.2.1.6 Significant Wildlife Habitat

Some significant wildlife habitat (SWH) features are delineated by MNRF, and were identified during the background review. The Study Area was also assessed to determine if additional candidate or confirmed SWH features were present. Candidate SWH features were identified by Stantec in the field and assessed using ELC. As per the *Significant Wildlife Habitat Technical Guide and Criteria Schedules for Ecoregion 6E* (MNRF 2015B), targeted species-use surveys for breeding birds, amphibians and reptiles were also used to confirm the presence of SWH.

3.2.2 Aquatic Environment

3.2.2.1 Fish Habitat

Field work was conducted to characterize aquatic habitat at potential watercourse crossings (Figure 3, Appendix A). Fall spawning surveys were conducted within the ROW of road crossings in November 2015. General morphological characteristics of the site, the presence of suitable spawning substrates and location of trout spawning redds (if present) were recorded.

Methods

July 27, 2017

A fish habitat assessment and fish community sampling survey were conducted in July 2016. The fish community surveys were completed with a Smith-Root LR-24 backpack electrofisher using a single pass method without the use of block nets. The survey was limited to areas within the road ROW. Captured fish were identified, enumerated and returned to the watercourse.

The following habitat characteristics were recorded:

- Watercourse size
- Key habitat features (e.g. pools, riffles, undercut banks)
- Groundwater seepage and upwelling areas
- Substrate types
- Bank stability
- In-stream cover
- Riparian vegetation

During the aquatic habitat assessment, air temperature, recent weather conditions, location coordinates, length of each reach surveyed, and *in situ* water quality data (pH, conductivity, dissolved oxygen, water temperature) were also recorded (Appendix H).

3.2.2.2 Fluvial Geomorphology

Rapid geomorphic assessments were conducted to assess channel morphology and stability at the 10 aquatic survey locations (Figure 3, Appendix A). The assessments were conducted as per the Ontario Ministry of the Environment (MOE) protocol (MOE 2003). Creek bank stability and characterization of active fluvial processes were documented. This assessment was conducted in November 2015 when the crossing sites were free of excessive ice and snow cover, allowing the condition of the banks to be observed.

The following information regarding fluvial geomorphology was recorded (Table H.2, Appendix H):

- Bankfull width/depth
- Substrate size
- Channel entrenchment (access to floodplain)
- Bed morphology (e.g., pool-riffle)
- Bed/bank stability

Methods
July 27, 2017

- Dominant fluvial process
- Characteristics promoting stability (e.g., vegetation type, rooting depth/density)
- Local channel disturbances

3.3 EVALUATION OF SIGNIFICANCE

The natural environment features identified during the NHIA were evaluated to determine significance using the definitions and criteria for NHFA, SAR or SOCC described below.

3.3.1 Natural Heritage Features and Areas

The following technical documents provide standard provincial guidance, and were used to identify NHFA and assess their significance and sensitivity:

- The Provincial Policy Statement (PPS) (MMAH 2014)
- *The Significant Wildlife Habitat Technical Guide* (SWHTG) (MNR 2000) and Ecoregion Criteria Schedule for 6E (MNRF 2015B)
- *Natural Heritage Reference Manual* for Natural Heritage Policies of the Provincial Policy Statement (NHRM) (MNR 2010)
- Significant Wildlife Habitat Mitigation Support Tool (SWHMST) (MNRF 2014)

The PPS and NHRM provide guidance for the identification of six categories of NHFA: Significant Wetlands and Significant Coastal Wetlands, Significant Woodlands, Significant Valleylands, SWH, Areas of Natural and Scientific Interest (ANSI), and Fish Habitat.

The SWHTG defines four categories of SWH: Habitats of Seasonal Concentrations of Animals, Rare Vegetation Communities or Specialized Habitats for Wildlife, Habitats of Species of Conservation Concern (Section 3.3.2), and Animal Movement Corridors.

3.3.2 Species at Risk and Species of Conservation Concern

This report uses the *Endangered Species Act, 2007* (ESA) definition of SAR, which includes species listed as *Extirpated*, *Endangered* or *Threatened* (and are thereby afforded protection) under the act.

The definition for SOCC was adapted from the NHRM and SWHTG:

- Special Concern species identified under the ESA on the SARO List

NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT AREA, CITY OF BARRIE

Methods

July 27, 2017

- Species identified as nationally endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or SARA, which are not protected in regulation under Ontario's ESA
- Provincially rare species (ranked S1-S3 by the NHIC)

Provincial ranks (S-ranks) are used by the NHIC to set protection priorities for rare species and vegetation communities. They are based on the number of occurrences in Ontario and are not legal designations. Species with provincial ranks of S1 to S3 are tracked by the MNRF and considered Species of Conservation Concern (SOCC). Provincial S-ranks are defined as follows:

S1: Critically imperiled; usually fewer than 5 occurrences

S2: Imperiled; usually fewer than 20 occurrences

S3: Vulnerable; usually fewer than 100 occurrences

S4: Apparently secure; uncommon but not rare, usually more than 100 occurrences

S5: Secure, common, widespread and abundant

S?: An S rank followed by a "?" indicates the rank is still uncertain

SNA: Introduced

The potential for SAR and SOCC to occur in the Study Area were determined using the following criteria:

- Records of the species in the Study Area from background sources (Section 4.2)
- Range overlap with the Study Area
- Presence of suitable habitat in the Study Area

SAR and SOCC with suitable habitat and at least one existing record and/or an overlapping range in the Study Area were considered to have a reasonable probability of occurring, and were targeted by the field investigation program. Where the targeted surveys adhered to accepted protocols for determining the presence/absence of the target species and failed to detect it, the species was considered absent from the Study Area.

Existing Conditions
July 27, 2017

4.0 EXISTING CONDITIONS

4.1 DESIGNATED NATURAL AREAS

Some natural environmental features are designated by MNRF, LSRCA, NVCA or the City, and identifiable through background review. These are referred to as Designated Natural Areas (DNA). The following features were identified for the Study Area (Figure 1, Appendix A; Appendix D):

The Lovers Creek Swamp Provincially Significant Wetland (PSW) runs roughly east-west through the Development Area. LIO mapping indicates that this feature should intersect the Study Area at Veterans Drive and Huronia Road (Figure 1, Appendix A), and the ROW only at Veterans Drive. However, the field investigation did not detect wetland habitat in the ROW at Veterans Drive, where deciduous and coniferous forest communities were present instead.

A designated Deer Wintering Area mapped by LIO (Figure 1, Appendix A) coincides with the wooded area surrounding the Lovers Creek Swamp PSW, running east-west through the Development Area and intersecting the Study Area at Veterans Drive and Huronia Road.

NVCA and LSRCA regulate lands, designated as “Regulation Limit”, within the Development Area (Figure 1, Appendix A). These lands coincide with sensitive natural features and hazards and fall under the jurisdiction of the corresponding CA.

Schedule 8B of the OPA identifies Natural Core Areas; Natural Linkage Areas; and Low, Medium and High Constraint Stream Corridor Areas in the Development Area (Appendix D).

Natural Core Areas are designated where the features present meet the definition of NHFA (Section 3.3.1), and in the Study Area correspond with Lovers Creek Swamp PSW.

4.2 TERRESTRIAL ENVIRONMENT

4.2.1 Vegetation

The background review identified five plant SAR and 12 plant SOCC with the potential to occur in the Study Area (Table 2).

NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT AREA, CITY OF BARRIE

Existing Conditions
July 27, 2017

Table 2 Plant SAR and SOCC with the Potential to Occur in the Study Area

Common Name	Latin Name	Provincial Designation/Rank	Source
American Ginseng	<i>Panax quinquefolius</i>	Endangered	NRSI 2012a
Butternut	<i>Juglans cinerea</i>	Endangered	NRSI 2012a
Eastern Prairie-Fringed Orchid	<i>Platanthera leucophaea</i>	Endangered	NRSI 2012a
Spotted Wintergreen	<i>Chimaphila maculata</i>	Endangered	NRSI 2012a
Purple Twayblade	<i>Liparis liliifolia</i>	Threatened	NRSI 2012a
Broad Beech Fern	<i>Phegopteris hexagonoptera</i>	Special Concern	NRSI 2012a
Hill's Pondweed	<i>Potamogeton hillii</i>	Special Concern	NRSI 2012a
White Blue-eyed Grass	<i>Sisyrinchium albidum</i>	S1	NRSI 2012a
Yellow Monkey-Flower	<i>Erythranthe geyeri</i>	S1	NRSI 2012a
Fogg's Goosefoot	<i>Chenopodium foggii</i>	S2	NRSI 2012a
Marsh Valerian	<i>Valeriana sitchensis ssp. uliginosa</i>	S2	NRSI 2012a
Rugulose Grapefern	<i>Sceptridium rugulosum</i>	S2	NRSI 2012a
Clinton's Clubrush	<i>Trichophorum clintonii</i>	S2S3	NRSI 2012a
Beaked Spike-rush	<i>Eleocharis rostellata</i>	S3	NRSI 2012a
Houghton's Flatsedge	<i>Cyperus houghtonii</i>	S3	NRSI 2012a
Ram's-head Lady's Slipper	<i>Cypripedium arietinum</i>	S3	NRSI 2012a
Weak Bluegrass	<i>Poa languida</i>	S3	NRSI 2012a

NRSI identified a total of 495 plant taxa through field surveys, including one SAR (butternut) and one SOCC (white blue-eyed grass) during the 2012 study (NRSI 2012). The locations of the SAR and SOCC observations are not clear in the corresponding report, which covers an area larger than the current Development Area.

During the current field investigations, 62 taxa were identified in the Study Area, 12 of which are introduced, 10 of which are ranked as exotic, and 39 of which are considered Apparently Secure (S4) or Secure (S5) in the province (Table E.1, Appendix E). No SAR or SOCC were identified during the field investigation, although searches were confined to the ROW and there is potential for these plants to occur elsewhere in the Study Area.

ELC assessments identified 59 ELC polygons in the Study Area. Cultural ELC communities occupied 57% of the total area (Table 3). Natural ELC vegetation communities in the Study Area included forests, woodlands, wetlands, thickets, and meadows that were largely fragmented by agriculture and linear infrastructure. Communities in the ROW generally contained a high proportion of introduced species, and other evidence of anthropogenic factors, such as roadside mowing and ditch maintenance. A full summary of the ELC assessment for the Study Area can be found in Figure 4, Appendix A and Table E.2, Appendix E.

Existing Conditions
July 27, 2017

Table 3 Summary of ELC Community Coverage

Community Class	Series Present	Total Area (ha)	Percent Cover
Cultural	Open Agriculture, Residential, Commercial and Institutional, Fencerow, Coniferous Plantation, Green Lands, Transportation and Utilities	282	57%
Forest	Deciduous Forest, Mixed Forest, Coniferous Forest	99	20%
Meadow	Graminoid Meadow, Mixed Meadow, Forb Meadow	49	10%
Wetland	Deciduous Swamp, Thicket Swamp, Meadow Marsh, Shallow Marsh	32	7%
Thicket	Deciduous Thicket	19	4%
Woodland	Coniferous Woodland, Deciduous Woodland	8	2%
Savannah	Savannah	2	0%
Aquatic System	Open Water	1	0%
Total		492	100%

NRSI (2012) documented three Rare Vegetation Communities (sand barrens) in the Development Area: NRSI (2012) Polygon #449.2 at the southwest corner of Salem Road and Veterans Drive (outside of the ROW), #506 to the east of Veterans Drive (outside of the Study Area), and #1005.2 located south of McKay Road East (outside of the Study Area). Sand barrens can be difficult to identify and are often contiguous with similar ecosites. MNRF conducted a site walk of these communities during the 2012 study to verify the classification, but did not find sufficient evidence for a positive conclusion (NRSI 2012).

No sand barrens were identified during the current field investigation. Although access restrictions precluded a detailed investigation of the community identified as Polygon 449.2 by NRSI (2012), based on the available evidence it is currently assessed as a graminoid meadow originating from anthropogenic sources. Grass species dominated the site, with black locust, red pine and scotch pine present and in early stages of regeneration. Vegetation coverage was complete, and no evidence of natural maintenance (e.g., erosion, fire) was observed.

Rare Vegetation Communities, as described by the SWHTG and Ecoregion Criteria Schedule for 6E, are considered to be absent from the Study Area. A SWH evaluation and results matrix is included in Appendix F.

4.2.2 Breeding Birds

The background review identified six avian SAR and five SOCC with the potential to occur in the Study Area (Table 4).

Existing Conditions
July 27, 2017

Table 4 Avian SAR and SOCC with the Potential to Occur in the Study Area

Common Name	Latin Name	Provincial Designation/Rank	Source
Henslow's Sparrow	<i>Ammodramus henslowii</i>	Endangered	MNRF 2015A
Eastern Meadowlark	<i>Sturnella magna</i>	Threatened	MNRF 2015A; NRSI 2012a
Bobolink	<i>Dolichonyx oryzivorus</i>	Threatened	MNRF 2015A; NRSI 2012a
Chimney Swift	<i>Chaetura pelagica</i>	Threatened	NRSI 2012a
Barn Swallow	<i>Hirundo rustica</i>	Threatened	NRSI 2012a
Eastern Whip-poor-will	<i>Caprimulgus vociferus</i>	Threatened	MNRF 2016a
Canada Warbler	<i>Cardellina canadensis</i>	Special Concern	MNRF 2016a
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	Special Concern	MNRF 2016a
Wood Thrush	<i>Hylocichla mustelina</i>	Special Concern	MNRF 2016a; NRSI 2012a
Eastern Wood Pewee	<i>Contopus virens</i>	Special Concern	MNRF 2016a
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Special Concern	MNRF 2016a; NRSI 2012a

NRSI (2012) documented the presence of 113 bird species, including three SAR (Bobolink, Barn Swallow and Eastern Meadowlark) and two SOCC (Grasshopper Sparrow and Wood Thrush):

- The locations of the Bobolink, Eastern Meadowlark and Barn Swallow observations were not identified in the corresponding report (NRSI 2012). All of these species were identified during the current field investigation (see below).
- Wood Thrush was identified in Polygons #422.2, #422.3 and #423 (NRSI 2012), all located outside of the current Study Area. However, these polygons are contiguous with a deciduous forest community that extends into the current Study Area. Wood Thrush was not identified during the current field investigation despite targeted surveys. As such, this species is considered absent from the Study Area.
- Grasshopper Sparrow was identified in Polygons #501.1, #501.2, #502, #505.1 and #506 (NRSI 2012). All of these observations occur in communities outside of the current Study Area with the exception of #501.1, which is located on the east side of Veterans Drive. Grasshopper Sparrow was not identified during the current field investigation despite targeted surveys. As such, this species is considered absent from the Study Area.

The current field investigation identified 44 bird species, including three SAR (Barn Swallow, Bobolink and Eastern Meadowlark) and one SOCC (Eastern Wood Pewee). All species identified are ranked as Apparently Secure (S4), Secure (S5) or introduced (SNA) in Ontario. All species were identified during the diurnal breeding bird and grassland bird surveys.

Existing Conditions
July 27, 2017

While the single Eastern Wood-pewee detection from June 1, 2016 does not provide positive confirmation of breeding, the surrounding deciduous forest and clearings are considered candidate Habitat for Species of Conservation Concern. No other SWH associated with bird species were identified in the Study Area. A SWH evaluation and results matrix is included in Appendix F.

4.2.3 Mammals

The background review identified two mammalian SAR with the potential to occur in the Study Area (Table 5).

Table 5 Mammalian SAR and SOCC with the Potential to Occur in the Study Area

Common Name	Latin Name	Provincial Designation/Rank	Source
Little Brown Myotis	<i>Myotis lucifugus</i>	Endangered	MNRF 2016a
Northern Long-eared Myotis	<i>Myotis septentrionalis</i>	Endangered	MNRF 2016a

NRSI identified 11 mammal species during the 2012 study (NRSI 2012), all of which are ranked as Secure (S5) in Ontario.

No mammals were identified in the Study Area during 2016 field investigations. Targeted searches for suitable Bat Maternity Colony habitat, including an assessment of suitable cavity trees, resulted in the delineation of eight candidate maternity roost features with boundaries that fall within or adjacent to the ROW (Figure 6, Appendix A). Candidate bat maternity roost features outside of the ROW would not be identifiable during roadside surveys, and may be present in the Study Area. Similarly, suitable roost habitat for bat SAR may occur in forested Ecosites in the Study Area. A SWH evaluation and results matrix is included in Appendix F.

4.2.4 Amphibians

The background review identified one SOCC with the potential to occur in the Study Area (Table 6).

Table 6 Amphibian SAR and SOCC with the Potential to Occur in the Study Area

Common Name	Latin Name	Provincial Designation/Rank	Source
Western Chorus Frog (GLSL population)	<i>Pseudacris triseriata</i>	S3	NRSI 2012a

Existing Conditions
July 27, 2017

NRSI identified seven amphibian species, including one SOCC (Western Chorus Frog) during the 2012 study (NRSI 2012). Western Chorus Frog is listed as Threatened federally. However, it is unclear whether this species was identified in the current Development Area or other lands studied by NRSI. Western Chorus Frog was not identified during the current field investigation despite targeted surveys. As such, this species is considered absent from the Study Area.

Five amphibian species were identified in the Study Area during the current field investigation (Tables G.4 and G.6, Appendix G.). All species identified are ranked Secure (S5) provincially, and are considered common in wetlands across the Study Area. Four Amphibian Breeding Habitats, including three for wetland species and one for woodland species, were confirmed in the Study Area (Figure 6, Appendix A). Typically, Amphibian Movement Corridors are located adjacent to Amphibian Breeding Habitats where they abut natural vegetation communities. However, since these corridors should have several layers of vegetation, be unbroken by roads and possess at least 15 m of uninterrupted vegetation on either side of a waterway (MNRF 2015B), no Amphibian Movement Corridors were found in the ROW. A SWH evaluation and results matrix is included in Appendix F.

4.2.5 Reptiles

The background review identified no reptilian SAR and two SOCC with the potential to occur in the Study Area (Table 7).

Table 7 Reptilian SAR and SOCC with the Potential to Occur in the Study Area

Common Name	Latin Name	Highest Provincial Designation/Rank	Source
Snapping Turtle	<i>Chelydra serpentina</i>	Special Concern	MNRF 2015A
Eastern Musk Turtle	<i>Sternotherus oderatus</i>	Special Concern	MNRF 2015A

NRSI identified two Secure (S5) species of snake during the 2012 study (NRSI 2012). However, it is unclear whether these individuals were observed in the current Development Area or other lands studied by NRSI.

No reptiles were identified in the Study Area during the field investigation. Seven candidate Turtle Wintering Areas were recorded at various wetlands across the Study Area (Figure 6, Appendix A; Table G.5, Appendix G). Gravel road shoulders were present at all assessed aquatic habitat features, but were not recorded as potential nesting habitat due to the high mortality rates associated with increased nest predation and vehicular collisions. A SWH evaluation and results matrix is included in Appendix F.

4.2.6 Insects

The background review identified no insect SAR and five SOCC with the potential to occur in the Study Area (Table 8).

Existing Conditions
July 27, 2017

Table 8 Insect SAR and SOCC with the Potential to Occur in the Study Area

Common Name	Latin Name	Highest Provincial Designation/Rank	Source
Monarch	<i>Danaus plexippus</i>	Special Concern	NRSI 2012a
Plains Emerald	<i>Somatochlora ensigera</i>	S1	MNRF 2015A
Arrow Clubtail	<i>Stylurus spiniceps</i>	S2	MNRF 2015A
Pronghorn Clubtail	<i>Gomphus graslinellus</i>	S3	NRSI 2012a
Delta-spotted Spiketail	<i>Cordulegaster diastatops</i>	S3	NRSI 2012a

NRSI identified 15 species of Odonata (dragonflies and damselflies) and 19 species of Lepidoptera (butterflies) during the 2012 study (NRSI 2012). All of the observed species are ranked Apparently Secure (S4) or Secure (S5) except for two SOCC (Pronghorn Clubtail and Delta-spotted Spiketail) which are ranked Vulnerable (S3). The precise locations of insect observations are not apparent in the associated report, and it is unclear whether these records correspond to the current Development Area or other lands studied by NRSI.

No insects were recorded in the Study Area during the current field investigation, and no associated SWH was observed. A SWH evaluation and results matrix is included in Appendix F.

4.3 AQUATIC ENVIRONMENT

4.3.1 Fish Habitat

The background data review did not identify aquatic SAR or SOCC in the Study Area. Fish habitat in the Study Area is described below by watershed. NRSI (2012b) assigned stream sensitivity rankings, and stream corridor constraint rankings **are identified in the City's OPA for the Study Area** (City of Barrie 2013). Background information, field data and photographs from the 2015 and 2016 surveys are provided in Table H.1 (Appendix H).

Lovers Creek Tributaries

Field surveys were completed by Stantec at five locations on tributaries of Lovers Creek. Three locations support Brook Trout (Stations BKT-000, BKT-008, and BKT-009), confirming the coldwater thermal regime indicated in the background data (Table H.1, Appendix H). Among these stations, morphology was primarily run underlain by coarse substrates and water temperatures ranged from 15°C to 18.8°C. The optimal temperature range for Brook Trout is 11°C to 16°C (Raleigh 1982). Although no trout spawning redds were identified, coarse substrates at these locations provide potential spawning habitat. Habitat sensitivity at these locations was ranked as High in the Natural Heritage Systems Report (NRSI 2012b) and, at the Huronia Road crossing locations, the tributaries are within High Constraint stream corridors (City of Barrie 2013). Available mapping (LIO 2016) does not correctly reflect the location of the watercourse associated with Station BKT-009; therefore, the location in Figure 3 was adjusted to reflect the

Existing Conditions
July 27, 2017

current flow path upstream of Huronia Road and the location of the Huronia Road culvert. The location of Station BKT-009 was illustrated accurately in background data reports (NRSI 2012a; NRSI 2012b).

At Station BKT-010 (Lockhart Road), the water temperature on July 18, 2016 was 27°C. The maximum tolerable limit for Brook Trout is 23.8°C (Raleigh 1982); therefore, this reach of this tributary of Lovers Creek does not provide suitable habitat for Brook Trout with respect to thermal regime. At the time of the 2015 and 2016 surveys, this location did not provide potential Brook Trout spawning habitat due to the extent of rip rap lining the channel. Habitat at this location was ranked as High (NRSI 2012b); however, this location currently does not provide high quality habitat that was a criterion for a High rank in the Natural Heritage Systems Report. Downstream of Lockhart Road, the tributary is within a High Constraint Stream Corridor (City of Barrie 2013).

The watercourse mapped at Station BKT-007 is a valley feature with no active stream channel. There is no direct fish habitat at this location. West of Veterans Drive, this tributary is within a Low Constraint Stream Corridor; the downstream reach is within a Medium Constraint Stream Corridor (City of Barrie 2013).

Bear Creek Tributaries

Field surveys were completed at three locations on tributaries of Bear Creek. Bear Creek Stations BKT-006 and BKT-015 provide seasonal fish habitat. Both locations were dry during Stantec's 2016 survey. Station BKT-006 was a well vegetated channel lined with terrestrial species upstream, with some cattails observed near the culvert and no defined channel downstream. Station BKT-015 consisted of a dry cattail marsh with no defined channel. NRSI ranked the habitat sensitivity at these locations as Medium. At both locations, the tributaries are within Medium Constraint Stream Corridor Areas (City of Barrie 2013).

At Station BKT-012 (Essa Road), the reach upstream of the road was a manicured grass drainage feature and there was a well-defined natural channel downstream of the road. Water temperature was 22.8°C on July 18, 2016, which is above the optimal temperature range for Brook Trout (11°C to 16°C) and approaching the maximum tolerable temperature of 23.8°C (Raleigh 1982). Based on water temperature, Bear Creek does not provide suitable habitat for Brook Trout with respect to thermal regime. **No fish were captured in Stantec's 2016 fish community sampling.** NRSI ranked the habitat sensitivity at this location as Medium upstream of Essa Road and High downstream of Essa Road. The City of Barrie OPA stream corridor constraint rankings are also Medium Constraint and High Constraint, respectively, upstream and downstream of Essa Road.

Thornton Creek Tributaries

The two Thornton Creek tributaries (BKT-013 and BKT-014) both provide seasonal fish habitat. Station BKT-013 was dry during both the fall and summer surveys and BKT-014 was dry during the fall survey. During the summer survey at BKT-014, the channel was lined with fine substrates and

Existing Conditions
July 27, 2017

the surface was covered in a thick layer of algae and water temperature was 24.5°C (July 18, 2016). In the vicinity of Station BKT-014, this Thornton Creek Tributary does not provide suitable habitat for Brook Trout with respect to thermal regime or spawning substrates. NRSI ranked these locations as Medium sensitivity. The stream corridor constraint rankings is Medium for both tributaries; however, at BKT-013, the reach located upstream of Mackay Road West is within a High Constraint Stream Corridor.

4.3.2 Fluvial Geomorphology

The background data review indicated that fluvial assessments were previously completed at 10 road crossings (consistent with Stantec's aquatic survey locations) to investigate channel stability, erosion thresholds and the appropriate meander belt width (AMEC 2013). Field investigations in support of the background data were conducted in 2012 and/or 2013. Additional field inspections were undertaken by Stantec in November 2015 to assess channel stability, to verify the initial findings and determine if channel conditions had changed since the 2012/2013 inspections. Background information and Stantec's field data and photographs from the November 2015 site inspections are provided in Appendix H.

Lovers Creek Tributaries

Stantec field surveys were undertaken at five road crossings on tributaries to Lovers Creek. Stations BKT-000, BKT-008, BKT-009, BKT-010 are characterized by watercourses that exhibit fluvial characteristics and well-defined bed and banks (Table H.2, Appendix H). Stations BKT-000, BKT-009 and BKT-010 are transitional (i.e., transitioning to/from a stable (in regime) system from/to an unstable system) and indicate a moderate degree of instability. This condition remains unchanged from earlier surveys of these sites (AMEC 2013). Station BKT-007 is located on a headwater tributary.

BKT-000

The culvert width of 2 m was approximately half of the observed bankfull width. The scour pool observed in the downstream side of the culvert indicated that the culvert was somewhat undersized with respect to fluvial geomorphology. The dominant process at BKT-000 was channel widening, as indicated by bank scour.

BKT-008

The watercourse at this station is a stable (in regime) watercourse with a bankfull width of approximately 3 m. There is a small earthen dam located approximately 15 m upstream of Huronia Road. The 2.4 m wide culvert is smaller than bankfull width, but scour and erosion at the site did not appear to be excessive.

Existing Conditions
July 27, 2017

BKT-009

The channel upstream of the Huronia Road culvert flows north in the ditch on the west side of Huronia Road for approximately 230 m. The ditch embankment is somewhat unstable with numerous small mass failures observed in 2015. The channel downstream of the culvert appeared stable and flow was perpendicular (eastward) with respect to the north-south road alignment. The dominant process at BKT-009 was channel widening, as indicated by bank scour.

BKT-010

Channel stability at Station BKT-010 has been affected by the placement of riverstone (rounded stone consisting of large gravel or small cobble). There was considerable backwater and the dominant fluvial process was aggradation, as indicated by excessive deposition of sand at the Lockhart Road culverts (two 3.1 m wide concrete box culverts). The creek channel was poorly defined, due to the riverstone and excessive deposition. The channel upstream and downstream of the riverstone placement at BKT-010 was well-vegetated and appeared to be in good condition, indicating that the instability at this site is local.

BKT-007

At Veterans Drive, this tributary was a poorly defined vegetated swale that did not exhibit fluvial processes (e.g., erosion, sediment transport or deposition). The locations of headwater tributaries were summarized previously (NRSI 2012) and were determined using aerial imagery, background information, and site visits in 2011 (NRSI 2012). Although active fluvial processes may be absent in headwater tributaries, these systems can provide habitat and contribute to water quality and quantity.

Background data include information from the rail crossing upstream of BKT-000 (south of Lockhart Road) and these data are included in Station BKT-011 in Table H.2 (Appendix H) for reference purposes.

Bear Creek Tributaries

Background data and mapping identify three tributaries of Bear Creek that cross roads in the Study Area. Two of the watercourses (Station BKT-006 and BKT-015) were small drainage features where fluvial processes were not observed and channel form was controlled by vegetation. Due to the lack of an alluvial channel at these two sites, rapid geomorphic assessments were not applicable. These observations are consistent with the background data sources, where the headwater origins of these watercourses were identified upstream of Salem Road (AMEC 2013).

The channel at Station BKT-012 was stable (in regime) with no excessive erosion or deposition. The culvert under Essa Road was a 3 m wide concrete box culvert. Substrate in the culvert was riverstone (coarse gravel and small cobble) with a defined low of channel that was approximately 2 m wide. Native sediment upstream and downstream of the culvert consisted of fine-textured silt, sand and fine gravel. The bankfull width was approximately 1-2 m.

Existing Conditions
July 27, 2017

Thornton Creek Tributaries

Station BKT-013 was located at a grassed drainage feature where alluvial processes were not observed and, therefore, a rapid geomorphic assessment was not applicable. Channel morphology at this site is vegetation-controlled. The headwater origin of this tributary is located approximately 250 m north of McKay Road West (NRSI 2012a).

Station BKT-014 was a well-defined channel that was stable (in regime), apart from bank scour that was observed on both sides of the channel immediately downstream of the McKay Road West culvert. The scour indicates that the culvert (0.6 m wide) is undersized for the channel (estimated bankfull width was 3 m). The channel drains to an online pond located approximately 15 m downstream of McKay Road West. The headwater origin of this tributary is located approximately 250 m north of McKay Road West (NRSI 2012a).

Summary of Significant Natural Features
July 27, 2017

5.0 SUMMARY OF SIGNIFICANT NATURAL FEATURES

Significant natural features identified for the Study Area are summarized in Table 9.

Table 9 Summary of Significant Natural Features in the Study Area

Category	Feature(s)	Location(s)
Designated Natural Areas	Lover's Creek Swamp PSW	Veterans Drive, Huronia Road (Figure 1, Appendix A)
	Deer Wintering Area	Veterans Drive, Huronia Road (Figure 1, Appendix A)
	Core Natural Area	Salem Road, McKay Road West, Huronia Road, Essa Road, Veterans Drive (Appendix D)
	Natural Linkage Area	Huronia Road, Veterans Drive, Essa Road, Lockhart Road (Appendix D)
	High Constraint Stream Corridor Area	Essa Road, Huronia Road, Lockhart Road (Appendix D)
	Medium Constraint Stream Corridor Area	Essa Road, Salem Road, McKay Road West, Veterans Drive (Appendix D)
	Low Constraint Stream Corridor Area	Veterans Drive (Appendix D)
SAR	Barn Swallow	BBS 9, Grassland 8, Grassland 6, Grassland 13, Grassland 14 (Figure 5, Appendix A)
SOCC	Eastern Wood-Pewee	BBS 4 (Figure 5, Appendix A)
Significant Wildlife Habitat	Amphibian Breeding Habitat	AMBR 1-4 (Figure 6, Appendix A)
	Candidate Turtle Wintering Area	TUWI 1-7 (Figure 6, Appendix A)
	Candidate Bat Maternity Colony Habitat	BAMA 1-8 (Figure 6, Appendix A)
Fish Habitat	Permanent Stream - Coldwater Thermal Regime (support Brook Trout)	Stations BKT-000, BKT-008, BKT-009 (Lovers Creek Tributaries)
	Permanent Stream – Thermal regime unconfirmed	Station BKT-010 (Lovers Creek Tributary), Station BKT-012 (Bear Creek Tributary downstream of Essa Road)
	Intermittent Stream	Station BKT-006 (Bear Creek Tributary), Station BKT-013 (Thornton Creek Tributary) Station BKT-014 (Thornton Creek Tributary), BKT-015 (Bear Creek Tributary)

6.0 EVALUATION OF ALTERNATIVES

6.1 DESCRIPTION OF ALTERNATIVES

Planned infrastructure improvements in the Salem Secondary Plan Development Area include upgrades to existing transportation infrastructure, road widenings and expansions to the sanitary sewers and trunk watermains along several existing road corridors (Figure 1, Appendix A).

Two alternatives are proposed for the Project (Table 10). Alternative 1 includes 1.5 m and 2.0 m bike lanes, 2.0 m sidewalks, a 4.2 m two-way left turn lane (TWLTL) and a rain garden (bioswale) in addition to vehicular lanes. Alternative 2 includes 1.5 and 2.0 m bike lanes, a 3.0 m multi-use trail (MUT), a 2.0 m sidewalk, a 4.2 m TWLTL or landscaped median and a 2.0 m rain garden on either side of the vehicular lanes. A key difference between Alternative 1 and Alternative 2 relates to the location of the rain gardens. The rain gardens are located within the existing ROW in Alternative 1, and require an additional 4.0 m for the ROW width in Alternative 2. All proposed watermain and sewer infrastructure will be planned within the proposed ROW for the alternatives.

Table 10 Alternatives Proposed for the Project

Alternative	Proposed ROW Width	Proposed Upgrades
Veterans Drive, McKay Road East, Lockhart Road		
1	34 m ROW	<ul style="list-style-type: none"> • 5 lane cross section, 4 lanes in each direction • 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction • 2.0 m sidewalk on each side of roadway • 4.2 m TWLTL or landscaped median • Rain garden included in ROW
2	38 m ROW	<ul style="list-style-type: none"> • 5 lane cross section, 4 lanes in each direction • 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction • 2.0 m sidewalk (one side of the roadway) • 3.0 m MUT (one side of the roadway) • 4.2 m TWLTL or landscaped median • 2.0 m rain garden feature on each side of the roadway
Salem Road, Essa Road, McKay Road West, Huronia Road		
1	27 m ROW	<ul style="list-style-type: none"> • 3 lane cross section, 2 lanes in each direction • 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction • 2.0 m sidewalk on each side of roadway • 4.2 m TWLTL or landscaped median • Rain garden included in ROW

Table 10 Alternatives Proposed for the Project

Alternative	Proposed ROW Width	Proposed Upgrades
Salem Road, Essa Road, McKay Road West, Huronia Road (continued)		
2	31 m ROW	<ul style="list-style-type: none"> • 3 lane cross section, 2 lanes in each direction • 2, 1.5 m curbside bicycle lanes plus 0.5 m buffer, 1 lane in each direction • 2.0 m sidewalk (one side of the road only) • 3.0 m MUT (one side of the road only) • 4.2 m TWLTL or landscaped median • 2.0 m rain garden on each side
<u>Existing ROW Widths</u> <ul style="list-style-type: none"> • Veterans Drive: 36 m north of Salem Road, 20 m south of Salem Road • McKay Road East: 20 m • Lockhart Road: 26 m 		
<u>Existing ROW Widths</u> <ul style="list-style-type: none"> • Essa Road: 30 m north of Athabaska Road, 20 m south of Athabaska Road. • Salem Road: 20 m • McKay Road West: 20 m • Huronia Road: 30 m north of Lockhart Road, 20 m south of Lockhart Road 		

The alternatives were evaluated based on criteria defined by the City in cooperation with Stantec, and approved by a stakeholder panel. A matrix outlining these criteria is provided in Appendix I. Each criterion is described under a separate heading below.

6.2 TERRESTRIAL ENVIRONMENT

6.2.1 Vegetation

Vegetation present in the Study Area includes natural and cultural communities. These communities include vegetation characteristic of disturbance within the existing ROW. Alternative 1 will displace less vegetation than Alternative 2, and will provide similar surface water attenuation and water quality control due to the proposed rain gardens. Species diversity and vegetation community health is expected to be improved by the presence of these rain gardens. Alternative 2 is considered to have offsetting positive and negative impacts resulting in a neutral overall assessment, and Alternative 1 is considered to have a slightly positive impact.

6.2.2 Wetlands

Wetlands, including the Lover's Creek Swamp PSW, are present in the Study Area. Although the Lover's Creek Swamp is mapped to intersect with the ROW at both roads, the field investigation did not identify any part of Lover's Creek Swamp in the existing ROWs. Other wetlands are identified in the existing ROW on all roads except McKay Road East. Alternative 1 will displace less wetland habitat than Alternative 2. Both alternatives will provide more surface water attenuation and water quality control, which is vital to the function of wetland habitats and may

Evaluation of Alternatives
July 27, 2017

result in increased species diversity and overall ecosystem health. There will be no increased fragmentation of wetlands, as the Project is restricted to existing road corridors. As a result of these considerations, Alternative 2 is considered to have offsetting positive and negative impacts resulting in a neutral overall assessment, and Alternative 1 is considered to have a slightly positive impact.

6.2.3 Wildlife and Wildlife Habitat

Wildlife habitat, including SWH, is found in the Study Area (Figure 6, Appendix A). Both alternatives will displace some wildlife habitat. Alternative 2 will displace more wildlife habitat than Alternative 1 as a result of the additional ROW width. This habitat is currently located either within or adjacent to the existing ROW, and no additional habitat fragmentation is anticipated. Both alternatives will provide increased surface water attenuation and improve water quality in wetlands and aquatic habitats (Sections 6.3.1 and 6.5). Consequently, Alternative 2 is considered to have offsetting positive and negative impacts resulting in a neutral overall assessment, and Alternative 1 is considered to have a slightly positive impact.

6.2.4 Species at Risk

SAR identified in the Study Area include grassland birds (Eastern Meadowlark, Bobolink and Barn Swallow). While the Project has the potential to impact the edge of grassland habitats, the overall suitability of habitat polygons should not be impacted. No additional fragmentation of grassland habitats will be experienced. Consequently, both alternatives are considered to have a neutral impact on SAR and SAR habitat.

6.3 AQUATIC ENVIRONMENT

6.3.1 Watercourses/Fisheries/Aquatic Impacts

Fish habitat was identified at most locations where mapped watercourses cross roads within the Study Area. Both alternatives require the same width for road widening and sidewalks/trails; therefore, the potential for impacts on fish habitat and stream morphology due to culvert replacements or extensions (where required) are similar for both alternatives (e.g., the need for longer culverts and possible channel realignments within the ROW is similar).

Alternative 1 will directly affect less habitat than Alternative 2. Both alternatives provide similar surface water attenuation and water quality control due to the proposed rain gardens. The rain gardens are expected to slow the rate of surface runoff to nearby watercourses and provide water quality control which will contribute to improved water quality for fish habitat. The slower rate of surface runoff may reduce erosion potential in receiving waters which will reduce the potential for changes to channel morphology which will also be beneficial to fish habitat.

Evaluation of Alternatives
July 27, 2017

Both alternatives must consider the fluvial geomorphology of the tributary of Lovers Creek south of BKT-009, located in the ditch on the west side of Huronia Road, as it may need to be relocated under both road improvement alternatives.

Lovers Creek at Lockhart Road (Station BKT-010) is aggrading (i.e., the supply of sediment is greater than the amount of material the system can transport), as indicated by excessive sand deposition upstream of the existing culvert. The proposed road works may provide an opportunity to restore channel dimension, slope, and alignment at this site, which can be designed to enhance fish habitat.

Potential negative effects of culvert extensions in Alternative 1 may be offset by improved water quality, resulting in a neutral overall assessment. Due to the increased ROW width of Alternative 2, there is a low level of negative impact on fish habitat and watercourse morphology due to the potential for increased enclosure of watercourses in culverts.

6.4 ENVIRONMENTAL IMPROVEMENTS

There are two major opportunities to improve environmental conditions in the Study Area:

1. Road wildlife mortalities can be decreased by providing wildlife crossing opportunities (culverts, bridges) where natural corridors occur. This applies especially to wetland features that are fragmented by existing roads and do not currently appear to be connected by culverts (AMPH 2, AMPH 9, AMPH 5, AMPH 4; Figure 2, Appendix A).

Existing culverts in the Study Area also provide upgrade opportunities for improving wildlife crossing, particularly where culvert replacements are planned. This enhancement is available for both Alternative 1 and Alternative 2. Culvert and bridge upgrades should be designed with the dual goal of maintaining or improving surface water drainage/flow and facilitating movement of wildlife and fish species between habitats separated by roadways. Open-bottom designs with both wet and dry crossing opportunities are preferred. Other design considerations include substrate, flow, water depth, cover, velocity, light penetration, and wildlife funnel fencing. These crossings would provide the highest benefit at the eleven (candidate and confirmed) SWH sites identified for turtles (TUWI 1-7) and amphibians (AMBR 1-4) (Figure 6, Appendix A). Preferred locations for wildlife crossing structures should be identified using ecologically based criteria in consultation with Project engineers during later design phases.

2. Water quality in wetlands that are currently affected by surface water runoff from roadways and agricultural fields can be improved through the addition and design of rain gardens.

Alternative 1 was considered to provide a moderately positive impact (or opportunity) for environmental enhancement. Alternative 2 provides similar opportunities for environmental enhancement; however, because it displaces more habitat than Alternative 1, it was considered to have a slightly positive impact (i.e., less positive than Alternative 1).

Evaluation of Alternatives
July 27, 2017

6.5 CONCLUSION

Alternatives 1 and 2 have the potential to provide a net benefit to wetlands and watercourses in the Study Area and opportunity for environmental improvements. As Alternative 1 presents equal opportunity for surface water attenuation and environmental improvement while displacing less habitat than Alternative 2, it is preferred over Alternative 2.

7.0 IMPACT ASSESSMENT AND MITIGATION RECOMMENDATIONS

7.1 TERRESTRIAL ENVIRONMENT

Potential effects on the terrestrial environment include impacts to vegetation, and wildlife and wildlife habitat, including direct loss and indirect disturbance to features. Significant natural environment features were identified in the Study Area, including DNAs, SWH, SAR and SOCC (See Table 9 in Section 5.0). DNAs correspond with one or more natural environment features. For example, the Core Natural Area and Natural Linkage Area designations on Schedule 8B of the OPA encompass the extent of the Lovers Creek Swamp PSW and the mapped Deer Wintering Area. As a result, impacts to DNAs can be assessed by means of their corresponding natural environment feature(s), and are addressed under the appropriate headers for vegetation (Section 7.1.1), wildlife and wildlife habitat (Section 7.1.2), and aquatic resources (Section Error! Reference source not found.). Similarly, SWH, SAR and SOCC are addressed under the appropriate headers below.

7.1.1 Potential Impacts to Vegetation and Wetlands

Direct loss of vegetation will occur where the Project overlays natural areas and vegetation removal is required to facilitate construction, including temporary work areas. Permanent loss of vegetation will be restricted to areas within the proposed ROWs. Clearing of work areas may also result in short-term disturbance, but no permanent loss or degradation of terrestrial vegetation is anticipated.

No SAR or SOCC plants were identified in the existing ROW. However, there is potential for SAR and SOCC to be present in the Study Area outside of the existing ROW. NRSI identified one potential SWH vegetation community, a Sand Dune, in the Study Area (NRSI 2012a). This habitat was not confirmed to be SWH during a subsequent MNRF site visit, and is assessed as a graminoid meadow community under the current NHIA. This habitat is also located outside of the proposed ROW, and no impacts are anticipated as a result of the Project.

Field investigations did not identify any part of the Lover's Creek Swamp PSW in the existing ROW. Other wetlands were identified in the existing ROW on all roads except McKay Road East. There will be no increased fragmentation of wetlands, as the Project is restricted to existing road corridors.

Other potential impacts associated with the Project are limited, but could include siltation of natural communities and spills of deleterious substances into natural communities. Sedimentation and spills may alter species composition in adjacent areas by smothering vegetation and introducing toxins and other substances that are harmful to vegetation and wildlife. Additional disturbance may be required to facilitate clean-up activities. Where they

occur, these impacts are expected to be localized to the construction area and adjacent areas.

7.1.1.1 Mitigation Recommendations

In accordance with the EAA, a number of recommendations are described here to mitigate the potential effects. Direct loss of vegetation will be confined to the proposed ROW. Given the disturbed nature of this habitat, the anticipated loss is not considered to be significant to the value of the natural environment features. It is recommended that barrier fencing be placed along the construction boundary where it intersects with natural areas to prevent accidental encroachment into these features.

Areas to be cleared of existing vegetation and wetlands should be reduced to the smallest area that is reasonable. This area should be clearly marked to prevent unnecessary clearing. Where natural features occur adjacent to construction activities, barrier fencing should be erected to protect vegetation that is to be retained. The construction contractor should ensure that heavy equipment and other construction activity does not occur beyond barrier fencing. Natural areas that are temporarily disturbed for access or construction should be restored to natural self-sustaining conditions. Topsoil should be stored separately to preserve local seed banks if appropriate, and for use on final grades.

Trees that are planned for removal should be inventoried in order to compensate with an appropriate landscape planting plan, using native species. The tree inventory should be implemented to address the City of Barrie By-law regulating protection of trees (By-law 2014-116).

Areas disturbed during construction should be treated with a suitable seed mix to stabilize soil and establish self-sustaining native vegetation as soon as possible following disturbance. Seed mixes should include fast-growing, short-lived perennial cover crop to stabilize soil and reduce competition from weeding exotics. Native seed mixes and cover crops are preferred, particularly where disturbance is contiguous with natural areas. A light (2 cm) layer of mulch (e.g., woodchips) is recommended to retain soil moisture and improve germination rates; however, the layer should be sparse enough to retain approximately 20% to 40% visible soil. An erosion mat may also be used to stabilize final grades where necessary, and should be applied post seeding and mulch application. Manufacturer specifications should indicate that the erosion mat is made of biodegradable material and designed to allow sufficient light penetration for seed germination.

All seed mixes and other planting lists should be designed to include species adapted to the site conditions, including soil type, moisture and sun exposure. Seed and other material should be from local sources where possible. Exceptions may include plantings in harsh urban environments, such as parking lots, etc. Invasive non-native species should not be seeded anywhere. Seeding efforts should receive water either through precipitation or irrigation after every seven successive days without rainfall for the first two months after planting.

Impact Assessment and Mitigation Recommendations
July 27, 2017

Qualitative vegetation monitoring should be completed annually for 2 years following the implementation of revegetation plans, to document the establishment of planted material, and implement adaptive management to correct deficiencies. Adaptive management may be triggered by poor survival of planted material, insufficient vegetation cover and the presence of unacceptable non-native and invasive species. Adaptive strategies may include supplemental plantings, and/or control of unacceptable species. An annual monitoring report should be prepared to document monitoring methods, findings, triggers for adaptive management and adaptive actions implemented (if any). The annual monitoring report should be prepared to the satisfaction of the City of Barrie, and the appropriate CA if regulated areas are present.

7.1.2 Potential Impacts to Wildlife and Wildlife Habitat

Loss of suitable habitat for SWH features occurs where habitat removal is required to facilitate construction. Twenty candidate or confirmed SWH features (representing four SWH categories) were identified for the Study Area. Candidate and confirmed SWH are mapped on Figure 6, Appendix A, and include candidate turtle wintering areas, candidate bat maternity roost, habitat for SOCC species (Eastern Wood Pewee), and confirmed amphibian breeding habitat.

DNAs in the Study Area that provide an important ecological function for wildlife and wildlife habitat include the Lovers Creek Swamp PSW, a Deer Wintering Area, Core Natural Areas and Natural Linkage Areas.

There is potential for construction to disturb or destroy nests of migratory birds, particularly during vegetation clearing and structural removal. Other slow-moving and ground-dwelling wildlife could be encountered in work areas during construction, including reptiles (snakes and turtles) and amphibians.

7.1.2.1 Mitigation Recommendations

Recommendations related to wildlife and wildlife habitat removal or disturbance are consistent with the measures outlined for vegetation and wetlands in Section 7.1.1.1.

Protection of nesting birds is provided by implementing the timing restrictions for vegetation/structure removal identified for MBCA protected species. The MBCA protects nests of migratory birds from damage while they are active, including nests in vegetation and on structures. The Primary Nesting Period (PNP; the period when the percent of total nesting species is greater than 10%) for this Study Area is between April 10 through August 9, although nesting also infrequently occurs outside of this period (ECCC 2016). If work is scheduled to occur outside the PNP restricted period, no mitigation will be required.

If vegetation/structure clearing is required during the PNP, an avian biologist should be retained to search suitable areas prior to work. The biologist should search for nests to manage risks to active nests protected by the MBCA. Nest searches should be completed within seven days of the proposed works. If work is not completed within seven days following the nest search, the

Impact Assessment and Mitigation Recommendations
July 27, 2017

search should be repeated to determine that birds have not established new nests during that period.

If no nests or signs of nesting are found, clearing or other activities may proceed in the area searched. If a nest is located, a designated buffer should be delineated, within which no activity will be allowed while the nest is active. The radius of the buffer will range from 5 m – 60 m depending on the sensitivity of the nesting species. The nest should be checked every few days to determine its status. Once the nest is determined to be inactive (e.g., the young are no longer active in the nest area), clearing and other activities in the area may proceed.

The potential for loss of ecological function at SWH for turtles and amphibians in the Study Area is considered to be low when paired with standard mitigation measures and design standards. However, Contractors should be aware of potential encounters with wildlife, including reptiles (snakes and turtles), and amphibians, and avoid them to the extent possible. Generally, sediment and construction fencing will also prevent wildlife access; however, there is some potential that individuals may enter the limits of construction. A thorough visual search for wildlife should be conducted in all work areas before work commences each day. Visual searches should include inspection of machinery and equipment for snakes prior to starting equipment, particularly during the peak snake activity period (generally April 30 to October 31). If slow moving wildlife are encountered during construction, they should be permitted reasonable time to flee the area. If an animal must be moved outside the construction zone, a qualified biologist should be consulted to determine appropriate handling protocols.

7.1.3 Potential Impacts to Species at Risk

Loss of suitable habitat for SAR occurs where habitat removal is required to facilitate construction. Three SAR birds and one SOCC bird were identified for the Study Area. The Project is anticipated to cause temporary (less than 1 year) disturbance to the edge of suitable habitats within the existing ROW, resulting in negligible impacts to the habitat. There is also potential for construction to disturb or destroy nests of migratory birds, SAR birds, and roosts of SAR bats while in use, particularly during vegetation clearing and structural removal.

7.1.3.1 Mitigation Recommendations

In addition to the mitigation outlined in Section 7.1.2.1 for migratory birds, the following species-specific SAR mitigation is recommended:

Where suitable habitat for Barn Swallow, Eastern Meadowlark and Bobolink is present in the Project footprint, timing restrictions for vegetation/structure removal should be modified to match the species-specific active season as defined by O. Reg. 242/08:

- Barn Swallow – May 1 to August 31
- Bobolink and Eastern Meadowlark – May 1 to July 31

Impact Assessment and Mitigation Recommendations
July 27, 2017

Tree clearing in candidate Bat Maternity Colony habitats (Figure 6, Appendix A) should take place outside of the period when maternity roosts are active (May 1 to August 31). If tree clearing is required during the restricted window, a qualified biologist will conduct a maternity roost occupancy survey per MNR guidance to confirm the absence of bats prior to the clearing.

7.2 AQUATIC ENVIRONMENT

7.2.1 Potential Impacts to Fish Habitat and Fluvial Geomorphology

There is potential for direct impacts on fish and fish habitat at watercourses where culvert replacements or extensions are required and if channel realignments are necessary. During construction (culvert replacements, extensions, channel realignments, watermain crossings, sanitary sewer crossings) there is potential for sediment transport from disturbed areas to enter surface waters, which can affect water quality, fish and fish habitat. Potential effects of the project can include changes to surface water flows due to changes in drainage patterns or groundwater contributions to receiving watercourses.

High Constraint Stream Corridor Areas intersect the Project at Essa Road, Huronia Road (three locations) and Lockhart Road. Habitat loss at these DNAs should be reduced to the extent possible in the design phase of the Project.

7.2.2 Mitigation Recommendations

The following mitigation measures are applicable for the protection of stream corridors, fish habitat and channel morphology. Additional measures may be required pending final project design.

Impacts to fish and fish habitat can be reduced to the extent possible by exercising due diligence during the design phase and during construction. While site-specific mitigation measures will be developed through the preparation of the detailed design plans, the following standard mitigation measures are recommended for the protection of channel stability and fish and fish habitat. The following measures are consistent with DFO's *Measures to Avoid Causing Harm to Fish and Fish Habitat* (DFO 2016).

- Where culvert extensions or replacements are required, design culverts to maintain fish passage and reduce the culvert footprint to the extent possible.
- Where culvert extensions or replacements are required, design culvert such that width is at least as wide as the bankfull width. This will reduce the potential for excessive channel scour and erosion downstream of undersized culverts.
- For active channels that require modifications or channel relocations, design and construct channels with an appropriate bankfull width and depth to reduce the potential for excessive erosion or deposition that would contribute to instability. Restoration plans should be designed to enhance fish habitat.

NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT AREA, CITY OF BARRIE

Impact Assessment and Mitigation Recommendations
July 27, 2017

- Sediment and erosion controls measures should be designed to reduce the risk of the entry of sediment and deleterious substances from the Project into surface water features. Recommendations for standard mitigation measures related to sedimentation and spills are provided in Section 7.3.
- Implement timing restrictions for in-water works to avoid and protect sensitive life periods of fish (e.g., spawning). The Midhurst District MNR did not provide in-water timing windows for watercourses in the Study Area. The *In-Water Work Timing Window Guidelines* (MNR 2013b) for waterbodies in MNR's Southern Region are based on resident fish species and are as follows (period when in-water work is restricted) but should be confirmed during Detail Design for specific sites:
 - Brook Trout (Coldwater): October 1 to May 31
 - Unknown Spring Spawning Species: March 15 to July 15
- Design and implement isolation plan to isolate temporary in-water work zones to maintain clean flow to downstream/around the work zone at all times (e.g., dam and pump bypass, flume bypass).
- Rescue and relocate fish from the work area. Equip intakes of pumping hoses with an appropriate device to avoid entraining and impinging fish.
- Manage water from dewatering operations to reduce the risk of erosion and/or release of sediment laden or contaminated water to watercourses (e.g., use settling basin, filter bag, energy dispersion measures)
- Restabilize banks of watercourses disturbed during construction to pre-construction configuration and condition (or better).

The following site-specific considerations are recommended for the protection and enhancement of channel stability and fish habitat:

- The channel at Site BKT-000 flows through a 2 m culvert, which appears to be undersized (bankfull width is 4-4.5 m). If an extension is required, extending the culvert downstream may cause a new scour pool to form, resulting in instability. This potential for instability may be reduced by extending the culvert upstream or replacing the culvert with a wider culvert that is at least equal to the bankfull width of the watercourse.
- Upstream of Station BKT-009, the channel flows along the west side of Huronia Road for approximately 230 m. The watercourse provides fish habitat which must be considered if relocation is required for infrastructure improvements on Huronia Road.
- Restore channel dimension, slope, and alignment of the Lovers Creek Tributary at Lockhart Road (Station BKT-010).

7.3 BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL

Mitigation measures should be implemented to reduce the risk of sediment and spills from entering natural features. The primary principles associated with these protection measures are to: reduce the duration of soil exposure; retain existing vegetation, where feasible; encourage revegetation; divert runoff away from exposed soils; keep runoff velocities low; and trap sediment and spills as close to the source as possible. Best management practices (BMPs) and standards are available to address these principles, including the *Erosion and Sediment Control Guideline for Urban Construction* (TRCA 2006), the *Sustainable Technologies Evaluation Program* (TRCA 2016), and the *Ontario Provincial Standards for Roads and Public Works* (Ontario Ministry of Transportation 2015).

The following mitigation measures are consistent with BMPs and standards, and are recommended:

- Vegetation removal should be minimized to the extent feasible. Silt fencing and/or barriers should be used along all construction areas adjacent to any natural areas. No equipment should be permitted to enter any natural areas beyond the protection fencing.
- Silt fencing should be used to protect sensitive natural areas (e.g., wetlands, watercourses and waterbodies), and in areas of fill placement or earth grubbing to contain sediment generated from exposed soils.
- All sediment and erosion controls should be monitored regularly and properly maintained, as required. Additional silt fence should be available on site, prior to grading operations, to provide a contingency supply in the event of an emergency. Controls should be removed only after the soils of the construction area have been stabilized and adequately protected or until cover is reestablished.
- All exposed soil areas should be stabilized and revegetated promptly upon completion of construction activities. Disturbed areas where slopes are $\geq 10\%$ should be stabilized with the installation of erosion control blankets.
- All toxic material should be stored in secure enclosures away from sensitive natural areas to prevent leaks and spills into the environment. Equipment should be refueled at minimum 30 m away from any sensitive natural areas to avoid potential impacts in the event that an accidental spill occurs.
- An adequate supply of spills cleanup materials should be maintained at the work site. Spills and leaks should be captured, contained and cleaned up immediately.
- Contaminant spills should be reported as per the *Environmental Protection Act*. All toxic chemicals and contaminants must be disposed of offsite in approved disposal sites under appropriate MOECC regulations.

NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT
AREA, CITY OF BARRIE

Impact Assessment and Mitigation Recommendations
July 27, 2017

- The construction activities should be monitored by an onsite Environmental Specialist to verify that the contract constraints and provisions are adhered to and to recommend remedial action in the event of an emergency or unforeseen situation.

8.0 REGULATORY APPROVAL REQUIREMENTS

8.1 SPECIES AT RISK ACT, 2002

No Threatened or Endangered species under the SARA were detected in the Study Area, and no permitting is anticipated to be required under SARA.

8.1 FISHERIES ACT

A determination regarding the applicability of the *Fisheries Act* requires details of the Project such as the location and nature of all activities that have the potential to affect fish and fish habitat (e.g., culvert extensions, replacements, channel realignments). At sites where fish habitat was identified, a Self-Assessment should be completed, using the detail design information for each site. If the Self-Assessment criteria cannot be met, a Request for Review form should be prepared and submitted to DFO to determine if a *Fisheries Act* Authorization is required for serious harm to fish. DFO review will likely be required if channel realignments or relocations are required.

8.2 ENDANGERED SPECIES ACT, 2007

Three ESA-protected species were recorded in the Study Area: Eastern Meadowlark, Bobolink and Barn Swallow. The Project is anticipated to cause temporary (less than 1 year) disturbance to the edge of suitable habitats within the existing ROW, resulting in negligible impacts to the habitat. Contravention of the ESA is likely avoided through the standard mitigation measures for vegetation protection and migratory birds.

ESA authorization is not likely to be required as long as all mitigation measures described in this report are implemented. Consultation with MNRF is recommended to confirm authorization is not required under the ESA.

8.3 CONSERVATION AUTHORITY REGULATED AREAS

A permit is required for development or interference with wetlands and alterations to shorelines and watercourses.

A permit application package will need to be prepared and submitted that includes the following information:

- Geographic Information System (GIS)-created location mapping on a topographic map base
- Cross section profiles of the watercourse channel

NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT
AREA, CITY OF BARRIE

Regulatory Approval Requirements
July 27, 2017

- Analysis showing that the culvert has been designed to convey flows as required by the applicable Conservation Authority
- Environmental data including in-water work windows (if required), temperature regime, fish species and fish habitat
- Maps and photographs showing the location of Project infrastructure relative to regulated environmental features
- Environmental mitigation measures for installation, dewatering, removal, re-vegetation and seeding
- Other site-specific data as required.

Summary
July 27, 2017

9.0 SUMMARY

Stantec was retained by the City of Barrie to complete a Transportation CEA for the Salem Secondary Plan Development Area. This NHIA addresses Phases 3 and 4 of the CEA process for the Schedule C road widenings and grade separations projects. The NHIA should be reviewed in conjunction with the standalone drainage and stormwater management report, also submitted as part of the CEA package,

Planned infrastructure improvements in the Salem Secondary Plan Development Area include upgrades to existing transportation infrastructure, road widenings and expansions to the sanitary sewers and trunk watermains along several existing road corridors. Two alternatives are proposed for the Project. Both alternatives include bike lanes, sidewalks and/or a multi-use trail, rain gardens and additional vehicular lanes. Alternative 2 results in the need for a ROW that is 4 m wider than the required ROW for Alternative 1. For both Alternatives, the proposed watermain and sewer infrastructure upgrades will be planned within the proposed road ROWs.

Both alternatives were evaluated based on criteria defined by the City in cooperation with Stantec, and approved by a stakeholder panel, including consideration of effects to watercourses, wildlife and wildlife habitat, species at risk, vegetation, wetlands, and opportunities for improvements. Alternative 1 is preferred over Alternative 2 due to its potential to provide net benefit to wetlands and watercourses in the Study Area and opportunity for environmental improvements while displacing less habitat than Alternative 2.

Potential negative impacts to natural environment features include direct loss of habitat, loss of ecological function and degradation of habitat quality. Mitigation measures are recommended to avoid, reduce and offset the potential effects. Specific mitigation measures were identified to protect vegetation, wildlife, and fish and include timing restrictions and sediment and erosion control measures. Opportunities for enhancement include the implementation of rain gardens to provide greater surface water attenuation and water quality control, and wildlife crossing structures to better facilitate movement of wildlife and fish across existing roads.

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July 27, 2017

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NATURAL HERITAGE IMPACT ASSESSMENT REPORT FOR THE SALEM SECONDARY PLAN DEVELOPMENT
AREA, CITY OF BARRIE

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