

720 Erbsville Road, Waterloo, Ontario Environmental Impact Study

Prepared for:
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NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

720 Erbsville Road, Waterloo, Ontario
Environmental Impact Study

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1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained in November 2020 by Sunvest Development Corp. to complete an Environmental Impact Study (EIS) for a proposed development at 720 Erbsville Road in the City of Waterloo, Ontario.

The subject property is approximately 9.3ha in area and is located in the northwest of the City of Waterloo. The property is bound by Conservation Drive and the Erbsville Kartway lands to the northwest and northeast, Erbsville Road to the southwest, and a small agricultural field to the southeast (Map 1).

The proposed residential development is a mixture of townhouses and stacked townhouses, with an internal road network, a mixture of residential density types, stormwater management, trails and parkland. The development will generally follow the land use structure of the Erbsville South Block Plan (City of Waterloo 2020a).

The subject property is comprised of agricultural fields, as well as wetlands and woodlands associated with Laurel Creek. The woodland/wetland complex on-site is part of the Environmentally Sensitive Policy Area (ESPA) 80, known as Laurel Creek Forest (Region of Waterloo 2015). The woodland/wetland complex is a Core Natural Feature and Laurel Creek is a Supporting "A" Natural Feature in the City of Waterloo's Official Plan (OP) (2020b). Wetlands are part of the Laurel Creek-Sunfish Lake Provincially Significant Wetland (PSW) complex. The subject property is located in Ecoregion 6E.

The requirement for an EIS has been triggered by the presence of significant woodlands, the Laurel Creek Forest ESPA and the Sunfish Lake-Laurel Creek PSW. The natural features on the subject property have been extensively studied through the Erbsville South Environmental Study (ESES) (Dougan and Associates et al. 2018) and the Erbsville South Block Plan (City of Waterloo 2020a). Technical studies, relevant to other aspects of the project have been prepared by IBI Group (engineering, stormwater management, surface and groundwater monitoring), and MHBC (planning). Ongoing natural environment monitoring of the subject lands as per the City's requirements has been undertaken by Stantec between 2006 and 2021 and referenced in the background.

This report summarizes work completed in support of the EIS and background information collected on natural heritage features and wildlife including breeding birds, mammals, herpetofauna, Lepidoptera, Odonata, vascular flora, and aquatic habitats in the vicinity of the subject property. This report identifies the findings of field surveys conducted as part of the Erbsville South Environmental Study (Dougan and Associates et al. 2018). As per the recommendations in the ESES and the Erbsville South Block Plan (City of Waterloo 2020a) natural features characterizations and findings completed within 3 years of the ESES will be used to determine impacts associated within the proposed development. This impact study has been developed in accordance with the Region of Waterloo's OP (2015), the City of Waterloo's OP (2020b) and the Grand River Conservation Authorities' (GRCA) policies (2013).

2.0 Project Scoping

2.1 Study Area

Although the proponent owns a number of properties in the area, for the purposes of this report, the “subject property” refers to the lands at 720 Erbsville Road, Waterloo. The “development footprint” is the land occupied by the agricultural field. Neighbouring natural features are being included that have ecological connections and interrelationships to the development area. This includes areas that contribute as well as receive flows from the development lands. In order to complete a comprehensive impact assessment, neighbouring natural features will be included in this study (but in lesser detail than features immediately adjacent to the development area). In order to effectively capture these interrelationships, we have included an area of approximately 200m around the proposed development portion of the subject property. For the purposes of this study, these lands will be referred to as the “study area”. This distance adequately captures the adjacent lands area as per the Provincial Policy Statement (PPS) (OMMAH 2020). Legacy data collected from agencies and wildlife atlases encompassed an area of approximately 1km around the property to ensure that all surrounding natural features were considered.

2.2 Preliminary Background Review for Scoping

In order to determine a study approach for the EIS, existing natural heritage information was gathered and reviewed to identify key natural heritage features and species that are known or have potential to occur within the study area. Background information on the natural environmental features within the study area was gathered from the Natural Heritage Information Centre (NHIC) (OMNRF 2020), Department of Fisheries and Oceans (DFO 2019) and relevant taxa-specific databases, as listed below.

Initial wildlife species lists were compiled to provide information on species reported from the vicinity of the study area (10km radius) using various atlases, including the Ontario Mammal Atlas (Dobbyn 1994), the Ontario Reptile and Amphibian Atlas (Ontario Nature 2019), the Ontario Butterfly Atlas (Macnaughton et al. 2020), and the Ontario Odonata Atlas (OOAD 2020). Data on breeding birds in the area was extracted from the Ontario Breeding Bird Atlas (Bird Studies Canada et al. 2008). Since this atlas provides data based on 10x10 km survey squares, information on breeding birds from the square that overlaps the study area (17NJ31) was compiled. These initial species lists were used to

guide the scope and type of wildlife field surveys required as outlined in the following sections.

Based on these initial species lists, a total of 14 Species at Risk (SAR) and 13 Species of Conservation Concern were identified as having records from within the vicinity of study area. SAR are those listed on the Species at Risk in Ontario List (MECP 2020). These include species identified by the Committee on the Status of Species at Risk in Ontario (COSSARO) as provincially Endangered, Threatened, or Special Concern. Species listed as Endangered or Threatened are protected by the Endangered Species Act, 2007, which includes protection to their habitat. As part of the recommendations in the ESES (Dougan and Associates et al. 2018) and the Erbsville South Block Plan (City of Waterloo 2020a), an Information Gathering Form has been submitted to the MECP.

Species considered Special Concern are included in the definition of Species of Conservation Concern, which includes the following:

- species designated provincially as Special Concern,
- species that have been assigned a conservation status (S-Rank) of S1 to S3 or SH by the Natural Heritage Information Centre, and
- species that are designated federally as Threatened or Endangered by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC), but not provincially by the COSSARO. These species are protected by the federal Species at Risk Act but not provincially by the Endangered Species Act.

Species of Conservation Concern are discussed further within the context of Significant Wildlife Habitat (SWH) (Section 5.1.4).

A preliminary screening exercise was conducted on these species to identify which species have suitable habitat within the study area. This involved cross-referencing the preferred habitat for reported SAR (MECP 2020) against species reported in the ESES (Dougan and Associates et al. 2018) and habitats known to occur within the development footprint. This was completed to ensure that the potential presence of all SAR and species of Conservation Concern within the study area was adequately assessed in this EIS.

Two regulated SAR, Barn Swallow (*Hirundo rustica*) and Blanding's Turtle (*Emydoidae blandingii*) were documented as being present in the study area as per the ESES (Dougan and Associates et al. 2018). Both species are considered to have suitable habitat within the development footprint. Category 3, rearing, foraging and resting, habitat is present for Barn Swallow to the extreme south of the development footprint (Dougan and Associates et al. 2018). Category 2, feeding, mating, thermoregulation, movement, and predator protection, habitat is present for Blanding's Turtle in wetland habitats in the northwest, north, northeast and east of the subject property and include a 30m buffer from all wetlands. Category 2 habitat for Blanding's Turtle does not overlap the development footprint. Category 3, movement corridors, habitat for Blanding's Turtle is present in the south and southeast of the development footprint.

Five SCC, Eastern Wood-Pewee (*Contopus virens*), Red-headed Woodpecker (*Melanerpes erythrocephalus*), Snapping Turtle (*Chelydra serpentina*), Monarch (*Danaus plexippus*) and Black Ash (*Fraxinus nigra*), were documented as being present in the study area as per the ESES (Dougan and Associates et al. 2018). Of these species one, Snapping Turtle, has potentially suitable habitat for nesting within the development footprint. These SAR and SCC are discussed in Section 4.0 of this report under their respective biota subsections (e.g., Birds). Full results of the SAR/SCC screening exercise are provided in Appendix I.

A preliminary screening for the presence of SWH was also completed for the proposed development area. The Significant Wildlife Habitat Technical Guide (SWHTG) is a guideline document that outlines the types of habitats that the MNRF considers significant in Ontario as well as criteria to identify these habitats (OMNR 2000, OMNRF 2015a). The SWHTG groups SWH into four broad categories: seasonal concentration areas, rare vegetation communities and specialized wildlife habitat, habitats of species of Conservation Concern, and animal movement corridors. Based on the results of this preliminary screening exercise and the ESES (Dougan and Associates et al. 2018) none of the SWH are anticipated in the development area.

Full results of the SWH screening are provided in Appendix II and further discussion is provided in Section 5.1.4

2.3 Terms of Reference and Agency Input

Based on the findings described above, a Terms of Reference (TOR) for the EIS was prepared by NRSI and submitted to the City of Waterloo, Region of Waterloo and GRCA on January 13, 2021 for review and comment. The GRCA, City of Waterloo and Region of Waterloo reviewed the TOR, and on January 27, February 2 and March 4, 2021, respectively, provided comments to NRSI on the study approach. As comments were relatively minor in nature and the specified agencies approved the TOR, comments were addressed through emails to agency staff and within this EIS. The Terms of Reference, City of Waterloo, Region of Waterloo and GRCA comments are appended to this report (Appendix III).

As part of the City of Waterloo subdivision guidelines for environmental monitoring, the proponent was required to complete monitoring of the study area for a minimum of two years prior to development of the subject property. Stantec Inc. has undertaken monitoring of the property beginning in 2006 and continuing through to 2021, however, to-date reports have been prepared up to 2020. The work program for these years included groundwater, vegetation and disturbance monitoring within the subject property.

2.4 Relevant Policies, Legislation, and Planning Studies

Natural features and species in the study area were evaluated against the relevant local, provincial and federal policies, legislation, and planning studies, to help inform suitable land-uses concepts, guide the layout of development, and identify areas to be protected. This analysis is shown in Table 1.

Table 1. Relevant Policies, Legislation and Planning Studies

Policy/Legislation	Description	Project Relevance

Provincial Policy Statement (OMMAH 2020).	• Issued under the authority of Section 3 of the Planning Act and came into effect on May 1, 2020, replacing the 2014 PPS (OMMAH 2020).
	• Section 2.1 of the PPS – Natural Heritage establishes clear direction on the adoption of an ecosystem approach and the protection of resources that have been identified as 'significant'.
	• The Natural Heritage Reference Manual (OMNR 2010) and the Significant Wildlife Habitat Technical Guide (OMNR 2000, OMNR 2015) were prepared by the MNRF to provide guidance on identifying natural features and in interpreting the Natural Heritage sections of the PPS.
		• Based on a preliminary analysis, the following natural features were identified within the study area which have implications under the PPS:
		  • Sunfish Lake-Laurel Creek Provincially Significant Wetland;
		  • Significant Woodland;
		  • Significant Wildlife Habitat;
		  • Habitat for Endangered and Threatened species, and
		  • Fish Habitat.

Endangered Species Act, 2007	• The original ESA, written in 1971, underwent a year-long review which resulted in a number of changes which came into force in 2007. • The ESA prohibits killing, harming, harassing or capturing Endangered and Threatened species and protects their habitats from damage and destruction.	• Based on an analysis and review of the ESES, two regulated SAR (Barn Swallow and Blanding's Turtle) were identified as having the potential to occur within the study area based on habitat present. • These SAR were identified as having habitat within the proposed development footprint.
Canadian Fisheries Act	• Manages threats to the sustainability and productivity of Canada's commercial, recreational and Aboriginal fisheries. • The Act prohibits "serious harm to fish" including destruction of habitat • DFO has developed an online, self-assessment tool, where	• The approach to stormwater management may have implications for fish habitat within Laurel Creek and Wideman Creek.

Policy/Legislation	Description	Project Relevance
	proponents can determine whether their projects require DFO review based on the type of water body the work is occurring in and the nature of the proposed activity.	
Region of Waterloo Official Plan (2015)	• The Regional Official Plan (OP) 2015 includes policies related to the natural environment. • Map 4 of the OP identifies the location of Environmentally Sensitive Landscapes and Core Environmental Features including: Provincially Significant City of Wetlands; Environmentally Guelph Sensitive Policy Areas; Regional Forests; Forests greater than 4 ha, and Significant Valley Features	• Policies speak to the protection of natural features including Provincially Significant Wetlands, Significant Woodlands, Environmentally Sensitive Policy Areas (ESPA), habitat for Threatened and Endangered species, Significant Wildlife Habitat, and fish habitat; all of which occur in the study area.
City of Waterloo Official Plan (2020b)	• The City of Waterloo Official Plan (2020b) outlines current policies for the protection of the City's natural heritage resources. • Schedule A4 of the OP identifies the location of Core Environmental Features, Supporting Environmental Features	• Policies speak to the protection of natural features including Core Environmental Features, Provincially Significant Wetlands, Significant Woodlands, ESPAs. Habitat for Endangered and Threatened species, Significant Wildlife Habitat, and fish habitat; all of which occur in the study area.
GRCA Regulation 150/06	• Regulation issued under *Conservation Authorities Act,* R.S.O. 1990. • Through this regulation, the GRCA has the responsibility to regulate activities in natural and hazardous areas (i.e., areas in and near rivers, streams, floodplains, wetlands, and slopes). • GRCA requires that an EIS be undertaken in accordance with their *EIS Guidelines and Submission Standards for Wetlands* where development is proposed within 120m of PSW or 30m of non-PSW (GRCA 2005).	• The GRCA regulates a significant portion of the study area as the land is within its regulatory area, primarily associated with the presence of Laurel Creek and the Sunfish Lake-Laurel Creek PSW and its associated floodplain. • As such, permitting from the GRCA must be obtained for proposed works within their regulation area.
Final Subwatershed Management Plan 309/313 (SWS) (1996)	• The Laurel Creek Watershed Study was completed in 1993 and provided a comprehensive	• The study area is located within Subwatershed #309 and should consider the

Policy/Legislation	Description	Project Relevance
	assessment of the natural features within the watershed. • The Watershed Study provided 29 recommendations for the Laurel Creek Subwatershed; the Final Subwatershed Management Plan 309/313 was completed in 1996 in accordance with the recommendations in the 1993 Watershed Study. • The SWS recommends constraints, remediation of riparian corridors, buffers, a community trail system and makes further recommendations.	recommendations in the SWS.
Erbsville South Block Plan Study (City of Waterloo 2020a)	• Identifies Core Environmental Features, development setbacks, stormwater management, corridors and linkages, watercourses, hydrogeology and future studies discussed in the Erbsville South Environmental Study (Dougan and Associates et al. 2018). • Provides land-use and development recommendations for the subject property and surrounding area and recommends buffers and retention of Environmental Features.	• The Block Plan Study addresses the subject property area and environmental features within the study area. • The Block Plan Study confirms that findings from the ESES may be used in subsequent studies within 3 years of the ESES publication
Erbsville South Environmental Study (ESES) (Dougan and Associates et al. 2018)	• Studied lands within the southern portion of the Erbsville Settlement Area. • Supplements existing environmental information from the study area, and provides key recommendations to Core Environmental Features, Watercourses, Development Setbacks, Corridors/Linkages, Hydrogeology, Stormwater Management Strategy, Stewardship Initiatives, and Future Studies.	• Subject property falls within a portion of the ESES. • Identifies that Scoped Environmental Impact Studies are required for site-specific development plans.

3.0 Field Methods

The field survey methods described below are primarily summarized from the ESES (Dougan and Associates et al. 2018). They also include vegetation monitoring completed by Stantec in 2017, 2018, 2019 and 2020 (Stantec 2018, 2019, 2020, 2021). Use of the existing field data in the ESES was confirmed with the City of Waterloo, Region of Waterloo and GRCA and is detailed in a Terms of Reference which is appended to this report (Appendix III).

In addition to existing field data, NRSI completed a field review of the subject property in December 2020 to confirm the condition of natural feature boundaries. NRSI also completed a tree inventory and tree tally in June 2021 to identify trees within the subject property that are anticipated to be impacted by the proposed development.

Table 2 provides a summary of field surveys, dates, weather conditions and observers.

Table 2. Field Survey Summary (summarized from Dougan and Associates et al. 2018)

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
Winter Wildlife Survey	Systematic search by ELC polygon	February 4, 2014	0800-1200	-12.2 to -7	1	0	None	D. White
Ecological Land Classification	Lee et. al (1998)	May 17, 2013	--	--	--	--	--	W. Frise
		July 16, 2013	--	--	--	--	--	W. Frise
		August 14, 2013	--	--	--	--	--	W. Frise
		October 22, 2013	--	--	--	--	--	W. Frise
		July 22, 2014	--	--	--	--	--	D. White and W. Frise
Vascular Flora Inventory	Systematic search by ELC polygon	May 17, 2013	--	--	--	--	--	W. Frise
		July 16, 2013	--	--	--	--	--	W. Frise
		August 14, 2013	--	--	--	--	--	W. Frise
		October 22, 2013	--	--	--	--	--	W. Frise
		July 22, 2014	--	--	--	--	--	D. White and W. Frise
Butternut Health Assessment	N/A	July 11, 2016	--	--	--	--	--	Z. Harris
Tree Inventory and Tree Tally	N/A	June 17, 2021	--	25	1	0	None	D. Stephenson and J. Lance
Vegetation Monitoring	Vegetation monitoring of established plots along transects;	July 16, 2017	--	--	--	--	--	Stantec Staff
		October 13, 2017	--	--	--	--	--	Stantec Staff

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
	photo plot monitoring	July 27, 2018	--	--	--	--	--	Stantec Staff
		October 16, 2018	--	--	--	--	--	Stantec Staff
		June 29, 2019	--	--	--	--	--	Stantec Staff
		October 8, 2019	--	--	--	--	--	Stantec Staff
Wetland and ESPA Flagging (ahead of Agency Site Walks	N/A	August 15, 2014	--	--	--	--	--	W. Frise
Wetland Boundary Delineation (with GRCA, RMOW and City of Waterloo staff)	N/A	August 18, 2014	--	--	--	--	--	W. Frise
ESPA Boundary Delineation	N/A	August 19, 2014	--	--	--	--	--	W. Frise
ESPA Boundary Re-flagging	N/A	October 10, 2014	--	--	--	--	--	W. Frise and K. Beauchamp
Wetland and ESPA boundary review	N/A	December 8, 2020	--	--	--	--	--	D. Stephenson and K. Burrell
Breeding Bird Surveys	Cadman et al. 2007	June 7, 2013	0630-0930	11-15	Calm	Cloudy	None	I. Richards
		June 14, 2013	0620-0930	15 - 18	2-3	Mostly Clear	None	I. Richards

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
Anuran Call Surveys	BSC 2009	April 27, 2013	2100-2300	11	0	N/A	None	D. White
		May 22, 2013	2100-2300	18-20	2	N/A	None	D. White
		June 15, 2013	2130-2330	18-20	0	N/A	None	D. White
Basking Turtle Surveys	Norminton 2013; OMNRF 2013a	April 27, 2013	1015-1050	11	Calm	Sunny	None	I. Richards
		May 16, 2013	0945-1020	16	3	Sunny	None	I. Richards
		June 7, 2013	0835-0930	11 - 15	Calm	Cloudy	None	I. Richards
		June 14, 2013	0820-0930	15 - 18	2-3	Mostly Clear	None	I. Richards
		June 19, 2013	1000-1500	21	Calm	Sunny	None	D. White
		May 13, 2014	1300-1400	12	Calm	Mixed sun/cloud	None	D. White
		June 4, 2014	1030-1100	12	Calm	Sunny	None	D. White
		March 9, 2016	1230-1445	6	Calm	Sunny	None	D. White
		April 27, 2016	1500-1730	10	Calm	Sunny	Clear	D. White
		May 4, 2016	1200-1545	14	Calm	Mixed sun/cloud	None	D. White

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
		May 11, 2016	1100-1315	15	Calm	Mixed sun/cloud	None	D. White
		May 16, 2016	1200-1430	17	Calm	Sunny	None	D. White
Turtle Nest Survey	OMNRF 2016a	June 7, 2013	0630-0930	11-15	Calm	Cloudy	None	I. Richards
		June 14, 2013	0620-0930	15-18	2-3	Clear	None	I. Richards
		June 19, 2013	0945-1500	21	Calm	Sunny	None	D. White
		June 5, 2016	1800-1945	17	--	50	None	D. White
		June 7, 2016	1800-1945	15	--	30	None	D. White
		June 9, 2016	1815-2145	11-17	--	15	None	K. Beauchamp
		June 10, 2016	1800-2130	17-23	--	Sunny	None	K. Beauchamp
		June 12, 2016	1800-2125	11-17	--	10	None	K. Beauchamp
		June 20, 2016	1330-1515	29	--	Sunny	None	M.A. Young, C Myrdal
Hatchling Turtle Survey	Systematic search within suitable habitats	September 20, 2013	--	20-23	--	Cloudy	Light Drizzle	K. Konze
Salamander Trapping	Wildlife Care Committee	April 4, 2014	--	--	--	--	--	D. White

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
	Research Protocol, Wildlife Scientific Collector's Authorization, and ESA 'B' Permit	April 9, 2014	--	--	--	--	--	D. White and K. Konze
		April 10, 2014	--	--	--	--	--	D. White and K. Konze
		April 11, 2014	--	--	--	--	--	D. White and K. Konze
		April 15, 2014	--	--	--	--	--	D. White and K. Konze
		April 17, 2014	--	--	--	--	--	D. White and K. Konze
Snake Coverboards	Systematic search within suitable habitats	May 8, 2013	0930-1530	14	Calm	Sunny	None	D. White
		June 4, 2013	0900-1500	16	Calm	Sunny	None	D. White
		June 19, 2013	0945-1515	15	Calm	Sunny	None	D. White
		October 21, 2013	1000-1600	11	Light breeze	Cloudy	Light Rain	D. White
Reptile Hand Search	OMNRF 2013b	May 13, 2014	0930-1130	22	Calm	Sunny	None	D. White
		June 4, 2014	1100-1500	16	Calm	Sunny	None	D. White
		June 20, 2014	0745-1115	20	Calm	Sunny	None	D. White
		July 22, 2014	0800-1200	23	Calm	Mix of sun/cloud	None	D. White
Roadkill Survey	Walking Transects	May 13, 2014	--	--	--	--	--	D. White
		April 20, 2016	1400-1930	4	Calm	Sunny	None	D. White

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
American Badger Survey	Systematic Searches in ELC Polygons	April 26, 2016	1245-1600	6	Calm	Overcast	None	D. White
Aquatic Habitat Characterization, Fish Community Sampling, and Trout Spawning Surveys	Stanfield 2013	November 10, 2013	--	--	--	--	--	C. Portt and Associates
		November 14, 2013	--	--	--	--	--	C. Portt
		November 19, 2013	--	--	--	--	--	C. Portt
		May 29, 2014	--	--	--	--	--	C. Portt
		August 18, 2014	--	--	--	--	--	C. Portt
		August 19, 2014	--	--	--	--	--	C. Portt
		August 20, 2014	--	--	--	--	--	C. Portt
		August 21, 2014	--	--	--	--	--	C. Portt
		August 22, 2014	--	--	--	--	--	C. Portt
		October 27, 2014	--	--	--	--	--	C. Portt
		January 20, 2015	--	--	--	--	--	C. Portt
Benthic Invertebrates	Jones et al. 2007	June 30, 2014	--	--	--	--	--	C. Portt

3.1 Terrestrial Field Surveys

Terrestrial field surveys were undertaken by Dougan and Associates within the study area to characterize natural features and identify significant and sensitive natural heritage features and species that have potential to be adversely affected by the proposed development. A total of 44 field visits were completed between April 2013 and July 2016.

An additional site visit was conducted by NRSI in December 2020 to confirm the boundaries of natural features within the subject property including wetlands and woodlands and a tree inventory and tree tally were completed in June 2021.

A variety of field surveys were undertaken by Dougan and Associates; these are described in detail below. Surveys conducted were undertaken in accordance with provincial and local guidance documents as indicated below.

3.1.1 Vegetation Surveys

Vegetation community delineation was completed by Dougan and Associates biologists using aerial photography and thorough investigations in the field between May 13, 2013 and July 22, 2014. The standard Ecological Land Classification (ELC) System for southern Ontario was applied (Lee et al. 1998). Details of vegetation communities were recorded including species composition, dominance, uncommon species or features, evidence of human impact, and surficial soil characterization.

All observed species of vascular flora were recorded during field surveys between May 13, 2013 and July 22, 2014. A three-season detailed botanical survey was completed concurrently with ELC surveys. Table 2 summarizes the specific dates, weather conditions and observers for ELC and vascular flora surveys.

3.1.1.1 Butternut Health Assessments

Initial vegetation surveys identified the presence of Butternut (*Juglans cinerea*), provincially and federally Endangered, within the study area. Butternut health assessments, completed in accordance with MNRF protocol following the Butternut Health Assessor's Field Guide (OMNRF 2015b), were conducted by Dougan and Associates biologists on July 11, 2016. Tissue samples were collected from each

Butternut observed and were sent to the Ontario Forest Research Institute (OFRI) to determine hybridity according to standardized sampling protocol.

3.1.2 Tree Inventory and Tree Tally

A tree inventory and tree tally were completed by NRSI Certified Arborists on June 17, 2021. The tree inventory was completed for all trees along the perimeter of the proposed stormwater management pond location, to the northwest of the subject property, that have the potential to be impacted by the proposed development. Individual trees ≥10cm in Diameter at Breast height (DBH) were assessed. The location of trees inventoried was subsequently surveyed using a SXBlue II GNSS GPS unit. The following information was recorded for each tree:

- species,
- DBH (centimetres),
- crown radius (metres)
- general health (excellent, good, fair, poor, very poor, dead),
- potential for structural failure (improbable, possible, probably, imminent),
- tree location (on-site/off-site), and
- general comments (i.e. disease, aesthetic quality, development constraints, sensitivity to development).

Trees within the area of the proposed stormwater management pond and in the southeastern hedgerow were not individually inventoried since all trees will need to be removed in support of the proposed development. Instead, a tally of these trees was completed to provide a general assessment of what is present and so that any required compensation can be provided for these trees following their removal. All trees ≥10cm DBH were tallied and the following information was recorded for each tree:

- species,
- DBH (centimetres),
- General health (excellent, good, fair, poor, very poor, dead), and
- general location by ELC polygon.

3.1.3 Natural Feature Delineation

The wetland boundaries on the subject property were flagged in the field on August 15, 2014 for subsequent surveying. Dougan and Associates biologists met with staff of the

City of Waterloo, Region of Waterloo and GRCA to confirm wetland boundary delineation on August 18, 2014. Wetland boundaries were reassessed by NRSI biologists on December 8, 2020. It was determined that the wetland boundary surveyed by NRSI was almost exactly the same as the boundary confirmed by agency staff in 2014, as a result the agency confirmed boundary was used for this EIS report.

The ESPA (woodland) dripline within the subject property was flagged on August 15, 2014. Dougan and Associates biologists met with staff of the City of Waterloo, Region of Waterloo and GRCA to confirm the ESPA boundary delineation on August 19, 2014. The ESPA boundary was re-flagged on October 10, 2014 in accordance with findings of the review of the boundary by agency staff. Woodland boundaries were reassessed by NRSI biologists on December 8, 2020. It was determined that the woodland dripline boundary surveyed by NRSI was almost exactly the same as the boundary confirmed by agency staff in 2014, as a result the agency confirmed boundary was used for this EIS report.

3.1.4 Breeding Bird Surveys

Breeding bird surveys were completed by Dougan and Associates biologists on June 7 and 17, 2013 and data was recorded using standard OBBA call codes (OBBA 2001). Surveys consisted of a walking transect by habitat type (ELC community) which occurred between dawn and 1000hrs. The location of walking transects within the study area are shown on Map 2. All visual and auditory observations of birds were recorded as well as the highest level of breeding evidence exhibited for each recorded species.

3.1.5 Reptile Surveys

3.1.5.1 Snake Surveys

A combination of active searches and cover board surveys were undertaken by Dougan and Associates biologists to identify snake species present within the study area and subject property.

<u>Active Searches</u>

Active searches were conducted for a total of 13.5 person-hours over four days on May 13, June 4 and 20 and July 22, 2014 for all snake species. This involved flipping over logs, rocks, or other suitable covers. Any moved items were carefully replaced to their

original location to avoid disrupting the habitat. During each survey, detailed notes were taken which described the habitat searched, level of effort, approximately how many suitable covers were looked under, weather conditions, and species observed.

Cover Board Surveys

A total of nine snake cover boards were installed in the study area for the property at 720 Erbsville Road on May 8, 2013; their locations are shown on Map 2. Each board measured 2ft x 2ft and was weathered in the field for one year prior to deployment. Boards were checked at total of three times on June 4 and 19 and October 21, 2013 during the morning for presence of snake species. When checking boards, biologists approached the board cautiously and lifted it to check for snakes underneath, taking care to replace the board in its original location. All snake species, sex (if known), number of individuals, and behaviour were recorded on a detailed observation form.

3.1.5.2 Turtle Surveys

A combination of basking, nesting and hatchling surveys were undertaken by Dougan and Associates biologists to identify turtle species present within the study area and subject property.

Basking Surveys

A total of 14 turtle basking surveys were undertaken within the study area between April 2013 and May 2016. A complete summary of surveys is provided in Table 2. One site, a small 0.17ha pond behind 665 Erbville Road within the study area, was surveyed in 2013 and 2014. The small pond at 665 Erbville Road and an additional site, the Forest Gate stormwater management pond, were surveyed in 2016. The locations of the two waterbodies surveyed within the study area are identified on Map 2. Basking turtle surveys followed the Occurrence Survey Protocol for Blanding's Turtle (*Emydoidea blandingii*) in Ontario (OMNRF 2013a). Surveys were conducted prior to mid-June, on sunny or mostly sunny days between 0800 and 1700 and in suitable temperatures as per the survey protocol (OMNRF 2013a). The edges of waterbodies and suitable basking locations such as logs, rocks and vegetation hummocks were surveyed from a distance using binoculars. Care was taken to carefully and quietly approach the ponds so as not to scare turtles before they could be documented. All turtle species, sex (if

known), number of individuals and behaviour were recorded on a detailed observation form.

Nesting Turtle Surveys

A total of nine turtle nesting surveys were conducted within the study area in 2013 and 2016. All surveys were completed in accordance with the Blanding's Turtle Nest and Nesting Survey Guidelines (OMNRF 2016a), except for the final survey in 2016 which could not be completed between 1800 and 2200 as recommended in the guidelines. A summary of all nesting turtle survey is provided in Table 2. Surveys were conducted on warm and humid nights between late May and early July, between 1800 and 2200. Transects were walked within all candidate nesting areas (open habitats with low vegetation cover, high sun exposure and well-drained soils). Habitats surveyed within the study area included agricultural fields and anthropogenic features. During surveys, careful attention was paid to any potentially disturbed soils that may have provided evidence of nesting activities.

Hatchling Turtle Surveys

A single targeted survey for turtle hatchlings was conducted on September 20, 2013 with a focus on the lands associated with the Regal Place property and to the south, within the study area. Areas with the highest potential were examined for signs of previous nesting activity and evidence of exit holes. The timing of these surveys corresponded to the typical fall emergence period. Surveys were completed during mild temperatures and following periods of recent precipitation or high humidity.

3.1.6 Amphibian Surveys

Targeted surveys were completed for anurans and salamanders within the study area and subject property by Dougan and Associates biologists between April and June 2013 and in April 2014.

3.1.6.1 Anuran Call Surveys

Evening anuran (frog and toad) call surveys were conducted on April 27, May 22 and June 15, 2013 using the Marsh Monitoring Program protocol (BSC 2009) at two stations within the study area (Map 2). Monitoring focused on calling frogs and toads during 6-minute call counts (extended from the standard 3-minute call counts in the Marsh Monitoring protocol), which included call intensity and an estimated number of

individuals. Additional information, including survey time, air and water temperature, wind speed, and cloud cover were recorded at each survey station.

3.1.6.2 Salamander Trapping

Salamander trapping surveys were conducted within the study area to assess the presence of Jefferson's Salamander, provincially and federally Endangered. Applicable permit applications were submitted and approved prior to the initiation of surveys (Appendix 2.6, Dougan and Associates et al. 2018). Salamander trapping surveys were conducted at one location within the study area, the pond behind 665 Erbsville Road, between April 8 and 15, 2014. Five nights of trapping were completed in accordance with MNRF protocols (Dougan and Associates et al. 2018).

Trapping at the pond was completed using nine standard minnow traps (i.e. galvanized wire mesh, 6mm squares). Traps were submerged in the target ponds in the evening and checked before 0800 the following morning. Traps were placed around the perimeter of the pond with a focus on areas with high breeding potential, such as woody debris, vegetation or suitable upland habitat (Map 2). Specimens captured were examined, recorded and then released back to the pond. This protocol ensured that captured individuals spent a minimal amount of time in the traps.

3.1.7 Mammal Surveys

3.1.7.1 Winter Wildlife Survey

A single winter wildlife survey was completed on February 4, 2014 by Dougan and Associates biologists. Weather was ideal for completion of the survey with a temperature of -12.2°C at the start of the survey, rising to -7°C by the end of the survey. The survey was completed approximately 50 hours after a large snowfall event, allowing for suitable snow conditions to observe wildlife activity imprinted on the snow. Evidence of winter wildlife was searched for along areas likely to serve as animal movement corridors. Signs of wildlife were identified to the species level where possible and behaviour was described. Field identification of tracks was aided by taking measurements and describing patterns and shapes.

3.1.7.2 American Badger Surveys

Two field surveys focused on the identification of evidence of American Badger (*Taxidea taxus*) presence were completed by Dougan and Associates biologists in April 2016. Open, upland habitats, hedgerows and forest edges were thoroughly searched for the presence of burrows. Transects across large open habitats were completed to ensure complete coverage of the study area and woodlands were examined within approximately 25m of open habitats. Surveys were completed prior to vegetation leaf-out to ensure good visibility and were conducted on days with dry, calm conditions. All mammal dens observed were characterized using measurements and photographs, and their GPS location was recorded.

3.1.8 Road Mortality Survey

A single targeted road mortality survey was completed by Dougan and Associates biologists on May 13, 2014. Incidental road mortality observations were noted throughout the study period. The targeted survey was completed by walking the edges of roadways within the study area, including Erbsville Road and Schnarr Street. The survey was timed to occur less than 24 hours after a major rainfall even, allowing for anuran mortalities to be targeted. All road mortalities were examined and identified to species where possible.

3.1.9 Additional Wildlife

All observations of birds, amphibians, reptiles, mammals and insects were documented on all field visits. This included actual direct observations of individuals, as well as signs of wildlife presence (i.e. tracks, scats, dens, nests etc.).

3.2 Terrestrial Monitoring

Terrestrial monitoring, including vegetation monitoring, disturbance monitoring and qualitative photographic monitoring, of the subject property has been completed by Stantec annually from 2017 to 2021. The results of terrestrial monitoring are summarized in annual monitoring reports (Stantec 2018, 2019, 2020, 2021; results of monitoring undertaken in 2021 are not yet published). Terrestrial monitoring could not be completed by Stantec in 2020 as a result of complications arising due to the COVID-19 pandemic; this decision was confirmed with City of Waterloo staff and it was determined that the monitoring would still be accepted if it resumed in 2021 (Stantec 2021).

The terrestrial monitoring of the subject property provides baseline data prior to grading and development. The results of this monitoring will assist in evaluating the impacts of the development on adjacent natural features. The focus of the terrestrial monitoring program is on vegetation communities within and adjacent to the proposed development footprint.

3.2.1 Vegetation Monitoring

Vegetation monitoring was completed by Stantec along four transects within the subject property. The first three transects were monitored between 2006 and 2021 with the fourth transect added in 2009. Permanent 2x2m plots were established 10m apart along each transect. Each transect has been monitored annually to characterize existing conditions, including descriptions of the canopy, shrub-layer and ground-layer with information on species presence and percent cover recorded. All trees ≥10 cm DBH within 5m of plots as well as standing water depth within each plot were also recorded. The locations of the transects and 2x2m plots are shown on Map 2.

Observations of disturbance within each plot, including type and severity, were recorded. Photographic monitoring to provide a visual representation of existing conditions within the subject property have been completed along each transect. The number, location and direction of each photo were recorded to allow for comparisons between monitoring years. Photographs have also been taken along the edges of natural areas within the subject property. Nine edge monitoring stations were established in 2006 and have

been monitored annually, with the exception of 2014 and 2020. The locations of the edge monitoring stations are shown on Map 2.

3.3 Aquatic Field Surveys

Aquatic biologists from C. Portt and Associates conducted a total of 12 visits to the subject property and study area between November 10, 2013 and January 20, 2015. A complete summary of field survey dates is provided in Table 2. During these site visits a detailed characterization of aquatic habitats within the study area was completed, including aquatic habitat assessments, electrofishing to determine the fish community, trout spawning surveys and benthic invertebrate sampling within Laurel Creek and Wideman Creek. These surveys are described in further detail in the following sections.

3.3.1 Aquatic Habitat Assessment and Fish Community Sampling

Aquatic habitat assessments were conducted between August 18 and 22, 2014 following the Ontario Stream Assessment (OSAP) protocol (Stanfield 2013). In order to characterize aquatic habitats, the following information was recorded for Laurel Creek, Wideman Creek and the Wideman Creek Tributary within the study area:

- substrate type;
- channel depth, width, etc.;
- water temperature;
- bank stability;
- aquatic vegetation cover; and
- critical life stage areas (i.e. spawning, nursery habitat, etc.).

Aquatic biologists conducted electrofishing to determine the fish community within aquatic habitats on the subject property. These surveys were undertaken by a two-person crew using a Halltech backpack electrofisher at three sites shown on Map 3. Fish were sampled by a single pass through each site, and all fish species were identified in the field and returned to the water. All species, number of individuals, bulk weight and size range were recorded. Individual weights and lengths were recorded for game species. Table 3 provides a summary of the length, mean width, mean depth and effort (number of electroseconds) at each fish sampling station within the study area.

Table 3. Summary of Fish Sampling Survey Station Details

Station	Date (2014)	Length (m)	Mean Width (m)	Mean Depth (mm)	Electroseconds
EMS-001	April 18	40	5.2	128	3410
EMS-002	April 18	42.3	4.2	184	2752
EMS-003	April 18	40.3	0.9	105	812

3.3.2 Spawning Surveys

Trout spawning surveys were conducted on November 10, 14 and 19, 2013 and on October 27, 2014. Surveys in 2013 investigated Laurel and Wideman Creek, while surveys in 2014 looked at Laurel Creek, Wideman Creek and the Wideman Creek Tributary (Map 3). The watercourses surveyed were carefully examined for evidence of substrate being disturbed in a manner consistent with spawning activity for Brown Trout (*Salmo trutta*) or Brook Trout (*Salvelinus fontinalis*) having occurred.

3.3.3 Benthic Invertebrate Sampling

Benthic invertebrates were sampled at three locations on Laurel Creek and one location on Wideman Creek within the study area (Map 3). Sampling followed the Ontario Benthic Biomonitoring Network (OBBN) protocol (Jones et al. 2007). At each location three kick and sweep samples were collected, two in riffles and one in a pool or run. A 500µm mesh dip net was used to collect samples. Each sample was preserved in 7% buffered Formalin for later sorting and identification.

In the laboratory, samples were placed in a 500µm sieve and rinsed with water to remove preservative and debris. Samples were then weighed, transferred to a white plastic tray and was diluted to create a slurry. Samples were then mixed gently and small sub-samples were removed. The sub-samples were sorted using a dissecting microscope at 6X magnification and benthos were removed, tallied and placed in plastic vials for identification. Sub-sampling continued until 100 organisms were recovered. The proportion of the sorted sample was calculated by dividing the weight of the sorted material by the weight of the whole sample.

Specimens were identified by William Morton to lowest practical level, to species where possible. Total number of taxa present in each sub-sample and in the three sub-samples combined was determined for each location and sampling date. The number of EPT taxa, the sum of the number of *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies) and *Trichoptera* (caddisflies), present in each sub-sample and in the three sub-samples

combined was determined for each location and sampling date. Shannon-Weaver diversity was calculated for three sub-samples combined for each location as:

$$H=-\Sigma p_i \ln p_i$$

where p_i is the proportion of the sample comprised of species i. The Hilsenhoff Biotic Index (HBI) was calculated for the three sub-samples combined for each location and sampling date as:

$$HBI=\Sigma n_i T_i/\Sigma n_i$$ where

Σn_i is the number of individuals of species i, and T_i is the tolerance value of species i from the literature.

The HBI tolerance values are directly or inferred from Hilsenhoff (1982, 1987) and Bode (1988a). The water quality implied by these indices is from Shannon and Weaver (1949; Shannon's diversity), Hilsenhoff (1987; HBI) and Bode (1988b, number of EPT taxa).

3.3.4 Water Temperature Sampling

Water temperature loggers (Watertemp Pro V2, Onset Corporation) were installed at one location in Wideman Creek (TB-W1) and three locations in Laurel Creek, within the study area, on May 22, 2014 (Map 3). An additional temperature logger was installed in Wideman Creek (T-W2) on June 8, 2014. Temperature was logged on the quarter hour. Data were retrieved during other site visits and the last retrievals took place in late October and early November 2014.

Maximum daily water temperature at each location was plotted against the maximum daily air temperature at the Kitchener-Waterloo weather station (StationID=48569) for the dates between June 16 and August 30, when both air and water temperature were available and maximum daily temperature was 24°C or higher. These plots were compared to the nomogram in Chu et al (2009) to determine the thermal classification of the watercourses.

4.0 Existing Conditions

4.1 Soils, Terrain and Drainage

The study area is located in the physiographic region known as the Waterloo Moraine or the Waterloo Sand Hills (Chapman and Putnam 1984). This region is characterized by irregular hummocky to steeply rolling land comprised of a number of layers of ice contact and glacial outwash sands and gravels, separated by layers of silt and clay rich tills (Chapman and Putnam 1984). A series of alluvial terraces of the Grand River spillway system occur in the general vicinity, typically exhibiting relatively uniform substrates of sands and gravels (Chapman and Putnam 1984). The study area is located within the spillway portion of the physiographic region.

The tills in the study area are dominated by silts, clays and sands in variable compositions (Dougan and Associates et al. 2018). In general, the study area consists of an overburden system of aquitards interspersed with aquifers all overlaying bedrock. Shallow groundwater flows toward Laurel Creek and discharges to the watercourse (Dougan and Associates et al. 2018). The topography of the proposed development footprint is relatively flat sloping gradually to the northeast, towards Laurel Creek.

4.2 Vegetation

4.2.1 Vegetation Communities

The proposed development footprint is comprised primarily of agricultural fields as well as a hedgerow in the southeast and a small Mineral Cultural Thicket (CUT1) community located in the northwest of the proposed development area, in the area of the proposed stormwater management pond. The remaining portion of the property and lands within 200m of the development area include swamps and woodlands. ELC community classification was not completed for the Sunfish Lake-Laurel Creek PSW complex in the north and northeast of the subject property as these lands are well outside of the proposed development footprint. A summary of ELC communities identified within the study area is provided in Table 4. ELC communities are described below in detail and shown on Map 4.

Table 4. Vegetation Communities Identified within the Study Area

Cultural	
CUT1	Mineral Cultural Thicket
CUW1	Mineral Cultural Woodland
HR	Hedgerow
Deciduous Forest	
FOD8-1	Fresh-Moist Poplar Deciduous Forest
Mixed Forest	
FOM	Mixed Forest
Wetland	
SWD7	Birch-Poplar Organic Deciduous Swamp
SWC4-2	Tamarack Coniferous Organic Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp
SWT3-2	Willow Organic Thicket Swamp
Aquatic	
SAS1	Submerged Shallow Aquatic
Anthropogenic	
ANTH	Anthropogenic
Agricultural	
AGR	Agricultural

Mineral Cultural Thicket (CUT1)

A small area of Mineral Cultural thicket is present in the northwest of the subject property between a residential lot and the agricultural field that comprises the majority of the subject property. A building foundation is present in this polygon, which is evidence of its disturbed, anthropogenic nature, see Map 4. The sub-canopy is dominated by Black Locust (*Robinia pseudoacacia*) with some Manitoba Maple (*Acer negundo*) and young Green Ash (*Fraxinus pennsylvanica*) also present. The understorey and groundcover are primarily early-successional non-native species. Several candidate Butternuts (*Juglans cinerea*) were observed in this ELC community, later confirmed to all be hybrids. This ELC community is located within the proposed development footprint.

Mineral Cultural Woodland (CUW1)

A Mineral Cultural Woodland is present in the north of the subject property, along Laurel Creek. This woodland has limited tree cover, under 60% canopy and is relatively disturbed. This ELC polygon is located within the Laurel Creek Forest ESPA. Several candidate Butternuts were observed in this community, they were all later confirmed to all be hybrids. The highly disturbed woodland polygon is dominated by non-native

species such as, Black Locust, European Buckthorn (*Rhamnus cathartica*), Periwink (*Vinca minor*), Garlic Mustard (*Alliaria petiolata*) and Orange Daylily (*Hemerocallis fulva*).

Hedgerow (HR)

A number of hedgerow polygons are present in the study area, including one present along the southeastern portion of the subject property, partially within the development footprint. The hedgerow within the subject property is an agricultural windbreak, that is comprised of native tree species, including Black Cherry (*Prunus serotina*) and American Basswood (*Tilia americana*).

Fresh-Moist Poplar Deciduous Forest (FOD8-1)

A small portion of this ELC community is present at the western edge of the study area. The polygon has moist soils due to its proximity to a swamp community. The forest is a young community with evidence of human disturbance, such as trails, cut stumps and piled woody debris. The canopy of the forest is primarily Trembling Aspen (*Populus tremuloides*).

Mixed Forest (FOM)

A small area of Mixed Forest is mapped to the southeast of the subject property, which continues off the subject property toward to the Erbsville Kartway.

Tamarack Coniferous Organic Swamp (SWC4-2)

A very small portion of this ELC community is present to the extreme southwest of the study area, behind the pond located at 665 Erbsville Road. The canopy of this community is very sparse at just over 25% and consists of Tamarack (*Larix laricina*) and Eastern White Cedar (*Thuja occidentalis*). Groundcover is comprised of grasses, sedges (*Carex* spp.), ferns and wetland herbs. A small tributary to Wideman Creek is present within this ELC polygon. This ELC community is within the Sunfish Lake-Laurel Creek PSW complex.

Birch-Poplar Organic Deciduous Swamp (SWD7)

This ELC community is located in the northwest of the subject property and in lands to the north associated with the Sunfish Lake-Laurel Creek PSW complex. It is also present in the west of the study area, north and west of the Regal Place residential

properties. Within the subject property the canopy of the Birch-Polar Organic Deciduous Swamp is dominated by Eastern Cottonwood (*Populus deltoides*), Eastern White Cedar and occasional willow spp. (*Salix* spp.). The understorey is comprised of European Buckthorn, Red-osier Dogwood (*Cornus sericea*) and willow spp. Groundcover is primarily Tussock Sedge (*Carex stricta*), Field Horsetail (*Equisetum arvense*), Periwinkle and Ostrich Fern (*Matteuccia struthiopteris*).

Mixed Swamp (SWM)

Two mixed swamp communities are mapped in the east of the subject property. These ELC communities are associated with the Sunfish Lake-Laurel Creek PSW complex and the Laurel Creek Forest ESPA.

Willow Mineral Thicket Swamp (SWT2-2)

A small portion of this ELC community is present in the extreme southwest of the study area behind the pond associated with 665 Erbsville Road. The sub-canopy is comprised mainly of Heart-leaved Willow (*Salix eriocephala*), which is less than 5m in height. The understorey is dominated by Red-osier Dogwood and the groundcover is mainly Reed Canary Grass (*Phalaris arundinacea*), Wild Strawberry (*Fragaria virginiana*), and avens spp. (*Geum spp.*)

Willow Organic Thicket Swamp (SWT3-2)

This ELC community is present in the north of the subject property, outside of the development footprint. This community borders the agricultural field and extends into the eastern portion of the study area associated with the Sunfish Lake-Laurel Creek PSW complex. The sub-canopy of this ELC community is characterized by Eastern White Cedar and young poplar spp. (*Populus* spp.). The understorey is dominated by willow spp. and Red-osier Dogwood. Groundcover is a mix of unspecified plant species in the facultative wetland to facultative upland spectrum (Dougan and Associates et al. 2018).

Submerged Shallow Aquatic (SAS1)

This ELC community is located in the southwest corner of the study area and is associated with the pond behind 665 Erbsville Road. It consists of a shallow aquatic community with emergent aquatic flora around the edge, and is considered a part of the

Sunfish Lake-Laurel Creek Wetland complex. An examination of the pond indicated that it was likely a dug pond that underwent natural succession to a wetland community. Vegetation at the perimeter of the pond is characterized by Narrow-leaved Cattail (*Typha angustifolia*), Soft-stemmed Bulrush (*Schoenoplectus tabernaemontanii*), Broad-leaved Arrowhead (*Sagittaria latifolia*), Dark-green Bulrush (*Scirpus atrovirens*), Reed Canary Grass and sedge spp. Wetland vegetation is also present on the slope that surrounds the pond and consists of Red-osier Dogwood, willow spp., Spotted Joe-pye Weed (*Eupatorium maculatum*) and Grass-leaved Goldenrod (*Euthamia graminifolia*).

Anthropogenic (ANTH)

Anthropogenic features, primarily consisting of residential lots and developments are present in the subject property and study area. A residential property is located in the northwest of the subject property and is comprised of a single-family dwelling, a paved driveway and maintained lawn. More sizeable residential developments are located to the west of Erbsville Road and include the Regal Place residential development as well as a series of single-family dwellings with paved or gravel driveways and maintained lawns. A residential block is also located in the southeast of the study area and is associated with Forest Gate Crescent. This residential area includes single-family dwellings, a paved road network, paved driveways, maintained lawns and stormwater management ponds.

Agricultural (AGR)

Agricultural polygons make up a significant portion of the subject property and study area. The primary agricultural field within the subject property is relatively flat and conveys some surface runoff to the deciduous swamp to the northeast of the subject property. An agricultural field is present in the study area, on the east side of Erbsville Road and to the southeast of the subject property. This field is separated from the subject property by a hedgerow and borders the Sunfish Lake-Laurel Creek PSW complex, as well as Wideman Creek. A large agricultural field is present within the study area on the west side of Erbsville Road. This field is bordered by hedgerows and natural features to the west of the study area. The majority of the proposed development footprint is comprised of an agricultural polygon.

4.2.2 Vascular Flora

Detailed vegetation inventories were conducted by Dougan and Associates (2018) and 238 species were identified from the natural areas that surround the proposed development area. A complete list of these species is appended to this report (Appendix IV). Approximately 26.2% of species recorded are considered non-native species, which included highly invasive species such as European Buckthorn, Periwinkle and Garlic Mustard.

Background information (Dougan and Associates et al. 2018) and SAR screening indicates that three significant plant species are known from within 1km of the study area. Appendix IV provides a summary of these species, their current status ranks, and preferred habitats. Based on field work conducted, one of these species, Black Ash, was confirmed within the study area but was not identified in the subject property and has no suitable habitat within the development footprint. Candidate Butternuts were also identified within the subject property and study area. Butternut Health Assessments, including hybridity testing, were completed for all individuals recorded. Based on these assessments, all of the identified Butternuts were confirmed to be hybrids and as such, are not provided protection under the Endangered Species Act. Since all Butternuts in the study area were identified as hybrids, they are not discussed further in this report.

4.2.2.1 Black Ash

Black Ash was documented in the SWC4-2 community to the extreme southwest of the study area. This species is typically closely associated with swamp ecosites. The ELC polygon that this species was observed in is part of the Sunfish Lake-Laurel Creek PSW complex and is separated from the subject property by Erbsville Road. Seeds from Black Ash may be deposited in Wideman Creek and flow downstream to where Laurel and Wideman Creek converge. From here any seeds deposited in the watercourse would travel southeast toward Sunfish Lake. It is considered improbable that Black Ash and their seeds known from the southwest of the study area would be transported to any vegetation communities adjacent to the proposed development footprint. As such, this species is not discussed further in this EIS.

4.2.2.2 Regionally Significant Flora

In addition to plant species of provincial and federal significance, several regionally or locally rare plant species were identified within the study area but outside the proposed development footprint.

These species include:

- Canada Rush (*Juncus canadensis*),
- Northern Bog Violet (*Viola nephrophylla*),
- Virginia Creeper (*Parthenocissus quinquefolia*),
- White Spruce (*Picea glauca*),
- Eastern Cottonwood, and
- Black Walnut (*Juglans nigra*).

Canada Rush and Northern Bog Violet are both ranked R in Waterloo Region, indicating that they are locally rare (Richardson and Martin 1999). Neither species was observed within the proposed development footprint.

Virginia Creeper, White Spruce and Eastern Cottonwood are ranked R+ indicating that they are locally rare, but only if demonstrably indigenous. Most populations of these species in Waterloo Region are thought to be non-indigenous (Richard and Martin 1999); however, the provenance of the individuals observed in the study area could not be confirmed. None of these species were observed within the proposed development footprint.

Black Walnut has a locally rarity status of R+*, which indicates that the species is significant in Waterloo Region if it is demonstrably indigenous and that given future studies it may be too common to be considered significant in the future (Richard and Martin 1999). This species was observed within the CUT1 community and the southeastern hedgerow, both of which are located in the proposed development footprint. It is not known whether the individuals within the development area are of indigenous origin. Black Walnut is now known to be very common throughout southwestern Ontario, including Waterloo Region. As such the rarity ranking should not apply for the proposed development footprint, which is supported by the ESES (Dougan and Associates et al. 2018).

4.2.3 Tree Inventory and Tree Tally

In total, 45 trees of eight species were inventoried from the location of the proposed stormwater management pond, within the Mineral Cultural Thicket (CUT1) community in the northwest of the subject property, by NRSI Certified Arborists. Of the trees inventoried and assessed, 22 (50%) are native species and 22 (50%) are non-native species. A single tree was only identified to genus, as Hawthorn species (*Crataegus* sp.), and was not included in these calculations. NRSI Certified Arborists identified the presence of two hybrid Butternuts during the completion of the tree inventory and tally.

Table 5 provides a list of tree species inventoried from the location of the proposed stormwater pond within the subject property, whether they are native or non-native, and their overall health.

Table 5. Summary of Inventoried Trees from the CUT1 Community

Common Name	Scientific Name	Excellent	Good	Fair	Poor	Very Poor	Dead	Total
Native Species								
Black Walnut	*Juglans nigra*			10	1			11
Butternut (hybrid)	*Juglans cinerea x ailantifolia*		1	1				2
Hawthorn species	*Crataegus sp.*			1				1
Manitoba Maple	*Acer negundo*			8				8
Sugar Maple	*Acer saccharum*			1				1
Total		0	1	21	1	0	0	23
Non-native Species								
Black Locust	*Robinia pseudoacacia*		7	10				17
English Oak	*Quercus robur*			3				3
Norway Maple	*Acer platanoides*			1	1			2
Total		0	7	14	1	0	0	22
Overall Total		0	8	35	2	0	0	45

Table 6 provides a summary of the overall health of trees inventoried within the subject property, along with their potential for structural failure. The majority of the trees are in fair condition with improbable potential for structural failure.

Table 6. Overall Health of Trees Inventoried from the CUT1 community

Potential for Structural Failure Rating	Overall Condition			Total
	Good	Fair	Poor	
Improbable	8	25		33
Possible		10	2	12
Probable				0
Imminent				0
Total	8	35	2	45

A total of 32 trees of 5 species were tallied within the CUT1 community, where the stormwater management pond is proposed. Of the trees tallied, 14 (44%) are native species and 18 (56%) are non-native species. Approximately 95 additional Black Locust that were <10 cm DBH were also noted within this area. Table 7 provides a summary of tree species tallied from the CUT1 community, whether they are native or non-native, and their overall health.

Table 7. Summary of Trees Tallied from the CUT1 community

Common Name	Scientific Name	Excellent	Good	Fair	Poor	Very Poor	Dead	Total
Native Species								
Black Walnut	*Juglans nigra*		1	5	2			8
Green Ash	*Fraxinus pennsylvanica*					1		1
Manitoba Maple	*Acer negundo*			2	2			4
White Ash	*Fraxinus americana*			1				1
Total		0	1	8	4	1	0	14
Non-Native Species								
Black Locust	*Robinia pseudoacacia*		3	15				18
Total		0	3	15	0	0	0	18
Overall Total		0	4	23	4	1	0	32

A total of 89 trees of 7 species were tallied within the southeastern hedgerow, which is in the proposed development footprint. Of the trees tallied, 88 (99%) are native species and 1 (1%) is a non-native species. Table 8 provides a summary of tree species tallied from the southeastern hedgerow, whether they are native or non-native, and their overall health.

Table 8. Summary of Trees Tallied from the Southeastern Hedgerow

Common Name	Scientific Name	Excellent	Good	Fair	Poor	Very Poor	Dead	Total
Native Species								
American Basswood	*Tilia americana*			3				3
Black Cherry	*Prunus serotina*				1			1
Black Walnut	*Juglans nigra*		16	26	13	3		58
Red Oak	*Quercus rubra*		4					4
Sugar Maple	*Acer saccharum spp. sacharrum*		3	1	2	2		8
White Ash	*Fraxinus americana*			1		1	12	14
Total		0	23	31	16	6	12	88
Non-Native Species								
Common Apple	*Malus pumila*			1				1
Total		0	0	1	0	0	0	1
Overall Total		0	0	0	0	0	0	89

4.2.4 Vegetation Monitoring

Stantec Inc. has completed vegetation and disturbance monitoring at the subject property between 2006 and 2021, the results of the 2017 – 2020 monitoring are summarized in annual reports (Stantec 2018, 2019, 2020, 2021; the results of monitoring undertaken in 2021 have not yet been published). Terrestrial monitoring could not be completed in 2020 as a direct result of complications arising from the COVID-19 pandemic (Stantec 2021). Generally, the results of plot, transect and photo monitoring are consistent with the findings of the ESES (Dougan and Associates et al. 2018).

Variability was observed in the coefficient of wetness between monitoring plots and monitoring years; however, this is not unexpected in floodplain communities where water levels rise and fall at differing rates between years. Moderate to large increases of exotic species groundcover was noted at 4 of the 8 monitoring plots. Increases in exotic species cover often related to shady monitoring plots with low vegetation cover at the start of monitoring; sunnier plots with dense native vegetation did not experience the same increases, as non-native species did not have the same opportunities to establish themselves. Increases in exotic species cover generally correlate to monitoring plots located along the edge of the agricultural field.

Significant tree dieback was noted at a few of the monitoring plots, particularly those located in proximity to Laurel Creek. Tree species affected include Eastern White Cedar, Green Ash and Yellow Birch (*Betula alleghaniensis*). Dieback of Green Ash is

expected to be related to the widely known and recognized spread of Emerald Ash Borer (*Agrilus planipennis*). Dieback of Eastern White Cedar and Yellow Burch is generally thought to be related to flooding in 2013. Overall, changes in species composition within the subject property is thought to be in response to natural fluctuations, including hydrology, sunlight levels and climatic conditions (Stantec 2018, 2019, 2020). These monitoring reports assist in identifying baseline conditions within the subject property.

4.3 Wildlife

4.3.1 Birds

In total, 114 bird species are reported from the vicinity of the study area based on the OBBA (Cadman et al. 2007). The data found in the OBBA includes those species that have been observed in the area (10 x 10km range), are known to nest in the area, and/or have exhibited some evidence of breeding in the area. Of these species, 64 were documented within the study area during field surveys. An additional six species not listed in the OBBA were observed during field surveys, which represented migrants or wintering birds. Within the study area, 50 species exhibited signs of breeding, such as males singing, females carrying food or nest materials, and the presence of fledged young. Two species were "Confirmed" to be breeding within the study area, 21 species showed signs of "Probable" breeding, and 26 showed signs of "Possible" breeding within the study area. Refer to Appendix V for a complete list of bird species found in the study area and vicinity.

A total of one regulated bird SAR and two bird SCC were observed within the study area, including Barn Swallow (SAR), Red-headed Woodpecker (SCC), and Eastern Wood-Pewee (SCC). None of these species have habitat within the proposed development footprint.

4.3.2 Herpetofauna

According to the Ontario Amphibian and Reptile Atlas (Ontario Nature 2019), 24 species of herpetofauna are reported from within 10km of the property. Field investigations, conducted by Dougan and Associates et al. (2018) confirmed the presence of 11 species within the study area. A total of one herpetofauna regulated SAR (Blanding's

Turtle), and one SCC (Snapping Turtle), were observed within the study area, but none within the proposed development footprint.

Appendix I provides a summary of SAR and SCC herpetofauna observed in the study area, as well as a description of their habitat. A complete list of herpetofauna reported from the study area, based on background information and observations made as part of this study, is included in Appendix V. The results of species-specific surveys are detailed in the following sections.

4.3.2.1 Anurans (Frogs and Toads)

A total of four species of anurans were recorded during anuran call surveys within the study area. These species included Spring Peeper (*Pseudacris crucifer*), Gray Treefrog (*Hyla versicolor*), Green Frog (*Lithobates clamitans*) and American Toad (*Anaxyrus americanus*). Table 9 provides a summary of the results of anuran calls surveys within the study area.

Table 9. Anuran Call Survey Results

Station	Species	Anuran Call Survey[1]			Total Species	Total Individuals[2]
		1	2	3		
ANR-002	Spring Peeper	Code 3	Code 3		2	Code 3 x 2 = 30
	Gray Treefrog		Code 3	Code 3		
ANR-003	Spring Peeper	Code 2(9)	Code 2(5)		4	Code 3 + 20 = 35
	Gray Treefrog		Code 3	Code 2(13)		
	Green Frog		Code 2(3)	Code 2(4)		
	American Toad	Code 2(7)				

[1]Marsh monitoring protocol call code with estimated number of individuals in brackets
[2]Assumes 15 individuals for call code 3

In addition to anurans documented during anuran call surveys, Northern Leopard Frog (*Lithobates pipiens*) was observed during the road mortality surveys along Erbsville Road.

4.3.2.2 Snakes

A single species of snake, Eastern Gartersnake (*Thamnophis sirtalis sirtalis*), was observed during targeted active searches within the study area, which included the observation of two individuals. No snakes were observed under cover boards placed within the study area. In addition to snakes observed during targeted surveys, a road mortality Eastern Milksnake (*Lampropeltis triangulum triangulum*) was observed and

photographed along Erbsville Road near the intersection of Conservation Drive within the study area.

4.3.2.3 Turtles

Three species of turtles were observed during turtle basking, nesting and hatchling surveys. During the completion of basking turtle surveys between April 2013 and May 2016, Midland Painted Turtle (*Chrysemys picta marginata*) and Snapping Turtle were observed within the study area, but none were observed within the proposed development footprint. The majority of turtle observations in the study area came from surveys conducted in 2016 with just two Midland Painted Turtles observed at BAS-001 in 2013. Midland Painted Turtle was the most abundant turtle species within the study area: a single individual was observed at BAS-001 in 2016, and a high count of six individuals were recorded at BAS-002 on May 11, 2016. The only Snapping Turtle observed during basking surveys was a dead individual observed along the bank at BAS-001 on May 4, 2016. Although the individual was dead, this observation confirms the presence of Snapping Turtle within the study area.

Confirmed turtle nesting behaviour was not observed during turtle nest surveys completed within the study area. Two species of turtle were observed incidentally at BAS-001 during the completion of these surveys: a Snapping Turtle on June 12, 2016 and a Blanding's Turtle on June 10, 2016.

No turtles were observed during hatchling turtle surveys completed in the study area in 2013. No exit holes or other evidence of turtle nesting, such as raided nests were observed in the study area.

Blanding's Turtle is designated Threatened provincially and Endangered federally, and, as such, individuals and their habitat are provided protection under the Endangered Species Act, 2007. The identification of Blanding's Turtle habitat and its significance within the subject property are discussed in Section 5.2.2.

No suitable habitat for Snapping Turtle is present within the development footprint. Turtle SWH for the study area and subject property is discussed in Section 5.1.4.

4.3.2.4 Regionally Significant Herpetofauna

Three of the reptile and amphibian species observed in the study area are considered regionally significant (RMOW 1985a). These species include Blanding's Turtle, Eastern Milksnake and Red-spotted Newt. Blanding's Turtle is also a designated SAR, as such its habitat within the study area is discussed at greater length in Section 5.2.2. None of the regionally significant herpetofauna are reported from the proposed development footprint.

Habitat for Eastern Milksnake may be present within the study area; however, suitable habitat is limited within the proposed development footprint. The edges of the woodland and wetland ecosites may provide suitable for this species, these areas are largely outside the proposed development footprint and will be protected by buffers. Targeted cover board surveys and active searches did not locate any Eastern Milksnakes within the subject property, as such habitat is not considered to be present for this species within the proposed development footprint. A single Red-spotted Newt was observed to the extreme southwest of the study area in the pond behind 665 Erbsville Road, Map 4. This pond is protected by its designation as PSW and ESPA; additionally, it is separated from the subject property by Erbsville Road, anticipated to be a significant barrier to herpetofauna dispersal.

4.3.3 Mammals

According to the Mammal Atlas of Ontario (Dobbyn 1994), 45 mammal species are reported from within 10km of the study area. Of these species, 12 were observed or evidence of their presence was detected within the study area during field surveys. No regulated SAR or SCC mammals were observed within the study area; however, targeted surveys were not completed for SAR bats and habitat for these species may be present within the study area. Candidate habitat for SAR bats is discussed in Section 4.4.3.2 below. Appendix V provides a complete list of mammal species reported from the study area. The results of targeted surveys for mammals are described below.

4.3.3.1 Winter Wildlife Survey

The winter wildlife survey was undertaken in the study area in order to identify areas of concentrated wildlife activity or movement. This survey focused on the margins of agricultural fields and woodlands as well as hedgerows. Wildlife movement was found

to be concentrated in these areas, and evidence of foraging and burrowing was also detected at the edges of forests and hedgerows. The most commonly detected species were Eastern Gray Squirrel (*Sciurus carolinensis*) and White-tailed Deer. Northern Raccoon (*Procyon lotor*) was detected moving through the CUW1 community in the north of the subject property. White-tailed Deer movement corridors are addressed as SWH in Section 5.1.4.4.

4.3.3.2 Bat Species at Risk

Several SAR bats were identified as having records from the vicinity of the study area during the completion of the SAR screening exercise. These species include Eastern Small-footed Myotis (*Myotis leibii*), Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*). Since no targeted field surveys were undertaken to confirm the presence of these species within the subject property, their habitat must be considered candidate. Important habitats for these species typically consist of hibernacula and maternity colony roost sites (Humphrey 2017; Humphrey and Fotherby 2019). No hibernacula or sites that would provide suitable features for hibernation are known from the study area. Maternity colony habitat for Little Brown Myotis, Northern Myotis and Tri-colored Bat are often found in buildings, rock crevices exfoliating bark and cavities in decaying trees (Humphrey and Fotherby 2019). Maternity habitat for Eastern Small-footed Myotis is poorly understood but thought to primarily consist of old buildings and rock crevices, cavities in dead or decaying trees may also be used (Humphrey 2017).

Natural occurring habitat for the four SAR bat species listed above would be confined to woodland areas of the subject property, these would include the CUW1, FOM, SWD7 and SWM communities. Suitable maternity colony habitat for SAR bats may also be present in the house located to the immediate northwest of the proposed development footprint, this building will be retained.

4.3.3.3 Locally Significant Mammal Species

Of the mammals observed in the study area, none are considered to be regionally rare. Three of the species are considered scarce regionally including, Beaver, American Mink and Coyote (RMOW 1985b).

4.3.4 Butterflies

According to the Ontario Butterfly Atlas (Macnaughton et al. 2020), 61 butterfly species are known to occur in the vicinity of the study area. Dougan and Associates biologists observed 10 species incidentally during surveys completed within the study area. A complete list of species observed is provided in Appendix V.

One butterfly species of Conservation Concern was observed within the subject property: Monarch. One species was observed that is considered to be regionally rare: Juvenal's Duskywing (*Erynnis juvenalis*) (Linton 2012).

4.3.4.1 Monarch

A single Monarch was photographed in the study area on June 12, 2013, and no additional observations were recorded. Suitable host plants for the species (Milkweed) are present along the edges of the subject property. No suitable habitat for Monarch is present within the proposed development footprint. Habitat for Monarch and its significance in the subject property is discussed further in Section 5.1.4.3.

4.3.5 Odonata

According to the Ontario Odonata Summary Atlas (NHIC 2005), 34 odonate (dragonfly and damselfly) species are reported from the vicinity of the study area. During field surveys conducted within the subject property, three (3) species of odonate were observed incidentally. None of the observed species are considered federally, provincially or regionally significant. A complete list of species observed is provided in Appendix V.

4.4 Aquatic Habitat

Three watercourses are present within the study area: Laurel Creek, Wideman Creek and a tributary of Wideman Creek. With the exception of the Wideman Creek tributary, these watercourses are associated with the Sunfish Lake-Laurel Creek PSW complex. Laurel Creek is present in the north and northwest of the subject property, while the remaining watercourses are found with the broader study area. A comprehensive characterization and assessment of aquatic habitat within the study area was undertaken by Dougan Associates (2018). These watercourses and their reaches are presented on Map 3 and described below.

4.4.1 Watercourse Characterization

4.4.1.1 Laurel Creek

Five reaches are identified for Laurel Creek within the study area (see Map 3). Reach L1 has a pool, riffle run channel form and substrate ranges between cobble and gravel in the riffles to sand and silt in the pools and slower runs. Woody debris was observed to be abundant in this reach. Vegetation along the banks of the watercourse is dominated by Eastern White Cedar as well as woody shrubs.

Reach L2 occurs behind the beaver dam and has many narrow channels due to flow from multiple points along the beaver dam, see Map 3. Channels in this reach have pool, riffle and run channel form. Substrate was observed to mainly be clay as well as some gravel and sand. Riparian vegetation was dominated by grasses and shrubs.

Reach L3 includes a ponded portion of the creek upstream of the beaver dam. Water velocity is slow and substrates were primarily silt. Groundwater seepage was evident along the north valley wall, the south wall could not be investigated as access was not granted by the landowner. Vegetation along the banks of this reach is mainly deciduous hardwoods.

Reach L4 is located upstream of the beaver dam to Erbsville Road. It has a pool, riffle, run channel configuration with cobble and gravel substrates. Erbsville Creek enters Laurel Creek in this reach. An abandoned road crosses this reach and erosion has occurred around the culverts as well as the remnants of a bypass channel and pond.

Reach L5 is located between from Erbsville Road to lands owned by the City of Waterloo beyond the western boundary of the study area. An investigation of this reach could not be completed by Dougan and Associates staff as access was not granted by the landowner.

4.4.1.2 Wideman Creek

Three reaches of Wideman Creek are identified within the study area. Reach W1 originates at the confluence with Laurel Creek in the southeast of the study area and extends to Erbsville Road. The reach is a narrow channel, braided in some places, with a pool, riffle and run channel form. The substrate in this reach is mainly hard till. Vegetation along the banks is mostly herbaceous with some woody shrubs also present. The Erbsville Road culvert does not act as a barrier to fish movement along the watercourse.

Reach W2 extends from Erbsville Road to the SWT2-2 community immediately north of the pond at 665 Erbsville Road. A naturally vegetated corridor between 3 and 10m wide is present along the reach. Vegetation consists of cattails, shrubs and small trees. It appears that the reach was straightened at some point given its very straight alignment, while natural meandering is still evident. The substrate is fine till and the reach has a run, pool and riffle channel form.

Reach W3 extends from the SWT2-2 community and beyond the study area boundary to Wideman Road. This reach is shallow with lots of woody debris present through the wetland. Three areas of groundwater seepage were noted, and it is likely that other smaller areas of groundwater discharge are also present.

4.4.1.3 Wideman Creek Tributary

A single reach of the Wideman Creek tributary is present within the study area. Reach WT-1 is located from the tributary's confluence with Wideman Creek along a roadside ditch west of Erbsville Road. The substrate is dominated by gravel, likely originating from the road shoulder. Watercress is present along the tributary suggesting limited groundwater discharge within the reach.

4.4.2 Fish Community and Habitat

Electrofishing was completed by C. Portt and Associates at three locations within the study area: two in Laurel Creek (EMS-001 and EMS-002) and one in Wideman Creek (EMS-003). The locations of fish sampling stations are present on Map 3. A total of 959 individual fish, representing 11 species, were captured during fish sampling within the study area. Iowa Darter (*Etheostoma exile*) was the most abundant species overall and was the most commonly encountered species at each sampling station. Iowa Darter and Brassy Minnow (*Hybognathus hankinsoni*) are considered coolwater species, typically found in watercourses that receive groundwater seepage. No fish SAR or SCC were observed within aquatic features in the study area. Full results of fish sampling surveys are presented in Table 10.

Table 10. Fish Sampling Survey Results

Species	Number of Individuals by Station			Total Individuals by Species
	EMS-001	EMS-002	EMS-003	
Blacknose Dace	2	39	1	42
Bluntnose Minnow	14	17	2	33
Brassy Minnow		13		13
Brook Stickleback			2	2
Creek Chub	2	56	2	60
Fathead Minnow	7		1	8
Iowa Darter	332	417	30	779
Largemouth Bass	1			1
Northern Redbelly Dace		6		6
Pumpkinseed	1			1
White Sucker	1	4	2	7
Total Species	**8**	**7**	**7**	**11**
Total Individuals	**360**	**559**	**40**	**959**

4.4.3 Trout Spawning Surveys

Trout spawning surveys were conducted in Laurel Creek and Wideman Creek within the study area. No evidence of salmonid spawning was observed during these surveys. Based on channel morphology, substrates and stream size, reaches L1 and L4 contain potential Brown Trout spawning habitat, and the same would likely be true for reaches L2 and L3 if the beaver dam were not present. Suitable spawning substrates for Brown Trout were not observed in Wideman Creek. Additional surveys for Redds are not recommend due to the comprehensive surveying undertaken as a part of previous studies in the area and the limited suitable habitat within the study area.

4.4.4 Benthic Invertebrate Sampling

Benthic invertebrates were sampled at four locations within the study area: three in Laurel Creek (BTH-001. BTH-002 and BTH-003) and one in Wideman Creek (BTH-004). The number of species identified per site ranged between 27 and 37, which is indicative of good water quality. The number of EPT (*Ephemeroptera*, *Plecoptera*, and *Trichoptera*) are consistent with moderately impacted water quality. The Hilsenhoff Biotic Index (HBI) is an indicator of the level of organic pollution, which shows fair to fairly poor water quality at the four sampling stations. Shannon-Weiner diversity indicates moderately polluted conditions at all sampling locations. Summarized results of benthic invertebrate sampling are present in Table 11.

Table 11. Results of Benthic Sampling Surveys

	Sampling Location			
	Laurel Creek			**Wideman Creek**
	BTH-001	**BTH-002**	**BTH-003**	**BTH-004**
Sampling Date (2014)	June 30	June 30	June 30	June 30
Number of Organisms	317	308	308	311
Taxa Richness	37	27	36	34
Water Quality Implied	non-impacted	non-impacted	non-impacted	non-impacted
Number of EPT Taxa	5	3	6	3
Water Quality Implied	moderately impacted	moderately impacted	moderately impacted	moderately impacted
HBI	6.7	6.0	6.9	6.4
Water Quality Implied	fairly poor	fair	fairly poor	fair
Shannon-Weiner Diversity	2.3	2.0	2.2	2.1
Water Quality Implied	moderately polluted	moderately polluted	moderately polluted	moderately polluted

4.4.5 Water Temperature

Water temperature was logged at five locations within the study area: three in Laurel Creek (TMP-001, TMP-002, TMP-003) and two in Wideman Creek (TMP-004 and TMP-005). Water temperature was found to be relatively consistent between the monitoring locations; however, it was considerably higher on a number of occasions at TMP-002 which was placed downstream from the beaver dam. Temperatures at TMP-002 was similar to other stations after significant rainfall events. This variation in temperature

suggests that this channel ceases to flow during low flow periods. As a result, the water temperature at this station rises. If this station is not taken into account, water temperatures in Laurel Creek did not exceed 24°C at TMP-001, and exceeded 24° on two days at TMP-003.

In Wideman Creek, water temperature at TMP-004 exceeded 24°C on one day, and were generally comparable to the temperatures of Laurel Creek. The creek was found to be notably colder at TMP-005, with a maximum of 19.9°C recorded.

The results of water temperature monitoring in Laurel Creek when compared to the nomogram derived from Ontario stream data and presented in Chu et al. (2009) indicate that it should be classified as a cool-warmwater or, possibly, coolwater stream. The results from Wideman Creek at TMP-004 indicate it is similar to Laurel Creek and indicate that it should be classified as a cool-warmwater or, possibly, coolwater stream. Results from TMP-005 indicate Wideman Creek at this location is a cold-coolwater or coolwater stream.

5.0 Significance and Sensitivity

The natural environment constraints analysis is used to identify natural features that are sensitive to disturbance based on the rarity or significance of the feature or its function, or policies that prohibit disturbance within them. These areas are identified as "constraints" and are discussed in the context of natural heritage policies governing their protection. As noted in previous sections, the proposed development footprint is comprised primarily of active agriculture with a hedgerow and small CUT1 community also located within the footprint of the proposed development. Constraints to significant natural features have been located outside of the proposed development footprint.

5.1 Natural Features

Information on designated natural areas, SWH, and wetlands was obtained from the ESES (Dougan and Associates et al. 2018), NHIC (MNRF 2020), the Region of Waterloo OP (2015) and the City of Waterloo OP (2020b).

5.1.1 Significant Wetlands

All of the wetlands within the study area and subject property are included in the Sunfish Lake-Laurel Creek PSW complex. The only waterbodies within the study area not included in the PSW are the Forest Gate stormwater management ponds. The Sunfish Lake-Laurel Creek PSW complex is present in the immediate north, northeast and east of the subject property (see Map 1). A wetland evaluation for the PSW complex was completed by the Ministry of Natural Resources in 2003 (Drabick 2003). A total of 109 wetland units were evaluated encompassing a total area of 811ha. The majority of wetlands within the PSW complex are swamps with some marsh (Dougan and Associates et al. 2018). All wetlands within the complex are either palustrine or riverine, with some small isolated wetlands also identified (Dougan and Associates et al. 2018). A variety of provincially and federally listed as well as regionally and locally rare wildlife species are known from the PSW complex.

The PPS (OMMAH 2014) states that development and site alteration is not permitted in significant wetlands; this policy applies to the Sunfish Lake-Laurel Creek PSW complex. In addition to the PPS, the Region of Waterloo OP (2015) and City of Waterloo OP (2020b) both identify that development is not permitted in PSWs, which are classified as

Core Environmental Features, with a few exceptions relating to essential infrastructure, and flooding and erosion control. In the context of the study area, the Sunfish Lake-Laurel Creek PSW provides significant wildlife habitat, habitat for Endangered and Threatened species and habitat for locally significant species.

The wetland boundary associated with the Sunfish Lake-Laurel Creek PSW complex was assessed in the field by an OWES certified Dougan and Associates staff member on August 15, 2014. These wetland boundaries were confirmed with GRCA staff during a site visit on August 18, 2014. Due to the length of time between the assessment of wetland boundaries by Dougan and Associates and this EIS, the wetland boundary was resurveyed by NRSI staff during a site visit on December 8, 2020 (no snow cover present). Since the wetland boundary delineated by NRSI in December 2020 varied little from the boundary recorded in 2014, it is the opinion of NRSI that the updated wetland boundary should not need to be confirmed by GRCA staff. The wetland boundaries delineated by Dougan and Associates and NRSI are presented on Map 4.

The ESES (Dougan and Associates et al. 2018) identifies that through discussion with the GRCA, a 30m buffer from the PSW is recommended. The 30m PSW buffer will extend from the wetland boundary delineated by Dougan and Associates and confirmed by the GRCA in 2014, see Map 5. The proposed buffer will effectively protect the PSW from edge effects and will provide improved wildlife habitat along the wetland boundary.

5.1.2 Environmentally Significant Policy Areas (ESPA)

The Laurel Creek Forest ESPA (#80) is located to the north, northeast and east of the subject property and is closely associated with Laurel Creek (see Map 1). The ESPA is a Core Natural Feature in the City of Waterloo's OP (2020b) and the Regional OP (Region of Waterloo 2015). Development or site alteration of Core Natural Features is not permitted under the policies in these official plans. The forest is primarily a combination of swamp and upland communities and provides an important natural corridor between Schaefer's Woods ESPA, west of the study area, and the Laurel Creek Reservoir, east of the study area. The woodlands associated with the ESPA provide significant wildlife habitat, habitat for Endangered and Threatened species and habitat for locally significant wildlife. Most of these habitats are concentrated within the portion of the ESPA that coincides with the PSW. Laurel Creek, a coolwater stream is located

within the ESPA, sections of this watercourse have been rehabilitated to provide improved fish habitat. In addition to being identified as an ESPA, the woodland qualifies as a Significant Woodland under the Natural Heritage Reference Manual (NHRM) (OMNR 2010).

The boundary of the Laurel Creek Forest ESPA within the study area was flagged by Dougan and Associates staff on August 19, 2014, following guidance provided by Region of Waterloo staff. The ESPA boundary generally followed the dripline of boundary trees or the edge of agricultural fields. The ESPA boundary was assessed in the field by Region of Waterloo staff on October 10, 2014; a portion of the EPSA boundary within the subject property was adjusted to exclude the residential property and Cultural Thicket at the northwest of the subject property. On December 8, 2020, NRSI biologists re-flagged the woodland dripline within the subject property to confirm that it had not changed significantly since it was delineated in 2014. Based on this site visit the woodland dripline was found to be virtually the same as the boundary surveyed in 2014; as such it is not expected that the dripline/ESPA boundary will need to be confirmed by Region of Waterloo staff. The ESPA/woodland dripline boundary surveyed in 2014 and 2020 are presented on Map 4.

The ESES recommends a 10m buffer from ESPAs and woodlands within the study area (Dougan and Associates et al. 2018). The 10m buffer will be established from the woodland dripline delineated by Dougan and Associates, this dripline is coincident with the Laurel Creek Forest ESPA boundary, see Map 5. The established 10m buffer will provide protection to the woodland and ESPA from edge effects related to the development and will be enhanced to improve wildlife habitat in an area that is currently comprised of anthropogenic, agricultural and cultural vegetation communities.

5.1.3 Watercourses

Laurel Creek, a coolwater stream system, is located within the subject property and study area. This watercourse provides habitat for a variety of fish species and provides a natural corridor for wildlife moving between the Schaefer Woods ESPA and the Laurel Creek Reservoir. Watercourses in the Region of Waterloo are regulated by the GRCA, and perennial watercourses are considered to be Supporting “A” Natural Features under the City of Waterloo OP (2020b). The form and ecological function of Supporting Natural

Features are to be maintained, enhanced, or where feasible restored. The City of Waterloo recommends a 30m buffer on either side of perennial watercourses, from the bankfull channel (City of Waterloo 2020b). The ESES identifies a 30m buffer from Laurel Creek, this recommendation has been carried forward and the 30m watercourse buffer is located outside of the proposed limit of development, except for some minor encroachment associated with the proposed stormwater management pond, see Map 5.

5.1.4 Significant Wildlife Habitat

Based on the results of a comprehensive background review and a review of the ESES, candidate SWH types were identified within the study area and subject property, but not within the development area. Significant Wildlife Habitats are considered to be Supporting "A" Natural Features in the City of Waterloo OP (2020b). Based on background information review, desktop analysis, and field studies completed by Dougan and Associates (2018), no SWH types are considered present in the proposed development area. SWH that are present adjacent to the development footprint and were considered for the subject property are discussed in detail in the following sections and shown on Map 5.

5.1.4.1 Seasonal Concentration Areas

Wildlife seasonal concentration areas are defined as areas where animals occur in relatively high densities for all, or portions, or their life cycle (OMNR 2000). These areas are generally small in size, particularly when compared to areas used by these species during other times of the year.

<u>Bat Maternity Colonies – Not SWH</u>

Habitat for bat maternity colonies has been identified as candidate for the study area and a portion of the subject property, based on the ESES. The FOM, SWD7 and SWM communities within the subject property may provide cavity trees that have the potential to be occupied by bat maternity colonies. Suitable bat maternity habitat SWH is not present within the proposed development footprint. Candidate areas for this SWH are entirely contained within the boundaries of the Laurel Creek Forest ESPA and the Sunfish Lake-Laurel Creek PSW complex.

Turtle Wintering Habitat – Not SWH

Suitable habitat for turtle wintering is potentially present within Laurel Creek as well as in the SWD7, SWM and SWT3-2 communities within the study area and subject property. Laurel Creek and these vegetation communities are entirely contained within the Sunfish Lake-Laurel Creek PSW complex, and do not overlap with the proposed development footprint.

Snake Hibernaculum – Not SWH

Candidate snake hibernaculum SWH was identified by Dougan and Associates for an old building foundation within the CUT1 community at the northwest end of the proposed development footprint, see Map 4. It is the opinion of NRSI that this foundation would not provide suitable habitat for snake hibernation. Snakes need to hibernate between the frostline and the groundwater table, in what is referred to as the life zone (OMNRF 2018). Due to the proximity of the foundation to Laurel Creek and the Sunfish Lake-Laurel Creek PSW complex it is anticipated that groundwater would be too close to the surface to provide suitable hibernacula in the vicinity of the old foundation. The approximate groundwater depth at the old building foundation is 348masl; it can be inferred from spot elevations in the ESES that the ground elevation in this area is approximately 349masl (Dougan and Associates et al. 2018). Frost depth in southern Ontario is typically between 62 and 122cm below ground surface (likely closer to 122cm in the Region of Waterloo) (Armstrong and Csathy 1963). Based on these elevations and the depth of frost in Southern Ontario it is likely that the frost line and groundwater table would be too close together to provide suitable hibernacula habitat for snakes. For this reason, the foundation would not provide snake hibernaculum SWH.

5.1.4.2 Specialized Wildlife Habitat

Specialized wildlife habitats include those that support wildlife species with highly specific habitat requirements, areas with exceptionally high species diversity, and/or areas that provide habitat that greatly enhances a species' chance of survival (OMNR 2000). The SWHTG indicates that most specialized habitats have not been formally identified or mapped by any agency (OMNR 2000).

Turtle Nesting Area – Not SWH

Turtle nesting area SWH was identified in the ESES for lands adjacent to the study area. All areas of turtle nesting SWH identified were located to the west of Erbsville Road. Suitable habitat was considered to potentially be present within the agricultural field in the subject property; however, turtle nesting surveys undertaken by Dougan and Associates in 2013 and 2016 did not identify any evidence of turtle nesting within the 720 Erbsville Road subject property. As such, this SWH is not present within the proposed development footprint.

Seeps and Springs – Not SWH

Seeps and springs are considered candidate in forested vegetation communities within the study area and subject property. No suitable habitat for seeps and springs is present within the proposed development footprint and the vegetation communities this SWH may occur in are entirely contained within the boundaries of the Laurel Creek Forest ESPA and the Sunfish Lake-Laurel Creek PSW complex.

Amphibian Breeding Habitat (Woodland) – Not SWH

No suitable amphibian breeding habitat (woodland) is present within the proposed development footprint and the wetland communities occupied by this SWH are entirely contained within the boundaries of the Laurel Creek Forest ESPA and the Sunfish Lake-Laurel Creek PSW complex.

5.1.4.3 Habitat for Species of Conservation Concern

Species of Conservation Concern are species with a provincial S-rank of S1 to S3, species listed as species of Special Concern provincially, or species listed as Endangered or Threatened nationally with no provincial designation (i.e., not protected by the ESA). Confirmed habitat for SCC may be considered Significant Wildlife Habitat (OMNR 2000). Three SCC were observed within the subject property during the completion of field surveys, but not within the proposed development footprint: Eastern Wood-Pewee, Snapping Turtle and Monarch.

5.1.4.4 Animal Movement Corridors

Animal movement corridors are elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another (OMNR 2000, MNRF 2015). They can include natural landscapes such as shorelines as well as anthropogenic features

such as trails, hedgerows and hydro corridors.

Deer Movement Corridors – Not SWH

In the ESES, deer movement corridor SWH was considered candidate for the subject property based on the presence of deer winter congregation areas to the west of the study area, in the large coniferous forest associated with the Schaefer's Woods ESPA. The winter wildlife survey, conducted by Dougan and Associates, identified the presence of a deer movement corridor between this winter congregation area and natural features to the east of the study area, including the Laurel Creek Reservoir. The deer movement corridor, considered candidate in the ESES, is located along the hedgerow to the southeast of the subject property, within the proposed development footprint.

The presence of this deer movement corridor was identified prior to the construction of the Regal Place subdivision. The construction of the subdivision significantly reduces the functionality of the hedgerow as a movement corridor for deer. The corridor associated with Wideman Creek is anticipated to provide a more suitable corridor for wildlife movement; this is stated in the ESES and was confirmed by agency staff. The Wideman Creek corridor is located 80m south of the southeastern hedgerow within the subject property, and as a result the hedgerow is considered redundant as a deer movement corridor. As the functionality of the southeastern hedgerow has been significantly inhibited by the construction of the Regal Place subdivision, and Wideman Creek provides a much more suitable deer movement corridor, the hedgerow in the southeast of the proposed development footprint is not considered deer movement corridor SWH.

5.1.5 Corridors and Linkages

Corridors and linkages are naturally or anthropogenically vegetated pathways between larger natural features in the landscape. They allow wildlife to move between otherwise disjunct areas of habitat, which facilitates access to different foraging, wintering and breeding area and allows for gene flow between wildlife populations. No designated corridors or linkages have been identified within the study area based on a review of background information sources. Three potentially suitable ecological linkages are present within the subject property, connecting natural features to the east and west of Erbsville Road. These potential linkages are present in three locations within the study

area, along Wideman Creek in the south of the study area, along the hedgerow in the south of the subject property (discussed in Section 5.1.4.4) and along Laurel Creek in the north of the study area, see Map 4 (Dougan and Associates et al. 2018).

The Wideman Creek corridor is located at the south end of the subject property and is comprised of riparian vegetation along the banks of Wideman Creek. It is considered the highest quality linkage in the study area (Dougan and Associates et al. 2018). The Final Subwatershed Management Plan 309/313 makes recommendations to strengthen the linkage function. This includes upgrading the culvert to Regional Storm capacity, designing the new culvert to provide opportunities for wildlife movement and planting native species within the 30m buffer applied to the creek. Marsh areas associated with Wideman Creek will be maintained. This enhanced wildlife corridor will allow for increased movement between natural features to the east and west of Erbsville Road and reduce road mortality. As a Secondary "A" Natural Feature, perennial watercourse, a 30m buffer applies to both sides of Wideman Creek. The 30m buffer does not overlap the subject property and has not been mapped.

Impacts and mitigation measures relating to the removal of the southeastern hedgerow are discussed in Section 6.3.6.

The Laurel Creek linkage is present in the north of the study area along the watercourse, and is part of the Laurel Creek Forest ESPA. This linkage provides a secondary movement corridor for wildlife in the study area and its vicinity. The linkage will be preserved by the 30m buffer applied to the PSW, and the 10m buffer from the ESPA.

5.2 Habitat of Endangered and Threatened Species

Based on the results of wildlife-specific field surveys detailed in Section 4.4, Category 3 habitat for Barn Swallow has been identified in the proposed development footprint. Category 2 habitat for Blanding's Turtle is present within the subject property and Category 3 habitat is located in the proposed development footprint. As per a recommendation in the ESES (Dougan and Associates et al. 2018) and the Erbsville South Block Plan (City of Waterloo 2020a), an Information Gathering Form has been submitted to the MECP.

5.2.1 Barn Swallow

A very small area of Category 3 Barn Swallow habitat is present in the extreme southwestern corner of the proposed development footprint, see Map 5. The Category 3 habitat within the proposed development area has been identified based on the presence of Barn Swallow nests in two locations within the study area, one behind 665 Erbsville Road and another at 521 Forest Gate Crescent. Category 3 habitat is considered the SAR habitat classification that has the most tolerance to alteration (OMNRF 2013c). Impacts relating to the removal of this habitat are discussed in Section 6.3.4.1.

5.2.2 Blanding's Turtle

Based on two observations of Blanding's Turtle within the area in 2016, Category 2 and Category 3 habitats for the species have been identified in the subject property (Dougan and Associates et al. 2018). Category 2 habitat has been identified in all wetland habitats within the subject property, this habitat also includes a 30m buffer from the edge of wetlands. As wetlands within the subject property are confirmed as part of the Sunfish Lake-Laurel Creek PSW complex, the boundary of Category 2 Blanding's Turtle habitat coincides with the PSW boundary and its buffer.

Category 3 habitat for Blanding's Turtle is more broadly defined and includes the area 30 to 250m around suitable wetlands and waterbodies. This habitat provides movement corridors for the species. Dougan and Associates completed a thorough analysis of Category 3 habitat for Blanding's Turtle within the study area (2018). The assessment generally assumed that, in areas where watercourses joined one wetland to another, the path taken would likely coincide with the watercourse as it provides the path of least resistance. This was also assumed when the watercourse does not provide the shortest route between two wetlands. Overland routes were included when they were considered logical and all habitats within the study area were assessed for this habitat; developed areas were excluded from the habitat. The MNRF also completed an assessment of Category 2 and 3 habitats for Blanding's Turtle, which is similar but slightly more extensive than the habitat mapped by Dougan and Associates (2018). The location of Category 2 and 3 habitats for Blanding's Turtle, based on the ESES and the MNRF's assessment, is presented on Map 5.

Category 3 habitat for Blanding's Turtle overlaps with the proposed development in the southeast, south and southwest of the subject property. Impacts and mitigation measures to address the removal of this habitat are discussed in Section 6.3.4.2. An Information Gathering Form (IGF) has been prepared by NRSI to identify habitat for Blanding's Turtle within the subject property and any anticipated impacts will be discussed. Dependent on comments received from the MECP, it may be necessary to pursue an authorization under the Endangered Species Act. Generally, habitat associated with Laurel Creek and the Wideman Creek corridor appears to provide more suitable travel corridors for Blanding's Turtle. It seems unlikely that a turtle would leave these watercourse systems to venture overland to rejoin the watercourse, even if it provides a shorter direct distance. It should additionally be noted that Erbsville Road is a significant barrier for Blanding's Turtle (and other herpetofauna species) movement; the most suitable route would be through the Wideman Creek culvert at Erbsville Road, once it has been updated and enhanced.

5.2.3 Bat Species at Risk

Targeted surveys were not undertaken for SAR bats within the study area. Potentially suitable maternity colony habitat for 4 bat SAR, Eastern Small-footed Myotis, Little Brown Myotis, Northern Myotis and Tri-colored Bat, is present within woodland communities located within the subject property. Any SAR bat habitat associated with woodland communities in the subject property would not be impacted by the proposed development. Suitable SAR bat habitat may also be found in the house to the immediate northwest of the proposed development footprint. This building will not be altered or demolished as part of the proposed development construction.

5.3 Summary of Natural Feature Constraints

Buffers are required for natural heritage features such as woodlands, wetlands, significant wildlife habitats, and watercourses to protect them from impacts during and following development. Table 12 provides a summary of buffers and constraints identified for the proposed development at 720 Erbsville Road. The buffers from natural features adjacent to the proposed development have been smoothed to create a uniform edge and contiguous natural features, as is recommended in the ESES (Dougan and Associates et al. 2018) and the Erbsville South Block Plan (City of Waterloo 2020a). Employing this approach will result in slightly variable buffer widths along the limit of

development, but will provide a uniform natural edge to the buffers instead of a jagged edge with small projections. Buffers for the subject property maintain a distance of approximately 30m between the limit of development and natural features including the Laurel Creek-Sunfish Lake PSW complex and the Laurel Creek watercourse. The distance between natural features and the limit of development is 10m in width in areas where only the woodland dripline associated with ESPA #80 is present adjacent to the development. The limit of development, which includes the PSW, watercourse and ESPA/woodland buffers is shown on Map 6.

Table 12. Summary of Natural Feature Constraints for the Subject Property

Natural Feature Constraint	Regulatory and Permitting Considerations	Project Considerations
Sunfish Lake-Laurel Creek PSW Complex (Core Environment Feature)	• GRCA Ont. Reg. 150/06 • Region of Waterloo OP (2015) • City of Waterloo OP (2020b)	• Development and site alteration within the regulated wetlands are prohibited • It must be demonstrated through an appropriate study (e.g. EIS) that a proposed development within 30 m of a confirmed wetland boundary (within the area of interference) will not negatively impact the wetland or its ecological functions. • A minimum 10m buffer must be provided for Core Environmental Features • A buffer of approximately 30m from the delineated PSW boundary has been identified for all areas within the subject property and has been incorporated into the limit of development.
Laurel Creek Forest ESPA and Significant Woodland (Core Environment Feature)	• Provincial Policy Statement (OMMAH 2020) • Region of Waterloo OP (2015) • City of Waterloo OP (2020b)	• Development and site alteration are not permitted within ESPAs or Significant Woodlands • Development within 30 m of an ESPA or Significant Woodland must demonstrate no negative impact to the feature through an EIS • A minimum 10m buffer must be provided for Core Environmental Features • The woodland dripline and ESPA boundary have been delineated in the field and a 10m buffer has been identified from this boundary and incorporated into the limit of development.
Laurel Creek and Wideman Creek (Supporting “A” Natural Features and Fish Habitat)	• Provincial Policy Statement (OMMAH 2020) • Federal Fisheries Act (1985) • GRCA Ont. Reg. 150/06 • Region of Waterloo OP (2015) • City of Waterloo OP (2020b)	• Development and site alteration are not permitted within fish habitat, except in accordance with federal and provincial requirements to the satisfaction of the Department of Fisheries and Oceans • Development and site alteration are not permitted in Supporting “A” Natural Features • Supporting Natural Features will be maintained, enhanced, and wherever possible, restored. • A 30m buffer is recommended on either side of perennial watercourses, to be assessed through an EIS • A 30m buffer has been provided for Laurel Creek and Wideman Creek and is incorporated into the limit of development, the buffer for Wideman Creek has not been mapped as it does not overlap the subject property.

Significant Wildlife Habitat (Supporting “A” Natural Features)	• Provincial Policy Statement (OMMAH 2020) • Region of Waterloo OP (2015) • City of Waterloo OP (2020b)	• Development and site alteration are not permitted in Supporting “A” Natural Features. • Supporting Natural Features will be maintained enhanced and, wherever possible, restored • Six SWH are considered candidate for the study area and subject property, one SWH (Amphibian Breeding Habitat Woodland) has been confirmed within the subject property • All identified SWH, are entirely contained within the Sunfish Lake-Laurel Creek PSW complex or the Laurel Screek ESPA and will be provided by their respective 30m and 10m buffers
Corridors and Linkages	• Provincial Policy Statement (OMMAH 2020) • Region of Waterloo OP (2015) • City of Waterloo OP (2020b)	• Linkages will be identified through appropriate studies accepted by the City, once identified they are to be maintained, enhanced or wherever possible, restored • Three linkages have been identified within the study area, one along Laurel Creek, one along a hedgerow in the southeast of the subject property and one along Wideman Creek • The linkages along Laurel Creek and Wideman Creek will be maintained and provided a 30m watercourse buffer as described above • Future enhancements are proposed for the Wideman Creek corridor in the ESES and Erbsville South Block Plan • The linkage within the subject area overlaps the development footprint and is proposed for removal. This linkage is disconnected from any habitats to the west. Approximately 80m to the south is a higher quality connection associated with Wideman Creek corridor, a much more suitable wildlife corridor. A second linkage is also present where Laurel Creek crosses Erbsville Road, to the north of the proposed development area. • Impacts and mitigation measures associated with the removal of this linkage are discussed in Section 6.3.6.
Habitat of Endangered and Threatened Species (Barn Swallow and Blanding’s Turtle) (Core Natural Feature)	• Provincial Policy Statement (OMMAH 2020) • Endangered Species Act, 2007 • Region of Waterloo OP (2015) • City of Waterloo OP (2020b)	• Development and site alteration are not permitted within significant habitats of endangered and threatened species, except in accordance with provincial and federal requirements • The habitats of endangered and threatened species are identified as Core Environmental Features • Category 3 habitat for Barn Swallow has been identified within the subject property and development footprint. • As the cumulative loss of foraging habitat for Barn Swallow is less than 50% it is not considered a significant impact • Category 2 habitat for Blanding’s Turtle is present within the subject property, this habitat is entirely contained within the PSW complex and its buffer • Category 3 habitat for Blanding’s Turtle has been identified in the southeast, south and southwest of the subject area, within the development footprint. • Potential SAR bat habitat is present in the house located in the northwest of the proposed development footprint. • Impacts and mitigation measures relating to the removal of the Habitats of Endangered and Threatened Species are discussed in Section 6.3.4.

6.0 Impact Analysis and Recommendations

6.1 Description of the Proposed Undertaking

The development of the subject property has been guided by a number of environmental, planning and engineering studies over the past years. The ESES was prepared by Dougan & Associates, IBI Group, JTB Environmental Systems Inc., LVM, and C. Portt and Associates. This study was approved by the City of Waterloo Council in June 2018 and builds on existing environmental data from the Laurel Creek Watershed Study and the Subwatershed Management Plan (#309 and #313). It identifies natural features and functions for the 720 Erbsville Road study area and surrounding area and recommends development setbacks and mitigation measures for development within the study area. The Erbsville South Block Plan Study (City of Waterloo 2020a), prepared by WSP for the City of Waterloo, provides a general pattern for development within the study area, and conceptual road networks and locations for stormwater management facilities. The Block Plan Study identifies key planning considerations for future development within the study area and summarizes the findings of related studies including the ESES (Dougan and Associates et al. 2018). The proposed development concept for 720 Erbsville Road was designed using the recommendations and framework provided in these studies. The proposed development concept has been designed to avoid direct impacts to natural features and their functions.

Details on the lots, internal road layout, stormwater management, grading and servicing have been prepared for the proposed development at 720 Erbsville Road. Details on stormwater management, grading and servicing have been provided in a Functional Servicing and SWM Report prepared by IBI Group (2021).

The proposed residential development at 720 Erbsville Road will include 12 townhouse blocks, comprising 59 townhouse units, and 6 stacked townhouses, comprising 120 stacked townhouse units. At-grade driveway parking areas will be provided for all 59 townhouses and 194 surface parking spaces will be provided within the development, which will provide a total parking capacity for 253 vehicles (+/- 1.41 per unit). Two entrances to the residential development will be provided from Erbsville Road, and

Erbsville Road itself will be widened by approximately 2m. An internal road and sidewalk network will provide access to the development for drivers and pedestrians alike and a future internal connection road will be constructed to provide access to a future development to the south of 720 Erbsville Road. Considerable amenity space will also be provided within the development.

A stormwater management system will be developed on-site, whereby runoff will be collected from buildings, impervious surfaces and landscaped areas through sheet flow and catch basins. During minor storm events, runoff will be collected in the internal storm sewer system and directed to an on-site stormwater management pond in the northwest of the proposed development area. For any storms in excess of the sewer capacity, runoff will be directed overland to the stormwater management pond. Quantity and quality controls will be provided on-site and will meet pre-development conditions as required by the GRCA and City of Waterloo (IBI Group 2021).

The proposed development area will be graded so that storm runoff drains to low points in driveway and parking areas where it will be collected in catch basins. Water will then be directed to the proposed stormwater management pond via storm sewers. Runoff from storm events in excess of the 100-year storm will be conveyed overland to the proposed stormwater management pond. Impervious surfaces will be graded between 0.5% and 5% to provide adequate drainage. Landscaped areas will be graded between 3% and 33%, and in other areas where grading is not possible retaining walls will be installed (IBI Group 2021).

Servicing of the proposed development will be provided through connections to existing municipal infrastructure along Erbsville Road, with the exception of the storm sewers. An internal sanitary sewer system will be installed along the private laneways; this will tie into the sanitary sewer constructed along Erbsville Road for the Regal Place Subdivision.

The proposed development follows the land use structure of the Erbsville South Block Plan (City of Waterloo 2020a) and has been guided through the completion of numerous environmental, engineering and planning studies.

6.2 Approach to Impact Analysis

The boundaries of significant natural features and their associated recommended buffers were provided to the study team to guide the development proposal. This information was combined with other physical and planning constraints to come up with a suitable development plan for the property which respects the natural environment. The details of the undertaking prepared by MHBC (2021) are shown on Map 6. Further details of the proposed development, including stormwater management, grading, and servicing were prepared by IBI Group under separate covers (IBI Group 2021).

Potential impacts arising from the proposed undertaking were determined by comparing details of the proposed undertaking with the characteristics of the existing natural features and their functions. The following is a description of the types of impacts which will be discussed.

- Direct impacts to the natural features on the subject lands associated with disruption or displacement caused by the actual proposed 'footprint' of the undertaking.
- Indirect impacts associated with changes in site conditions such as drainage and water quantity/quality. Potential sources of indirect impacts associated with the proposed development include:
    - Water balance: The FSR and SWM Report provided by IBI Group (2021) provides a simplified approach to the assessment of pre- and post-development water balance for the subject property.
    - Water quality: The FSR and SWM Report provide by IBI Group (2021) describes the approach to protecting water quality.
    - Erosion and sedimentation during construction: An Erosion and Sediment Control (ESC) Plan will be required at the Site Plan stage. Preliminary recommendations and measures are included in this EIS and the FSR SWM Report (IBI Group 2021).
    - Indirect impacts to wildlife habitat: The natural features adjacent to the proposed development will be retained and buffered to protect them from potential impacts of new land uses, and opportunities for plantings and habitat enhancement are described.

- Induced impacts associated with impacts after the development is constructed such as subsequent demand on the resources created by increased habitation/use of the area and vicinity.

6.3 Direct Impacts and Mitigations

The approach to identifying and delineating the natural features and associated buffers was aimed at avoiding direct impacts from development on important natural features. Therefore, direct impacts to these natural features have been avoided.

6.3.1 Site Grading

A preliminary grading plan has been prepared by IBI Group and is described in the FSR and SWM Report (2021). Grading will be completed outside of all significant natural features and their identified buffers, with the exception of minor encroachment to allow for the construction of the stormwater management facilities.

Mitigation:

- *The limit of development and grading should be protected with heavy duty silt fencing in areas adjacent to natural features or isolated trees identified for retention.*
- *Graded areas should be re-vegetated as soon as possible to minimize erosion, the selected seed mix should contain species that are native and complementary to adjacent natural vegetation communities.*

6.3.2 Tree and Vegetation Removal

A total of 166 trees were inventoried or tallied by NRSI Certified Arborists within the proposed development area. The location of these trees was compared to the grading plan and recommendations for tree removal and retention are provided below. Based on the proposed development concept, direct impacts to natural features will include limited tree loss along the southeastern property boundary as well as in the vicinity of the proposed stormwater management facility, within the Mineral Cultural Thicket vegetation community (CUT1). The majority of the proposed development footprint is currently occupied by agricultural lands, and as a result, vegetation removal within natural vegetation communities will be limited to the CUT1 community and southeastern hedgerow.

The proposed undertaking will result in the removal of 166 trees. Trees to be removed include those situated within the grading limit or in close proximity that may incur root damage as a result of grading. All of the trees proposed for removal are located outside

of the boundaries of significant natural features. None of the trees proposed for removal are rare or regionally significant. A significant portion of the trees proposed for removal in the area of the proposed stormwater management pond are invasive, non-native Black Locust.

Mitigation:

- *It is recommended that tree protection fencing (and associated sediment and erosion control fencing) be installed at the grading line limit where vegetation communities abut the proposed grading area.*
- *Upon installation of the tree protection fencing, the area should be reviewed by a Certified Arborist to ensure that trees are properly protected and no limb or root damage has occurred.*
- *Vegetation should only be cleared where absolutely necessary.*
- *Areas to be cleared should be clearly marked using flagging tape, fencing, spray paint or other signage prior to the initiation of clearing activities.*
- *Trees will be felled into the area to be cleared to avoid damage to adjacent vegetation.*

6.3.3 Bird Nest Destruction

The Migratory Birds Convention Act (MBCA) protects migratory birds, their eggs and nests from being harmed or destroyed. Removal of trees and vegetation from the proposed development area should occur outside of the April 1 to August 31 time period.

Mitigation:

- *During the time period from April 1 to August 31 it is recommended that no clearing of vegetation occur within the 720 Erbsville Road property.*
- *The Canadian Wildlife Service (CWS) advises that, nest searches as a means of mitigating nest destruction during the core breeding period, may be undertaken in "simple" habitats such as isolated landscape trees, hedgerows, and constructed features where the potential to observe all active nests is relatively high. If required at the time of development, nest searches by a qualified biologist are a feasible strategy for portions of the proposed development area including isolated trees and the hedgerow in the southeast of the development area.*

6.3.4 Species at Risk

6.3.4.1 Barn Swallow

The proposed development will result in a slight reduction in foraging habitat for the species. The ESES provides a complete assessment of the reduction in Barn Swallow foraging habitat based on proposed developments at 665 Erbsville Road and 720 Erbsville Road. Calculations in ESES identify the total loss of foraging habitat for Barn Swallows using the two known nest sites as it relates to the proposed development at 720 Erbsville Road as well as a proposed future development at 665 Erbsville Road. These calculations also take into account the enhancement of proposed wetland, watercourse and ESPA/woodland buffers. Any reduction of foraging habitat for Barn Swallow that is less than 50% of the total habitat available is not considered to be significant and will not impact the species' ability to nest successfully in areas adjacent to the proposed development area (Dougan and Associates et al. 2018). The ESES identifies that foraging habitat for Barn Swallows nesting behind 665 Erbsville Road will be reduced by 32.7%, while those nesting at 521 Forest Gate Crescent will have their foraging habitat reduced by 16.5% (Dougan and Associates et al. 2018). The loss of available foraging habitat for both nest sites is considerably less than 50%, therefore no significant impacts to Barn Swallow Category 3 habitat are anticipated within the proposed development footprint.

Mitigation:

- *Native plantings and enhancements to buffer areas are recommended as general measures to ensure the functionality of the buffers and to increase the availability of habitat for wildlife species. A planting plan will be prepared for the buffer areas associated with the proposed development area. These buffer enhancements will improve the quality of foraging habitat for Barn Swallows nesting in the vicinity of the proposed development area by providing a more diverse insect population associated with a more heterogenous natural habitat (as opposed to agricultural field planted with corn).*

6.3.4.2 Blanding's Turtle

Category 2 habitat for Blanding's Turtle is present within the subject property and is considered to be moderately tolerant of alteration (OMNRF 2013d). As a result of the

buffer smoothing recommended in the ESES and Erbsville South Block Plan an area of approximately 0.05ha of Category 2 habitat for Blanding's Turtle overlaps with the proposed development area. The area is currently agricultural field and is generally unsuitable for the life processes of Blanding's Turtle. Smoothing of buffers provides natural features and wildlife habitat with a more contiguous and uniform edge, limiting cusps or projections which provide less suitable habitat and are susceptible to disturbance. Buffer areas outside of the limit of development and adjacent to natural features will be planted and enhanced to provide suitable habitat for species like Blanding's Turtle. The small overlap between the proposed development footprint and Category 2 Blanding's Turtle habitat is not anticipated to impact the species or its habitat. Additional mitigation measure or permitting that may be required by the MECP will be addressed at the detailed design stage.

Mitigation:

- *Native plantings and enhancements to buffer areas are recommended as measure to ensure the functionality of buffers and to increase the availability of suitable habitat for wildlife species. A planting plan will be prepared for the buffer areas associated with the proposed development area. These buffer enhancements will improve the quality of habitat for Blanding's Turtle since much of the Category 2 habitat area is currently agricultural field planted with corn.*

Category 3 habitat for Blanding's Turtle is present in the south of the proposed development footprint. The Category 3 habitat identified within the proposed development area consists of agricultural row crop, the highest quality portions of Category 3 habitat within the subject property are to be retained and enhanced where possible. Additionally, no Blanding's Turtles were observed using the development area for any part of their life cycle despite extensive field surveys. Category 3 habitat within the development area currently connects Category 2 habitat to Erbsville Road, where there is the risk of road mortality for turtles attempting to cross to the other side. The future enhancement of the Wideman Creek corridor and replacement of the culvert under Erbsville Road, as described in the ESES (Dougan and Associates et al. 2018) and Erbsville South Block Plan (City of Waterloo 2020a), are expected to provide a safer and more appropriate corridor for Blanding's Turtle as well as other turtle species attempting to travel from the Laurel Creek-Sunfish Lake PSW complex to the west side

of Erbsville Road. Direct impacts to Category 3 habitat for Blanding's Turtle within the development area are anticipated to be minimal and are not expected to adversely affect the ability of the species to carry out its life processes as long as appropriate mitigation measures are undertaken. An IGF has been submitted to the MECP identifying the removal of the habitat and proposed mitigation measures. Dependent on comments received from the MECP, it may be necessary to pursue an authorization under the Endangered Species Act for the removal of this habitat.

Mitigation:

- *In order to mitigate the loss of marginal Category 3 habitat within the proposed development area a planting plan will be prepared for buffer areas to increase the functionality of overland movement habitat for the species.*
- *The presence of the Wideman Creek corridor will ensure that a linkage is available between the Laurel Creek-Sunfish Lake PSW complex and Blanding's Turtle habitat on the west side of Erbsville Road.*

Since Category 3 habitat for Blanding's Turtle has been identified within the proposed development area, direct impacts to the species including mortality as a result of interactions with construction equipment are possible during the construction phase if proper mitigation measures are not taken.

Mitigation:

- *The proposed work area shall be surrounded with geotextile cloth fencing (exclusion fencing/sediment control measures) in order to exclude turtles from the work area and to prevent nesting in areas which may be disturbed by digging and other works. Fencing should be installed by late May to ensure that turtles aren't accessing the development area to nest before the fence goes up. Fencing is to be regularly inspected and maintained throughout the construction period. Any gaps in the fencing should be immediately repaired and replaced. Fencing will follow guidelines outlined in the documents, Reptile and Amphibian Exclusion Fencing (OMNRF 2013e) and Best Management Practices for Mitigating the Effects of Roads on Amphibian and Reptile Species at Risk in Ontario (OMNRF 2016b).*

- *In order to prevent migrating turtles from entering the developed areas, permanent wildlife fencing is recommended. Specifications to be provided at the detailed design stage.*
- *Prior to construction work starting, examination of the work area by a qualified biologist and the relocation of any wildlife is recommended.*
- *Site grading will occur outside of sensitive turtle habitats to the greatest extent possible to avoid contraventions of the ESA.*
- *To avoid impacts to the wetlands adjacent to the development, the existing drainage and stormwater management regime should be maintained during all construction activities.*
- *All on-site workers will receive SAR response training and shall be advised to stop work immediately and inform the Contract Administrator if any turtles or any other potential SAR are encountered during any phase of the work.*

6.3.4.3 Bat Species at Risk

No targeted surveys were completed for SAR bats during the completion of the ESES or during field work conducted by NRSI. Candidate SAR bat habitat has been identified in treed vegetation communities that are located outside of the proposed development footprint, these habitats will not be impacted by the proposed development. Tree removals are proposed in the southeastern hedgerow as well as the CUT1 communities within the proposed development footprint. Although these habitats do not provide habitat for SAR bats, they may be used as day roosts during the bat active season in Ontario, April 1 to September 31.

Mitigation:

- *To prevent harm to SAR bats, all proposed tree removal and vegetation clearing should be completed outside of the bat active season, April 1 to September 30.*

6.3.5 Significant Wildlife Habitat

Significant Wildlife Habitats associated with the subject property are confined to natural features including ESPA #80 and the Laurel Creek-Sunfish Lake PSW complex. Direct impacts to these habitats are not expected to occur as a result of the proposed development and both natural features are provided buffers that will also protect any associated SWH.

6.3.6 Corridors and Linkages

The hedgerow in the southeast of the development footprint has been identified as an ecological linkage in the ESES (Dougan and Associates et al. 2018). This ecological linkage is approximately 115m long and a single tree wide for most of its length. The hedgerow is proposed for removal in support of the development. The function of the hedgerow as a corridor is poor due to its narrow width and the barrier presented by Erbsville Road. The linkage function provided by the hedgerow has been degraded following the construction of the Regal Place Subdivision, to the west of Erbsville Road. The linkage is also redundant since the Wideman Creek corridor is located just 80m south of the hedgerow, and this corridor is much better suited to a linkage function and enhancement efforts. The presence of two wildlife corridors in close proximity to one another means that White-tailed Deer and other wildlife may attempt to cross Erbsville Road at multiple points, increasing the potential for collisions between wildlife and vehicles. The Wideman Creek corridor will provide a crossing location for which signage can be installed to inform motorists that it is a wildlife crossing location. Additionally, an alternative wildlife corridor is provided along Laurel Creek to the north of the proposed development footprint and will be retained in its existing condition. This corridor provides a second linkage should the Wideman Creek corridor be rendered ineffective at any point in the future.

Mitigation:

- *Enhancement of buffer areas within the subject property will help direct wildlife toward to Wideman Creek corridor.*
- *Grubbing of vegetation in the hedgerow should be completed in keeping with the mitigation measures recommended for tree and vegetation removal as well as those relating to bird nest destruction.*

6.4 Indirect Impacts and Mitigations

The following outlines potential sources of indirect impacts associated with the proposed development. These impacts are effects that are not a direct result of the development footprint, but can instead occur in areas adjacent to the development site. For the development at 720 Erbsville Road, these can include:

- Changes to groundwater and surface water flow patterns,

- Changes to water quality,
- Sedimentation and erosion, and
- Indirect impacts to wildlife.

6.4.1 Surface Flow and Groundwater Water Balance

A preliminary stormwater management strategy has been provided in the FSR and SWM report (IBI Group 2020), and demonstrates how the requirements of the GRCA and City of Waterloo are met. The stormwater management strategy is based on maintaining existing drainage patterns including pre-development infiltration rates and patterns. Stormwater runoff within the proposed development will be managed in two catchment areas. Catchment area 201 will attenuate runoff for all internal laneways, parking areas, rooftops and amenity spaces to an on-site stormwater management pond through collection in catchbasins and conveyance through on-site storm sewers. Water from catchment area 201 is eventually discharged to Laurel Creek. Catchment area 202 will convey runoff from the rear yard areas of townhouses, located to the east of the proposed development adjacent to Laurel Creek, to a swale for infiltration to the groundwater. Impervious area within catchment area 201 has been calculated to be 70% and is 40% in catchment area 202.

Surface flows in catchment area 201 will be directed to catchbasins located in the low points of roads and parking areas. Water will be conveyed from the catchbasins through storm sewers to the stormwater management pond in the northwest of the proposed development area. Water can be conveyed through the storm sewers for all storm events (2-year, 5-year and 25-year) with the exception of the 100-year storm. During the 100-year storm event, runoff will be directed overland to the stormwater management pond. Peak discharges have been calculated by IBI Group to be below allowable levels for all the storm events. This has been achieved through pond routing. An emergency overflow weir has been provided for any storm events in exceedance of the 100-year storm. Existing diffuse drainage patterns for the site will be maintained through the use of a level stone spreader outlet from the stormwater management pond. Specifications of the level stone spreader outlet will be provided at the detailed design stage (IBI Group 2021).

The proposed stormwater management pond has been designed to be large enough to detain runoff from the 100-year storm for over 48 hours as is required in the South Erbsville Block Plan (City of Waterloo 2020a). The stormwater management pond will allow the detention of 955m^3 of water which can be discharged over a 64-hour period; this will effectively control runoff volumes to Laurel Creek (IBI Group 2021).

Surface flows in catchment area 202 will drain overland to an infiltration swale proposed at the back of rear yard areas located in the catchment area. Runoff within catchment area 202 is at too low of an elevation to be conveyed to the stormwater management pond in the northwest of the proposed development area. The infiltration swale has been designed to store and infiltrate water up to the 100-year storm event (IBI Group 2021).

IBI Group has confirmed that the use of active infiltration measures will be feasible for the proposed development. This was confirmed through the Hydrogeological Investigation prepared by LVM (2015). Infiltration of runoff within the proposed development area will be achieved through lot-level infiltration galleries, the infiltration swale in catchment 202 and soakaway pits to be located throughout the development area. These measures will ensure that the existing infiltration rate of 195mm annually will be maintained (IBI Group 2021). The locations of these measures and details of their implementation are to be provided at the detailed design stage.

Mitigation

- *Implement the stormwater management strategy provided in the FSR and SWM report (IBI Group 2021).*
- *Implement measures to promote infiltration and enhance groundwater recharge in exceedance of existing conditions to meet the requirements of the Erbsville South Block Plan (City of Waterloo 2020a).*

6.4.2 Changes to Water Quality

The preliminary stormwater management strategy developed by IBI Group and described in the FSR and SWM report (2021) identifies how water quality will be maintained for the subject property and adjacent wetlands and watercourses. An Enhanced Protection Level is required for the downstream receiver, and 80% Total

Suspended Solids (TSS) removal for 90% of annual flows much be achieved by the stormwater management system. A treatment-train approach will be implemented for the proposed development, as is recommended in the Erbsville South Block Plan (City of Waterloo 2020a). The treatment-train approach will use an oil-grit separator unit as well as additional polishing and extended detention in a dry pond facility to meet the Enhanced Protection Level (IBI Group 2021).

Runoff within catchment area 201 will be treated using a Stormceptor oil-grit separator unit installed at the inlet to the proposed stormwater management pond. This unit will treat runoff generated within the internal roadways, parking areas and rooftops and will service an area of approximately 2.81ha. Using output generated by the Stormceptor software, the unit proposed for installation will provide TSS removal of 80% or greater for 90% of annual flows generated in this catchment (IBI Group 2021). Although the unit will meet the Enhanced Protection Level required, tertiary treatment of runoff will be implemented prior to discharge of water from the site. Since oil-grit separators are typically credited with achieving 50% TSS removal, the extended detention stormwater pond will provide the remaining 30% TSS removal. The stormwater management pond outlets to a level stone spreader outlet prior to discharging to Laurel Creek. The level stone spreader outlet will assist in maintaining the existing diffuse drainage patterns of the site and will mitigate thermal impacts by cooling water prior to its discharge overland to Laurel Creek. The level stone spreader outlet will also mitigate the effects of erosion by slowing discharged water and spreading it over a large area.

Runoff within catchment area 202 will be managed through the implementation of an infiltration swale along the rear yard areas in the east of the proposed development area which back onto the buffer to the PSW. This swale will treat runoff from the landscaped rear yard areas and infiltrate water to Laurel Creek and the associated PSW.

Provided that the preliminary storm water management strategy, developed by IBI Group, achieves 80% TSS removal for 90% of annual flows as described in the FSR and SWM report, no impacts to water quality are anticipated as a result of the proposed development.

Mitigation

- *Monitor Laurel Creek for changes in water quality following implementation of the proposed stormwater management strategy.*

6.4.3 Sediment and Erosion

During construction, areas of bare soil will be exposed which have the potential to erode during rainfall events and impact adjacent natural features. In the event of a heavy rain, sediment laden runoff can enter adjacent natural areas by way of overland flow. In order to protect on-site and off-site natural features from potential impacts due to sediment, an Erosion and Sediment Control (ESC) plan must be developed prior to any construction activities on the site. The details of the ESC plan will follow the Erosion and Sediment Control Guidelines for Urban Construction which will be provided during final design. The ESC plan will take in consideration recommendations provided in the ESES (Dougan and Associates et al. 2018).

A preliminary sediment and erosion control plan was provided in the FSR and SWM report prepared by IBI Group (2021) and includes:

- Silt fence erected around site perimeter before any work begins on the site to protect adjacent areas from migration of sediment in overland flow;
- A “mud mat” installed at the construction entrance(s) to the site to minimize the amount of sediment transported off site via construction vehicles; and
- Stabilization of all disturbed areas as quickly as possible to minimize erosion.

Mitigation:

- *A final ESC plan should be prepared and implemented taking into account recommendations provided in the ESES and details provided by IBI.*
- *An environmental monitoring program is recommended to ensure that the ESC control measures are installed, maintained and functioning as intended.*

6.4.4 Indirect Impacts to Wildlife and Vegetation Communities

Indirect disturbances can stress natural features and weaken their ecological integrity. Natural features in a weakened state are more susceptible to the establishment and proliferation of invasive, non-native species such as Black Locust. The establishment of

invasive species in natural vegetation communities reduces their ecological value by suppressing native species, reducing biodiversity, and decreasing habitat suitability. Potential indirect impacts to wildlife in adjacent natural features may arise from noise and dust associated with construction activities and unnatural lighting resulting from the development. Large amounts of dust can induce changes in vegetation due to increased heat absorption and decreased transpiration. Dust can also cause adverse effects to wetlands and aquatic systems through increased sedimentation. Indirect impacts associated with construction are anticipated to be temporary and localized; therefore, significant effects on wildlife from noise and dust are not expected.

Mitigation:

- *Dust and noise associated with construction is anticipated to be temporary.*
- *Best Management Practices for limiting dust should be employed, such as moistening areas of bare soil with water during construction activities and seeding areas of bare soil within 30 days of being inactive.*
- *Topsoil should be stockpiled in areas with limited exposure to wind and away from buffers and natural features.*
- *Construction activities should be limited on a daily basis to daytime hours (typically 7:00am to 7:00pm).*
- *Lighting designs should include shielding and directional lighting on roads and buildings to avoid lightwash impacts on wildlife and their habitats.*
- *Permanent wildlife exclusion fencing should be established at the limit of buffer areas to prevent wildlife including turtles from entering the proposed development.*
- *The limit of development should be well established to avoid excessive vegetation removal during grubbing, grading and other construction activities.*
- *Designated areas for construction lay-down, vehicle access, parking, equipment storage, stockpiling of materials and on-site construction offices should be located outside of natural features and their buffers, ideally these areas should be kept away from buffers to limit potential indirect impacts to natural features.*

Maintenance of the stormwater management ponds has the potential to impact wildlife such as amphibians and turtles which may take up residence in the pond. It is well

documented that Painted Turtles and Snapping Turtles move into man-made ponds after construction, and it is possible that the pond may attract Blanding's Turtles as well. The pond has been placed outside of the Category 2 habitat of Blanding's Turtle which will avoid the need for registering any maintenance works for an exemption under the ESA, but best management practices should be employed when planning pond clean out. Timing windows to avoid the active turtle season as well as wildlife salvage prior to activities will help avoid impacts to wildlife.

Mitigation:

- *Install permanent fencing (such as chain link plus a wildlife barrier) around the SWM pond to effectively exclude turtles (including juveniles) from the infrastructure.*
- *Assess wildlife use of the pond prior to clean-out. Avoid in-water maintenance of SWM pond during the summer season when turtles may be using the pond (i.e. avoid work during May 1 to August 31).*
- *Implement wildlife and fish salvage immediately prior to maintenance work (i.e. dredging), to ensure that turtles are not overwintering in the pond.*

6.5 Induced Impacts and Mitigations

Induced impacts are described as those that are not directly related to the construction or operation of the facilities in question, but rather arise from the use of the natural areas by humans as a result of the development. The regularly encountered example is occupancy effects such as increased use of natural areas by residents and their pets resulting in impacts such as unauthorized trail construction, introduction of non-native and invasive plant species, garbage dumping and wildlife disturbance and mortality. Once the development is completed, subsequent use of the natural areas by residents is difficult to control.

A variety of options are available to assist with the mitigation of potential impacts related to human occupancy, some of these are discussed in the ESES (Dougan and Associates et al. 2018). These include restricting or controlling human access into natural features through fencing or dense plantings at the interface of the development and natural area to prevent access and rear lot encroachment into buffers and other

sensitive areas. The City of Waterloo requires that standard chain-link fencing be installed along the interface of public/private spaces to prevent encroachment. Fencing should be located at the limit of buffers, or allowed encroachment. The potential low impact public trail system can assist in providing controlled access to less sensitive natural areas. Signage can also be provided along the trail to educate residents on the natural features and to recommend good practices for walking through natural areas (i.e. remain on trails, keep pets on-leash, respect plants and wildlife, etc.).

Education with respect to the values and appropriate stewardship of the neighbouring natural areas should be promoted through signage and environmental brochures. The City of Waterloo has a brochure entitled “Naturally Your Waterloo” that can be purchased and provided to homeowners.

6.6 Monitoring

The City of Waterloo requires pre, during and post construction monitoring as detailed in the ESES and the Erbsville South Block Plan. The reader is referred to these for more detail. As noted above, the pre-construction monitoring has been completed by Stantec for many years and is ongoing.

6.7 Impact Assessment Summary

A summary of potential impacts associated with proposed development, with associated recommended mitigations and significance of impacts once mitigated, are presented in Table 13.

Table 13. Summary of Potential Development Impacts and Mitigation

Potential Impact	Recommended Mitigation Measure(s)	Resulting Impact Significance
Design and Construction Phase		
Vegetation/habitat removal	• The proposed conceptual development occurs outside of the adjacent wetland and recommended 30m buffer, and outside of the Significant Woodland and recommended 10m buffer • A very small area of Category 3 Barn Swallow habitat will be removed. Category 3 habitat is considered most tolerant to disturbance and the quantity removed is below the percentage considered impactful to the species. • A small area of Category 3 Blanding's Turtle habitat will be removed. Category 3 habitat is considered most tolerant to disturbance and the habitat is currently agricultural field Buffer areas will be enhanced to provide additional habitat for the species and direct them to the Wideman Creek corridor. • The proposed conceptual development will not directly impact any significant wildlife habitats	• Not Significant
Impacts to Laurel Creek, Wideman Creek	• The proposed conceptual development is well removed from the creeks and is not anticipated to cause any negative impact to these watercourses or the fish habitat they provide. • No impacts to water quantity will result from the proposed development, all runoff from the subject property will be conveyed to the SWM pond or infiltration swale for eventual discharge to Laurel Creek. Peak flows are slightly below or equal to existing conditions for the proposed development area (IBI Group 2021). • The FSR and SWM report (IBI Group 2021) identifies how water quality will be maintained for runoff leaving the proposed development area.	• Not Significant
Bird nesting disruption and avoidance, and active nest destruction	• Time vegetation removal activities to occur outside the typical bird breeding season (April 1 – August 31) • If vegetation removal must occur during the bird breeding season, retain an avian biologist to survey for active nests just prior to vegetation removal activities	• Not Significant
Damage or other disturbance to the adjacent natural features	• Clearly demarcate the limits of construction with silt fencing around the perimeter of the construction zone	• Not Significant
Wildlife avoidance of the area, and other impacts associated with construction	• Restrict the daily timing of construction activities to between 7:00 am and 7:00 pm • Establish wildlife exclusion fencing at the limit of buffer areas • Areas of bare soil should be moistened with water to prevent dust and seeded if left inactive for more than 30 days • These construction-related impacts are expected to be temporary, minimal and localized	• Not Significant
Erosion and sedimentation	• A Sediment and Erosion Control Plan should be developed and implemented. • Install silt fencing along the boundaries of the construction zone, inspect on a regular basis, remove accumulated sediment as needed and immediately replace any damaged fencing	• Not Significant

Potential Impact	Recommended Mitigation Measure(s)	Resulting Impact Significance
Impacts to groundwater recharge/discharge functions	• The proposed development occurs outside of the adjacent wetland and associated 30m buffer, and is not anticipated to cause any impact to any groundwater discharge that has been observed in association with this feature. The FSR and SWM prepared by IBI Group (2021) identifies a stormwater management strategy to maintain infiltration and groundwater recharge at existing conditions for the proposed development area.	• Not Significant
Alterations to wetland hydrological balance	• The FSR and SWM prepared by IBI Group (2021) identifies a stormwater management strategy to maintain infiltration and groundwater recharge at existing conditions for the proposed development area. Active infiltration measures will be implemented to maintain the wetland hydrological balance. • Runoff rates to Laurel Creek and the PSW complex will be maintained through the extended detention pond, this facility will ensure that peak discharge rates are equal or slightly less than existing conditions (IBI Group 2021).	• Not Significant
Post-Construction Use		
Disturbances to adjacent and retained natural features on property	• No vegetation clearing should occur within the adjacent forest or wetland communities, or elsewhere within the subject property, with the exception of non-native species removal; • Garbage, leaf litter, and other debris should not be deposited within the adjacent forest or wetland, or within other existing subject property natural features; • The use of lawn or garden chemicals should be reduced or eliminated; • Any landscape plantings should use native species to avoid the proliferation of non-native species within adjacent natural features. • Household pet cats should not be permitted by the owners to roam within the adjacent natural features • “Naturally Your Waterloo” brochure should be distributed to residents	• Not Significant

7.0 Summary and Conclusions

NRSI was retained by Sunvest Development Corp. to complete an EIS for a proposed development at 720 Erbsville Road in the City of Waterloo, Ontario. This EIS builds on the characterization of natural features presented in the ESES (Dougan and Associates et al. 2018) as well as recommendations made in the Erbsville South Block Plan (City of Waterloo 2020a). It also incorporates the findings of 15 years of pre-construction terrestrial and water monitoring completed by Stantec on the subject property.

Barn Swallow and Blanding's Turtle, both Species at Risk, have been observed in the study area but not within the subject property. Category 3 habitat that overlaps the development footprint has been identified for both species in the ESES. A very small amount of Category 3 Barn Swallow habitat is present in the proposed development footprint, which is considered the most tolerant to disturbance. The quantity of habitat that will be removed is not considered to likely impact Barn Swallow based on correspondence with the MNRF provided in the ESES. Blanding's Turtle Category 2 habitat is present in wetland features on the subject property and within their 30m buffer. Category 3 habitat for Blanding's Turtle overlaps the development area and is proposed for removal. Since Category 3 habitat proposed for removal in the development footprint consists entirely of agricultural fields and buffer enhancements are proposed which will direct migrating Blanding's Turtles to the Wideman Creek corridor, negative impacts to the species are not anticipated. An IGF has been submitted to the MECP; dependent on comments received it may be necessary to pursue an authorization under the Endangered Species Act for removal of this habitat.

The woodland/wetland complex within the subject property is designated as an ESPA, PSW, Significant Woodland and a Core Natural Feature in the City of Waterloo's OP (2020b). Laurel Creek to the east of the subject property is a Supporting "A" Natural Feature in the City's OP and provides an important ecological linkage for wildlife movement. The proposed development footprint of the subject property is comprised almost entirely of agricultural lands with a small cultural thicket in the northwest and a hedgerow in the southeast. The cultural thicket contains a high percentage of invasive, non-native Black Locust. The hedgerow in southeast provides a poor movement corridor for wildlife: its quality has been degraded since the construction of the Regal

Place subdivision to the west of Erbsville Road and a more suitable ecological linkage, Wideman Creek, is located 80m to the south.

The ESES and Erbsville South Block Plan provide recommendations for development of the subject property as well as appropriate buffers and setbacks from natural features. These recommendations were employed for the design of the layout of the proposed development. Recommended buffers have been adhered to and have been smoothed as recommended in the ESES to maintain a uniform edge and improve the quality of habitat provided in buffer areas. Buffers adjacent to the development footprint will be allowed to naturalize and will be enhanced with native plantings. The enhanced buffer areas will provide improved habitat and movement corridors for Barn Swallow and Blanding's Turtle as well as other wildlife.

A Functional Servicing and Stormwater Management report has been prepared by IBI Group (2021) that demonstrates how the development design will meet the criteria of provincial and local policies (GRCA, City of Waterloo) and the ESES for quantity, quality, erosion control, infiltration and thermal mitigation. These criteria will be achieved through on-site stormwater management facilities, infiltration of runoff, use of a level stone spreader outlet to maintain the thermal regime of watercourses and implementation of a treatment train approach to protect water quality.

Mitigation and compliance monitoring measures have been provided by the team of IBI Group and NRSI to avoid, minimize and lessen any potential impacts during the construction process and occupancy by residents. The need for a pre, during and post construction monitoring program has been identified, the details of which will be identified at the detailed design stage. The program will aim to track and compare environmental conditions of the subject property and adjacent natural features to ensure that negative impacts do not occur as a result of the development.

The development concept for 720 Erbsville Road has been located outside of natural features and their buffers. The plan identifies how buffer areas will be established between the proposed development and natural features to ensure that negative impacts do not occur. This report provides recommendations to minimize impacts and ensure that mitigative measures are installed and functioning property. Assuming the

recommendations in this EIS and reports by the study team are implemented, no negative impacts to natural features or their ecological functions are anticipated as a result of the proposed development.

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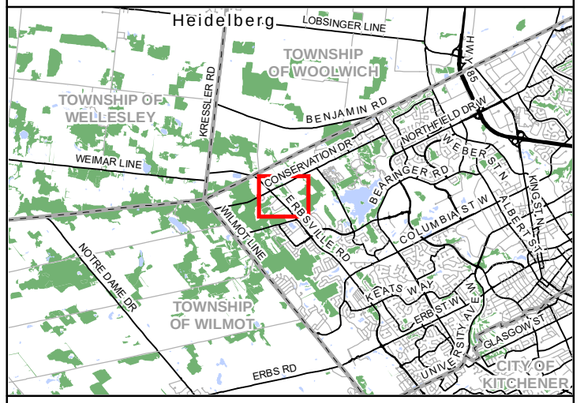
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MAPS

Map 1

720 Erbsville Road
Environmental Impact Study
Study Area and Natural Features



Legend

- Subject Property
- Study Area
- Regal Place Subdivision
- ESPA #80 (Region of Waterloo, 2016)
- Permanent Watercourse
- Water Body
- Provincially Significant Wetland (PSW)
- Other Wetland (Non-PSW)
- Unevaluated Wetland

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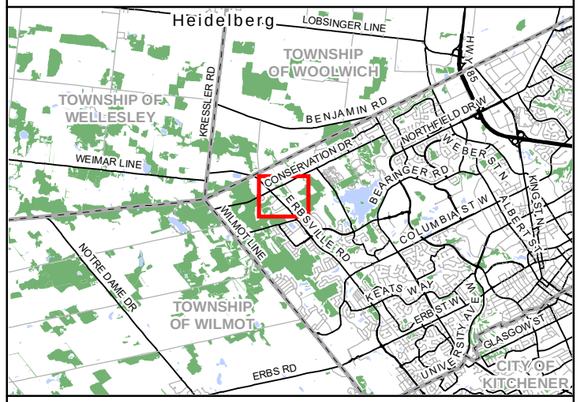
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Map 2

720 Erbsville Road
Environmental Impact Study
Terrestrial Field Surveys



Legend

- Study Area (200m)
- Subject Property
- Tree Inventory Area
- Photographic Edge Monitoring Station (Stantec)
- Vegetation Monitoring Transect (Stantec)
- Anuran Call Station (ANR)
- Salamander Trap Placement (SAL)
- Turtle Basking Survey (BAS)
- Snake Board (SNK)
- Breeding Bird Survey (BBS) Transect
- Road Mortality Survey
- Permanent Watercourse
- Water Body

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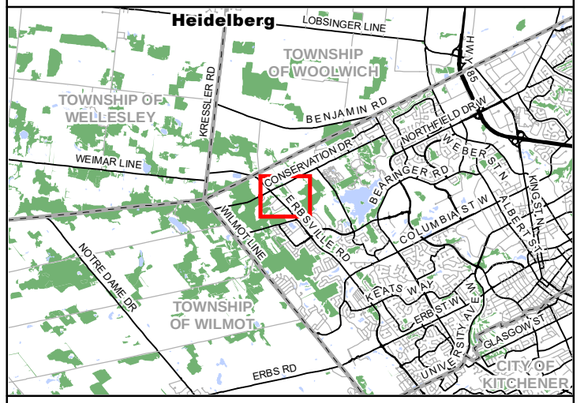
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Map 3

720 Erbsville Road
Environmental Impact Study
Aquatic Survey Locations



Legend

- Study Area (200m)
- Subject Property
- Beaver Dam
- Benthic Sampling (BTH)
- Temperature Logger (TMP)
- Electrofishing Station (EMS)
- Spawning Survey (2013)
- Spawning Survey (2014)
- Watercourse Reach
- Reach Break
- Water Body

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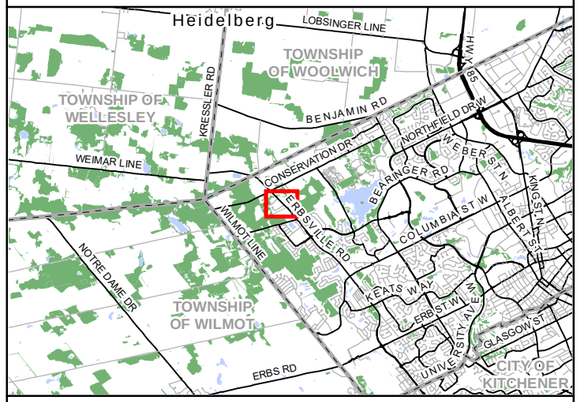
CONSERVATION DRIVE
SCHNARR STREET
REGAL PLACE
ERBSVILLE ROAD
FOREST GATE CRESCENT
Laurel Creek
Laurel Creek
Wideman Creek

SWD7
SWD7
FOD8-1
CUW1
ANTH
CUT1
SWT3-2
SWM
SWM
SWM
AG
ANTH
HR
ANTH
HR
ANTH
AG
FOM
HR
HR
AG
HR
ANTH
SWT2-2
SWC4-2
SAS1

Map 4

720 Erbsville Road Environmental Impact Study

Existing Conditions



Legend

- Subject Property
- Study Area
- Building Foundation
- Red-spotted Newt
- Wetland Boundary (NRSI 2020)
- Wetland Boundary (GRCA Confirmed 2014)
- Dripline (NRSI, 2020)
- Dripline (Dougan & Associates, 2014) / ESPA (#80) Boundary
- Permanent Watercourse
- Laurel Creek Linkage
- Southeastern Hedgerow Linkage
- Wideman Creek Linkage
- Ecological Land Classification (Dougan and Associates 2018)

(AG) Agricultural

(ANTH) Anthropogenic

(CUT1) Mineral Cultural Thicket Ecosite

(CUW1) Mineral Cultural Woodland Ecosite

(FOD8-1) Fresh - Moist Poplar Deciduous Forest Type

(FOM) Mixed Forest

(HR) Hedgerow

(SAS1) Submerged Shallow Aquatic Ecosite

(SWC4-2) Tamarack Organic Coniferous Swamp Type

(SWD7) Birch - Poplar Organic Deciuous Swamp Ecosite

(SWM) Mixed Swamp

(SWT2-2) Willow Organic Thicket Swamp Type

(SWT3-2) Willow Organic Thicket Swamp Type

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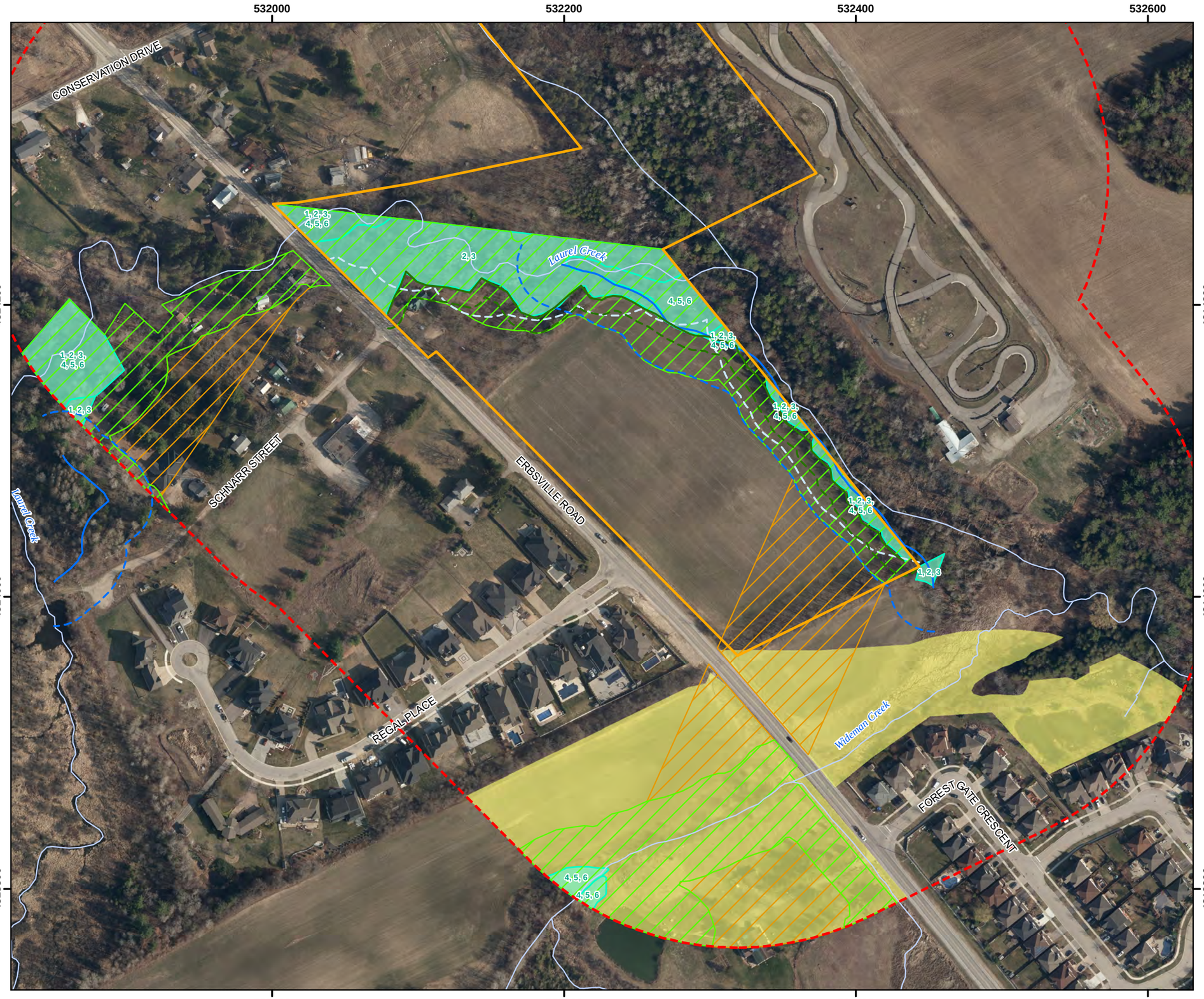
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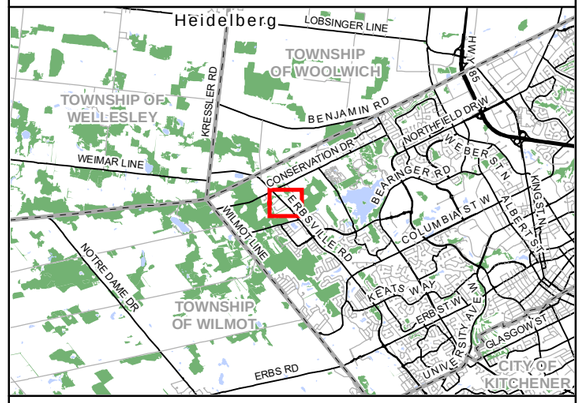
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Map 5

720 Erbsville Road
Environmental Impact Study
Significance and Sensitivity





Legend

- Subject Property
- Study Area
- Dripline / ESPA (#80) Boundary (Dougan and Associates 2014)
- Dripline / ESPA (#80) Buffer (10m)
- PSW Boundary (GRCA confirmed 2014)
- PSW Buffer (30m)
- Permanent Watercourse
- Watercourse Buffer (30m)
- Barn Swallow Category 3 Habitat
- Blanding's Turtle Category 2 Habitat
- Blanding's Turtle Category 3 Habitat
- Significant Wildlife Habitat (SWH)

1. Bat Maternity Colonies (Candidate)
2. Seeps and Springs (Candidate)
3. Eastern Wood-Pewee (Candidate)
4. Turtle Wintering Habitat (Candidate)
5. Terrestrial Crayfish (Candidate)
6. Amphibian Breeding Habitat (Woodland) (Confirmed)

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Date: December 13, 2021

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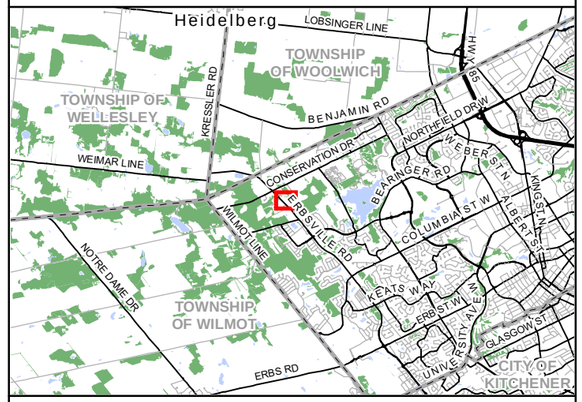
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Map 6

720 Erbsville Road Environmental Impact Study

Proposed Development Area and Limit of Development





Legend

- Subject Property
- Development Limit
- Wetland Boundary (GRCA Confirmed 2014)
- Permanent Watercourse
- Dripline (Dougan and Associates, 2014)
- Floodline
- Proposed Grading
- Proposed Site Plan
- Proposed Services
- Existing Contours
- Ecological Land Classification (Dougan and Associates 2018)

(AG) Agricultural

(ANTH) Anthropogenic

(CUT1) Mineral Cultural Thicket Ecosite

(CUW1) Mineral Cultural Woodland Ecosite

(FOM) Mixed Forest

(HR) Hedgerow

(SWD7) Birch - Poplar Organic Deciuous Swamp Ecosite

(SWM) Mixed Swamp

(SWT3-2) Willow Organic Thicket Swamp Type

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Project: 2520
Date: December 13, 2021

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APPENDIX I

Species at Risk and Species of Conservation Concern Screening

SAR and SCC Screening Table for the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	S-RANK[1]	SARO[2]	COSEWIC[3]	SARA[3]	Background Source	Documented by ESES (Dougan and Associates 2018)	Habitat Preference[4]	Suitable Habitats within the Development Footprint	Rationale
Birds										
Ammodramus savannarum	Grasshopper Sparrow	S4B		SC		BSC et al. 2008	No	Well-drained grassland or prairie with low cover of grasses, taller weeds on sandy soil; hayfields or weedy fallow fields; uplands with ground vegetation of various densities; perches for singing; requires tracts of grassland > 10 ha	No	Suitable habitat is not present within the development footprint. Breeding bird surveys (Dougan and Associates 2018) did not document the presence of this species within the study area.
Cardellina canadensis	Canada Warbler	S4B	SC	T	Schedule 1	BSC et al. 2008	No	Interior forest habitats with a dense, well-developed shrub and vegetation understory; along riparian zones or wet bottomland habitat. require tracts of land which are >30ha.	No	Suitable habitat is not present within the development footprint. Breeding bird surveys (Dougan and Associates 2018) documented the species >400m from the subject property along Conservation Drive.
Chaetura pelagica	Chimney Swift	S4B	THR	T	Schedule 1	BSC et al. 2008	No	Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water.	No	Suitable habitat is not present within the footprint. Breeding bird surveys (Dougan and Associates 2018) did not document the presence of this species within the study area.
Chordeiles minor	Common Nighthawk	S4B	SC	T	Schedule 1	BSC et al. 2008	No	Open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs.	No	Suitable habitat is not present within the development footprint. Breeding bird surveys (Dougan and Associates 2018) did not document the presence of this species within the study area.
Contopus virens	Eastern Wood-Pewee	S4B	SC	SC		BSC et al. 2008	Yes	Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks	No	Suitable habitat is not present within the development footprint. Breeding bird surveys documented the presence of this species within the subject property.
Dolichonyx oryzivorus	Bobolink	S4B	THR	T	No Schedule	BSC et al. 2008	No	Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha.	No	Suitable habitat is not present within the development footprint. Breeding bird surveys (Dougan and Associates 2018) did not document the presence of this species within the study area.
Empidonax virescens	Acadian Flycatcher	S2S3B	END	E	Schedule 1	BSC et al. 2008	No	Mature, shady, deciduous forests; heavily wooded ravines; creek bottoms or river swamps; availability of good quality habitat is limiting factor; needs at least 30 ha of forest.	No	Suitable habitat is not present within the development footprint. Breeding bird surveys (Dougan and Associates 2018) did not document the presence of this species within the study area.

SAR and SCC Screening Table for the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	S-RANK[1]	SARO[2]	COSEWIC[3]	SARA[3]	Background Source	Documented by ESES (Dougan and Associates 2018)	Habitat Preference[4]	Suitable Habitats within the Development Footprint	Rationale
Falco peregrinus anatum/tundrius	Peregrine Falcon	S3B	SC	SC	Schedule 1	BSC et al. 2008	No	Rock cliffs, crags, especially situated near water; tall buildings in urban centres; threatened by chemical contamination; reintroduction efforts have been attempted in numerous locations throughout Ontario.	No	Suitable habitat is not present within the development footprint. Breeding bird surveys (Dougan and Associates 2018) did not document the presence of this species within the study area.
Hirundo rustica	Barn Swallow	S4B	THR	T		BSC et al. 2008	Yes	Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water.	Yes	Foraging habitat is present within the development footprint. Breeding bird surveys documented the species off-site, within the study area (Dougan and Associates 2018).
Hylocichla mustelina	Wood Thrush	S4B	SC	T		BSC et al. 2008	No	Carolinian and Great Lakes-St. Lawrence forest zones; undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges; must have some trees higher than 12 m.	No	Suitable breeding habitat is not present within the development footprint. Breeding bird surveys did not document the species within the study area (Dougan and Associates 2018).
Melanerpes erythrocephalus	Red-headed Woodpecker	S4B	SC	T	Schedule 1	BSC et al. 2008	Yes	Open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees; feeds on insects and stores nuts or acorns for winter; loss of habitat is limiting factor; requires cavity trees with at least 40 cm dbh; require about 4 ha for a territory.	No	Suitable breeding habitat is not present within the development footprint. Breeding bird surveys documented the species breeding within the larger study area (Dougan and Associates 2018).
Setophaga cerulea	Cerulean Warbler	S3B	THR	E	Schedule 1	BSC et al. 2008	No	Mature deciduous woodland of Great Lakes- St. Lawrence and Carolinian forests, sometimes coniferous; swamps or bottomlands with large trees; area sensitive species needing extensive areas of forest (>100 ha).	No	Suitable habitat is not present within the development footprint. Breeding bird surveys (Dougan and Associates 2018) did not document the presence of this species within the study area.
Sturnella magna	Eastern Meadowlark	S4B	THR	T	No Schedule	BSC et al. 2008	No	Open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees; old orchards with adjacent, open grassy areas >10 ha in size.	No	Suitable habitat is not present within the development footprint. Breeding bird surveys (Dougan and Associates 2018) did not document the presence of this species within the study area.

SAR and SCC Screening Table for the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	S-RANK[1]	SARO[2]	COSEWIC[3]	SARA[3]	Background Source	Documented by ESES (Dougan and Associates 2018)	Habitat Preference[4]	Suitable Habitats within the Development Footprint	Rationale
Herpetofauna										
Graptemys geographica	Northern Map Turtle	S3	SC	SC	Schedule 1	Ontario Nature 2020; Dougan and Associates 2018	No	Large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water.	No	Suitable habitat is not present within the development footprint. Herpetofaunal surveys documented a single individual off-site, >200m from the subject property (Dougan and Associates 2018).
Chelydra serpentina serpentina	Common Snapping Turtle	S3	SC	SC	Schedule 1	Ontario Nature 2020; Dougan and Associates 2018	Yes	Permanent or semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddybanks or bottoms. The species often uses soft soil or clean dry sand on south-facing slopes for nest sites and may nest at some distance from water.	Yes	Suitable nesting habitat is found within the development footprint, however, field surveys did not document the species within the development footprint. Species was detected within the study area (Dougan and Associates 2018).
Emydoidea blandingii	Blanding's Turtle (Great Lakes/St Lawrence population)	S3	THR	T	Schedule 1	Ontario Nature 2020; Dougan and Associates 2018	Yes	Shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs; not readily observed.	Yes	Suitable nesting habitat is found within the development footprint, however, field surveys did not document the species within the development footprint. Species was detected within the study area (Dougan and Associates 2018).
Ambystoma jeffersonianum	Jefferson Salamander	S2	END	E	Schedule 1	Ontario Nature 2020; Dougan and Associates 2018	No	Damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding; hides under leaf litter, stones or in decomposing logs.	No	Suitable habitat is not present within the development footprint. Salamander trapping (Dougan and Associates 2018) did not document the presence of this species within the study area.
Pseudacris triseriata	Western Chorus Frog	S3	NAR	T	Schedule 1	Ontario Nature 2020; Dougan and Associates 2018	No	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools ponds and temporary pools	No	Suitable habitat is not present within the development footprint. Anuran call surveys (Dougan and Associates 2018) did not document the presence of this species within the study area.
Mammals										
Myotis leibii	Eastern Small-footed Bat	S2S3	END			Dobbyn 1994	No	Roosts in caves, mine shafts, crevices or buildings that are in or near woodland; hibernates in cold dry caves or mines; maternity colonies in caves or buildings; hunts in forests	No	Suitable habitat is not present within the development footprint. Suitable habitat is found within the study area.

SAR and SCC Screening Table for the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	S-RANK[1]	SARO[2]	COSEWIC[3]	SARA[3]	Background Source	Documented by ESES (Dougan and Associates 2018)	Habitat Preference[4]	Suitable Habitats within the Development Footprint	Rationale
Myotis lucifungus	Little Brown Myotis	S5	END	E	Schedule 1	Dobbyn 1994	No	Uses caves, quarries, tunnels, hollow trees or buildings for roosting; winters in humid caves; maternity sites in dark warm areas such as attics and barns; feeds primarily in wetlands, forest edges	No	Suitable habitat is not present within the development footprint. Suitable habitat is found within the study area.
Myotis septentrionalis	Northern Myotis	S3?	END	E	Schedule 1	Dobbyn 1994	No	Hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, man-made structures but prefers hollow trees or under loose bark; hunts within forest, below canopy	No	Suitable habitat is not present within the development footprint. Suitable habitat is found within the study area.
Perimyotis subflavus	Tri-colored Bat	S3?	END	E	Schedule 1	Dobbyn 1994	No	During the summer, the Tri-colored Bat is found in a variety of forested habitats. It forms day roosts and maternity colonies in older forest and occasionally in barns or other structures. They forage over water and along streams in the forest. Tri-colored Bats eat flying insects and spiders gleaned from webs. At the end of the summer they travel to a location where they swarm; it is generally near the cave or underground location where they will overwinter. They overwinter in caves where they typically roost by themselves rather than part of a group.	No	Suitable habitat is not present within the development footprint. Suitable habitat is found within the study area.
Taxidea taxus jacksoni	American Badger	S2	END	E	Schedule 1	Dobbyn 1994	No	Open grasslands and oak savannahs; dens in new hole or enlarged existing hole; sometimes makes food caches	No	Suitable habitat is not present within the development footprint. Field surveys did not document the presence of this species or suitable burrows and/or dens within the study area (Dougan and Associates 2018).
Butterflies										
Danaus plexippus	Monarch	S4	SC	E	Schedule 1	TEA 2020	Yes	Open areas with milkweed species (*Asclepias spp.*).	No	Suitable habitat is not present within the development footprint. Incidental observations (Dougan and Associates 2018) documented the species within the study area.

SAR and SCC Screening Table for the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	S-RANK[1]	SARO[2]	COSEWIC[3]	SARA[3]	Background Source	Documented by ESES (Dougan and Associates 2018)	Habitat Preference[4]	Suitable Habitats within the Development Footprint	Rationale
Plants										
Aesculus glabra	Ohio Buckeye	S1				Dougan and Associates 2018	No	Deciduous forests, swamps, and river-bank thickets. Frequently planted as an ornamental, north of naturally occurring range.	No	Waterloo Region is well north of naturally occurring range. Individual documented within the study area was a planted individual (Dougan and Associates 2018).
Fraxinus nigra	Black Ash	S3		T	No Schedule	Dougan and Associates 2018	Yes	Usually on mucky or peaty soils in swamps, such as river floodplains; a dominant tree, or merely scattered (as often in cedar swamps).	No	Suitable habitat is not present within the development footprint. Vascular floral surveys documented the species off-site, within the study area (Dougan and Associates 2018).
Juglans cinerea	Butternut	S2?	END	E	Schedule 1	Dougan and Associates 2018	No	In Ontario, Butternut usually grows alone or in small groups in deciduous forests. It prefers moist, well-drained soil and is often found along streams. It is also found on well-drained gravel sites and rarely on dry rocky soil. This species does not do well in the shade, and often grows in sunny openings and near forest edges.	Yes	Several Butternuts were found wihtin the development footprint, however, genetic testing documented that all individuals are hybrids (Dougan and Associates 2018).

[1]MNRF 2019a; [2]MECP 2019; [3]Government of Canada 2019; [4]OMNR 2000

Legend
SRank
S1 Critically Imperiled
S2 Imperiled
S3 Vulnerable
S4 Apparently Secure
S5 Secure
S#? Rank Uncertain
COSSARO
END Endangered
THR Threatened
SC Special Concern
NAR Not at Risk
COSEWIC
E Endangered
T Threatened
SC Special Concern
NAR Not at Risk
SARA Schedule
Schedule 1 Officially Protected under SARA

APPENDIX II

Significant Wildlife Habitat Screening

Significant Wildlife Habitat Assessment Tables

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Waterfowl Stopover and Staging Areas (Terrestrial)					
Rationale: Habitat important to migrating waterfowl.	American Black Duck Wood Duck Green-winged Teal Blue-winged Teal Mallard Northern Pintail Northern Shoveler American Wigeon Gadwall	CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these Ecosites.	Fields with sheet water during Spring (mid March to May). • Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available[cxlviii]. Information Sources • Anecdotal information from the landowner, adjacent landowners or local naturalist clubs may be good information in determining occurrence. • Reports and other information available from Conservation Authorities (CAs) • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Field Naturalist Clubs • Ducks Unlimited Canada • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • Any mixed species aggregations of 100 or more individuals required. • The area of the flooded field ecosite habitat plus a 100-300m radius buffer dependent on local site conditions and adjacent land use is the significant wildlife habitat[cxlviii]. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). • SWHMiST[cxlix] Index #7 provides development effects and mitigation measures.	Suitable habitat of sufficient size is not present within the study area or development footprint. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Waterfowl Stopover and Staging Areas (Aquatic)					
Rationale: Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district.	Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed Duck Surf Scoter White-winged Scoter Black Scoter Ring-necked Duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	• Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify. • These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water). Information Sources • Environment Canada • Naturalist clubs often are aware of staging/stopover areas. • OMNRF Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging. • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Ducks Unlimited projects • Element occurrence specification by Nature Serve: http://www.natureserve.org • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of: • Aggregations of 100[l] or more of listed species for 7 days[l], results in > 700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH[cxlix] • The combined area of the ELC ecosites and a 100m radius area is the SWH[cxlviii] • Wetland area and shorelines associated with sites identified within the SWHTG[cxlviii] Appendix K[cxlix] are significant wildlife habitat. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). • SWHMiST[cxlix] Index #7 provides development effects and mitigation measures.	Suitable habitat of sufficient size is not present within the study area or development footprint. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Shorebird Migratory Stopover Area					
Rationale: High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel Ruddy Turnstone Sanderling Dunlin Whimbrel	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. Sewage treatment ponds and storm water ponds do not qualify as a SWH. Information Sources • Western hemisphere shorebird reserve network. • Canadian Wildlife Service (CWS) Ontario Shorebird Survey. • Bird Studies Canada • Ontario Nature • Local birders and naturalist clubs • Natural Heritage Information Center (NHIC) Shorebird Migratory Concentration Area	Studies confirming: • Presence of 3 or more of listed species and > 1000 shorebird use days during spring or fall migration period. (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period) • Whimbrel stop briefly (<24hrs) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100m radius area[cxlviii] • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #8 provides development effects and mitigation measures.	Suitable habitat of sufficient size is not present within the study area or development footprint. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Raptor Wintering Area					
Rational: Sites used by multiple species, a high number of individuals and used annually are most significant	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl Special Concern: Short-eared Owl Bald Eagle	Hawks/Owls: Combination of ELC Community Series; need to have present one Community Series from each land class: Forest: FOD, FOM, FOC Upland: CUM, CUT, CUS, CUW	The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. Raptor wintering sites need to be > 20 ha[cxlviii, cxlix] with a combination of forest and upland.[xvi, xvii, xviii, xix, xx, xxi]. Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands[cxlix] Field area of the habitat is to be wind swept with limited snow depth or accumulation. Eagle sites have open water, large trees and snags available for roosting Information Sources • OMNRF Ecologist or Biologist • Field Natural Clubs • Natural Heritage Information Center (NHIC) Raptor Winter Concentration Area • Data from Bird Studies Canada • Reports and other information available from Conservation Authorities CAs.	Studies confirm the use of these habitats by: • One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two listed hawk/owl species • To be significant a site must be used regularly (3 in 5 years)[cxlix] for a minimum of 20 days by the above number of birds • The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #10 and #11 provides development effects and mitigation measures.	Suitable habitat of sufficient size is not present within the development footprint. Criterion species are not tolerant of highly urbanized areas. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Bat Hibernacula					
Rationale Bat hibernacula are rare habitats in Ontario landscapes.	Big Brown Bat Tri-coloured Bat	Bat Hibernacula may be found in these ecosites: CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)	• Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. • Active mine sites should not be considered as SWH • The locations of bat hibernacula are relatively poorly known. Information Sources • OMNRF for possible locations and contact for local experts • Natural Heritage Information Center (NHIC) Bat Hibernaculum • Ministry of Northern Development and Mines for location of mine shafts. • Clubs that explore caves (eg. Sierra Club) • University Biology Departments with bat experts.	• All sites with confirmed hibernating bats are SWH. • The habitat area includes a 200m radius around the entrance of the hibernaculum[cxlviii, ccvii] for most. • Studies are to be conducted during the peak swarming period (Aug. – Sept.). Surveys should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects"[ccv] • SWHMiST[cxlix] Index #1 provides development effects and mitigation measures.	Suitable habitat not present within the study area or development footprint. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Bat Maternity Colonies					
Rationale: Known locations of forested bat maternity colonies is extremely rare in all Ontario landscapes.	Big Brown Bat Silver-haired Bat	Maternity colonies considered SWH are found in forested Ecosites. All ELC Ecosites in ELC Community Series: FOD FOM SWD SWM	Maternity colonies can be found in tree cavities, vegetation and often in buildings[xxii, xxv, xxvi, xxvii, xxxi] (buildings are not considered to be SWH). • Maternity roosts are not found in caves and mines in Ontario[xxii] • Maternity colonies located in Mature deciduous or mixed forest stands[ccix, ccx] with >10/ha large diameter (>25cm dbh) wildlife trees[ccvii] • Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3[ccxiv] or class 1 or 2[ccxii] • Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred[ccx] Information Sources • OMNRF for possible locations and contact for local experts • University Biology Departments with bat experts.	• Maternity Colonies with confirmed use by: • >10 Big Brown Bats • >5 Adult Female Silver-haired Bats • The area of the habitat includes the entire woodland or a forest stand ELC Ecosite or an Ecoelement containing the maternity colonies. • Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for wind Power Projects[ccv] • SWHMiS T[cxlix] Index #12 provides development effects and mitigation measures.	Suitable habitat is present within the study area. None of the listed ELC communities overlap with the proposed development footprint as such bat habitat assessments were not undertaken for the subject property. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Turtle Wintering Area					
Rationale: Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant	Midland Painted Turtle Special Concern: Northern Map Turtle Snapping Turtle	Snapping and Midland Painted Turtles - ELC Community Classes: SW, MA, OA and SA; ELC Community Series: FEO and BOO Northern Map Turtle - Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.	For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen[cix, cx, cxi, cxviii]. • Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH. Information Sources • EIS studies carried out by Conservation Authorities. • Local field naturalists and experts, as well as university herpetologists may also know where to find some of these sites. • OMNRF ecologist or biologist • Natural Heritage Information Center (NHIC)	• Presence of 5 over-wintering Midland Painted Turtles is significant. • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant. • The mapped ELC ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep-water pool where the turtles are over wintering is the SWH. • Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept. – Oct.) or spring (Mar. – May)[cvii] • Congregation of turtles is more common where wintering areas are limited and therefore significant[cix, cx, cxi, cxii]. • SWHMiST[cxiix] Index #28 provides development effects and mitigation measures for turtle wintering habitat.	Suitable overwintering habitat is present within the study area and subject property (within Laurel Creek). Suitable habitat is not present within the development footprint. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Snake Hibernaculum					
Rationale: Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant	Snakes: Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake Special Concern: Milksnake Eastern Ribbonsnake Lizard: Special Concern (Southern Shield population): Five-lined Skink	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may be directly related to these habitats. Observations of congregations of snakes on sunny warm days in the spring or fall is a good indicator. For Five-lined Skink, ELC Community Series of FOD and FOM and Ecosites: FOC1 FOC3	• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural locations. The existence of features that go below the frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line[xliv, l, li, liii, cxii.] • Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. • Five-lined skink prefer mixed forests with rock outcrop openings providing cover rock overlaying granite bedrock with fissures cciii. Information Sources • In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells). • Reports and other information from CAs. • Local Field naturalists and experts, as well as university herpetologists may also know where to find some of these sites. clubs • Natural Heritage Information Center (NHIC) • OMNRF ecologist or biologist may be aware of locations of wintering skinks	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct). • Note: If there are Special Concern Species present, then site is SWH • Note: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population [i.e. strong hibernation site fidelity]. Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30m buffer is the SWH[i] • SWHMiST[cxlix] Index #13 provides development effects and mitigation measures for snake hibernacula. • Presence of any active hibernaculum for skink is significant. • SWHMiST[cxlix] Index #37 provides development effects and mitigation measures for five-lined skink wintering habitat.	Candidate Snake Hibernaculum habitat was identified for the subject property within the ESES. An old foundation is present in the cultural thicket to the north of the subject property. This SWH was considered as part of this EIS; however, due to the proximity of the foundation to the Sunfish Lake-Laurel Creek PSW and Laurel Creek proper, it is expected that subgrade conditions would be too wet to provide suitable conditions for snake hibernation. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Bank and Cliff)					
Rationale: Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow populations are declining in Ontario.	Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles Cliff faces, bridge abutments, silos, barns Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation. Information Sources • Reports and other information available from CAs • Ontario Breeding Bird Atlas [ccv] • Bird Studies Canada; *NatureCounts* http://www.birdscanada.org/birdmon/ • Field Naturalist clubs	Studies confirming: • Presence of 1 or more nesting sites with 8[cxlvix] or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50m radius habitat area from the peripheral nests[ccvii] • Field surveys to observe and count swallow nests are to be completed during the breeding season Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”[ccxi] • SWHMiST[cxlix] Index #4 provides development effects and mitigation measures	Suitable habitat not present within the study area or development footprint. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs)					
Rationale: Large Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Great Blue Heron Black-crowned Night-heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15m from ground, near the top of the tree. Information Sources • Ontario Breeding Bird Atlas[ccv], colonial nest records. • Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNR). • NHIC Mixed Wader Nesting Colony • Aerial photographs can help identify large heronries • Reports and other information available from CAs • MNRF District Offices • Local naturalist clubs	Studies confirming: • Presence of 5[l] or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300m radius or extent of the Forest Ecosite containing the colony or any island <15.0ha with a colony is the SWH [cc, ccvii] • Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells • SWHMiST[cxlix] Index #5 provides development effects and mitigation measures.	Suitable habitat of sufficient size is not present within the study area or development footprint. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Ground)					
Rationale: Colonies are important to local bird populations, typically sites are only known colony in area and are used annually.	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1:50,000 NTS map). Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird) MAM1 – 6 MAS1 – 3 CUM CUT CUS	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. • Brewers Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands. Information Sources • Ontario Breeding Bird Atlas[ccv], rare/colonial species records. • Canadian Wildlife Service • Reports and other information available from CAs • Natural Heritage Information Center (NHIC) Colonial Waterbird Nesting Area • MNRF District Offices • Field naturalist clubs	Studies confirming: • Presence of >25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern[i]. • Presence of 5 or more pairs for Brewer's Blackbird. • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant. • The edge of the colony and a minimum 150m area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0ha with a colony is the SWH[cc, ccvii] • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #6 provides development effects and mitigation measures.	Suitable habitat not present within the study area or development footprint. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Migratory Butterfly Stopover Areas					
Rationale: Butterfly stopovers areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	Painted Lady Red Admiral Special Concern: Monarch	Combination of ELC Community Series: Need to have present one Community Series from each landclass: Field: CUM CUS CUT Forest: FOC FOM FOD CUP Anecdotally, a candidate sight for butterfly stopover will have a history of butterflies being observed.	A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Ontario[cxlix]. • The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south[xxxii, xxxiii, xxxiv, xxxv, xxxvi]. • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat cxlviii, cxlix. • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes[xxxvii, xxxviii, xxxix, xl, xli]. Information Sources • OMNRF (NHIC) • Agriculture Canada in Ottawa may have list of butterfly experts. • Field Naturalist Clubs • Toronto Entomologists Association • Conservation Authorities	Studies confirm: • The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct)[xliii]. MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day[xxxvii], significant variation can occur between years and multiple years of sampling should occur [xl, xlii]. • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD • MUD of >5000 or >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. • SWHMiST[cxlix] Index #16 provides development effects and mitigation measures.	Study area not located within 5 km of Lake Ontario. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Landbird Migratory Stopover Areas					
Rationale: Sites with a high diversity of species as well as high number are most significant	All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.on.ec.gc.ca/wildlife_e.html All migrant raptors species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)	All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD	Woodlots need to be >10 ha[f] in size and within 5km [iv, v, vi, vii, viii, ix, x, xi, xii, xiii, xiv, xv] of Lake Ontario. • If multiple woodlands are located along the shoreline, those woodlands <2km from Lake Ontario are more significant[cxlix] • Sites have a variety of habitats; forest, grassland and wetland complexes[cxlix]. • The largest sites are more significant[cxlix] • Woodlots and forest fragments are important habitats to migrating birds[ccxviii], these features located along the shore and located within 5km of Lake Ontario are Candidate SWH[cxlviii]. Information Sources • Bird Studies Canada • Ontario Nature • Local birders and naturalist club • Ontario Important Bird Areas (IBA) Program	Studies confirm: • Use of the woodlot by >200 birds/day and with >35 spp. with at least 10 bird spp. recorded on at least 5 different survey dates. This abundance and diversity of migrant bird species is considered above average and significant. • Studies should be completed during spring (Apr/May) and fall (Aug/Oct) migration using standardized assessment techniques. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #9 provides development effects and mitigation measures.	Study area not located within 5 km of Lake Ontario. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Deer Yarding Areas					
Rationale: Winter habitat for deer is considered to be the main factor for northern deer populations. In winter, deer congregate in "yards" to survive severe winter conditions. Deer yards typically have a long history of annual use by deer, yards typically represent 10-15% of an areas summer range.	White-tailed Deer	Note: OMNRF to determine this habitat. ELC Community Series providing a thermal cover component for a deer yard would include: FOM, FOC, SWM and SWC. Or these ELC Ecosites: CUP2 CUP3 FOD3 CUT	• Deer yarding areas or winter concentration areas (yards) are areas deer move to in response to the onset of winter snow and cold. This is a behavioural response and deer will establish traditional use areas. The yard is composed of two areas referred to as Stratum I and Stratum II. Stratum II covers the entire winter yard area and is usually a mixed or deciduous forest with plenty of browse available for food. Agricultural lands can also be included in this area. Deer move to these areas in early winter and generally, when snow depths reach 20cm, most of the deer will have moved here. If the snow is light and fluffy, deer may continue to use this area until 30cm snow depth. In mild winters, deer may remain in the Stratum II area the entire winter. • The Core of a deer yard (Stratum I) is located within the Stratum II area and is critical for deer survival in areas where winters become severe. It is primarily composed of coniferous trees (pine, hemlock, cedar, spruce) with a canopy cover of more than 60%[cxciv]. • OMNRF determines deer yards following methods outlined in “Selected Wildlife and Habitat Features: Inventory Manual"[cxcv] • Woodlots with high densities of deer due to artificial feeding are not significant.	No Studies Required: • Snow depth and temperature are the greatest influence on deer use of winter yards. Snow depths > 40cm for more than 60 days in a typically winter are minimum criteria for a deer yard to be considered as SWH[lvi, lvii, lviii, lix, lx, í]. • Deer Yards are mapped by OMNRF District offices. Locations of Core or Stratum 1 and Stratum 2 Deer yards considered significant by OMNRF will be available at local MNRF offices or via Land Information Ontario (LIO). • Field investigations that record deer tracks in winter are done to confirm use (best done from an aircraft). Preferably, this is done over a series of winters to establish the boundary of the Stratum I and Stratum II yard in an "average" winter. MNRF will complete these field investigations[cxcv]. • If a SWH is determined for Deer Wintering Area or if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWHMiST[cxlix] Index #2 provides development effects and mitigation measures.	Deer overwintering yard not identified by MNRF within or adjacent to the study area. **Not SWH**

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Deer Winter Congregation Areas					
Rationale: Deer movement during winter in the southern areas of Ecoregion 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions[cxlviii]	White-tailed Deer	All Forested Ecosites with these ELC Community Series: FOC FOM FOD SWC SWM SWD Conifer plantations much smaller than 50ha may also be used.	• Woodlots will typically be >100 ha in size. Woodlots <100ha may be considered as significant based on MNRF studies or assessment. • Deer movement during winter in the southern areas of Eco-region 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands[cxlviii]. • If deer are constrained by snow depth refer to the Deer Yarding Area habitat within Table 1.1 of this Schedule. • Large woodlots > 100ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha[ccxxiv]. • Woodlots with high densities of deer due to artificial feeding are not significant. Information Sources • MNRF District Offices • LIO/NRVIS	Studies confirm: • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF[cxlviii]. • Use of the woodlot by white-tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNR[i]. • Studies should be completed during winter (Jan/Feb) when >20cm of snow is on the ground using aerial survey techniques[ccxxiv] , ground or road surveys, or a pellet count deer density survey[ccxxv]. • If a SWH is determined for Deer Wintering Area of if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWHMiST[cxlix] Index #2 provides development effects and mitigation measures.	Stratum 2 Deer overwintering habitat (wetland and woodland habitats) is identified by MNRF as occurring within the wetland and woodland features within the study area. Suitable habitat is not present within the development footprint. **Not SWH**

Significant Wildlife Habitat Assessment Tables

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Cliff and Talus Slopes					
Rationale: Cliffs and Talus Slopes are extremely rare habitats in Ontario.	Any ELC Ecosite within Community Series: TAO CLO TAS CLS TAT CLT	A Cliff is vertical to near vertical bedrock >3m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris.	Most cliff and talus slopes occur along the Niagara Escarpment. Information Sources • The Niagara Escarpment Commission has detailed information on location of these habitats. • OMNRF District • Natural Heritage Information Center (NHIC) has location information on their website • Local naturalist clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes[lxxviii] • SWHMiST[cxlix] Index #21 provides development effects and mitigation measures.	Vegetation type not present within the study area or development footprint. **Not SWH**

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Sand Barrens					
Rationale: Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry.	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always <60%.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. They have little or no soil and the underlying rock protrudes through the surface. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered but less than 60%.	Any sand barren area, >0.5ha in size. Information Sources • OMNRF Districts. • Natural Heritage Information Center (NHIC) has location information on their website • Field naturalist clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Sand Barrens[lxxviii] • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics)[i]. • SWHMiST[cxlix] Index #20 provides development effects and mitigation measures.	Vegetation type not present within the study area or development footprint. **Not SWH**

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Alvar					
Rationale: Alvars are extremely rare habitats in Ecoregion 6E. Most alvars in Ontario are in Ecoregion 6E and 7E. Alvars in 6E are small and highly localized just north of the Palaeozoic-Precambrian contact.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 Five Alvar Indicator Species: 1) Carex crawei 2) Panicum philadelphicum 3) Eleochairs compressa 4) Scutellaria parvula 5) Trichostema branchiatum These indicator species are very specific to Alvars within Ecoregion 6E	An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plant. Undisturbed alvars can be phyto- and zoo geographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover[lxxviii].	An Alvar site > 0.5 ha in size[lxxv]. Information Sources • Alvars of Ontario (2000), Federation of Ontario Naturalists[lxxvi]. • Ontario Nature – Conserving Great Lakes Alvars[ccviii]. • Natural Heritage Information Center (NHIC) has location information on their website • Field Naturalist clubs • Conservation Authorities	Field studies identify four of the five Alvar indicator species[lxxv, cxlix] at a Candidate Alvar site is Significant. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotics sp.). • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses[lxxv]. • SWHMiST[cxlix] Index #17 provides development effects and mitigation measures.	Vegetation type not present within the study area or development footprint. **Not SWH**

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Old Growth Forest					
Rationale: Due to historic logging practices, extensive old growth forest is rare in the Ecoregion. Interior habitat provided by old growth forests is required by many wildlife species.	Forest Community Series: FOD FOC FOM SWD SWC SWM	Old Growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris.	Woodland Stands areas 30ha or greater in size or with at least 10 ha interior habitat assuming 100m buffer at edge of forest Í. Information Sources • OMNRF Forest Resource Inventory mapping • OMNRF Forester, Ecologist or Biologist • Field Local naturalist clubs • Conservation Authorities • Sustainable Forestry License (SFL) companies will possibly know locations through field operations. • Municipal forestry departments	Field Studies will determine: • If dominant trees species of the ecosite are >140 years old, then stand is Significant Wildlife Habitat[cxlviii] • The stand will have experienced no recognizable forestry activities[cxlviii] • The area of Forest Ecosites combined to make up the stand is the SWH. • Determine ELC Vegetation Type for forest stand[boxviii] • SWHDSS[cxlix] Index #23 provides development effects and mitigation measures.	Vegetation type not present within the study area or development footprint. **Not SWH**

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Savannah					
Rationale: Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%.	• No minimum size to site Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. Information Sources • Natural Heritage Information Center (NHIC) has location information on their website • OMNRF Ecologists • Field naturalists clubs • Conservation Authorities	Field studies confirm one or more of the Savannah indicator species listed in[lxxv] Appendix N should be present. Note: Savannah plant spp. list from Ecoregion 6E should be used[cxlviii]. • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics sp.). • SWHMiST[cxlix] Index #18 provides development effects and mitigation measures.	Vegetation type not present within the study area or development footprint. **Not SWH**

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Tallgrass Prairie					
Rationale: Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover.	• No minimum size to site Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. Information Sources • OMNR Districts • Natural Heritage Information Center (NHIC) has location information available on their website • Field naturalists clubs • Conservation Authorities	Field studies confirm one or more of the Prairie indicator species listed in[lxxv] Appendix N should be present. Note: Prairie plant spp. list from Ecoregion 6E should be used[cxlviii]. • Area of the ELC Ecosite is the SWH • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics). • SWHMiST[cxlix] Index #19 provides development effects and mitigation measures.	Vegetation type not present within the study area or development footprint. **Not SWH**

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community[1]	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes[1]	Habitat Description[1]	Detailed Information and Sources[1]	Defining Criteria[1]	Assessment Details
Other Rare Vegetation Communities					
Rationale: Plant communities that often contain rare species which depend on the habitat for survival.	Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG[cxlviii]. Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in appendix M[cxlviii] The OMNR/NHIC will have up to date listing for rare vegetation communities. Information Sources • Natural Heritage Information Center (NHIC) has location information available on their website • OMNRF Districts • Field naturalists clubs • Conservation Authorities	Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG[cxlviii]. • Area of the ELC Vegetation Type polygon is the SWH. • SWHMiST[cxlix] Index #37 provides development effects and mitigation measures.	Other rare vegetation types not present within the study area or development footprint. **Not SWH**

Significant Wildlife Habitat Assessment Tables

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Waterfowl Nesting Area					
Rationale: Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 Note: includes adjacency to Provincially Significant Wetlands	A waterfowl nesting area extends 120m[cxlix] from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120m of each individual wetland where waterfowl nesting is known to occur[cxlix]. • Upland areas should be at least 120m wide so that predators such as raccoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40cm dbh) in woodlands for cavity nest sites. Information Sources • Ducks Unlimited staff may know the locations of particularly productive nesting sites. • OMNRF Wetland Evaluations for indication of significant waterfowl nesting habitat. • Reports and other information available from CAs	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding Mallards, or • Presence of 10 or more nesting pairs for listed species including Mallards. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120m[cxlviii] from the wetland and will provide enough habitat for waterfowl to successfully nest. • SWHMiST[cxlix] Index #25 provides development effects and mitigation measures.	Suitable habitat of sufficient size is not present within the study area or development footprint. **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Bald Eagle and Osprey Nesting, Foraging and Perching Habitat					
Rationale: Nest sites are fairly uncommon in Eco-region 6E are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	Osprey Special Concern: Bald Eagle	ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands	• Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. • Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms). Information Sources • Natural Heritage Information Center (NHIC) compiles all known nesting sites for Bald Eagles in Ontario. • MNRF values information (LIO/NRVIS) will list known nesting locations. Note: data from NRVIS is provided as a point and does not represent all the habitat. • Nature Counts, Ontario Nest Records Scheme data. • OMNRF Districts • Sustainable Forestry License (SFL) companies will identify additional nesting locations through field operations. • Check the Ontario Breeding Bird Atlas[ccv] or Rare Breeding Birds in Ontario for species documented • Reports and other information available from CAs. • Field naturalists clubs	Studies confirm the use of these nests by: • One or more active Osprey or Bald Eagle nests in an area[cxlviii]. • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300m radius around the nest or the contiguous woodland stand is the SWHccvii, maintaining undisturbed shorelines with large trees within this area is important[cxlviii]. • For a Bald Eagle the active nest and a 400-800m radius around the nest is the SWH[cvi], ccvii. Area of the habitat from 400-800m is dependent on site lines from the nest to the development and inclusion of perching and foraging habitat[cvi]. • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for >3 years or suspected of not being used for >5 years before being considered not significant[ccvii] • Observational studies to determine nest site use, perching sites and foraging areas need to be done from mid March to mid August. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #26 provides development effects and mitigation measures	Suitable habitat is present within the greater study area. Breeding bird surveys did not document criterion species within the development footprint. **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Woodland Raptor Nesting Habitat					
Rationale: Nests sites for these species are rarely identified; these area sensitive habitats and are often used annually by these species.	Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk	May be found in all forested ELC Ecosites. May also be found in SWC, SWM, SWD and CUP3.	All natural or conifer plantation woodland/forest stands >30ha with >10ha of interior habitat[lxxxviiii, lxxxix, xc, xci, xciii, xciv, xcv, xcvi, cxxxiii]. Interior habitat determined with a 200m buffer[cxlviii]. • Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Cooper's hawk nest along forest edges sometimes on peninsulas or small off-shore islands. • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest. Information Sources • OMNRF • Check the Ontario Breeding Bird Atlas[ccv] or Rare Breeding Birds in Ontario for species documented. • Check data from Bird Studies Canada • Reports and other information available from CAs	Studies confirm: • Presence of 1 or more active nests from species list is considered significant[cxlviii]. • Red-shouldered Hawk and Northern Goshawk – a 400m radius around the nest or 28ha area of habitat is the SWH[ccvii]. • Barred Owl – a 200m radius around the nest is the SWH[ccvii]. • Broad-winged Hawk and Coopers Hawk – a 100m radius around the nest is the SWH[ccvii]. • Sharp-shinned Hawk – a 50m radius around the nest is the SWH[ccvii]. • Conduct field investigations from mid-March to end of May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • SWHMiST[cxlix] Index #27 provides development effects and mitigation measures.	Suitable habitat not present within the study area. Breeding bird surveys did not document confirmed nesting of criterion species (Dougan and Associates 2018). Suitable habitat not present within the development footprint. **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Turtle Nesting Area					
Rationale: These habitats are rare and when identified will often be the only breeding site for local populations of turtles	Midland Painted Turtle Special Concern: Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100m)[cxlviii] or within the following ELC Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used. Information Sources • Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels). • Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may help to find potential nesting habitat for them. • Natural Heritage Information Center (NHIC) • Field Naturalist clubs and landowners	Studies confirm: • Presence of 5 or more nesting Midland Painted Turtles • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH[i] • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH[cxlviii]. • Travel routes from wetland to nesting area are to be considered within the SWH[cxlix]. • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • SWHMiST[cxlix] Index #28 provides development effects and mitigation measures for turtle nesting habitat.	Herpetofauna surveys did not document turtle nesting occurrences within the development footprint (Dougan and Associates 2018). **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Seeps and Springs					
Rationale: Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps/Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs.	Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system[cxvii, cxlix]. • Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species[cxlx, cxx, cxxi, cxxii, cxiii, cxiv] Information Sources • Topographical Map • Thermography • Hydrological surveys conducted by CAs and MOE • Field naturalists clubs and landowners • Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped.	Field Studies confirm: • Presence of a site with 2 or more seeps/springs should be considered SWH. • The area of a ELC forest ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat[cxlviii] • SWHMiST[cxlix] Index #30 provides development effects and mitigation measures	Suitable habitat not present within the development footprint. **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Amphibian Breeding Habitat (Woodland)					
Rationale: These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations.	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians.	• Presence of a wetland, pond or woodland pool (including vernal pools) >500m^2 (about 25m diameter) [ccvii] within or adjacent (within 120m) to a woodland (no minimum size)[clxxxii, lxiii, lxv, lxvi, lxvii, lxviii, lxix, lxx] Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat[cxlviii] Information Sources • Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records • Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. • OMNRF District • OMNRF wetland evaluations • Field naturalist clubs • Canadian Wildlife Service Amphibian Road Call Survey • Ontario Vernal Pool Association: http://www.ontariovernalpools.org	Studies confirm: • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses)[lxxi] or 2 or more of the listed frog species with Call Level Codes of 3. • A combination of observational study and call count surveys[cviii] will be required during the spring March-June when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. • The habitat is the woodland area plus a 230m radius of woodland area[lxiii,lxv, lxvi, lxvii, lxviii, lxix, lxx, lxxi] if a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is the be included in the habitat. • SWHMiST[cxlix] Index #14 provides development effects and mitigation measures.	Suitable habitat is present within the study area. Field studies did not confirm SWH within the development footprint. **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Amphibian Breeding Habitat (Wetland)					
Rationale: These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Tree frog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	ELC Community Classes SW, MA, FE, BO, OA and SA. Typically these wetland ecosites will be isolated (>120m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bull Frog) may be adjacent to woodlands.	• Wetlands >500m2 (about 25m diameter)[ccvii] supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats[clxxxiv]. • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. • Bullfrogs require permanent water bodies with abundant emergent vegetation. Information Sources • Ontario Herpetofaunal Summary Atlas (or other similar atlases) • Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count. • OMNRF Districts and wetland evaluations • Reports and other information available from CAs.	Studies confirm: • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species and with at least 20 individuals (adults or eggs masses)[lxxi, lxxiii], or 2 or more of the listed frog/toad species with Call Level Codes of 3. or; Wetland with confirmed breeding Bullfrogs are significant. • The ELC ecosite wetland area and the shoreline are the SWH. • A combination of observational study and call count surveys[cviii] will be required during spring March to June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWHMiST[cxlix] Index #15 provides development effects and mitigation measures.	Suitable wetland habitat not present within the study area or development footprint. **Not SWH**

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Woodland Area-Sensitive Bird Breeding Habitat					
Rationale: Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	Yellow-Bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Special Concern: Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha.[cv, cxxxi, cxxxii, cxxxiii, cxxxiv, cxxv, cxxvi, cxxxvii, cxxxviii, cxxxix, cxl, cxli, cxlii, cxliii, cxliv, cxlv, cxlvi, cl, cli, clii, cliii, cliv, clv, clvii, clviii, clix] • Interior forest habitats are at least 200m from forest edge habitat. Information Sources • Local bird clubs • Canadian Wildlife Service (CWS) for the location of forest bird monitoring. • Bird studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to greatest value to interior species • Reports and other information available from CAs.	• Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. • Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH. • Conduct field investigations in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”[ccxi] • SWHMiST[cxlix] Index #34 provides development effects and mitigation measures.	Suitable habitat not present within the study area. Breeding bird surveys completed did not document criterion species within the development footprint (Dougan and Associates 2018). **Not SWH**

Significant Wildlife Habitat Assessment Tables

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Marsh Bird Breeding Habitat					
Rationale: Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	American Bittern Virginia Rail Sora Common Gallinule American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Sandhill Crane Green Heron Trumpeter Swan Special Concern: Black Tern Yellow Rail	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 For Green Heron: All SW, MA and CUM1 sites.	• Nesting occurs in wetlands • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present[cxxiv]. • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water. Information Sources • Contact OMNRF, wetland evaluations are a good source of information. • Field naturalist clubs • Natural Heritage Information Center (NHIC) Records • Reports and other information available from CAs. • Ontario Breeding Bird Atlas[ccv]	Studies confirm: • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or 1 pair of Sandhill Cranes; or breeding by any combination of 5 or more of the listed species[i]. • Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH[i]. • Area of the ELC ecosite is the SWH • Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]. • SWHMiST[cxlix] Index #35 provides development effects and mitigation measures	Suitable habitat of sufficient size is not present within the study area. Breeding bird surveys did not document criterion species within the development footprint (Dougan and Associates 2018). **Not SWH**

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Open Country Bird Breeding Habitat					
Rationale: This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow Special Concern: Short-eared Owl	CUM1 CUM2	Large grassland areas (includes natural and cultural fields and meadows) >30 ha [clx, clxi, clxii, clxiii, clxiv, clxv, clxvi, clxvii, clxviii, clxix]. Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years)[i]. Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species. Information Sources • Agricultural land classification maps, Ministry of Agriculture. • Ask local birders • Ontario Breeding Bird Atlas[ccv] • Reports and other information available from CAs.	Field Studies confirm: • Presence of nesting or breeding of 2 or more of the listed species. • A field with 1 or more breeding Short-eared Owl is to be considered SWH. • The area of SWH is the contiguous ELC ecosite field areas. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi]. • SWHMiST[cxlix] Index #32 provides development effects and mitigation measures.	Suitable habitat of sufficient size is not present within the study area. Breeding bird surveys did not document criterion species within the development footprint (Dougan and Associates 2018). **Not SWH**

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Shrub/Early Successional Bird Breeding Habitat					
Rationale: This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records cxcix.	Indicator spp.: Brown Thrasher Clay-coloured Sparrow Common spp.: Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher Special Concern: Yellow-breasted Chat Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species.	Large field areas succeeding to shrub and thicket habitats>10ha[cbxiv] in size. • Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years)[i]. Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species [cbxiii]. Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands. Information Sources • Agricultural land classification maps Ministry of Agriculture Local bird clubs • Ontario Breeding Bird Atlas[ccv] • Reports and other information available from CAs	Field Studies confirm: • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species[i]. • A field with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat. • The area of the SWH is the contiguous ELC ecosite field/thicket area. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWHMiST[cxlix] Index #33 provides development effects and mitigation measures.	Suitable habitat of sufficient size is not present within the study area. Breeding bird surveys did not document criterion species within the development footprint (Dougan and Associates 2018). **Not SWH**

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Terrestrial Crayfish					
Rationale: Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare.[ccii]	Chimney or Digger Crayfish: (*Fallicambarus fodiens*) Devil Crawfish or Meadow Crayfish: (*Cambarus Diogenes*)	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM	Wet meadow and edges of shallow marshes (no minimum size) identified should be surveyed for terrestrial crayfish. • Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water. • Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed. Information Sources • Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998	Studies Confirm: • Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable marsh meadow or terrestrial sites[cci] • Area of ELC Ecosite or an ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH • Surveys should be done April to August during in temporary or permanent water Note the presence of burrows or chemistry are often the only indicator of presence, observance or collection of individuals is very difficult[cci] • SWHMiST[cxlix] Index #36 provides development effects and mitigation measures.	Suitable habitat of sufficient size is not present within the development footprint. **Not SWH**

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Special Concern and Rare Wildlife Species					
Rationale: These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre.	All plant and animal element occurrences (EO) within a 1 or 10km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy.	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites[bxviii]. Information Sources • Natural Heritage Information Centre (NHIC) will have the Special Concern and Provincially Rare (S1-S3, SH) species lists with element occurrences data. • NHIC Website: "Get Information": http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas[ccv] • Expert advice should be sought as many of the rare spp. have little information available about their requirements.	Studies Confirm: • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs to be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat. • SWHMiST[cxlix] Index #37 provides development effects and mitigation measures.	Field surveys did not document SC and/or Rare Wildlife Species within the development footprint. **Not SWH**

Significant Wildlife Habitat Assessment Tables

Table 5. Characteristics of Animal Movement Corridors for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Amphibian Movement Corridors					
Rationale: Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	Corridors may be found in all ecosites associated with water. • Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1.	Movement corridors between breeding habitat and summer habitat [clxxiv, clxxv, clxxvi, clxxvii, clxxviii, clxxix, clxxx, clxxxi]. Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat – Wetland) of this Schedule[í]. <u>Information Sources</u> • MNRF District Office • Natural Heritage Information Center NHIC • Reports and other information available from CAs • Field Naturalist Clubs	• Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites. • Corridors should consist of native vegetation, with several layers of vegetation. Cooridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant[cxlix]. • Corridors should have at least 15m of vegetation on both sides of waterway [cxlix] or be up to 200m wide[cxlix] of woodland habitat and with gaps <20m [cxlix]. • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat[cxlix]. • SWHMiST[cxlix] Index #40 provides development effects and mitigation measures.	Amphibian Breeding Habitat (Wetland) not present within the development footprint. Therefore, amphibian movement corridors are not applicable. **Not SWH**

Table 5. Characteristics of Animal Movement Corridors for Ecoregion 6E.

	Wildlife Species[1]	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes[1]	Habitat Criteria and Information Sources[1]	Defining Criteria[1]	Assessment Details
Wildlife Habitat: Deer Movement Corridors					
Rationale: Corridors important for all species to be able to access seasonally important life-cycle habitats or to access new habitat for dispersing individuals by minimizing their vulnerability while travelling.	White-tailed Deer	Corridors may be found in all forested ecosites. A Project Proposal in Stratum II Deer Wintering Area has potential to contain corridors.	Movement corridor must be determined when Deer Wintering Habitat is confirmed as SWH from Table 1.1 of this schedule[i]. • A deer wintering habitat identified by the OMNRF as SWH in Table 1.1 of this Schedule will have corridors that the deer use during fall migration and spring dispersion [clxxxii, clxxxiii, cxlix, cxciv]. • Corridors typically follow riparian areas, woodlots, areas of physical geography (ravines, or ridges). Information Sources • MNRF District Office • Natural Heritage Information Center (NHIC) • Reports and other information available from CAs • Field Naturalist Clubs	• Studies must be conducted at the time of year when deer are migrating or moving to and from winter concentration areas. • Corridors that lead to a deer wintering yard should be unbroken by roads and residential areas. • Corridors should be at least 200m wide[cxlix] with gaps <20m[cxlix] and if following riparian area with at least 15m of vegetation on both sides of waterway[cxlix] . Shorter corridors are more significant than longer corridors[cxlix] • SWHMiST[cxlix] Index #39 provides development effects and mitigation measures.	Deer Winter Congregation Area is present within the study area; therefore, deer movement corridors were considered candidate SWH within the ESES for the hedgerow. The hedgerow is a poor movement corridor since it is only a single tree wide for the majority of its length. The ability of the southeastern hedgerow to function as deer movement corridor has been significantly reduced by the construction of the Regal Place subdivision. Additionally, this movement corridor is redundant since the Wideman Creek corridor is located just 80m south of the hedgerow. Based on the factors the hedgerow in the southeast of the development footprint is not considered SWH. **Not SWH**

APPENDIX III

Terms of Reference and Reviewing Agency Comments

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

January 13, 2021 Project No. 2520

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Trevor Heywood
Resource Planner, Grand River Conservation Authority
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Dear Ms. McMullen, Ms. Gurney, and Mr. Heywood,

Re: 720 Erbsville Road, Waterloo, ON
Environmental Impact Study - Terms of Reference

Natural Resource Solutions Inc. (NRSI) has been retained as part of a team by Sunvest Development Corp. to prepare an Environmental Impact Study (EIS) for the proposed development of the above noted property located on Erbsville Road in north Waterloo, Ontario. An EIS is required as the lands contain significant woodlands, the Laurel Creek Forest Environmentally Sensitive Policy Area (ESPA), and the Sunfish Lake-Laurel Creek Provincially Significant Wetland (PSW), which are designated and protected as:

- Core Environmental Features in the Region of Waterloo's Official Plan (2015),
- Core Natural Features, and Supporting Natural Features in the City of Waterloo's Official Plan (2020a), and
- Wetlands and watercourses in GRCA's Policies (2013).

In addition, the lands contain known and potential habitat for Species At Risk (SAR). These species and their habitat are protected under the Endangered Species Act through the Ministry of Environment, Conservation and Parks (MECP).

The natural features have been extensively studied through the Erbsville South Environmental Study (Dougan and Associates 2018) and the Erbsville South Block Plan (City of Waterloo 2020b). The EIS will be prepared in collaboration with the study team, which includes NRSI (biology), IBI (engineering, stormwater management, surface and groundwater monitoring), CVD (hydrogeology), and MHBC (planning).

This Terms of Reference (TOR) has been prepared in accordance with the City of Waterloo Official Plan (2020a), Region of Waterloo Official Plan (2015), Greenlands Network Implementation Guidelines (Region of Waterloo 2016), Erbsville South Block Plan (City of Waterloo 2020b), Erbsville South Environmental Study (Dougan and Associates 2018), and GRCA EIS Guidelines (2005). The

details of the TOR are attached for your review and comment. Please feel free to contact me if you have any questions or comments.

Sincerely,
Natural Resource Solutions Inc.



David E. Stephenson, M.Sc.
Senior Terrestrial and Wetland Biologist



Ken Burrell, M.E.S.,
Terrestrial and Wetland Biologist

720 Erbsville Road, Waterloo
Environmental Impact Study Terms of Reference
January 13, 2021

Introduction

The subject property is approximately 9.3 ha in area and is bounded to the northwest by Conservation Drive and the Erbsville Kartway lands, Erbsville Road to the south, and a small agricultural field to the east (Map 1). Habitat within the subject property is comprised of agricultural fields, with wetlands and woodlands associated with Laurel Creek. The woodland/wetland complex on-site is part of Environmentally Sensitive Policy Area (ESPA) 80 known as Laurel Creek Forest (Region of Waterloo 2015) and is a Core Natural Feature in the City of Waterloo's Official Plan (2020a). Wetlands are part of the Laurel Creek-Sunfish Lake PSW.

Proposed Undertaking

The proposed development is a mixture of townhouses and detached houses, with an internal road network, a mixture of residential density types, stormwater management, trails and parkland (Appendix I). The development plan will follow the land use structure of the Erbsville South Block Plan (City of Waterloo 2020b).

Proposed Study Area

Although the proponent owns a number of properties in the area, for the purposes of this study, the "subject property" refers to the property located at 720 Erbsville Road, Waterloo. The "development footprint" is the land occupied by the agricultural field and the existing dwelling which are understood to be the lands being considered for the development. In addition, neighbouring natural features are being included that have ecological connections and interrelationships to the development area. This includes areas that contribute to as well as receive flows from the development lands. As well, there are fairly extensive woodlands and wetlands nearby, and in order to complete a comprehensive impact assessment, these larger features will be included in this study (but to a lesser detail than features immediately adjacent to the development area as reference to previously completed studies will provide the necessary information). To capture these ecological interrelationships, we have included an area of 200m around the property boundary. For the purpose of this study, these lands are called the 'study area'. This distance also adequately captures the adjacent lands area as per the PPS.

Species At Risk (SAR) and Species of Conservation Concern (SCC) Screening

A SAR and SCC screening was completed by comparing the habitat requirements for significant species that are known from the vicinity of the study area based on the ESES (Dougan and Associates 2018) against the ELC communities and habitats within the subject property. This comparison allowed it to be determined which species occur or have the potential to occur within the subject property, and identify those species with potential to be impacted by the proposed undertaking. Based on this assessment, the following SAR and SCC have the potential to occur within the development footprint:

- Barn Swallow (*Hirundo rustica*),
- Snapping Turtle (*Chelydra serpentina serpentina*),
- Blanding's Turtle (*Emydoidea blandingii*), and
- Butternut (*Juglans cinerea*).

The SAR/SCC screening was completed for the submission of this TOR, and is appended (Appendix II).

Concurrent with the EIS process, NRSI will be submitting an Information Gathering Form to the MECP to address SAR documented by the ESES (Dougan and Associates 2018). Correspondence and documentation from this process will be appended to the EIS.

Significant Wildlife Habitat (SWH) Screening
SWH types were also screened based on NRSI's knowledge of the natural features on and adjacent to the subject property based on the survey results from the ESES (Dougan and Associates 2018), and using discrete significance criteria established by the MNRF (OMNRF 2015). Based on this assessment, the only SWH that has the potential to occur within the development footprint is deer movement corridors (*Candidate*).

Appendix II provides a summary of the SWH screening exercise including rationale as to why the SWH types are considered "candidate" or "not present".

Characterization of Natural Features
The natural features have been well studied through the Erbsville South Environmental Study (ESES) (Dougan and Associates 2018). As per recommendations made within the ESES (Dougan and Associates 2018) and the Erbsville South Block Plan (City of Waterloo 2020b) natural feature characterizations and findings within 3 years of the ESES (2018) will be used to determine impacts associated with the proposed undertaking. A summary of field surveys completed as part of the ESES (Dougan and Associates 2018) is provided in Appendix III.

The natural features on the subject property have been extensively characterized based on the field surveys completed as part of the ESES (Dougan and Associates 2018). The EIS will rely on the data in the existing reports but will provide a summary of site conditions. The following key components will be included in the site characterization:

- Summary of and mapping of vegetation communities using the Ecological Land Classification system for southern Ontario,
- Plant and wildlife species diversity and habitats,
- There have been no significant changes to any of the wetland boundaries and Core Environmental Feature boundaries as identified in the ESES (Dougan and Associates 2018) on the subject property. NRSI completed a field review of the subject property (December 8, 2020) to confirm natural feature boundaries, as documented in the ESES (Dougan and Associates 2018). Findings from this field survey confirmed that the natural features are consistent with the ESES findings. These boundaries will continue to be used and will be shown on all maps,
- Summary of wildlife species known to use the site including birds, mammals, reptiles and amphibians, and
- Description of aquatic habitat, fish and benthic communities in Laurel Creek.

Assessment of Potential Impacts
The analysis of impacts will be divided into:

- Direct impacts associated with disruption or displacement caused by the actual proposed 'footprint' of the undertaking, such as tree removal, direct impacts to wildlife and/or their habitats, or removal of invasive species / hazard trees.

- Indirect impacts associated with changes in site conditions such as indirect impacts to wildlife and modifications to drainage quantity/quality. This will include an analysis of the stormwater management plan for the site.
- Induced impacts associated with impacts after the development is constructed such as subsequent demand on the resources created by habitation/use of the area and vicinity.

Environmental Monitoring

The pre-construction monitoring program will incorporate field surveys completed during the ESES (Dougan and Associates 2018) and recommends a single year (2021) of pre-construction monitoring ahead of construction (i.e. site grading), due to the comprehensive field surveys completed to-date. The proposed biological monitoring program is provided in Appendix IV.

A pre-construction monitoring report will be prepared for the study area. The report will document the findings from the biological monitoring program. This data will be used to characterize the baseline conditions prior to the anticipated construction. The monitoring report will be submitted to the City for distribution to other agencies for review. It is expected that a condition of approval will require the implementation of the monitoring program and report, prior to final approval of the plan of subdivision. The site plan agreement will include an overview of the monitoring requirements.

Recommendations will be provided in the EIS for during- and post-construction monitoring of biological features, surface water and groundwater, mitigation measures and compliance, as per the City of Waterloo's Development Monitoring Protocol (1999). The basics of the during- and post-construction monitoring plan will be prepared during the EIS and implemented through the conditions of draft approval and agreement with the City. Prior to the initiation of the during-construction phase, the pre-construction monitoring methods will be revised to incorporate the recommendations of the EIS. The study design of the pre-construction monitoring plan will be replicated to provide consistency between the pre-, during- and post-construction monitoring plan.

Reporting

A summary of the findings, conclusions and recommendations in the EIS will be provided. The EIS report will be prepared in digital format including appropriate mapping (study area, existing conditions, monitoring locations, and development plan) and appendices (final TOR, species lists, pertinent agency correspondence, analysis tables, etc.) and will be submitted as part of a full submission with the study teams reports.

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MAPS

532000 532250 532500

4814500 4814250 4814000

Sunfish Lake
Laurel Creek
Wetland Complex

CONSERVATION DRIVE

Sunfish Lake
Laurel Creek
Wetland Complex

Sunfish Lake
Laurel Creek
Wetland Complex

Laurel Creek

ERBSVILLE ROAD

SCHNARR STREET

Laurel Creek

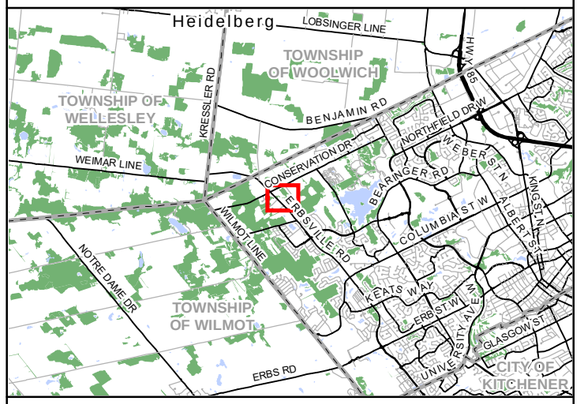
REGAL PLACE

Sunfish Lake
Laurel Creek
Wetland Complex

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Map 1

720 Erbsville Road
Environmental Impact Study
Study Area and Natural Features



Legend

- Subject Property
- ESPA #80 (Region of Waterloo, 2016)
- Permanent Watercourse
- Water Body
- Provincially Significant Wetland (PSW)

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

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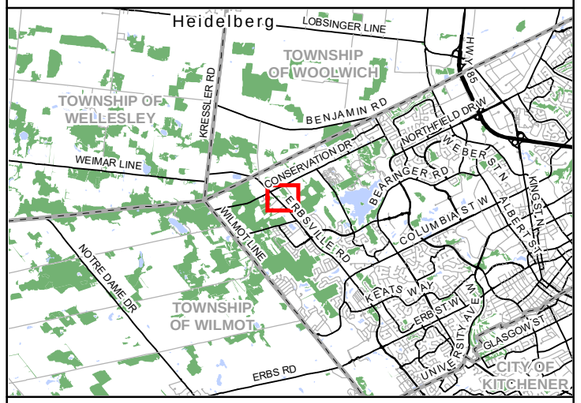
Project: 2520 Date: December 14, 2020	NAD83 - UTM Zone 17 Size: 11x17" **1:2,500**

N

0 50 100 150 Metres

Map 2

720 Erbsville Road
Environmental Impact Study
Natural Heritage Constraints



Legend

- Subject Property
- ESPA #80 Boundary (Significant Woodland Dripline - confirmed with Region of Waterloo August 19 and October 10, 2014)
- ESPA #80 Buffer (15m)
- Provincially Significant Wetland Boundary (Confirmed with GRCA August 18, 2014)
- PSW Buffer (30m)
- Permanent Watercourse
- Water Body

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Project: 2520 Date: December 14, 2020	NAD83 - UTM Zone 17 Size: 11x17" **1:2,500**

0 50 100 150 Metres

N

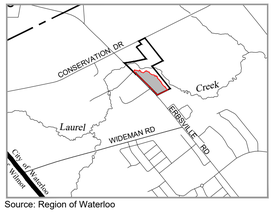
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APPENDIX I

Concept Plan – 720 Erbsville Road

720 Erbsville Road Development Concept

Key Plan



Source: Region of Waterloo

Property Boundary (±9.3ha)

Potential Development Area (±3.1ha)

Potential Stormwater Management Facility

PROPERTY	DEV AREA	UNITS ±
A- 720 Erbsville Road	3.1ha	PT "A" 79 T.H. PT "B" 39 T.H. or 23 Singles
TOTAL	**± 3.1ha**	**± 102-118**

NOTES:
- Environmental constraints based on Erbsville EA Study, September, 2018
- Property boundaries approx. (City of Waterloo Open Data)- to be verified by survey
- Development area calculation does not account for potential road widenings or easements
- For conceptual purposes only
- Google Satellite 2018 Aerial Imagery

Rev. No.	Date	Issued / Revision	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON. N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

Approval Stamp	**Date** Oct 24, 2019
	Drawn By GC
	Plan Scale 1:750 (36x24)
	File No. 0977D
Project ERBSVILLE	**Checked By** D.A.
Client	**Other**
File Name Development Concept	**Dwg No.** 1 of 1

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APPENDIX II

SAR / SCC, and SWH Screening Results

These pages have been deleted.

An updated SAR/SCC Screening is provided in Appendix II of the 720 Erbsville Road, Waterloo, Ontario, Environmental Impact Study.

An updated SWH Screening is provided in Appendix III of the 720 Erbsville Road, Waterloo, Ontario, Environmental Impact Study.

APPENDIX III

ESES (Dougan and Associates 2018) Field Survey Summary

Table 1. Field Survey Summary (summarized from Dougan and Associates 2018)

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
Winter Wildlife Survey	Systematic search by ELC polygon	February 4, 2014	0800-1200	-12.2 to -7	1	0	None	D. White
Ecological Land Classification	Lee et. al (1998)	May 17, 2013	--	--	--	--	--	W. Frise
		July 16, 2013	--	--	--	--	--	W. Frise
		August 14, 2013	--	--	--	--	--	W. Frise
		October 22, 2013	--	--	--	--	--	W. Frise
		July 22, 2014	--	--	--	--	--	D. White and W. Frise
Vascular Flora Inventory	Systematic search by ELC polygon	May 17, 2013	--	--	--	--	--	W. Frise
		July 16, 2013	--	--	--	--	--	W. Frise
		August 14, 2013	--	--	--	--	--	W. Frise
		October 22, 2013	--	--	--	--	--	W. Frise
		July 22, 2014	--	--	--	--	--	D. White and W. Frise
Butternut Health Assessment	N/A	July 11, 2016	--	--	--	--	--	Z. Harris
Wetland and ESPA Flagging (ahead of Agency Site Walks	N/A	August 15, 2014	--	--	--	--	--	W. Frise

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
Wetland Boundary Delineation (with GRCA, RMOW and City of Waterloo staff)	N/A	August 18, 2014	--	--	--	--	--	W. Frise
ESPA Boundary Delineation	N/A	August 19, 2014	--	--	--	--	--	W. Frise
ESPA Boundary Re-flagging	N/A	October 10, 2014	--	--	--	--	--	W. Frise and K. Beauchamp
Breeding Bird Surveys	Cadman et al. 2007	June 7, 2013	0630-0930	11-15	Calm	Cloudy	None	I. Richards
		June 14, 2013	0620-0930	15-18	2-3	Mostly Clear	None	I. Richards
Anuran Call Surveys	BSC 2009	April 27, 2013	2100-2300	11	0	N/A	None	D. White
		May 22, 2013	2100-2300	18-20	2	N/A	None	D. White
		June 15, 2013	2130-2330	18-20	0	N/A	None	D. White
Basking Turtle Surveys	Norminton 2013	April 27, 2013	1015-1050	11	Calm	Sunny	None	I. Richards
		May 16, 2013	0945-1020	16	3	Sunny	None	I. Richards
		June 7, 2013	0835-0930	11-15	Calm	Cloudy	None	I. Richards
		June 14, 2013	0820-0930	15-18	2-3	Mostly Clear	None	I. Richards
		June 19, 2013	1000-1500	21	Calm	Sunny	None	D. White
		May 13, 2014	1300-1400	12	Calm	Mixed sun/cloud	None	D. White

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
		June 4, 2014	1030-1100	12	Calm	Sunny	None	D. White
		March 9, 2016	1230-1445	6	Calm	Sunny	None	D. White
		April 27, 2016	1500-1730	10	Calm	Sunny	Clear	D. White
		May 4, 2016	1200-1545	14	Calm	Mixed sun/cloud	None	D. White
		May 11, 2016	1100-1315	15	Calm	Mixed sun/cloud	None	D. White
		May 16, 2016	1200-1430	17	Calm	Sunny	None	D. White
Turtle Nest Survey	OMNRF 2016B	June 7, 2013	0630-0930	11-15	Calm	Cloudy	None	I. Richards
		June 14, 2013	0620-0930	15-18	2-3	Clear	None	I. Richards
		June 19, 2013	0945-1500	21	Calm	Sunny	None	D. White
		June 5, 2016	1800-1945	17	--	50	None	D. White
		June 7, 2016	1800-1945	15	--	30	None	D. White
		June 9, 2016	1815-2145	11-17	--	15	None	K. Beauchamp
		June 10, 2016	1800-2130	17-23	--	Sunny	None	K. Beauchamp
		June 12, 2016	1800-2125	11-17	--	10	None	K. Beauchamp

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
		June 20, 2016	1330-1515	29	--	Sunny	None	M.A. Young, C Myrdal
Hatchling Turtle Survey	Systematic search within suitable habitats	September 20, 2013	--	20-23	--	Cloudy	Light Drizzle	K. Konze
Salamander Trapping	Wildlife Care Committee Research Protocol, Wildlife Scientific Collector's Authorization, and ESA 'B' Permit	April 4, 2014	--	--	--	--	--	D. White
		April 9, 2014	--	--	--	--	--	D. White and K. Konze
		April 10, 2014	--	--	--	--	--	D. White and K. Konze
		April 11, 2014	--	--	--	--	--	D. White and K. Konze
		April 15, 2014	--	--	--	--	--	D. White and K. Konze
		April 17, 2014	--	--	--	--	--	D. White and K. Konze
Snake Coverboards	Systematic search within suitable habitats	May 8, 2013	0930-1530	14	Calm	Sunny	None	D. White
		June 4, 2013	0900-1500	16	Calm	Sunny	None	D. White
		June 19, 2013	0945-1515	15	Calm	Sunny	None	D. White
		October 21, 2013	1000-1600	11	Light breeze	Cloudy	Light Rain	D. White
Reptile Hand Search	OMNR 2013B	May 13, 2014	0930-1130	22	Calm	Sunny	None	D. White

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
		June 4, 2014	1100-1500	16	Calm	Sunny	None	D. White
		June 20, 2014	0745-1115	20	Calm	Sunny	None	D. White
		July 22, 2014	0800-1200	23	Calm	Mix of sun/cloud	None	D. White
Roadkill Survey	Walking Transects	May 13, 2014	--	--	--	--	--	D. White
American Badger Survey	Systematic Searches in ELC Polygons	April 20, 2016	1400-1930	4	Calm	Sunny	None	D. White
		April 26, 2016	1245-1600	6	Calm	Overcast	None	D. White
Aquatic Habitat Characterization, Fish Community Sampling, and Trout Spawning Surveys	Stanfield 2013	November 10, 2013	--	--	--	--	--	C. Portt and Associates
		November 14, 2013	--	--	--	--	--	C. Portt and Associates
		November 19, 2013	--	--	--	--	--	C. Portt and Associates
		May 29, 2014	--	--	--	--	--	C. Portt and Associates
		August 18, 2014	--	--	--	--	--	C. Portt and Associates
		August 19, 2014	--	--	--	--	--	C. Portt and Associates
		August 20, 2014	--	--	--	--	--	C. Portt and Associates
		August 21, 2014	--	--	--	--	--	C. Portt and Associates

Survey Type	Protocol	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed*	Cloud Cover	Precipitation	Observers
		August 22, 2014	--	--	--	--	--	C. Portt and Associates
		October 27, 2014	--	--	--	--	--	C. Portt and Associates
		January 20, 2015	--	--	--	--	--	C. Portt and Associates
Benthic Invertebrates	Jones et al. 2007	June 30, 2014	--	--	--	--	--	C. Portt

*Wind is provided in the Beaufort Wind Scale, unless otherwise stated (where available).

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APPENDIX IV

Pre-Construction Biological Monitoring Program

720 Erbsville Road, Waterloo – Pre-Construction Biological Monitoring Program

Natural Resource Solutions Inc. (NRSI) has been retained by Sunvest Development Corp. to carry out the Stage 1 pre-construction monitoring program required by the City of Waterloo. This monitoring is required to document baseline conditions in advance of proposed residential development. The monitoring program will include a biological monitoring component (to be completed by NRSI), and a surface and groundwater monitoring component (to be completed by IBI Group).

Biological Monitoring Program

Field surveys will be carried out to provide baseline characterization of the biological features within the study area. The intent of these surveys is to provide a single year (2021) of pre-construction baseline data in addition to the fieldwork completed and summarized in the ESES (Dougan and Associates 2018). The following surveys are proposed:

- Terrestrial feature monitoring outlined in the City of Waterloo's Development Monitoring Protocol (1999) document for pre-construction (Section 2.2.3) will be conducted twice annually (spring and fall) by walking through the subject property and documenting the following:
    - General health of vegetation and trees
    - Evidence of soil movement
    - Evidence of human disturbance or encroachment
    - General fish and wildlife observations
    - Overall conditions
- Vascular flora and vegetation plots. Installation and monitoring of permanent 10m x 10m monitoring plots within the subject property.
- Photo monitoring at fixed locations will focus on edges of natural features where buffers will be implemented in future development.
- Anuran call surveys according to the Marsh Monitoring Protocol (MMP) (BSC 2009).
- Breeding bird surveys within the subject property, consistent with the Ontario Breeding Bird Atlas protocol (OBBA 2001). Surveys will include random (wandering) transects and 10-minute point counts. Surveys will be conducted twice during the peak breeding season (late May to early July) according to methodology.
- Aquatic habitat characterization of Laurel Creek during the summer at locations where access is available.
- Fish community sampling once annually (summer) at 2 stations in the study area. The sampling will consist of backpack electrofishing using the multiple pass method and will be carried out using the Ontario Stream Assessment Protocol (Stanfield 2017).
- Benthic macro-invertebrate (benthic) sampling twice annually (spring and fall) at 2 stations in the study area, located at the same locations as the fish community sampling. The sampling and assessment will involve the kick-and-sweep method and will be carried out using the Ontario Benthic Biomonitoring Network Protocol

(OBBN) (Jones et al. 2007). Benthic sample identification and analysis will be completed by certified NRSI taxonomists at NRSI's laboratory.

- Incidental wildlife observations made during all field visits will be recorded, including direct observations, as well as signs such as dens, tracks, scat, etc.

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APPENDIX IV

Vascular Flora Reported from Study Area

Plant Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

	Scientific Name	Common Name	Conservation Status							CC	CW	Native Status	Location (ELC polygons)
			Global	National			Provincial		Local				
			G Rank	COSEWIC	SARA	SARA Schedule	SARO	SRANK	Waterloo Region				
				Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	MNRF 2020a	MNRF 2020a	Richardson & Martin 1999	Oldham et al. 1998	Oldham et al. 1998		Additional Notes
Pteridophytes		**Ferns & Allies**											
Dennstaedtiaceae		**Bracken Fern Family**											
1	*Pteridium aquilinum*	Bracken Fern	G5					S5		2	3	N	21,26,32
Dryopteridaceae		**Wood Fern Family**											
2	*Athyrium filix-femina*	Common Lady Fern	G5					S5		4	0	I	7
3	*Cystopteris bulbifera*	Bulblet Fern	G5					S5		5	-3	N	27
4	*Dryopteris carthusiana*	Spinulose Wood Fern	G5					S5		5	-3	N	21,24,27,32
5	*Dryopteris cristata*	Crested Wood Fern	G5					S5		7	-5	N	19,20,27
6	*Dryopteris marginalis*	Marginal Wood Fern	G5					S5		5	3	N	24
7	*Gymnocarpium dryopteris*	Common Oak Fern	G5					S5		7	3	N	27
8	*Matteuccia struthiopteris*	Ostrich Fern	G5					S5		5	0	N	5,7,8,19,21,25,27,29,33
9	*Onoclea sensibilis*	Sensitive Fern	G5					S5		4	-3	N	1,2,3,4,17,19,21,25,26,27,32, 33,37
Equisetaceae		**Horsetail Family**											
10	*Equisetum arvense*	Field Horsetail	G5					S5		0	0	N	1,2,4,8,17,19,21,26,27,28,29, 32,33
Lycopodiaceae		**Clubmoss Family**											
11	*Diphasiastrum digitatum*	Southern Ground-cedar	G5					S5	R*	3	5	N	27
Osmundaceae		**Royal Fern Family**											
12	*Osmunda regalis*	Royal Fern	G5					S5		7	-5	N	25,27,29
13	*Osmundastrum cinnamomeum*	Cinnamon Fern	G5					S5		7	-3	N	27
Thelypteridaceae		**Beech Fern Family**											
14	*Thelypteris palustris*	Marsh Fern	G5					S5		5	-3	N	2,19,27
Gymnosperms		**Conifers**											
Cupressaceae		**Cypress Family**											
15	*Thuja occidentalis*	Eastern White Cedar	G5					S5		4	-3	N	1,2,4,7,8,10,16,17,19,21,27,2 8,29,32,33,37,42
Pinaceae		**Pine Family**											
16	*Larix decidua*	European Larch	G5					SE2		0	5	I	4
17	*Larix laricina*	Tamarack	G5					S5		7	-3	N	2,19,29
18	*Picea abies*	Norway Spruce	G5					SE3		0	5	I	6,16,42
19	*Picea glauca*	White Spruce	G5					S5	R+	6	3	N	4,6,17,42
20	*Picea pungens*	Blue Spruce	G5					SE1		0	3	I	7,16
21	*Pinus nigra*	Black Pine	G5					SE3		0	5	I	6,16
22	*Pinus strobus*	Eastern White Pine	G5					S5		4	3	N	2,4,6,21,27,32,33,42
23	*Tsuga canadensis*	Eastern Hemlock	G4G5					S5		7	3	N	21,24,27,33
Dicotyledons		**Dicots**											
Aceraceae		**Maple Family**											
24	*Acer negundo*	Manitoba Maple	G5					S5		0	0	N	3,7,10,17,23
25	*Acer platanoides*	Norway Maple	GNR					SE5		0	5	I	16
26	*Acer rubrum*	Red Maple	G5					S5		4	0	N	19,25,27,33
27	*Acer saccharinum*	Silver Maple	G5					S5		5	-3	N	17
28	*Acer saccharum*	Sugar Maple	G5					S5		4	3	N	5,7,21,24,32,33,42
Anacardiaceae		**Sumac or Cashew Family**											
29	*Rhus typhina*	Staghorn Sumac	G5					S5		1	3	N	24.
30	*Toxicodendron radicans*	Poison Ivy	G5					S5		2	0	N	7
Apiaceae		**Carrot or Parsley Family**											
31	*Cicuta bulbifera*	Bulb-bearing Water-hemlock	G5					S5		5	-5	N	19,27,31
32	*Cicuta maculata*	Spotted Water-hemlock	G5					S5		6	-5	N	8,37
33	*Daucus carota*	Wild Carrot	GNR					SE5		0	5	I	10,13,17,18,21,23,26,28,36
34	*Sium suave*	Hemlock Water-parsnip	G5					S5		4	-5	N	1
Apocynaceae		**Dogbane Family**											
35	*Vinca minor*	Periwinkle	GNR					SE5		0	5	I	5,6,7,8
Araliaceae		**Ginseng Family**											
36	*Aralia hispida*	Bristly Sarsaparilla	G5					S5	R	8	5	N	27
37	*Aralia nudicaulis*	Wild Sarsaparilla	G5					S5		4	3	N	27
Asclepiadaceae		**Milkweed Family**											
38	*Asclepias incarnata*	Swamp Milkweed	G5					S5		6	-5	N	2,12,23,31
39	*Asclepias syriaca*	Common Milkweed	G5					S5		0	5	N	10,21,32
Asteraceae		**Composite or Aster Family**											
40	*Achillea millefolium*	Common Yarrow	G5					SE5?		0	3	N	26
41	*Ambrosia artemisiifolia*	Common Ragweed	G5					S5		0	3	N	28
42	*Arctium lappa*	Great Burdock	G5					SE5		0	3	I	21
43	*Arctium minus*	Common Burdock	GNR					SE5		0	3	I	17
44	*Bidens frondosa*	Devil's Beggarticks	G5					S5		3	-3	N	1,2
45	*Cichorium intybus*	Chicory	GNR					SE5		0	5	I	13,28,36
46	*Cirsium arvense*	Creeping Thistle	GNR					SE5		0	3	I	13,21,23,36,
47	*Cirsium vulgare*	Bull Thistle	GNR					SE5		0	3	I	10,32,
48	*Erigeron philadelphicus*	Philadelphia Fleabane	G5					S5		1	-3	N	13,21,26,36
49	*Eupatorium perfoliatum*	Common Boneset	G5					S5		2	-3	N	12,15,19,31,33
50	*Eurybia macrophylla*	Large-leaved Aster	G5					S5		5	5	N	21
51	*Euthamia graminifolia*	Grass-leaved Goldenrod	G5					S5		2	0	N	21
52	*Rudbeckia hirta*	Black-eyed Susan	G5					S5		0	3	N	26
53	*Solidago canadensis*	Canada Goldenrod	G5					S5		1	3	N	10,13,14,17,18,21,22,23,26,2 8,32,33,34,36
54	*Solidago rugosa*	Rough-stemmed Goldenrod	G5					S5		4	0	N	19,21,29
55	*Symphyotrichum lanceolatum*	Panicled Aster	G5					S5		3	-3	N	1,22
56	*Symphyotrichum novae-angliae*	New England Aster	G5					S5		2	-3	N	17,23
57	*Symphyotrichum puniceum*	Swamp Aster	G5					S5		6	-5	N	18,21,22,31,37
58	*Tanacetum vulgare*	Common Tansy	GNR					SE5		0	5	I	23
59	*Taraxacum officinale*	Common Dandelion	G5					SE5		0	3	I	2,5,6,7,10,13,17,21,28,32,36
60	*Tussilago farfara*	Colt's-foot	GNR					SE5		0	3	I	1,17,19,21,22,24
Balsaminaceae		**Touch-me-not Family**											
61	*Impatiens capensis*	Spotted Jewelweed	G5					S5		4	-3	N	1,8,12,17,19,23,25,27,29,31
Berberidaceae		**Barberry Family**											
62	*Caulophyllum thalictroides*	Blue Cohosh	G4G5					S5		5	5	N	5,24
63	*Podophyllum peltatum*	May-apple	G5					S5		5	3	N	34
Betulaceae		**Birch Family**											
64	*Alnus incana*	Grey Alder	G5					S5	R*	6	-3	N	19
65	*Betula alleghaniensis*	Yellow Birch	G5					S5		6	0	N	2,19,21,24,27,33
66	*Betula papyrifera*	Paper Birch	G5					S5		2	3	N	19,21,32
67	*Ostrya virginiana*	Eastern Hop-hornbeam	G5					S5		4	3	N	7,21,24
Boraginaceae		**Borage Family**											
68	*Myosotis laxa*	Small Forget-me-not	G5					S5		6	-5	N	4,5,8
69	*Myosotis scorpioides*	True Forget-me-not	G5					SE5		0	-5	I	6,19,29
70	*Symphytum officinale*	Common Comfrey	GNR					SE5		0	5	I	17
Brassicaceae		**Mustard Family**											
71	*Alliaria petiolata*	Garlic Mustard	GNR					SE5		0	0	I	3,5,6,7
72	*Barbarea vulgaris*	Bitter Wintercress	GNR					SE5		0	0	I	7
73	*Thlaspi arvense*	Field Penny-cress	GNR					SE5		0	5	I	21
Campanulaceae		**Bellflower Family**											
74	*Lobelia siphilitica*	Great Blue Lobelia	G5					S5		6	-3	N	3
Caprifoliaceae		**Honeysuckle Family**											
75	*Lonicera tatarica*	Tatarian Honeysuckle	GNR					SE5		0	3	I	3
76	*Sambucus canadensis*	Common Elderberry	G5T5					S5		5	-3	N	21
77	*Triosteum aurantiacum*	Orange-fruited Horse-gentian	G5					S4S5		7	5	N	21
78	*Viburnum opulus*	Cranberry Viburnum	G5					S5		5	-3	I	1,2,4,21,22,24,28,32
Caryophyllaceae		**Pink Family**											

79	*Silene latifolia*	White Campion	G5T5					SE5		0	5	I	7
Clusiaceae		**St. John's-wort Family**											
80	*Hypericum perforatum*	Common St. John's-wort	GNR					SE5		0	5	I	21
Cornaceae		**Dogwood Family**											
81	*Cornus alternifolia*	Alternate-leaved Dogwood	G5					S5		6	3	N	5,7,10,24,28,32,
82	*Cornus canadensis*	Bunchberry	G5					S5		7	0	N	27
83	*Cornus racemosa*	Gray Dogwood	G5					S5		2	0	N	19,21,29,31
84	*Cornus sericea*	Red-osier Dogwood	G5					S5		2	-3	N	1,2,3,8,12,17,18,19,21,22,23, 29,31,33,37
Cucurbitaceae		**Gourd Family**											
85	*Echinocystis lobata*	Wild Mock-cucumber	G5					S5		3	-3	N	32
Dipsacaceae		**Teasel Family**											
86	*Dipsacus fullonum*	Common Teasel	GNR					SE5		0	3	I	10,21,34
Fabaceae		**Pea Family**											
87	*Lotus corniculatus*	Garden Bird's-foot Trefoil	GNR					SE5		0	3	I	13,17,23,28,36
88	*Medicago lupulina*	Black Medic	GNR					SE5		0	3	I	26
89	*Medicago sativa*	Alfalfa	GNR					SE5		0	5	I	13,36
90	*Melilotus albus*	White Sweet-clover	G5					SE5		0	3	I	13,28,34,36
91	*Melilotus officinalis*	Yellow Sweet-clover	GNR					SE5		0	3	I	18
92	*Robinia pseudoacacia*	Black Locust	G5					SE5		0	3	I	7,10
93	*Vicia cracca*	Tufted Vetch	GNR					SE5		0	5	I	13,17,23,36
Fagaceae		**Beech Family**											
94	*Fagus grandifolia*	American Beech	G5					S4		6	3	N	24,33
95	*Quercus rubra*	Northern Red Oak	G5					S5		6	3	N	34,42
Geraniaceae		**Geranium Family**											
96	*Geranium maculatum*	Spotted Geranium	G5					S5		6	3	N	21
97	*Geranium robertianum*	Herb-Robert	G5					S5		2	3	I	10,21,24,32
Grossulariaceae		**Currant Family**											
98	*Ribes americanum*	Wild Black Currant	G5					S5		4	-3	N	1,4,7,8,17,21,22,
99	*Ribes cynosbati*	Prickly Gooseberry	G5					S5		4	3	N	33
100	*Ribes triste*	Swamp Red Currant	G5					S5		6	-5	N	17
Hippocastanaceae		**Buckeye Family**											
101	*Aesculus glabra*	Ohio Buckeye	G5					S1		10	0	N	6
Juglandaceae		**Walnut Family**											
102	*Juglans cinerea*	Butternut	G4	END	Endangered	Schedule 1	END	S2?		6	3	N	7,10
103	*Juglans nigra*	Black Walnut	G5					S4?	R+*	5	3	N	7, 27,34,42
Lamiaceae		**Mint Family**											
104	*Ajuga reptans*	Creeping Bugleweed	GNR					SE2		0	5	I	27
105	*Glechoma hederacea*	Ground Ivy	GNR					SE5		0	3	I	7
106	*Lycopus americanus*	American Water-horehound	G5					S5		4	-5	N	12
107	*Lycopus uniflorus*	Northern Water-horehound	G5					S5		5	-5	N	2,31
108	*Prunella vulgaris*	Self-heal	G5					S5		0	0	N	17,27,29,32
109	*Scutellaria galericulata*	Hooded Skullcap	G5					S5		6	-5	N	12,19,23,31
110	*Scutellaria lateriflora*	Mad Dog Skullcap	G5					S5		5	-5	N	27
Magnoliaceae		**Magnolia Family**											
111	*Liriodendron tulipifera*	Tulip Tree	G5					S4		8	3	N	42
Oleaceae		**Olive Family**											
112	*Fraxinus nigra*	Black Ash	G5	THR	No Status	No schedule		S3		7	-3	N	21,27,29
113	*Fraxinus pennsylvanica*	Green Ash	G5					S4		3	-3	N	2,4,5,7,10,17,21,28,32,33,34, 42
114	*Syringa vulgaris*	Common Lilac	GNR					SE5		0	5	I	7,42
Onagraceae		**Evening-primrose Family**											
115	*Epilobium ciliatum ssp. glandulosum*	Glandular Willowherb	G5T5					SU		3	-3	I	23,31
Papaveraceae		**Poppy Family**											
116	*Chelidonium majus*	Greater Celandine	G5					SE5		0	5	I	7
117	*Sanguinaria canadensis*	Bloodroot	G5					S5		5	3	N	7
Plantaginaceae		**Plantain Family**											
118	*Plantago lanceolata*	English Plantain	G5					SE5		0	3	I	13,36
119	*Plantago major*	Common Plantain	G5					SE5		0	3	N	13,26,36
Polygalaceae		**Milkwort Family**											
120	*Polygaloides paucifolia*	Gay-wing Milkwort	G5					S5		6	3	N	33
Polygonaceae		**Smartweed Family**											
121	*Persicaria amphibia*	Water Smartweed	G5					S5		5	-5	N	31
122	*Rumex crispus*	Curly Dock	GNR					SE5		0	0	I	14,18,22,23,29
Primulaceae		**Primrose Family**											
123	*Lysimachia borealis*	Northern Starflower	G5					S5		6	0	N	19,27
124	*Lysimachia ciliata*	Fringed Loosestrife	G5					S5		4	-3	N	1,4,29
Pyrolaceae		**Wintergreen Family**											
125	*Pyrola elliptica*	Shinleaf	G5					S5		5	5	N	19,33
Ranunculaceae		**Buttercup Family**											
126	*Actaea pachypoda*	White Baneberry	G5					S5		6	5	N	24
127	*Actaea rubra*	Red Baneberry	G5					S5		6	3	N	27
128	*Anemonastrum canadense*	Canada Anemone	G5					S5		3	-3	N	10
129	*Caltha palustris*	Yellow Marsh Marigold	G5					S5		5	-5	N	1,3,8,19,27
130	*Coptis trifolia*	Goldthread	G5					S5		7	-3	N	19,27,
131	*Ranunculus abortivus*	Kidney-leaved Buttercup	G5					S5		2	0	N	27
132	*Ranunculus acris*	Tall Buttercup	G5					SE5		0	0	I	13,36
133	*Ranunculus bulbosus*	Bulbous Buttercup	GNR					SE3		0	-3	I	3
Rhamnaceae		**Buckthorn Family**											
134	*Frangula alnus*	Glossy Buckthorn	GNR					SE5		0	0	I	19
135	*Rhamnus cathartica*	Common Buckthorn	GNR					SE5		0	0	I	1,3,4,7,8,10,17,21,23,24,28,3 2,33,34,42
Rosaceae		**Rose Family**											
136	*Agrimonia gryposepala*	Hooked Agrimony	G5					S5		2	3	N	4,10,33
137	*Fragaria virginiana*	Wild Strawberry	G5					S5		2	3	N	4,5,17,21,22,24,26,32,33,34
138	*Geum aleppicum*	Yellow Avens	G5					S5		2	0	N	10,17
139	*Geum canadense*	White Avens	G5					S5		3	0	N	4,10,34
140	*Geum urbanum*	Wood Avens	G5					SE3		0	5	I	21,34
141	*Prunus serotina*	Black Cherry	G5					S5		3	3	N	5,6,7,10,21,24,32,33
142	*Prunus virginiana*	Choke Cherry	G5					S5		2	3	N	4,5,7,21,24,27,32,34
143	*Rosa multiflora*	Multiflora Rose	GNR					SE5		0	3	I	22
144	*Rubus allegheniensis*	Allegheny Blackberry	G5					S5		2	3	N	21,24,26,32
145	*Rubus idaeus ssp. strigosus*	Wild Red Raspberry	G5T5					S5		2	3	N	3,7,10,21,23,32
146	*Rubus pubescens*	Dewberry	G5					S5		4	-3	N	1,2,4,19,21,27
147	*Spiraea alba*	White Meadowsweet	G5					S5		3	-3	N	1,19,23,31,37
Rubiaceae		**Madder Family**											
148	*Galium odoratum*	Sweet Bedstraw	GNR					SE1		0	5	I	8
149	*Mitchella repens*	Partridge-berry	G5					S5		6	3	N	27
Salicaceae		**Willow Family**											
150	*Populus balsamifera*	Balsam Poplar	G5					S5		4	-3	N	3,4,17,29,31,32,37
151	*Populus deltoides*	Eastern Cottonwood	G5					S5	R+	4	0	N	3,4,5,8,42
152	*Populus tremuloides*	Trembling Aspen	G5					S5		2	0	N	2,3,4,5,6,17,19,21,23,24,26,2 7,28,32,33
153	*Salix amygdaloides*	Peach-leaved Willow	G5					S5		6	-3	N	17
154	*Salix bebbiana*	Bebb's Willow	G5					S5		4	-3	N	12,17,31
155	*Salix discolor*	Pussy Willow	G5					S5		3	-3	N	1
156	*Salix eriocephala*	Heart-leaved Willow	G5					S5		4	-3	N	12,19,22
157	*Salix interior*	Sandbar Willow	G5					S5		1	-3	N	31
158	*Salix nigra*	Black Willow	G5					S4		6	-5	N	31
159	*Salix petiolaris*	Meadow Willow	G5					S5		3	-3	N	12,31
Saxifragaceae		**Saxifrage Family**											
160	*Mitella nuda*	Naked Mitrewort	G5					S5		6	-3	N	19,27,33
Scrophulariaceae		**Figwort Family**											
161	*Chelone glabra*	White Turtlehead	G5					S5		7	-5	N	23
162	*Verbascum thapsus*	Common Mullein	GNR					SE5		0	5	I	23
163	*Veronica officinalis*	Common Speedwell	G5					SE5		0	5	N	12
Solanaceae		**Nightshade Family**											

164	*Physalis heterophylla*	Clammy Ground-cherry	G5					S4		3	5	N	7
165	*Solanum dulcamara*	Bittersweet Nightshade	GNR					SE5		0	0	I	1,3,10,19,21,23,25,27,29,31,32
Tiliaceae		**Linden Family**											
166	*Tilia americana*	American Basswood	G5					S5		4	3	N	7,10,21,23,24,34
167	*Tilia cordata*	Little-leaf Linden	GNR					SE1		0	5	I	6
Ulmaceae		**Elm Family**											
168	*Ulmus americana*	American Elm	G5					S5		3	-3	N	6
169	*Ulmus pumila*	Siberian Elm	GNR					SE3		0	3	I	17
Urticaceae		**Nettle Family**											
170	*Boehmeria cylindrica*	False Nettle	G5					S5		4	-5	N	27
171	*Laportea canadensis*	Wood Nettle	G5					S5		6	-3	N	25
172	*Pilea pumila*	Dwarf Clearweed	G5					S5		5	-3	N	31
173	*Urtica dioica*	Stinging Nettle	G5					S5		2	0	N	1,3,23,27,31
Verbenaceae		**Vervain Family**											
174	*Verbena hastata*	Blue Vervain	G5					S5		4	-3	N	12
Violaceae		**Violet Family**											
175	*Viola cucullata*	Marsh Blue Violet	G4G5					S5		5	-5	N	5,6
176	*Viola nephrophylla*	Northern Bog Violet	G5					S5	R	7	-3	N	1,3
177	*Viola sororia*	Woolly Blue Violet	G5					S5		4	0	N	5,6
Vitaceae		**Grape Family**											
178	*Parthenocissus quinquefolia*	Virginia Creeper	G5					S4?	R+	6	3	N	3,19
179	*Parthenocissus vitacea*	Thicket Creeper	G5					S5		4	3	N	1,8,24,27,28,32,34
180	*Vitis riparia*	Riverbank Grape	G5					S5		0	0	N	17,21,23,24,28,32
Alismataceae		**Water-plantain Family**											
181	*Sagittaria latifolia*	Broad-leaved Arrowhead	G5					S5		4	-5	N	12,18,19,30,31
Araceae		**Arum Family**											
182	*Arisaema triphyllum*	Jack-in-the-pulpit	G5					S5		5	-3	N	7,19,24,27,32
Cyperaceae		**Sedge Family**											
183	*Carex aquatilis*	Water Sedge	G5					S5		7	-5	N	29
184	*Carex arctata*	Drooping Woodland Sedge	G5					S5		5	5	N	33
185	*Carex aurea*	Golden Sedge	G5					S5		4	-3	N	12,32
186	*Carex comosa*	Bristly Sedge	G5					S5		5	-5	N	25
187	*Carex gracilescens*	Slender Loose-flowered Sedge	G5					S4		7	5	N	12
188	*Carex gracillima*	Graceful Sedge	G5					S5		4	3	N	4,5,10,27,32,33
189	*Carex hystericina*	Porcupine Sedge	G5					S5		5	-5	N	12,15,18
190	*Carex intumescens*	Bladder Sedge	G5					S5		6	-3	N	27,29
191	*Carex lacustris*	Lake Sedge	G5					S5		5	-5	N	3
192	*Carex lupulina*	Hop Sedge	G5					S5		6	-5	N	1
193	*Carex pensylvanica*	Pennsylvania Sedge	G5					S5		5	5	N	33
194	*Carex pseudocyperus*	Cyperus-like Sedge	G5					S5		6	-5	N	18,27,29
195	*Carex radiata*	Eastern Star Sedge	G4					S5		4	0	N	19
196	*Carex retrorsa*	Retrorse Sedge	G5					S5		5	-5	N	31
197	*Carex scabrata*	Eastern Rough Sedge	G5					S5	R	8	-5	N	27
198	*Carex stipata*	Awl-fruited Sedge	G5					S5		3	-5	N	14,15,27,29,31
199	*Carex stricta*	Tussock Sedge	G5					S5		4	-5	N	3,4,8
200	*Carex vulpinoidea*	Fox Sedge	G5					S5		3	-5	N	12,14,18
201	*Schoenoplectus tabernaemontani*	Soft-stemmed Bulrush	G5					S5		5	-5	N	12,14,18,31
202	*Scirpus atrovirens*	Dark-green Bulrush	G5					S5		3	-5	N	1,12,14,15,18,22,23,29
203	*Scirpus cyperinus*	Cottongrass Bulrush	G5					S5		4	-5	N	31
Juncaceae		**Rush Family**											
204	*Juncus canadensis*	Canada Rush	G5					S5	R	6	-5	N	12,18
205	*Juncus effusus ssp. solutus*	Soft Rush	G5T5					S5?		4	-5	N	12,14,15,31
206	*Juncus tenuis*	Path Rush	G5					S5		0	0	N	15
Lemnaceae		**Duckweed Family**											
207	*Lemna minor*	Lesser Duckweed	G5					S5?		5	-5	N	19,30
Liliaceae		**Lily Family**											
208	*Asparagus officinalis*	Garden Asparagus	G5					SE5		0	3	I	7
209	*Clintonia borealis*	Blue Bead-lily	G5					S5		7	0	N	27.
210	*Convallaria majalis*	European Lily-of-the-valley	G5					SE5		0	5	I	4.
211	*Erythronium americanum*	Yellow Trout-lily	G5					S5		5	5	N	7
212	*Hemerocallis fulva*	Orange Daylily	GNA					SE5		0	5	I	7,23,28
213	*Maianthemum canadense*	Wild Lily-of-the-valley	G5					S5		5	3	N	19,24,27,32,33
214	*Maianthemum racemosum*	Large False Solomon's Seal	G5					S5		4	3	N	24,27,32,33
215	*Maianthemum stellatum*	Star-flowered False Solomon's Seal	G5					S5		6	0	N	8
216	*Polygonatum biflorum*	Giant Solomon's Seal	G5					S4		8	3	N	7
217	*Trillium erectum*	Red Trillium	G5					S5		6	3	N	5,7
218	*Trillium grandiflorum*	White Trillium	G5					S5		5	3	N	7
Orchidaceae		**Orchid Family**											
219	*Epipactis helleborine*	Eastern Helleborine	GNR					SE5		0	3	I	24,33,
Poaceae		**Grass Family**											
220	*Agrostis gigantea*	Redtop	G4G5					SE5		0	-3	I	14,15
221	*Agrostis stolonifera*	Creeping Bentgrass	G5					SE5		0	-3	N	31
222	*Bromus inermis*	Smooth Brome	GNR					SE5		0	5	I	13,17,23,26,28,34,36
223	*Calamagrostis canadensis*	Bluejoint Reedgrass	G5					S5	X	4	-5	N	31
224	*Cinna latifolia*	Drooping Woodreed	G5					S5		7	-3	N	31
225	*Dactylis glomerata*	Orchard Grass	GNR					SE5		0	3	I	13,17,34,36
226	*Elymus repens*	Creeping Wildrye	GNR					SE5		0	3	I	22,23
227	*Elymus virginicus*	Virginia Wildrye	G5					S5		5	-3	N	1
228	*Glyceria grandis*	Tall Mannagrass	G5					S5		5	-5	N	14,29,31
229	*Glyceria striata*	Fowl Mannagrass	G5					S5		3	-5	N	1,25,27,29
230	*Leersia oryzoides*	Rice Cutgrass	G5					S5		3	-5	N	15,19,30,31
231	*Muhlenbergia frondosa*	Wirestem Muhly	G5					S4	R*	5	-3	N	32
232	*Phalaris arundinacea*	Reed Canary Grass	G5					S5		0	-3	N	1,14,17,18,21,22,23,29,30,31
233	*Phleum pratense*	Common Timothy	GNR					SE5		0	3	I	13,17,23,34,36
234	*Phragmites australis*	Common Reed	G5					S4?		0	-3	N	12,15,22
235	*Poa compressa*	Canada Bluegrass	GNR					SE5		0	3	I	34
236	*Poa pratensis*	Kentucky Bluegrass	G5					S5		0	3	N	6,10,14,16,32,34
Typhaceae		**Cattail Family**											
237	*Typha angustifolia*	Narrow-leaved Cattail	G5					SE5		0	-5	I	12,15,17,18,19,22,31
238	*Typha latifolia*	Broad-leaved Cattail	G5					S5		1	-5	N	14,15,19,23,29,31
Total													**238**

*NHIC Atlas Squares: 17NJ31

References

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Legend: Plant Species List

Provincial Ranks							
SRANK							
S1	Critically Imperiled	**S4**	Apparently Secure	**S#?**	Uncertain Rank	**SNR**	Unranked	**NP**	Not Provided
S2	Imperiled	**S5**	Secure	**SX**	Presumed Extirpated	**SU**	Unrankable		
S3	Vulnerable	**S#S#**	Status is Between Ranks	**SH**	Possibly Extirpated (Historical)	**SNA**	Not Applicable		
SARO							
END	Endangered	**SC**	Special Concern	**DD**	Data Deficient				
THR	Threatened	**NAR**	Not at Risk	**EXP**	Extirpated				
Federal Ranks							
COSEWIC and SARA							
E	Endangered	**SC**	Special Concern	**NS**	No Status	**N-A**	Non-Active	**EX**	Extirpated
T	Threatened	**NAR**	Not at Risk	**DD**	Data Defficient	**X**	Extinct		
SARA Schedule							
Schedule 1	Extirpated, Endangered, Threatened, Special Concern Species officially protected under SARA						
Schedule 2	Endangered, Threatened species not yet re-assessed using revised criteria; may be considered for inclusion to Schedule 1						
Schedule 3	Special Concern species not yet re-assessed using revised criteria; may be considered for inclusion to Schedule 1						
Global Ranks							
GRANK							
G1	Critically Imperiled	**G4**	Apparently Secure	**GNA**	Not Applicable		
G2	Imperiled	**G5**	Secure				
G3	Vulnerable	**GNR**	Unranked				
Regional Status							
Waterloo Region							
R	Native, Present and Rare	**R***	Native, Present and Rare with the exception that additional research may prove otherwise			**R#**	Native, Present and Rare, however, known Waterloo Region reports are treated as hypothetical.		
R+	Native, Present and Rare if demonstrably indigenous - most populations in Waterloo Region are thought to be of non-indigenous origin			**X**	Native and Present, and all Introduced Species				
Native							
N	Native						
I	Invasive						

APPENDIX V

Wildlife Species Reported from the Study Area

Bird Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	OBBA*	NHIC Data**	Erbsville South Environmental Study: Highest Level of Breeding Evidence
		MNRF 2020a	MNRF 2020a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	Martin 1996	Cadman et al. 2007	MNRF 2020b	Dougan and Associates 2018
Anatidae	**Ducks, Geese & Swans**									
Aix sponsa	Wood Duck	S5					√*	CO		PO
Anas platyrhynchos	Mallard	S5						CO		PR
Lophodytes cucullatus	Hooded Merganser	S5								PO
Branta canadensis	Canada Goose	S5						CO		CO
Phasianidae	**Partridges, Grouse & Turkeys**									
Bonasa umbellus	Ruffed Grouse	S4						CO		
Meleagris gallopavo	Wild Turkey	S5						CO		PO
Phasianus colchicus	Ring-necked Pheasant	SNA						CO		
Podicipediformes	**Grebes**									
Podilymbus podiceps	Pied-billed Grebe	S4B,S4N					√	PR		
Columbidae	**Pigeons & Doves**									
Columba livia	Rock Pigeon	SNA						CO		
Zenaida macroura	Mourning Dove	S5						CO		PO
Cuculiformes	**Cuckoos & Anis**									
Coccyzus americanus	Yellow-billed Cuckoo	S4B					√	PR		
Coccyzus erythropthalmus	Black-billed Cuckoo	S5B					√	CO		PO
Caprimulgidae	**Goatsuckers**									
Chordeiles minor	Common Nighthawk	S4B	SC	SC	T	Schedule 1	√*	PR		
Apodidae	**Swifts**									
Chaetura pelagica	Chimney Swift	S4B,S4N	THR	T	T	Schedule 1		PR		
Trochilidae	**Hummingbirds**									
Archilochus colubris	Ruby-throated Hummingbird	S5B					√	PR		X
Rallidae	**Rails, Gallinules & Coots**									
Porzana carolina	Sora	S4B					√	PO		
Rallus limicola	Virginia Rail	S5B					√	PR		
Charadriidae	**Plovers & Lapwings**									
Charadrius vociferus	Killdeer	S5B,S5N						CO		PO
Scolopacidae	**Sandpipers & Allies**									
Actitis macularia	Spotted Sandpiper	S5						PR		PR
Scolopax minor	American Woodcock	S4B						PR		
Ardeidae	**Herons & Bitterns**									
Ardea alba	Great Egret	S2B					√	-		X
Ardea herodias	Great Blue Heron	S4					√	PO		X
Botaurus lentiginosus	American Bittern	S4					√	-		X
Butorides virescens	Green Heron	S4B					√	PR		X
Cathartidae	**Vultures**									
Cathartes aura	Turkey Vulture	S5B					√	PO		X
Pandionidae	**Osprey**									
Pandion haliaetus	Osprey	S5B					√	CO		X
Accipitridae	**Hawks, Kites, Eagles & Allies**									
Accipiter cooperii	Cooper's Hawk	S4	NAR	NAR	NS	No schedule	√	CO		
Accipiter striatus	Sharp-shinned Hawk	S5	NAR	NAR	NS	No schedule	√	PO		PO

Bird Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Buteo jamaicensis	Red-tailed Hawk	S5	NAR	NAR	NS	No schedule		CO		PO
Buteo lineatus	Red-shouldered Hawk	S4B	NAR	NAR	SC	Schedule 3	√			X
Circus hudsonius	Northern Harrier	S4B	NAR	NAR	NS	No schedule	√	PO		
Haliaeetus leucocephalus	Bald Eagle	S2N, S4B	NAR	NAR	NS	No schedule	√			X
Strigidae	**Typical Owls**									
Bubo virginianus	Great Horned Owl	S4						CO		PO
Megascops asio	Eastern Screech-Owl	S4	NAR	NAR	NS	No schedule		CO		
Alcedinidae	**Kingfishers**									
Megaceryle alcyon	Belted Kingfisher	S4B					√	PR		
Picidae	**Woodpeckers**									
Colaptes auratus	Northern Flicker	S4B						CO		PO
Dryobates pubescens	Downy Woodpecker	S5						CO		PR
Dryobates villosus	Hairy Woodpecker	S5						CO		
Dryocopus pileatus	Pileated Woodpecker	S5					√	CO		PO
Melanerpes carolinus	Red-bellied Woodpecker	S4					√	PR		PR
Melanerpes erythrocephalus	Red-headed Woodpecker	S4B	SC	E	T	Schedule 1	√	CO		X
Falconidae	**Caracaras & Falcons**									
Falco peregrinus	Peregrine Falcon	S3B	SC	NAR	SC	Schedule 1	√	PR		
Falco sparverius	American Kestrel	S4						CO		
Tyrannidae	**Tyrant Flycatchers**									
Contopus virens	Eastern Wood-Pewee	S4B	SC	SC	SC	Schedule 1		PR	X	PR
Empidonax alnorum	Alder Flycatcher	S5B					√	PR		PR
Empidonax traillii	Willow Flycatcher	S5B						PR		X
Empidonax virescens	Acadian Flycatcher	S2S3B	END	E	E	Schedule 1	√	PO		
Myiarchus crinitus	Great Crested Flycatcher	S4B						PR		PR
Sayornis phoebe	Eastern Phoebe	S5B						CO		
Tyrannus tyrannus	Eastern Kingbird	S4B						PR		PR
Vireonidae	**Vireos**									
Vireo gilvus	Warbling Vireo	S5B						PR		PO
Vireo olivaceus	Red-eyed Vireo	S5B						CO		PR
Corvidae	**Crows & Jays**									
Corvus brachyrhynchos	American Crow	S5B						CO		PO
Cyanocitta cristata	Blue Jay	S5						CO		PO
Alaudidae	**Larks**									
Eremophila alpestris	Horned Lark	S5B						PR		PO
Hirundinidae	**Swallows**									
Hirundo rustica	Barn Swallow	S5B	THR	T	T	Schedule 1		CO		PR
Petrochelidon pyrrhonota	Cliff Swallow	S4B					√*	CO		
Progne subis	Purple Martin	S3S4B					√*	CO		
Stelgidopteryx serripennis	Northern Rough-winged Swallow	S4B						PO		
Tachycineta bicolor	Tree Swallow	S4B						CO		PR
Paridae	**Chickadees & Titmice**									
Poecile atricapillus	Black-capped Chickadee	S5						CO		PO
Sittidae	**Nuthatches**									
Sitta canadensis	Red-breasted Nuthatch	S5					√	CO		
Sitta carolinensis	White-breasted Nuthatch	S5						CO		PO
Certhiidae	**Creepers**									
Certhia americana	Brown Creeper	S5B					√	CO		
Troglodytidae	**Wrens**									
Thryothorus ludovicianus	Carolina Wren	S4					√	PR		
Troglodytes aedon	House Wren	S5B						CO		PR
Troglodytes hiemalis	Winter Wren	S5B					√	PR		

Bird Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Polioptilidae	**Gnatcatchers**									
Polioptila caerulea	Blue-gray Gnatcatcher	S4B					√	CO		
Regulidae	**Kinglets**									
Regulus satrapa	Golden-crowned Kinglet	S5B					√	CO		
Turdidae	**Thrushes**									
Catharus fuscescens	Veery	S4B					√	CO		
Hylocichla mustelina	Wood Thrush	S4B	SC	T	T	Schedule 1		CO		
Sialia sialis	Eastern Bluebird	S5B	NAR	NAR	NS	No schedule	√	CO		X
Turdus migratorius	American Robin	S5B						CO		CO
Mimidae	**Mockingbirds, Thrashers & Allies**									
Dumetella carolinensis	Gray Catbird	S4B						CO		PR
Mimus polyglottos	Northern Mockingbird	S4					√	-		
Toxostoma rufum	Brown Thrasher	S4B					√	PR		PO
Sturnidae	**Starlings**									
Sturnus vulgaris	European Starling	SNA						CO		PO
Bombycillidae	**Waxwings**									
Bombycilla cedrorum	Cedar Waxwing	S5B						CO		PO
Passeridae	**Old World Sparrows**									
Passer domesticus	House Sparrow	SNA						CO		PO
Fringillidae	**Finches & Allies**									
Haemorhous mexicanus	House Finch	SNA						CO		
Haemorhous purpureus	Purple Finch	S4B					√	PR		
Spinus pinus	Pine Siskin	S4B					√	PR		
Spinus tristis	American Goldfinch	S5B						PR		PO
Emberizidae	**New World Sparrows & Allies**									
Ammodramus savannarum	Grasshopper Sparrow	S4B	SC	SC	SC	Schedule 1	√	PR		
Melospiza georgiana	Swamp Sparrow	S5B						PR		PR
Melospiza melodia	Song Sparrow	S5B						CO		PR
Passerculus sandwichensis	Savannah Sparrow	S4B						CO		
Pipilo erythrophthalmus	Eastern Towhee	S4B						CO		
Pooecetes gramineus	Vesper Sparrow	S4B					√	PR		
Spizella passerina	Chipping Sparrow	S5B						CO		PR
Spizella pusilla	Field Sparrow	S4B						PR		PR
Zonotrichia albicollis	White-throated Sparrow	S5B					√	PR		
Icteridae	**Troupials & Allies**									
Agelaius phoeniceus	Red-winged Blackbird	S4						CO		PO
Dolichonyx oryzivorus	Bobolink	S4B	THR	T	T	Schedule 1		PR		
Icterus galbula	Baltimore Oriole	S4B						CO		PO
Icterus spurius	Orchard Oriole	S4B					√	PR		
Molothrus ater	Brown-headed Cowbird	S4B						CO		PO
Quiscalus quiscula	Common Grackle	S5B						CO		PO
Sturnella magna	Eastern Meadowlark	S4B	THR	T	T	Schedule 1		CO		
Parulidae	**Wood Warblers**									
Cardellina canadensis	Canada Warbler	S4B	SC	T	T	Schedule 1	√	PR		X
Cardellina pusilla	Wilson's Warbler	S4B						-		X
Geothlypis philadelphia	Mourning Warbler	S4B					√	PR		PR
Geothlypis trichas	Common Yellowthroat	S5B						PR		PR
Leiothlypis ruficapilla	Nashville Warbler	S5B					√	CO		
Mniotilta varia	Black-and-white Warbler	S5B					√	PR		
Parkesia noveboracensis	Northern Waterthrush	S5B					√	CO		
Seiurus aurocapilla	Ovenbird	S4B					√	CO		
Setophaga caerulescens	Black-throated Blue Warbler	S5B						PR		

Bird Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Setophaga cerulea	Cerulean Warbler	S3B	THR	E	E	Schedule 1	√	PO	X	
Setophaga citrina	Hooded Warbler	S4B	NAR	NAR	NS	No schedule	√	CO		
Setophaga coronata	Yellow-rumped Warbler	S5B					√	PO		
Setophaga pensylvanica	Chestnut-sided Warbler	S5B					√	PR		
Setophaga petechia	Yellow Warbler	S5B						CO		PR
Setophaga pinus	Pine Warbler	S5B					√	CO		
Setophaga ruticilla	American Redstart	S5B					√	PR		
Setophaga virens	Black-throated Green Warbler	S5B					√	PR		
Vermivora cyanoptera	Blue-winged Warbler	S4B					√	CO		
Cardinalidae	**Cardinals, Grosbeaks & Allies**									
Cardinalis cardinalis	Northern Cardinal	S5						CO		PO
Passerina cyanea	Indigo Bunting	S4B						PR		
Pheucticus ludovicianus	Rose-breasted Grosbeak	S4B						CO		PR
Piranga olivacea	Scarlet Tanager	S4B					√	CO		
Total								**114**	**2**	**64**

*OBBA Atlas Square: Square # 17NJ31

**NHIC Atlas Square: Square # 17NJ31

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Reptile and Amphibian Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	ORAA*	NHIC Data**	Erbsville South Environmental Study
		MNRF 2019a	MNRF 2019a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	RMOW 1985	Ontario Nature 2019	MNRF 2020b	Dougan and Associates 2018
Turtles										
Chelydra serpentina	Snapping Turtle	S4	SC	SC	SC	Schedule 1	C	X	X	X
Chrysemys picta marginata	Midland Painted Turtle	S4		SC	NS	No schedule	C	X		X
Emydoidea blandingii	Blanding's Turtle (Great Lakes / St. Lawrence population)	S3	THR	E	T	Schedule 1	√	X		X
Graptemys geographica	Northern Map Turtle	S3	SC	SC	SC	Schedule 1		X		
Trachemys scripta	Pond Slider	SNA						X		
Snakes										
Lampropeltis triangulum	Milksnake	S4	NAR	SC	SC	Schedule 1	√	X		X
Storeria dekayi	Dekay's Brownsnake	S5	NAR	NAR	NS	No schedule	C*	X		
Storeria occipitomaculata	Red-bellied Snake	S5					C*	X		
Thamnophis sirtalis sirtalis	Eastern Gartersnake	S5					C	X		X
Salamanders										
Ambystoma jeffersonianum	Jefferson Salamander	S2	END	E	E	Schedule 1	√	X	X	
Ambystoma laterale	Blue-spotted Salamander	S4					C	X		
Ambystoma maculatum	Spotted Salamander	S4					√	X		
Necturus maculosus	Mudpuppy	S4	NAR	NAR	NS	No schedule	√	X		
Notophthalmus viridescens viridescens	Red-spotted Newt	S5					√	X		X
Plethodon cinereus	Eastern Red-backed Salamander	S5					C	X		
Frogs and Toads										
Anaxyrus americanus	American Toad	S5					C	X		X
Hyla versicolor	Gray Treefrog	S5					C	X		X
Pseudacris triseriata pop. 2	Western Chorus Frog (Great Lakes / St. L	S4	NAR	T	T	Schedule 1		X		
Pseudacris crucifer	Spring Peeper	S5					C	X		X
Lithobates catesbeianus	American Bullfrog	S4					√	X		
Lithobates clamitans	Green Frog	S5					C	X		X
Lithobates palustris	Pickerel Frog	S4	NAR	NAR	NS	No schedule	√	X		
Lithobates pipiens	Northern Leopard Frog	S5	NAR	NAR	NS	No schedule	C	X		X
Lithobates sylvaticus	Wood Frog	S5					C	X		
Total								**24**	**2**	**11**

*ORAA Atlas Square: 17NJ31

**NHIC Atlas Squares: Square # 17NJ31

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Mammal Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	Ontario Mammal Atlas	Erbsville South Environmental Study
		MNRF 2020a	MNRF 2020a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	RMOW 1985	Dobbyn 1994	Dougan and Associates 2018
Didelphimorphia	**Opossums**								
Didelphis virginiana	Virginia Opossum	S4					R	X	
Eulipotyphla	**Shrews, Moles, Hedgehogs, and Allies**								
Blarina brevicauda	Northern Short-tailed Shrew	S5						X	
Condylura cristata	Star-nosed Mole	S5						X	
Parascalops breweri	Hairy-tailed Mole	S4					R	X	
Sorex cinereus	Masked Shrew	S5					G	X	
Sorex fumeus	Smoky Shrew	S5					R	X	
Sorex palustris	Water Shrew	S5					R	X	
Chiroptera	**Bats**								
Eptesicus fuscus	Big Brown Bat	S4						X	
Lasionycteris noctivagans	Silver-haired Bat	S4						X	
Lasiurus borealis	Eastern Red Bat	S4						X	
Lasiurus cinereus	Hoary Bat	S4						X	
Myotis leibii	Eastern Small-footed Myotis	S2S3	END					X	
Myotis lucifugus	Little Brown Myotis	S3	END	E	E	Schedule 1		X	
Myotis septentrionalis	Northern Myotis	S3	END	E	E	Schedule 1		X	
Perimyotis subflavus	Tri-colored Bat	S3?	END	E	E	Schedule 1		X	
Lagomorpha	**Rabbits and Hares**								
Lepus americanus	Snowshoe Hare	S5					S	X	
Lepus europaeus	European Hare	SNA						X	
Sylvilagus floridanus	Eastern Cottontail	S5						X	X
Rodentia	**Rodents**								
Castor canadensis	Beaver	S5					S	X	X
Erethizon dorsatum	Porcupine	S5					S	X	
Glaucomys sabrinus	Northern Flying Squirrel	S5					R	X	
Marmota monax	Woodchuck	S5						X	X
Microtus pennsylvanicus	Meadow Vole	S5						X	X
Mus musculus	House Mouse	SNA						X	
Napaeozapus insignis	Woodland Jumping Mouse	S5						X	
Ondatra zibethicus	Muskrat	S5						X	X
Peromyscus leucopus	White-footed Mouse	S5						X	
Peromyscus maniculatus	Deer Mouse	S5						X	
Rattus norvegicus	Norway Rat	SNA						X	
Sciurus carolinensis	Eastern Gray Squirrel	S5						X	X
Synaptomys cooperi	Southern Bog Lemming	S4					R	X	
Tamias striatus	Eastern Chipmunk	S5						X	
Tamiasciurus hudsonicus	Red Squirrel	S5						X	
Zapus hudsonius	Meadow Jumping Mouse	S5						X	
Peromyscus sp.	Peromyscus mouse sp	S5							X
Canidae	**Canines**								
Canis latrans	Coyote	S5					S	X	X
Vulpes vulpes	Red Fox	S5						X	
Felidae	**Felines**								
Lynx rufus	Bobcat	S4					R	X	
Mephitidae	**Skunks and Stink Badgers**								
Mephitis mephitis	Striped Skunk	S5						X	X

Mammal Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Mustelidae	**Weasels and Allies**								
Mustela erminea	Ermine	S5						X	
Mustela frenata	Long-tailed Weasel	S4					S	X	
Neovison vison	American Mink	S4					S	X	X
Taxidea taxus jacksoni	American Badger (Southwestern Ontario population)	S1	END	E	E	Schedule 1		X	
Procyonidae	**Raccoons and Allies**								
Procyon lotor	Northern Raccoon	S5						X	X
Ursidae	**Bears**								
Ursus americanus	American Black Bear	S5	NAR	NAR	NS	No schedule		X	
Artiodactyla	**Deer and Bison**								
Odocoileus virginianus	White-tailed Deer	S5						X	X
Total								**45**	**12**

*Mammal Atlas Square Numbers: NU
**NHIC Atlas Squares: 17NJ31

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Butterfly Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	TEA Atlas*	Erbsville South Environmental Study
		MNRF 2020a	MNRF 2020a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	Linton 2012	Macnaughton et al. 2020	Dougan and Associates 2018
Hesperiidae	**Skippers**								
Anatrytone logan	Delaware Skipper	S4					C	X	
Ancyloxypha numitor	Least Skipper	S5					UC	X	
Carterocephalus palaemon	Arctic Skipper	S5					R	X	
Epargyreus clarus	Silver-spotted Skipper	S4					UC	X	
Erynnis baptisiae	Wild Indigo Duskywing	S4					UK	X	
Erynnis juvenalis	Juvenal's Duskywing	S5					R	X	X
Euphyes vestris	Dun Skipper	S5					VC	X	
Hylephila phyleus	Fiery Skipper	SNA					R	X	
Poanes hobomok	Hobomok Skipper	S5					C	X	X
Poanes viator	Broad-winged Skipper	S4					C	X	
Polites mystic	Long Dash Skipper	S5					UC	X	
Polites peckius	Peck's Skipper	S5					VC	X	
Polites themistocles	Tawny-edged Skipper	S5					C	X	
Pompeius verna	Little Glassywing	S4					UC	X	
Thymelicus lineola	European Skipper	SNA					VC	X	
Wallengrenia egeremet	Northern Broken Dash	S5					C	X	
Papilionidae	**Swallowtails**								
Battus philenor	Pipevine Swallowtail	SNA						X	
Papilio cresphontes	Giant Swallowtail	S4					UC	X	
Papilio glaucus	Eastern Tiger Swallowtail	S5					VC	X	
Papilio polyxenes	Black Swallowtail	S5					VC	X	
Pieridae	**Whites and Sulphurs**								
Colias eurytheme	Orange Sulphur	S5					VC	X	
Colias philodice	Clouded Sulphur	S5						X	
Pieris oleracea	Mustard White	S4					PE	X	
Pieris rapae	Cabbage White	SNA					VC	X	
Lycaenidae	**Harvesters, Coppers, Hairstreaks, Blues**								
Celastrina ladon	Spring Azure	SU					C	X	X
Celastrina lucia	Northern Spring Azure	S5						X	
Celastrina neglecta	Summer Azure	S5					VC	X	
Celastrina sp.	Azure species	SNA						X	
Cupido comyntas	Eastern Tailed Blue	S5					UC	X	
Glaucopsyche lygdamus	Silvery Blue	S5						X	
Lycaena hyllus	Bronze Copper	S5					VC	X	
Satyrium acadica	Acadian Hairstreak	S4					UC	X	
Satyrium calanus	Banded Hairstreak	S4					UC	X	
Satyrium edwardsii	Edwards' Hairstreak	S4					R	X	
Nymphalidae	**Brush-footed Butterflies**								
Aglais milberti	Milbert's Tortoiseshell	S5					UC	X	X
Boloria bellona	Meadow Fritillary	S5					VC	X	
Cercyonis pegala	Common Wood-Nymph	S5					VC	X	
Chlosyne harrisii	Harris's Checkerspot	S4						X	
Chlosyne nycteis	Silvery Checkerspot	S5					R	X	
Coenonympha tullia	Common Ringlet	S5					C	X	
Danaus plexippus	Monarch	S2N,S4B	SC	E	SC	Schedule 1	VC	X	X
Euphydryas phaeton	Baltimore Checkerspot	S4					R	X	
Lethe anthedon	Northern Pearly-Eye	S5					C	X	
Lethe appalachia	Appalachian Brown	S4					UC	X	
Lethe eurydice	Eyed Brown	S5					VC	X	X
Libytheana carinenta	American Snout	SNA					R	X	
Limenitis archippus	Viceroy	S5					VC	X	X
Limenitis arthemis arthemis	White Admiral	S5					C	X	
Limenitis arthemis astyanax	Red-spotted Purple	S5					C	X	
Megisto cymela	Little Wood-Satyr	S5					VC	X	
Nymphalis antiopa	Mourning Cloak	S5					VC	X	X
Nymphalis l-album	Compton Tortoiseshell	S5					UC	X	
Phyciodes cocyta	Northern Crescent	S5					UC	X	
Phyciodes tharos	Pearl Crescent	S4					C	X	X
Polygonia comma	Eastern Comma	S5					VC	X	
Polygonia interrogationis	Question Mark	S5					VC	X	
Polygonia progne	Gray Comma	S5					UC	X	
Speyeria cybele	Great Spangled Fritillary	S5					VC	X	
Vanessa atalanta	Red Admiral	S5					VC	X	
Vanessa cardui	Painted Lady	S5					C	X	X
Vanessa virginiensis	American Lady	S5					C	X	
Total								**61**	**10**

*TEA Atlas Square: 17NJ31
**NHIC Atlas Square: Square # 17NJ31

References

Ministry of Natural Resources and Forestry (MNRF). 2019a. Natural Heritage Information Centre (NHIC): Species List for Ontario. Published: 2014-07-17. All Species List Updated: 2019-02-07. Available: https://www.ontario.ca/page/get-natural-heritage-information

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Odonate Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	Region of Waterloo Status	Odonate Atlas*	Erbsville South Environmental Study
		MNRF 2020a	MNRF 2020a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	Region of Waterloo 1985	OOAD 2020	Dougan and Associates 2018
Calopterygidae	**Broadwinged Damselflies**								
Calopteryx maculata	Ebony Jewelwing	S5					X	X	X
Lestidae	**Spreadwings**								
Lestes congener	Spotted Spreadwing	S5					Expected	X	
Lestes disjunctus	Northern Spreadwing	S5					Expected	X	
Lestes eurinus	Amber-winged Spreadwing	S3					Expected	X	
Lestes rectangularis	Slender Spreadwing	S5					X	X	
Lestes unguiculatus	Lyre-tipped Spreadwing	S5					X	X	
Coenagrionidae	**Narrow-winged Damselflies**								
Enallagma carunculatum	Tule Bluet	S5					X	X	
Enallagma civile	Familiar Bluet	S5					X	X	
Enallagma ebrium	Marsh Bluet	S5					X	X	
Enallagma exsulans	Stream Bluet	S5					X	X	
Enallagma geminatum	Skimming Bluet	S4					X	X	
Enallagma signatum	Orange Bluet	S4					X	X	
Ischnura posita	Fragile Forktail	S4					X	X	
Ischnura verticalis	Eastern Forktail	S5					X	X	
Nehalennia irene	Sedge Sprite	S5					X	X	
Aeshnidae	**Darners**								
Aeshna constricta	Lance-tipped Darner	S5					Expected	X	
Aeshna tuberculifera	Black-tipped Darner	S4					X	X	
Anax junius	Common Green Darner	S5					X	X	X
Cordulegasteridae	**Spiketails**								
Cordulegaster diastatops	Delta-spotted Spiketail	S4					Possible	X	X
Corduliidae	**Emeralds**								
Epitheca princeps	Prince Baskettail	S5					X	X	
Somatochlora walshii	Brush-tipped Emerald	S4					X	X	
Libellulidae	**Skimmers**								
Celithemis elisa	Calico Pennant	S5					Expected	X	
Erythemis simplicicollis	Eastern Pondhawk	S5					X	X	
Leucorrhinia intacta	Dot-tailed Whiteface	S5					X	X	
Libellula luctuosa	Widow Skimmer	S5					X	X	
Libellula pulchella	Twelve-spotted Skimmer	S5					X	X	
Pachydiplax longipennis	Blue Dasher	S5					X	X	
Pantala hymenaea	Spot-winged Glider	S4					Expected	X	
Plathemis lydia	Common Whitetail	S5					X	X	
Sympetrum obtrusum	White-faced Meadowhawk	S5					X	X	
Sympetrum rubicundulum	Ruby Meadowhawk	S5					X	X	
Sympetrum semicinctum	Band-winged Meadowhawk	S4					X	X	
Sympetrum vicinum	Autumn Meadowhawk	S5					X	X	
Tramea lacerata	Black Saddlebags	S4					X	X	
Total								**34**	**3**

**Odonate Atlas Square Numbers: Square(s) 17NJ31*

References

Ministry of Natural Resources and Forestry (MNRF). 2019a. Natural Heritage Information Centre (NHIC): Species List for Ontario. Published: 2014-07-17. All Species List Updated: 2019-02-07. Available: https://www.ontario.ca/page/get-natural-heritage-information

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Ontario Odonata Atlas Database (OOAD). 2020. Natural Heritage Information Centre, Ontario Ministry of Natural Resources and Forestry. Species list from atlas square ##XX## queried on January 13, 2020.

Ministry of Natural Resources and Forestry (MNRF). 2020b. Natural Heritage Information Centre (NHIC): Make a Natural Heritage Area Map Application. Published: 2014-07-17. Updated 2020-01-06. Available: https://www.ontario.ca/page/make-natural-heritage-area-map

Fish Species Reported from the Study Area - Erbsville South Environmental Study (Project #2520)

Scientific Name	Common Name	SRANK	SARO	COSEWIC	SARA	SARA Schedule	ARA Data	Erbsville South Environmental Study
		MNRF 2020a	MNRF 2020a	Government of Canada 2019	Government of Canada 2019	Government of Canada 2019	Government of Ontario 2015	Dougan and Associates 2018
Leuciscidae	**Minnows**							
Campostoma anomalum	Central Stoneroller	S4	NAR	NAR	NS	No schedule		X
Chrosomus eos	Northern Redbelly Dace	S5					X	X
Hybognathus hankinsoni	Brassy Minnow	S5					X	X
Luxilus cornutus	Common Shiner	S5					X	X
Notropis rubellus	Rosyface Shiner	S4	NAR	NAR	NS	No schedule		X
Pimephales notatus	Bluntnose Minnow	S5	NAR	NAR	NS	No schedule	X	X
Pimephales promelas	Fathead Minnow	S5					X	X
Rhinichthys atratulus	Blacknose Dace	S5					X	X
Rhinichthys cataractae	Longnose Dace	S5						X
Semotilus atromaculatus	Creek Chub	S5					X	X
Catostomidae	**Suckers**							
Catostomus commersonii	White Sucker	S5					X	X
Umbridae	**Mudminnows**							
Umbra limi	Central Mudminnow	S5					X	X
Salmonidae	**Trouts and Salmons**							
Salmo trutta	Brown Trout	SNA						X
Gasterosteidae	**Sticklebacks**							
Culaea inconstans	Brook Stickleback	S5					X	X
Centrarchidae	**Sunfishes and Basses**							
Lepomis gibbosus	Pumpkinseed	S5					X	X
Micropterus salmoides	Largemouth Bass	S5						X
Pomoxis nigromaculatus	Black Crappie	S4						X
Percidae	**Perches and Darters**							
Etheostoma nigrum	Johnny Darter	S4						X
Etheostoma caeruleum	Rainbow Darter	S4						X
Etheostoma exile	Iowa Darter	S5					X	X
Total							**12**	**20**

*NHIC Atlas Squares: Square # 17NJ31

References

Ministry of Natural Resources and Forestry (MNRF). 2019a. Natural Heritage Information Centre (NHIC): Species List for Ontario. Published: 2014-07-17. All Species List Updated: 2019-02-07. Available: https://www.ontario.ca/page/get-natural-heritage-information

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Ministry of Natural Resources and Forestry (MNRF). 2020b. Natural Heritage Information Centre (NHIC): Make a Natural Heritage Area Map Application. Published: 2014-07-17. Updated 2020-01-06. Available: https://www.ontario.ca/page/make-natural-heritage-area-map

Legend: Wildlife Species Lists

Provincial Ranks

SRANK

S1	Critically Imperiled	**S4**	Apparently Secure	**S#?**	Uncertain Rank	**SNR**	Unranked	**NP**	Not Provided
S2	Imperiled	**S5**	Secure	**SX**	Presumed Extirpated	**SU**	Unrankable		
S3	Vulnerable	**S#S#**	Status is Between Ranks	**SH**	Possibly Extirpated (Historical)	**SNA**	Not Applicable		

Breeding Status Qualifiers

B	Breeding	**N**	Non-breeding	**M**	Migrant

SARO

END	Endangered	**SC**	Special Concern	**DD**	Data Deficient
THR	Threatened	**NAR**	Not at Risk	**EXP**	Extirpated

Federal Ranks

COSEWIC and SARA

E	Endangered	**SC**	Special Concern	**NS**	No Status	**N-A**	Non-Active	**EX**	Extirpated
T	Threatened	**NAR**	Not at Risk	**DD**	Data Defficient	**X**	Extinct		

SARA Schedule

Schedule 1	Extirpated, Endangered, Threatened, Special Concern Species officially protected under SARA
Schedule 2	Endangered, Threatened species not yet re-assessed using revised criteria; may be considered for inclusion to Schedule 1
Schedule 3	Special Concern species not yet re-assessed using revised criteria; may be considered for inclusion to Schedule 1

Regional Status

Region of Waterloo Status

√	Regionally Significant	**UC**	Uncommon	**S**	Scarce	**C***	Thought to be common, difficult to find
VC	Very Common	**G**	General	**R**	Rare	**UK**	Unknown
C	Common	**O**	Occasional	**PE**	Possible Extirpated	**NRA**	No Rank Assigned (<5 records and records over 40 years old)

Bird Species Only:

√*	Significant when nesting in natural circumstances

Other

Bird Breeding Evidence Codes

OB **Observed**

- Species observed (no evidence of breeding)

PO **Possible**

- Species observed in its breeding season in suitable nesting habitat
- Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season

PR **Probable**

- ≥ 7 individuals singing or producing other sounds associated with breeding (e.g. drumming) heard during the same visit in suitable nesting habitat during the species' breeding season
- Pair observed in their breeding season in suitable nesting habitat
- Permanent territory presumed through registration of territorial song, or the occurrence of an adult bird, at the same place, in breeding habitat, during its breeding season, on at least 2 days a week or more apart.
- Courtship or display, including interaction between a male and female or 2 males including courtship feeding or copulation
- Visiting probable nest site
- Agitated behaviour or anxiety calls of an adult
- Brood patch on adult female or cloacal protuberance on adult male
- Nest-building or excavation of nest hole, except by a wren of woodpecker

CO **Confirmed**

- Distraction display or injury feigning
- Used nest or egg shells found (occupied or laid within the period of the survey)
- Recently fledged young or downy young
- Adults leaving or entering nest site in circumstances indicating occupied nest
- Adult carrying fecal sac
- Adult carrying food for young
- Nest containing eggs
- Nest with young seen or heard