



REPORT

Natural Environment Level 1 and 2 Technical Report

Proposed Arnott Pit, Township of Lanark Highlands, Ontario

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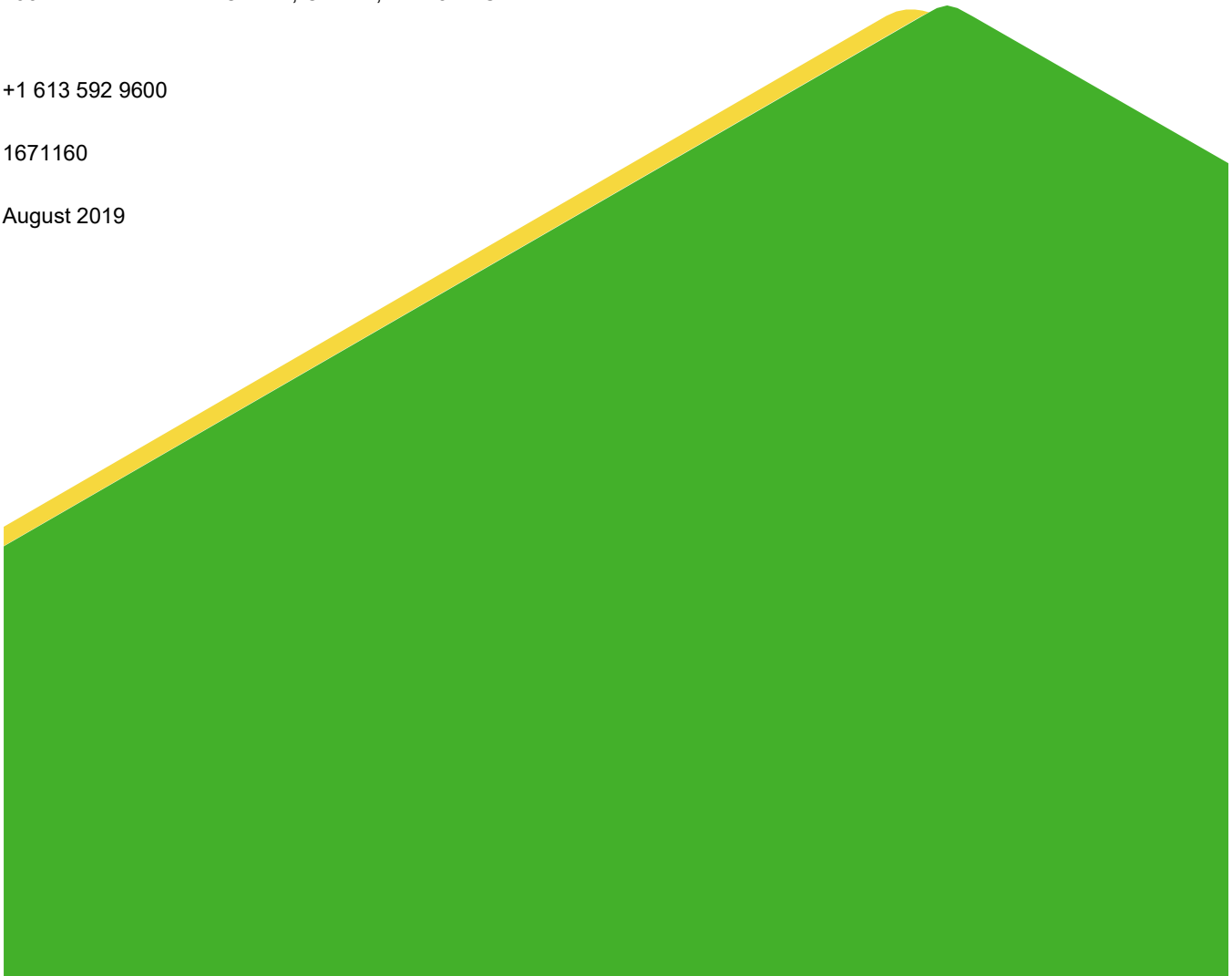
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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Thomas Cavanagh Construction Ltd. (Cavanagh) to undertake natural environment studies to support the application for a Category 3, Class A Pit Above Water under the *Aggregate Resources Act* (ARA) for the proposed Arnott Pit, located on Part 3, Concession V in the Geographic Township of Lanark (now part of the Township of Lanark Highlands), Ontario (the Site; Figure 1).

1.1 Purpose

This report specifically addresses the requirements of a Natural Environment Level 1 and Level 2 (NEL 1/2) Technical Report (Aggregate Resources of Ontario Provincial Standards, Section 2.2) that will accompany the application for a Category 3, Class A Pit Above Water. This NEL 1/2 assessment will also satisfy the Township of Lanark Highlands (the Township) Official Plan requirements for an Environmental Impact Statement (EIS).

For the purpose of this report, the following definitions are used:

License Boundary (Figure 1) – The area of the Site that is licensed for aggregate extraction under the ARA. The area to be licensed is 19.5 ha (the Site).

ARA Study Area (Figure 1) – The Study Area for the NEL 1/2 assessment is defined in the Aggregate Resources of Ontario Provincial Standards, Sections 2.2.3 and 2.2.4 as the Site and surrounding 120 metres (m). Because there is no predicted groundwater drawdown (Golder, 2018), and there are no sensitive natural features beyond 120 m that have potential to be influenced by the proposed operation, the Study Area was not extended beyond 120 m.

The purpose of this report is to assess potential environmental impacts of the proposed aggregate extraction on the Site with respect to the following:

- The environmental features and functions in the Study Area;
- The influence of extraction on the surrounding natural environment; and,
- The rehabilitation potential of the Site after extraction.

1.2 Site Description

The Site is located at the southwest corner of the intersection of Pine Grove Road (Arnott Road) and Lanark Concession Road 6A, in the Township of Lanark Highlands (Figure 1). The Site consists of active agricultural fields (row crop) and farm operation buildings.

1.2.1 Adjacent Land Use

Surrounding land uses include existing aggregate extraction operations to the north, east and west; with agriculture, rural residential and natural areas to the south, west and east. The natural areas in the Study Area include forests and unevaluated forested wetlands. The adjacent aggregate operations include the Lanark Pit/Quarry (to the north) and the Pine Grove Pit immediately to the west, both are owned and operated by Cavanagh.

2.0 ENVIRONMENTAL POLICY CONTEXT

The Site is located in the Township of Lanark Highlands. Documents reviewed to gain an understanding of the natural heritage features and regulations that are relevant to the proposed Site and Study Area consisted of the following:

- The ARA (Ontario, 1990) and the Provincial Standards of Ontario – Category 3 – Class A Pit Above Water (MNR, 1997)
- The Provincial Policy Statement (MMAH 2014)
- The *Fisheries Act* (Canada 1985)
- The *Endangered Species Act* (Ontario 2007)
- The *Species at Risk Act* (Canada 2002)
- Lanark County Sustainable Communities Official Plan (McIntosh Perry 2012)
- The Corporation of the Township of Lanark Highlands Official Plan (2016)
- The Mississippi Valley Conservation Authority Reg. 153/06 Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario 2006)

An overview of the above noted legislation and policy documents are discussed in Sections 2.1 to 2.7.

2.1 Aggregate Resources Act

Applicants are required under the ARA Provincial Standards to prepare a Level 1 Natural Environment Technical Report and, where significant natural environment features occur on, or in proximity (i.e., within 120 m, or the estimated area of groundwater drawdown) to the proposed operation, a Level 2 Natural Environment Report is required. Significant natural heritage features are defined in the PPS (MMAH 2014) with guidance from supporting technical manuals prepared by the Ministry of Natural Resources and Forestry (MNR 2000; MNR 2010; MNR 2015a; MNR 2015b). A Level 2 Natural Environment Technical Report, identifying the particular features and functions of the designated natural environment feature(s), the nature of the potential negative impacts of the extractive operation, the proposed mitigation of those effects and the nature and magnitude of any residual effects is also required to satisfy the ARA Provincial Standards (MNR 1997). As well, the proposed rehabilitation of the extraction area, and any particular prescriptions for that rehabilitation, are identified and discussed in the Level 1 and, if necessary, the Level 2 Natural Environment Technical Reports.

2.2 Provincial Policy Statement

The Provincial Policy Statement (PPS) was issued under Section 3 of *The Planning Act* and came into effect on April 30, 2014.

The natural heritage policies of the PPS (MMAH 2014) indicate that:

- 2.1.1 Natural features and areas shall be protected for the long-term;
- 2.1.2 The diversity and connectivity of natural features in an area, and the long-term *ecological function* and biodiversity of *natural heritage systems*, should be maintained, restored or, where possible, improved, recognizing linkages between and among *natural heritage features and areas*, *surface water features* and *ground water features*;

- 2.1.3 Natural heritage systems shall be identified in Ecoregions 6E and 7E, recognizing that natural heritage systems will vary in size and form in settlement areas, rural areas, and prime agricultural areas;
- 2.1.4 *Development* and *site alteration* shall not be permitted in:
 - a) significant wetlands in Ecoregions 5E, 6E and 7E; and,
 - b) significant coastal wetlands.
- 2.1.5 Unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions, development and site alteration shall not be permitted in:
 - a) significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E;
 - b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);
 - c) significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);
 - d) significant wildlife habitat;
 - e) significant areas of natural and scientific interest; and,
 - f) coastal wetlands in Ecoregions 5E, 6E and 7E that are not subject to policy 2.1.4(b).
- 2.1.6 *Development* and *site alteration* shall not be permitted in *fish habitat* except in accordance with *provincial and federal requirements*;
- 2.1.7 Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements; and,
- 2.1.8 *Development* and *site alteration* shall not be permitted on *adjacent lands* to the *natural heritage features and areas* identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the *ecological function* of the *adjacent lands* has been evaluated and it has been demonstrated that there will be no *negative impacts* on the natural features or on their *ecological functions*.

2.3 Fisheries Act

The purpose of the *Fisheries Act* (Canada 1985) is to maintain healthy, sustainable and productive Canadian fisheries through the prevention of pollution, and the protection of fish and their habitat. In 2012, changes were made to the *Fisheries Act* to enhance Fisheries and Oceans Canada's (DFO) ability to manage threats to Canada's commercial, recreational and Aboriginal (CRA) fisheries. Revised project screening, reporting and mitigation tools were implemented in 2013 to make regulatory requirements clear and consistent and improve compliance (DFO 2013).

Projects affecting waterbodies supporting Canada's CRA fisheries must comply with the provisions of the *Fisheries Act*. The proponent is responsible for determining if the project is likely to cause impacts to CRA fisheries and if these impacts can be avoided or mitigated. The proponent must gather information on the type and scale of impact on the fishery and determine if the impacts will result in serious harm to fish. Proponents have a duty to maintain records of self-assessments completed for projects they undertake, and need to provide this information to DFO upon request. Serious harm to fish is defined as: the death of fish; and/or any permanent alteration to, or destruction of, fish habitat. If it is determined that the impacts cannot be avoided or mitigated and

will result in serious harm to fish, an application for authorization must be submitted to the DFO. Projects that have the potential to obstruct fish passage or affect flows needed by fish also require an authorization; even if these occur outside of CRA fishery areas (DFO 2013).

2.4 Species at Risk

2.4.1 Species at Risk Act (SARA)

At a federal level, Species at Risk (SAR) designations for species occurring in Canada are initially determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). If approved by the federal Minister of the Environment and Climate Change, species are added to the federal List of Wildlife Species at Risk (Canada 2002). Species that are included on Schedule 1 as endangered or threatened are afforded protection of critical habitat on federal lands under the *Species at Risk Act* (SARA). On private or provincially-owned lands, only aquatic species listed as endangered, threatened or extirpated and migratory birds are protected under the SARA, unless ordered by the Governor in Council.

2.4.2 Endangered Species Act (ESA)

In 2019, administration of the *Endangered Species Act* (ESA) was transferred from the MNR to the Ministry of the Environment, Conservation and Parks (MECP). SAR designations for species in Ontario are initially determined by the Committee on the Status of Species at Risk in Ontario (COSSARO), and if approved by the provincial Minister of Environment, Conservation and Parks, species are added to the ESA which came into effect June 30, 2008 (Ontario 2007). The legislation prohibits the killing or harming of species identified as endangered or threatened in the various schedules to the Act. The ESA also provides habitat protection to all species listed as threatened or endangered. As of June 30, 2008, the Species at Risk Ontario (SARO) list is contained in O. Reg. 230/08.

Subsection 9(1) of the ESA prohibits the killing, harming or harassing of species identified as 'endangered' or 'threatened' in the various schedules to the Act. Subsection 10(1)(a) of the ESA states that "*No person shall damage or destroy the habitat of a species that is listed on the Species at Risk in Ontario (SARO) list as an endangered or threatened species*".

General habitat protection is provided, by the ESA, to all threatened and endangered species. Species-specific habitat protection is only afforded to those species for which a habitat regulation has been prepared and passed into law as a regulation of the ESA. The ESA has a permitting process to allow alterations to protected species or their habitats as well as a registration process for certain activities and species.

2.5 County of Lanark

The Site is designated as "Rural Area" in the County of Lanark Sustainable Communities Official Plan (SCOP). Lands to the west, north and east are identified as "Licensed Aggregate Extraction Area", and the remainder of the Study Area is identified as "Rural Area" (Schedule A). According to the SCOP, the County's objectives for the Rural Area are:

- 1) To ensure that residential and non-residential development is consistent with rural service levels;
- 2) To maintain the distinct character of rural, waterfront and settlement areas; and,
- 3) To ensure that development is compatible with natural heritage features and natural resource uses.

The SCOP states that: "The establishment of new [mineral extraction] related activities shall be...subject to local Official Plan policies and local Zoning By-law regulations".

2.6 Township of Lanark Highlands

The Site is designated as “Rural Communities” in the Township of Lanark Highlands OP (Schedule A), with a portion identified as “Mineral Aggregate Reserve” (Schedule B).

According to the OP, permitted uses and activities within the Rural Communities designation will relate to the management or use of resources, resource-based recreational activities, limited residential development and other land uses, with Section 3.2.3 of the OP listing various non-residential land uses permitted in the Rural Communities. Aggregate extraction, with the exception of wayside pits and quarries, is not permitted. Establishment of mineral aggregate operations on lands with this designation will require an amendment to the OP.

The Mineral Aggregate Reserve designation identifies potential pit and quarry resources. These areas are to be protected from development that would preclude eventual resource use, unless that land use serves a greater long-term public interest. Establishment of mineral aggregate operations on lands with this designation will require an amendment to the OP.

Within the Study Area, lands to the west and east of the Site are designated as “Pit”, while the extraction operation to the north of the Site is designated as “Quarry”. Areas to the south of the Site are designated “Rural Communities”.

2.7 Mississippi Valley Conservation Authority (MVCA)

The Study Area is located within the jurisdiction of the MVCA. The Study Area is located in the Mississippi River watershed, within the Mississippi Lake subwatershed.

3.0 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed license boundary is shown on Figure 2. There will be a Common Boundary Agreement between the proposed Arnott Pit and the adjacent Cavanagh Pine Grove Pit to the west. Required setbacks to adjacent properties and adjacent roads will also be included, as well as a greater than 30 m setback to the unevaluated wetland located east of the northern portion of the Site. The pit will involve extraction above the groundwater table (a minimum of 1.5 m from the groundwater table) and no dewatering of the excavation will be required. The buildings on the Site may be removed or altered.

Further details on the proposed operations within the Site are provided in the ARA Site Plans prepared for the proposed Arnott Pit.

4.0 METHODS

4.1 Background Review

The investigation of existing conditions on the Site and in the Study Area included a background information search and literature review to gather data about the local area and provide context for the evaluation of the natural features using the following resources:

- Online Make-A-Map Natural Heritage Explorer maintained by the MNRF (MNRF 2018a)
- Land Information Ontario (LIO) geospatial data (MNRF 2018b)
- Species at Risk Public Registry (ECCC 2018)
- Species at Risk in Ontario (SARO) List (MNRF 2018c)

- Breeding Bird Atlas of Ontario (OBBA) (Cadman et al. 2007)
- Atlas of the Mammals of Ontario (Dobbyn 1994)
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2017)
- Bat Conservation International (BCI) range maps (BCI 2017)
- Ontario Butterfly Atlas (Jones et al. 2017)
- eBird species maps (eBird 2018)
- Lanark County Sustainable Communities Official Plan (McIntosh Perry 2012)
- Township of Lanark Highlands Official Plan (2016)
- MVCA floodplain mapping (MVCA 2017)
- MVCA Watershed Report Card (MVCA 2013)
- Aerial imagery

To develop an understanding of the drainage patterns, ecological communities and potential natural heritage features that may be affected by the proposed aggregate extraction, MNR LIO data were used to create base layer mapping for the Study Area. A geographic query of the MNR Make-a-Map database was conducted to identify element occurrences of any natural heritage features, including wetlands, Areas of Natural and Scientific Interest (ANSIs), life science sites, rare vegetation communities, rare (i.e., S1-S3 species in the NHIC), threatened or endangered species and other natural heritage features within two kilometres (km) of the Site. A formal information request was also submitted to the MNR, with a response provided in a letter dated March 28, 2017 (Appendix A).

4.2 SAR Screening

SAR considered for this report include those species listed in the ESA and the SARA. An assessment was conducted to determine which SAR had potential habitat in the Study Area. A screening of all SAR which have the potential to be found in the vicinity of the Study Area was conducted first as a desktop exercise using the sources listed in Section 4.1. Species with ranges overlapping the Study Area, or recent occurrence records in the vicinity, were screened by comparing their habitat requirements to habitat conditions in the Study Area.

The potential for the species to occur was determined through a probability of occurrence. A ranking of low indicates no suitable habitat availability for that species in the Study Area and no specimens identified. Moderate probability indicates more potential for the species to occur, as suitable habitat appeared to be present in the Study Area, but no occurrence of the species has been recorded. Alternatively, a moderate probability could indicate an observation of a species, but there is no suitable habitat on the Site or in the Study Area. High potential indicates a known species record in the Study Area (including during field surveys or background data review) and good quality habitat is present.

Searches were conducted during field surveys for suitable habitats and signs of all SAR identified through the desktop screening. If the potential for the species to occur in the Study Area was moderate or high, the screening was refined based on field surveys (i.e., habitat assessment) and/or species-specific surveys. Any habitat identified during ground-truthing or other field surveys with potential to provide suitable conditions for additional SAR not already identified through the desktop screening was also assessed and recorded.

4.3 Field Surveys

The habitats and communities on the Site and in the Study Area, where access was possible, were characterized through field surveys. The following sections outline the methods used for each of the field surveys in the Study Area. During all surveys, area searches were conducted and additional incidental wildlife, plant, and habitat observations were recorded. Searches were also conducted to document the presence or absence of suitable habitat, based on habitat preferences, for those species identified in the desktop SAR screening described above. The dates when all surveys were conducted are included in Table 1.

Table 1: Summary of Field Surveys Conducted in the Study Area in 2017

Date	Type of Survey
16 April	Site Reconnaissance, Amphibian Surveys, Visual Encounter Survey (all wildlife)
15 June	Breeding Bird Survey, Visual Encounter Survey (all wildlife), Botanical Inventory and Ecological Land Classification
21 June	Deploy Bat Detectors, Bat Exit/Habitat Survey
5 July	Collect Bat Detectors, Breeding Bird Survey, Visual Encounter Survey (all wildlife)
18 September	Botanical Inventory and Ecological Land Classification

4.3.1 Plant Community Surveys and Botanical Inventory

Plant communities in the Study Area were first delineated at a desktop level using high-resolution aerial imagery, then ground-truthed in the field using the Ecological Land Classification (ELC) system for Southern Ontario (Lee et al. 1998). These inventories were carried out by systematically traversing the Site and portions of the Study Area where access was obtained, to ensure a thorough survey of species and communities. During the field surveys, information on plant community structure and composition, and soils was recorded in order to better define and refine the plant community polygons.

The botanical inventory included area searches in all habitats on the Site, to the extent possible. Species planted for landscape and garden purposes are not included; however, escapees that have become established on their own are. Lists of all plant species identified during all of the field surveys were compiled. Efforts to locate butternut trees (*Juglans cinerea*) were concentrated on the Site, and within 50 m of the Site, where access was possible. Searches for trees were conducted during all field surveys, and marked when/if found using a hand-held GPS unit.

4.3.2 Breeding Bird Survey

Breeding bird point count surveys for songbirds and other diurnal birds were conducted at five stations on the Site and in the Study Area (Figure 1). Surveys followed protocols from the Ontario Breeding Bird Atlas (Cadman et al. 2007). Point count stations were established in representative habitats on the Site and were spaced a minimum of 250 m apart. Surveys were conducted between 30 minutes before sunrise and 10:00 am to encompass the period of maximum bird song.

Each station consisted of a circle with a 100 m radius from the centre point (where the observer stands), and each point count was 10 minutes in duration, and was separated into survey windows of 0-3, 3-5, and 5-10 minutes. All birds seen or heard were noted on pre-printed datasheets and observations were made regarding sex, age

and notable behaviour, when possible. Birds heard or seen outside of the 100 m radius were also noted using methods from the OBBA, including estimated distance (where possible).

The buildings and structures in the Study Area were surveyed from public access points concurrently with breeding bird surveys, with a focus on those buildings on the Site, for the presence of nesting SAR such as barn swallow. In addition, crepuscular surveys for chimney swift occurred concurrently with the bat surveys discussed below.

During all field surveys, visual encounter surveys (VES) for bird species not easily detected by point count surveys, such as raptors, were completed.

4.3.3 Bat Surveys

Bat surveys conducted on the Site included a habitat assessment, stand-watch exit surveys, and the use of acoustic bat detectors (Wildlife Acoustics SM3BAT+®). During the first survey, during daylight, the buildings and any trees that provide potential suitable maternity roosting habitat, were inspected for any visual signs of bats (e.g., guano). Tenants of the onsite buildings were interviewed about any observations of bats they may have had. Searches for hibernacula habitat were performed by searching for suitable structures or geology (e.g. caves, karst, and crevices).

Two bat detectors were then deployed (Figure 1) and programmed to record bat calls for at least 10 consecutive nights, as per draft MNRF recommended protocols (undated). Both detectors recorded data for 14 nights (June 21 to July 5, 2017) during the maternity roosting season. Each station was located to provide coverage of the Site and target areas where bats would most likely be roosting, commuting or feeding. Specifically, the first location was at barn and farm house, and the second location was near two very large hollow maple trees. The U1 microphones were left open with no horn or windscreen for maximum recording capability. They were set to record from 30 minutes before sunset to 30 minutes after sunrise. The detectors were triggered by ultrasound (which may or may not be a bat). Once triggered, they recorded a file between 5 and 15 seconds in duration and then started a new recording (if ultrasound persisted) or slept until they were next triggered.

Sonobat Data Wizard was used to attribute file names and scrub the data set of noise files. The high grade noise scrubber setting was used. The data was analyzed and auto-classified using SonoBat 4.2.1 nnE. The Sonobat program is specifically intended for determination of bats to the species level wherever possible, and validation of the species-level classification was conducted by Golder's bat acoustic specialist. The results of the species classification were tallied on a per-night basis for each station for each species or species group. Once automated classification was complete, a subset of the files were reviewed (QA/QC'd) by an experienced and qualified bat acoustic specialist using the SonoVet tool. All recordings identified as high frequency calls were reviewed and a subset of the low frequency calls were also reviewed. For calls that were auto-classified to species by SonoBat but not reviewed, the SonoBat classification was accepted.

Crepuscular stand-watch surveys were also conducted by two biologists to visually observe bat species exiting potential maternity roosts on the Site. Surveys consisted of observing the potential maternity roosts from 30 minutes before sunset to 60 minutes after sunset.

4.3.4 Herpetile Surveys

Wetland habitat in the Study Area was surveyed for amphibian breeding activity. One round of early spring amphibian surveys was conducted to capture the breeding period of woodland amphibians. Potential habitat for amphibians that breed later in the season was not identified, therefore only the early season survey was conducted. Amphibian call-count surveys followed standardized protocols (Bird Studies Canada, 2003), and were conducted in areas where access was permitted. Two stations were distributed across the Study Area, based on

the locations of potential breeding habitat and following spacing requirements in the methodology. Surveys were conducted between 30 minutes after sunset and midnight. At each station, a three minute survey was completed with amphibian species identified by vocalization. The search area is generally identified by a 100 m radius semi-circle around the listening station. Amphibians heard beyond the 100 m survey plot are noted along with any other wildlife encountered during the survey.

During all field surveys, visual encounter surveys (VES) for herpetiles were conducted following recommended MNRF protocols (MNRF 2013). All suitable habitats for reptiles were searched (e.g., flipping logs and other types of cover objects, observations in piles of rocks, around building foundations and wells) and all reptiles and amphibians observed were identified and recorded.

4.3.5 Aquatic Habitat Surveys

Other than spring flooded wetlands, there are no surface water features, including watercourses or headwater drainage features on the Site or within the Study Area, therefore no aquatic habitat surveys were completed as part of this study.

4.3.6 Visual Encounter Surveys

General wildlife surveys included track and sign surveys, area searches, and incidental observations, concurrent with other site investigations. These surveys followed recommended protocols (MNRF 2013; McDiarmid 2012; Bookhout 1994).

The full range of habitats across the Site were searched, with special attention paid to edge habitats and other areas where mammals might be active. Areas of exposed substrate such as sand or mud were located and examined for any visible tracks. Any wildlife (including mammals, reptiles, birds, butterflies, and dragonflies) seen and identified were recorded. When encountered, tracks and other signs (e.g., tracks, scats, hair, tree scrapes, etc.) were identified to a species, if possible, and recorded. Observations of wildlife species or signs during all site investigations were recorded.

4.4 Analysis of Significance and Sensitivity and Impact Assessment

An assessment was conducted to determine if any significant environmental features, SAR, or other significant species exist, or have moderate or high potential to exist, in the Study Area and assess whether the development would negatively impact surrounding significant natural heritage features or SAR. Preventative, mitigative and remedial measures were considered in assessing the net effects of the proposed extraction operation on the surrounding ecosystem.

5.0 EXISTING CONDITIONS

5.1 Ecosystem Setting and Regional Context

The Study Area is located in Ecoregion 5E (Georgian Bay Ecoregion), within the Ontario Shield Ecozone. This Ecoregion covers approximately 7.5% of the province (Crins et al. 2009) and is situated at the southern edge of the Precambrian shield. The soils in this Ecoregion are dominated by Humo-ferric Podzols, with acidic bedrock, Mesisols and Melanic Brunisols making up the balance. Forest is the dominant land cover (approximately 78.5%), with water and pasture lands comprising approximately 13% (Crins et al. 2009).

The Study Area lies in an area of drumlinized till plains within the Algonquin Highlands physiographic region, with areas of peat and muck soils to the east and shallow till and rock ridges to the west (Chapman and Putnam 1984). These highlands are a broad upland area with gentle regional slopes to the northeast and southwest. Due to the soil conditions, little of this region is actively farmed.

The Site and Study Area are located within the Mississippi Valley River watershed, specifically the Mississippi Lake subwatershed. This subwatershed is characterized by 55% forest cover and is graded as having excellent surface water quality (MVCA 2013).

5.2 Geology and Hydrogeology

Two geology/hydrogeology site investigations have previously been completed at the proposed Arnott Pit. The objectives of the site investigations were to assess the spatial extent of the aggregate resource at the site, and to establish the depth to the groundwater table. The first investigation, completed in November 2009, included the completion of 31 test pits across the site and beyond the site boundary to the east. The second investigation, completed in 2017, included the drilling of one borehole (BH17-1) and the installation of a monitoring well in the north-central portion of the site. In addition, during 2017 and 2018 a groundwater level monitoring program was completed at BH17-1 to provide information on the seasonal variation of the groundwater table at the site. The results of the site investigations are provided in Golder's groundwater table assessment (Golder 2018).

Based on the test pitting results, the thickness of the sand deposit at the site is greatest in the north/northwest portion of the site where the ground surface rises. Within this portion of the site, most test pits were completed to the maximum reach of the excavation equipment without encountering bedrock (i.e., greater than 6 metres thick). The thickness of the sand deposit was also greater than 6 metres in most areas along the western boundary of the site. The thickness of the sand deposit thins within the southern and eastern portions of the site. The test pits completed to the east of the proposed license boundary had limited thicknesses of sand and encountered glacial till or bedrock near surface.

Groundwater was encountered in 3 of the 31 test pits. In the northern portion of the site, the groundwater table was typically beyond the reach of the excavation equipment (i.e., greater than 6 metres below ground surface). Based on the groundwater level data collected at BH17-1, the water table in the northern-most portion of the site is greater than 14.5 metres below ground surface. Based on the available information from the test pitting completed in November 2009 and the groundwater level monitoring program completed at BH17-1 in 2017 and 2018, when encountered, the groundwater table in the overburden at the site varies between 146.37 mASL (TP#26) and 148.36 mASL (BH17-1 in November 2017). The available groundwater level data indicates there is minimal seasonal variation in the groundwater table at BH17-1. In the southern and eastern portion of the site, where the overburden thickness decreases, the groundwater table was not encountered. Within these areas, the groundwater table is interpreted to be within the bedrock.

5.3 Surface Water Resources

There are no surface water features on the Site. Off-Site, but within the Study Area, there is one forested wetland, as identified during the plant community survey (Figure 1).

5.4 Aquatic Habitat and Fish

There is no fish habitat on the Site or within the Study Area.

5.5 Plant Communities

5.5.1 Regional Setting

The Study Area is located in the Great Lakes – St. Lawrence Forest Region, which contains a wide variety of both coniferous and deciduous species, including yellow birch (*Betula alleghaniensis*), white ash (*Fraxinus americana*), green ash (*Fraxinus pennsylvanica*), eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*) and balsam fir (*Abies balsamea*), sugar maple (*Acer saccharum*) and beech (*Fagus sylvatica*) in combination with basswood (*Tilia americana*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), white oak (*Quercus alba*), and bur oak (*Quercus macrocarpa*). Bitternut hickory (*Carya cordiformis*), butternut (*Juglans cinerea*), and silver maple (*Acer saccharinum*) (Rowe 1972).

Topography of the Great Lakes – St. Lawrence Forest Region is irregular, but generally flat and is underlain by limy glacial deposits (Rowe 1972).

5.5.2 Ecological Land Classification

Overall, the Site is an agricultural row crop field, small meadow, and residential property. The surrounding Study Area is composed of agricultural fields, existing aggregate pits, and patches of forest, meadow, and forested wetland.

During the field surveys conducted on Site and in the Study Area, four plant communities were identified based on the ELC system (Lee et al. 1998) in addition to agricultural, residential and existing aggregate extraction areas. No rare plant communities were identified. These communities are shown on Figure 1 and are briefly described in Table 2.

Table 2: Plant Communities on the Site and in the Study Area

Plant Community	Description	SRANK ^a
AGRICULTURAL		
AGRCH: Agricultural Hay Field	This community was a portion of a larger graminoid hayfield at the southern edge of the Study Area. Access to this area was not obtained.	N/A
AGRCR: Agricultural Row Crop	This community made up the majority of the Site, and a portion of the Study Area. It appears to undergo crop rotation and was planted with soy beans in 2017. Due to the above-average precipitation in spring and summer 2017, small isolated pockets of saturated soil persisted in this field where tilling and planting was not possible. These areas, while too small to map as wetland communities, supported small clusters of moisture tolerant plants such as green bulrush (<i>Scirpus atrovirens</i>), and rushes (<i>Juncus</i> spp.).	N/A
ANTHROPOGENIC		
PIT: Existing Aggregate Pits	This community included active and inactive aggregate pits at the eastern, northern, and western edges of the Study Area.	N/A
RES: Rural Residential	This community included individual rural lots, and other related land uses. Within the Site, in addition to the house, there were several other outbuildings such as barns and sheds.	N/A

Plant Community	Description	SRANK ^a
TERRESTRIAL		
CUM1-1: Mixed Meadow	This community was a small semi-manicured meadow, adjacent to the residential property at the northern portion of the Site. It persists as a meadow, but receives mowing on occasion (i.e., once or twice annually). There were a few manicured trails throughout. It was dominated by a mix of grasses and forbs such as Timothy (<i>Phleum pratense</i>), and parsnip (<i>Pastinaca sativa</i>).	N/A
FOD5-1 Dry to Fresh Sugar Maple Deciduous Forest	This community included a portion of two different woodlots at the southern portion of the Study Area. Only those portions of these woodlots that are within the Study Area boundary were accessed and surveyed. It is possible that the remainder of these woodlots outside of the Study Area include additional forest and swamp communities. Overall the canopy was semi-mature to mature, closed to partially closed and dominated by sugar maple (<i>Acer saccharum</i>), with associates such as black cherry (<i>Prunus serotina</i>), and ironwood (<i>Ostrya virginiana</i>). The understory and groundcover was sparse with seedling trees, shrubs and forbs. Downed woody debris and snags were occasional. Within both of these woodlots were several mature potential cavity trees.	S5
FOD5-8 Dry to Fresh Sugar Maple – White Ash Deciduous Forest	This community was present in the western half of the woodlot at the northern corner of the Study Area. It did not occur on the Site itself. It was at a higher elevation than the eastern portion, and partially on a slope. Overall, the canopy was semi-mature, closed and dominated by sugar maple, with associates such as white ash (<i>Fraxinus americana</i>), and ironwood. The understory and groundcover was sparse with seedling trees, and forbs such as white trillium (<i>Trillium grandiflorum</i>) blue cohosh (<i>Caulophyllum thalictroides</i>). Downed woody debris and snags were occasional. Within this community were a few mature potential cavity trees.	S5
SWM1-1 White Cedar-Hardwood Mixed Mineral Swamp	This community was the eastern half of the woodlot at the northern corner of the Study Area. It did not occur on the Site itself. It was at a lower elevation than the western portion, at the bottom of a slope. Overall, the canopy was immature, partially open, dominated by green ash with associates such as white cedar (<i>Thuja occidentalis</i>) and yellow birch (<i>Betula alleghaniensis</i>). The understory and groundcover were moderately dense, with a mix of moisture tolerant species such as sensitive fern (<i>Onoclea sensibilis</i>), and wood nettle. Snags and downed woody debris were rare to occasional. There were areas where spring pooling and overland flow occurs, but only saturated soil remained by early summer.	S5

Notes: ^a SRANK is a provincial –level rank indicating the conservation status of a species or plant community and is assigned by the NHIC in Ontario (NHIC 2015). SRANKs are not legal designations but are used to prioritize protection efforts in the Province. SRANKs for plant communities in Ontario are defined in the Significant Wildlife Habitat Technical Guide (MNR 2000). Ranks 1-3 are considered extremely rare to uncommon in Ontario; Ranks 4 and 5 are considered to be common and widespread. N/A indicates a community that has not been ranked.

5.5.3 Vascular Plants

A total of 81 vascular plant taxa were identified on the Site during the field survey. For a list of plants identified within the Site refer to Appendix C. No SAR, provincially rare, or regionally significant plant species were observed.

5.6 Wildlife

Forty bird species, five herpetile species, 15 mammal species, and 9 insect species were identified in the Study Area. Of these, 22 bird species, two herpetile species, 15 mammal species and nine insect species were identified on the Site. For a list of wildlife identified refer to Appendix D. The wildlife community in the Study Area included common species such as song sparrow (*Melospiza melodia*), and white-tailed deer (*Odocoileus virginianus*). Moderate numbers of spring peepers (*Pseudacris crucifer*) and wood frogs (*Lithobates sylvaticus*) were heard in the SWM1-1 in the northeastern corner of the Study Area, but no amphibians were heard calling on the Site itself during surveys. During the fourteen nights of bat acoustic data collection, a total of 2,307 bat calls were recorded. This included six species (Appendix D), plus unknown high frequency recordings. The majority of calls were that of big brown bat (*Eptesicus fuscus*) followed by silver-haired bat (*Lasionycteris noctivagans*).

5.6.1 Significant Wildlife Species

One pair of barn swallows (*Hirundo rustica*) and their active nest was observed in the barn on the Site during surveys in June 2017 (Figure 2). Although the contents of the nest could not be seen, the adults were seen carrying food to the nest during surveys. A single adult male eastern wood-pewee (*Contopus virens*) was heard singing in the woodlot at the western edge of the Study Area, but not within the Site (Figure 2). Three adult monarchs (*Danaus plexippus*) were observed foraging on flowering plants in the Site during surveys in June (Figure 2). Although monarch caterpillars were not found, there are many common milkweed plants throughout the Site. During the bat acoustic data collection, little brown myotis (*Myotis lucifugus*) were recorded consistently in low numbers on most nights. A single call of a tri-colored bat (*Perimyotis subflavus*) was recorded on one night at Station 2 (Figure 2).

For further discussion on significant wildlife species refer to Section 6.0.

6.0 ASSESSMENT OF SIGNIFICANT NATURAL HERITAGE FEATURES

This section assesses the natural heritage features and functions (as outlined in Section 2.0) located within the Study Area. The following sources were used during the assessment of features:

- Natural Heritage Reference Manual (NHRM; MNR 2010)
- Significant Wildlife Habitat Technical Guide (SWHTG; MNR 2000)
- Significant Wildlife Habitat Mitigation Support Tool (SWHMiST; MNRF 2014)
- Significant Wildlife Habitat Criteria Schedules for Ecoregions 6E and 7E (MNRF 2015a; 2015b)

6.1 Habitat of Endangered or Threatened Species

Based on the background review and field surveys, three endangered species were identified on the Site and/or in the Study Area (Appendix B). This included barn swallow (*Hirundo rustica*), little brown myotis (*Myotis lucifugus*), and tri-colored bat (*Perimyotis subflavus*). One additional threatened species was identified as having potential to occur in the Study Area but not on the Site, namely chimney swift (*Chaetura pelagica*).

Barn Swallow

One pair of barn swallows and their active nest was observed in the barn on the Site during surveys in June 2017 (Figure 2). Barn swallow, potentially the same individual birds, was also observed foraging of the meadow (CUM1-1) on the Site. The barn on the Site is proposed for removal as part of this application, and a portion of the foraging habitat (defined as the area between 5 m and 200 m of the nest) is also proposed for removal.

Removal of barn swallow habitat is regulated under Section 23.5 of O. Reg. 242/08 of the ESA. Mitigation measures to address the loss of existing barn swallow nesting habitat on the Site are provided in Section 8.2.

Chimney Swift

No structures on the Site were deemed suitable for this species, as the chimney on the house contains a woodstove insert. In addition, no chimney swift were observed on the Site during surveys. Other buildings in the Study Area may be suitable for this species, but were not surveyed. Because potential habitat in the Study Area will not be impacted, the proposed extraction will have no adverse effects on chimney swift and no further analysis is warranted.

Little Brown Myotis, and Tri-colored Bat

Little brown myotis and tri-coloured bat, both designated endangered under both the ESA and the SARA, were recorded on the Site and have high potential to also be present in the Study Area. Both species will roost in both natural and man-made structures, with little brown bats showing preference for hollow trees and peeling bark and tri-coloured bat showing preference for clumps of dead leaves or squirrel nests. Both species may use caves or abandoned mines for hibernaculum, but high humidity and stable above freezing temperatures are required (ECCC 2015).

During the acoustic monitoring studies, these species were not recorded at the Site within the first hour after sunset, which indicates that they are likely roosting off-site and moving to the Site as part of their nightly foraging. Given that the Site is adjacent to a number of mature deciduous forest blocks, it is likely that the roost habitats are present in those areas, rather than on the Site. The only suitable roost habitats on the Site are the existing house, barn and sheds, and two mature, partially hollow, maple trees near Station 2. However, as noted, no recordings of any SAR bats were made in the vicinity of these structures or trees within the first hour after sunset, which indicates that they are not likely being used by SAR bats for roosting.

Because potential habitat in the Study Area will not be impacted, the proposed extraction will have no adverse effects on little brown or tri-colored bat and no further analysis is warranted.

6.2 Significant Wetlands

Significant wetlands are areas identified as provincially significant by the MNRF using evaluation procedures established by the Province, as amended from time to time (MMAH 2014). Wetlands are assessed based on a range of criteria, including biology, hydrology, societal value and special features (MNRF 2014).

Innisville Wetlands PSW is located off-Site and outside the Study Area (Figure 2). There is no surface water connection between the PSW and the Site; however, there is likely surface water connection between the PSW and the unevaluated wetland within the Study Area (ELC code SWM1-1). Proposed aggregate extraction will be limited to above the water table. There will be no groundwater drawdown as a result of the proposed extraction. Also, because there will be no extraction below the water table and no alteration to drainage on the Site, interference with the function of potential groundwater-dependent natural environment features in the Study Area will not occur.

The unevaluated wetland in the Study Area (Figure 2) may qualify for complexing with the adjacent Innisville Wetland PSW; however, as described above, no impacts to any of these wetlands are anticipated as a result of the proposed extraction or operations. Therefore, no formal complexing exercise was undertaken. Further, the license boundary will respect a minimum 30 m setback to this feature.

No further analysis is warranted.

6.3 Fish Habitat

No fish habitat was identified in the Study Area. No further analysis is warranted.

6.4 Significant Woodlands

Woodlands can vary in their level of significance at the local, regional and provincial levels. Significant woodlands are an area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history (MMAH 2014). These are to be identified using criteria established by the MNRF and are included in the Natural Heritage Reference Manual (NHRM) for Policy 2.3 of the PPS (MNR 2010).

The Township of Lanark Highlands state in their OP (2016) that: "Council shall designate areas where development must be controlled on Schedule B. These include Areas of Natural or Scientific Interest (ANSI's), fish habitat, significant woodlands and riparian zones." No significant woodlands are mapped on the Site or within the Study Area on Schedule B of the OP.

Further analysis is not warranted.

6.5 Significant Valleylands

Significant valleylands should be defined and designated by the planning authority. General guidelines for determining significance of these features are presented in the Natural Heritage Reference Manual (NHRM) for Policy 2.3 of the PPS (MNR 2010). Recommended criteria for designating significant valleylands under the PPS include prominence as a distinctive landform, degree of naturalness, importance of its ecological functions, restoration potential, and historical and cultural values.

There are no significant valleylands on the Site or in the Study Area. Further analysis is not warranted.

6.6 Significant Areas of Natural or Scientific Interest (ANSIs)

Significant ANSIs are areas identified as provincially significant by the MNRF using evaluation procedures established by the Province, as amended from time to time.

There are no ANSIs on the Site or in the Study Area. Further analysis is not warranted.

6.7 Significant Wildlife Habitat

Significant wildlife habitat (SWH) is one of the more complicated natural heritage features to identify and evaluate. The NHRM includes criteria and guidelines for designating SWH. There are two other documents, the Significant Wildlife Habitat Technical Guide (SWHTG) and the Significant Wildlife Habitat Mitigation Support Tool (SWHMiST) (MNR 2000 and MNRF 2014), that can be used to help decide what areas and features should be considered significant wildlife habitat. These documents were used as reference material for this study.

There are four general types of significant wildlife habitat: seasonal concentration areas, migration corridors, rare or specialized habitats, and species of conservation concern. The specific habitats considered in this report are evaluated based on the criteria outlined in the Ecoregion 6E and 7E Criterion Schedules (MNRF 2015a; 2015b). All types of SWH are discussed below in relation to the Site and the Study Area.

6.7.1 Seasonal Concentration Areas

Seasonal concentration areas are those areas where large numbers of a species congregate at one particular time of the year. Examples include deer yards, amphibian breeding habitat, bird nesting colonies, bat hibernacula, raptor roosts, and passerine migration concentrations. If a SAR, or if a large proportion of the population may be lost if significant portions of the habitat are altered, all examples of certain seasonal concentration areas may be designated.

The SWHTG identifies the following 14 types of seasonal concentrations of animals that may be considered significant wildlife habitat, and outlines means of identifying such habitat. They are:

- Winter deer yards
- Moose late winter habitat
- Colonial bird nesting sites
- Waterfowl stopover and staging areas (aquatic and/or terrestrial)
- Waterfowl nesting areas
- Shorebird migratory stopover areas
- Landbird migratory stopover areas
- Raptor winter feeding and roosting areas
- Wild turkey winter range
- Turkey vulture summer roosting areas
- Reptile hibernacula (and turtle wintering areas)
- Bat hibernacula
- Bullfrog concentration areas
- Migratory butterfly stopover areas

In addition to the above list, the SWHECS considers bat maternity colonies and bat migratory stopover areas as seasonal concentration areas for wildlife.

Deer and moose management is an MNRF responsibility, and deer winter congregation areas considered significant are mapped by the MNRF. There are neither deer yards nor moose late winter habitat identified on the Site or in the Study Area. Further analysis is not warranted.

There are no banks, cliffs, rocky islands or peninsulas suitable for colonial bird nesting habitat on the Site or in the Study Area. Further, no heronries were identified during the site investigations. Further analysis is not warranted.

No areas suitable for supporting waterfowl during migration times (stopover and staging) were identified during site investigations. No terrestrial stopover or staging habitat was observed on the Site or in the Study Area. Further analysis is not warranted.

Shorebird stopover sites are typically well-known and have a long history of use. There are no areas of suitable shorebird foraging habitat on the Site or in the Study Area. In addition, no concentrations of shorebirds or presence of the listed species was identified during the site investigations. Further analysis is not warranted.

The Study Area is not located in close enough proximity (i.e., within 5 km) to the Great Lakes to provide suitable landbird migratory stopover areas. Further analysis is not warranted.

Ideal raptor winter roosting areas are generally located in mature mixed or coniferous woodlands that abut windswept fields that do not get covered by deep snow. There are no suitable habitats on the Site or in the Study Area for raptor winter feeding and roosting. Further analysis is not warranted.

Suitable habitat for wild turkey includes a mix of forest and open land such as natural grassland or agriculture. For wintering, wild turkeys tend to prefer large dense coniferous forests adjacent to open land and close to both a food source and groundwater seeps. There is no suitable habitat for wild turkey on the Site or in the Study Area. Further analysis is not warranted.

No significant turkey vulture summer roosting habitat was observed on the Site or in the Study Area. Further analysis is not warranted.

Reptile hibernacula and evidence of snake congregations were searched for during site investigations on the Site and in the Study Area. The foundations of the existing house and barn on the Site may provide some hibernacula potential, but no evidence of snake congregation were observed during field surveys. No other structures in the Study Area were deemed suitable for potential hibernacula. The forest areas in the Study Area may provide this type of habitat; however, no drawdown effects are expected from the proposed extraction (above-water) and alteration of the adjacent habitat from active agriculture to active pit is not likely to have any negative impacts on hibernacula within the forest areas, if any. As they will not be impacted by the proposed extraction, further analysis is not warranted.

No potential turtle over-wintering habitat was observed on the Site or in the Study Area, as no standing water of suitable depth was present. Further analysis is not warranted.

There are no suitable areas of bat hibernacula in the study area, and no karst topography or features are known to occur on the Site or in the Study Area (OMNDM 2016). Based on the site investigations, no portions of the Site provide the necessary number (>10/ha) of large (>25cm DBH) wildlife trees to be considered significant maternity roost habitat; however, this habitat type may be present within the mature forests within the Study Area (outside the Site). Because no drawdown effects are expected from the proposed extraction (above-water), and alteration of the adjacent habitat from active agriculture to active pit is not likely to have any negative impacts on the adjacent forest communities, no impacts to this potential habitat type is expected, and further analysis is not warranted.

No bat migratory stopover areas are identified in this eco-region.

The Site and Study Area do not provide suitable large open water areas for bullfrog. Further analysis is not warranted.

The Site and Study Area are not located within 5 km of Lake Ontario, and therefore does not meet the criteria for significant migratory butterfly stopover habitat. Further analysis is not warranted.

6.7.2 Migration Corridors

The SWHTG (MNR 2000) defines animal movement corridors as elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another. This is generally in response to different seasonal habitat requirements. For example, trails used by deer to move to wintering areas or areas used by amphibians between breeding and summer habitat. To qualify as significant wildlife habitat, these corridors would be a critical link between habitats that are regularly used by wildlife.

The Site is occupied by open agricultural fields within a landscape that is dominated by active agriculture and resource extraction. The Study Area is not adjacent to any major watercourse or other major landscape feature. For this reason, no migration corridors have been identified on the Site or in the Study Area. Further analysis is not warranted.

6.7.3 Rare or Specialized Habitats

Rare Habitats

Rare habitats are those with plant communities that are considered rare in the province, such as sand barrens, alvars, old growth forests, savannah and tallgrass prairie. It is assumed that these habitats are at risk and that they are also likely to support additional wildlife species that are considered significant. Generally, communities assigned an SRANK of S1 to S3 (extremely rare to rare-uncommon) by the NHIC qualify as rare.

None of the plant communities identified on the Site or in the Study Area are ranked S1 to S3 by the NHIC, nor were any old growth forests identified. Further analysis is not warranted.

Specialized Habitats

Specialized habitats are microhabitats that provide a critical resource to some groups of wildlife. The SWHTG defines 14 specialized habitats that may be considered significant wildlife habitat, and outlines means of identifying such habitats. They are:

- Habitat for area-sensitive species
- Forests providing a high diversity of habitats
- Old-growth or mature forest stands
- Foraging areas with abundant mast
- Amphibian woodland breeding ponds
- Turtle nesting habitat
- Specialized raptor nesting habitat
- Moose calving areas
- Moose aquatic feeding areas
- Mineral licks
- Mink, otter, marten, and fisher denning sites
- Highly diverse areas
- Cliffs
- Seeps and springs

In addition to the above list, the SWHECS considers waterfowl nesting habitat, bald eagle and osprey nesting, foraging and perching habitat, woodland raptor nesting habitat, and amphibian wetland (i.e., non-woodland) breeding habitat as specialized habitat for wildlife. Waterfowl nesting was discussed under Section 6.7.1 (Seasonal Concentration Areas).

There are no forested areas on the Site, and no portions of the forested areas that extend into the Study Area that provide habitat for area-sensitive breeding birds (measured 200 m from the edge). Further analysis is not warranted.

There are no forested areas on the Site, and the forested areas that extend into the Study Area do not appear to provide a high diversity of habitats, old-growth forests, or foraging areas with abundant mast. Further analysis is not warranted.

No wetlands are present on the Site. The single wetland in the Study Area (SWM1-1) was surveyed for breeding amphibians, and it was determined that this feature meets the criteria for significant amphibian breeding habitat (woodland). This area will be at least 30 m from the license boundary, and no drawdown effects are expected from the proposed extraction (above-water). For these reasons, no impacts to this type of SWH are anticipated and no further analysis is not warranted.

The SWHECS indicates that exposed mineral soils in open sunny areas must be present to support turtle nesting. The Site and Study Area consists mainly of active agricultural lands and resource extraction, providing an abundance of exposed soils; however, no surface water features are present on the Site or in the Study Area, therefore, this type of SWH is not present. Further analysis is not warranted.

Nesting habitat for raptors, as well as perching and foraging habitat for bald eagle and osprey, were not identified as no raptor nests were observed during site investigations. Further, to meet the SWHECS criteria for this habitat type, there must be > 10 ha of interior forest habitat (measured 200 m from any edge) present. This is not present on the Site or in the Study Area. Further analysis is not warranted.

No moose calving or aquatic feeding areas, mineral licks, or mink, otter, marten or fisher denning sites were observed during the site investigation on the Site or in the Study Area. Further analysis is not warranted.

Highly diverse areas are described in the SWHTG as areas with a high species or plant community diversity. The Site and Study Area are primarily active agriculture and resource extraction, and so do not meet this criteria. Further analysis is not warranted.

There is no cliff / talus habitat on the Site or in the Study Area, according to the criteria presented in the SWHECS. Further analysis is not warranted.

No evidence of groundwater seepage or springs were observed on the Site or in the Study Area. Further analysis is not warranted.

6.7.4 Habitat for Species of Conservation Concern

Habitat for species of conservation concern (SOCC) includes habitat for three groups of species:

- Species that are rare, those whose populations are significantly declining, or have a high percentage of their global population in Ontario;
- Species listed as special concern under the ESA; and,
- Species listed as threatened or endangered under SARA.

Rare species are considered at five levels: globally rare, nationally rare, provincially rare, regionally rare, and locally rare (i.e., in the municipality). This is also the order of priority that should be attached to the importance of maintaining species. Some species have been identified as being susceptible to certain practices, and their presence may result in an area being designated significant wildlife habitat. Examples include species vulnerable to forest fragmentation and species such as woodland raptors that may be vulnerable to forest management or human disturbance. The final group of species of conservation concern includes species that have a high proportion of their global population in Ontario. Although they may be common in Ontario, they are found in low numbers in other jurisdictions.

Four SOCC were assessed to have potential to occur on the Site or in the Study Area (Appendix B), including monarch (*Danaus plexippus*), common nighthawk (*Chordeiles minor*), eastern wood pewee (*Contopus virens*), and eastern ribbonsnake (*Thamnophis sauritus*).

Habitats on the Site for any of the above species is limited, as the Site is dominated by active agriculture. Small areas of potential foraging habitat for monarch are present in the cultural meadow area (ELC code: CUM1-1) and roadsides in the Study Area. Common nighthawk may nest on the Site or in the Study Area. Eastern wood pewee and eastern ribbonsnake would not utilize the Site, but may be present in the forested habitats in the Study Area. The proposed extraction will not limit the ability of these species to utilize the remainder of the Site (outside of license boundary), as open habitats will remain un-touched in that area. The proposed extraction will not impact the habitats in the Study Area, as no vegetation removal or impacts to groundwater will occur. The habitats on the Site and in the Study area are well-represented throughout the local landscape, and so SWH of this type is not considered present. Further analysis is not warranted.

There are four specialized habitats that may be considered habitat for special concern species. They are:

- Marsh bird breeding habitat;
- Open country bird breeding habitat;
- Shrub/early successional bird breeding habitat; and,
- Terrestrial crayfish.

There is no marsh habitat on the Site or in the Study Area. No open country or shrub/early successional breeding bird habitat meeting the size criteria, or containing the required species as listed in the SWHECS are present on the Site or in the Study Area. No evidence of terrestrial crayfish was identified on the Site or in the Study Area during the field surveys. Further, the proposed extraction will be above the water table and no groundwater impacts are expected. Further analysis is not warranted.

7.0 IMPACT ANALYSIS

The project was assessed for potential direct and indirect effects on the natural environment. A single significant natural heritage feature occurs on the Site, namely the presence of a single active barn swallow nest. The proposed extraction will require the removal of the barn that the barn swallows are nesting in. Mitigation with respect to these impacts are described in Section 8.2. No significant natural features were identified in the Study Area, outside the Site.

8.0 REHABILITATION / MITIGATION / MONITORING

8.1 Rehabilitation Concept

The primary rehabilitation objective is to restore the maximum amount of land possible for agricultural capability. Topsoil at the Site will be stripped and stored for use in rehabilitating the Site for future agricultural use. Details of the final rehabilitation plan will be described in detail on the rehabilitation Site Plan.

8.2 Mitigation

A single active barn swallow nest was confirmed within the barn on the Site. As the proposed extraction will require removal of the barn and the habitat which it represents, avoidance of potential impact or injury to individuals or habitat is not possible, and mitigation measures must be implemented. To comply with the ESA regulation, certain rules must be followed including registering the proposed activity through a Notice of Activity with the MECP prior to removing the habitat. The proponent must create replacement habitat, prepare and maintain a mitigation plan, undertake monitoring and reporting as per the regulation.

8.3 Monitoring

Monitoring of the mitigation measures to be implemented for barn swallow, as described in Section 8.2, will need to be undertaken. The monitoring requirements are outlined in the regulation, and are highly prescribed.

No other monitoring is required.

9.0 SUMMARY AND RECOMMENDATIONS

The proposed Arnott Pit has been assessed for potential ecological impacts under the ARA Provincial Standards, the Provincial Policy Statement, policies of the Lanark County and the Township of Lanark Highlands, as well as other relevant legislation, including the ESA.

Based on these analyses, it is expected that there will be no negative impacts to the significant natural features and functions in the Study Area. These conclusions are based on the following recommendations:

- Establish a minimum 30 m setback to the unevaluated wetland in the Study Area from the license boundary, to be clearly demarcated and respected.
- Sediment/erosion controls will be implemented adjacent to natural features during site preparation and as needed during operations, as required.
- To comply with the ESA regulation, certain rules must be followed to allow for the removal of barn swallow habitat at the Site, including registering the proposed activity through a Notice of Activity with the MECP prior to removing the habitat. The proponent must create replacement habitat, prepare and maintain a mitigation plan, and undertake monitoring and reporting as per the regulation.

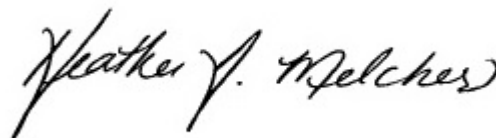
10.0 CLOSURE

We trust this report meets your current needs. If you have any further questions regarding this report, please contact the undersigned.

Golder Associates Ltd.



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Heather Melcher, M.Sc.
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GAW/HM/sg

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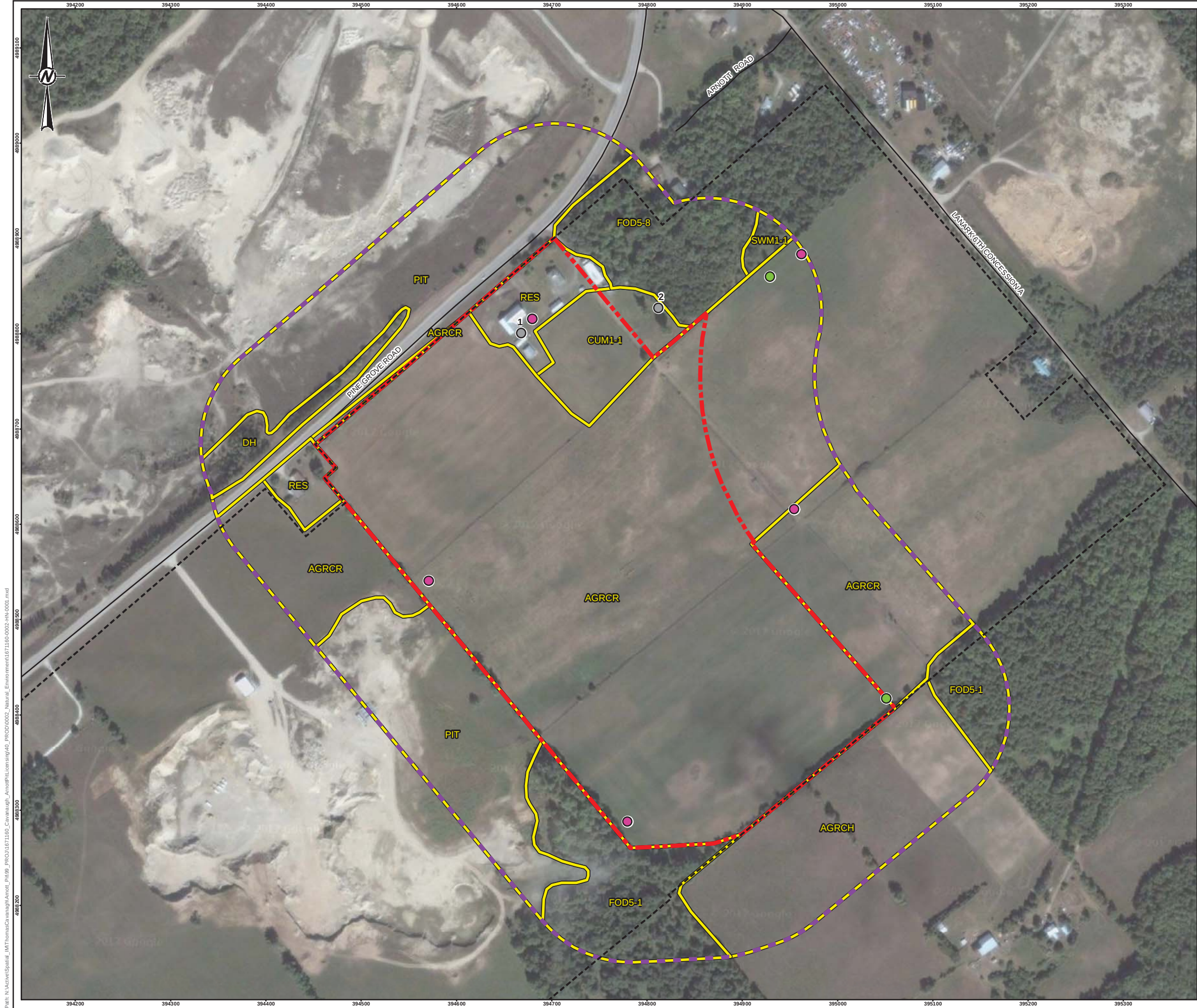
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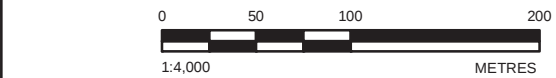
LEGEND

- BAT STATION
- BREEDING BIRD STATION
- NOCTURNAL AMPHIBIAN STATION
- ROADWAY
- WATERCOURSE
- ARNOTT PIT PROPOSED LICENSE BOUNDARY
- ARA STUDY AREA
- CAVANAGH PROPERTY BOUNDARY
- ECOLOGICAL LAND CLASSIFICATION

AGRCR: ROW CROP
AGRCH: HAYFIELD
CUM1-1: MIXED MEADOW
DH: DECIDUOUS HEDGEROW
FOD5-1: DRY TO FRESH SUGAR MAPLE DECIDUOUS FOREST
FOD5-8: DRY TO FRESH SUGAR MAPLE – WHITE ASH DECIDUOUS FOREST
PIT: EXISTING AGGREGATE PIT
SWM1-1: WHITE CEDAR HARDWOOD MIXED SWAMP
RES: RESIDENTIAL/RURAL

REFERENCE(S)

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4. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28



CLIENT
THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT
NATURAL ENVIRONMENT LEVEL 1 AND 2 TECHNICAL REPORT
PROPOSED ARNOTT PIT, LANARK HIGHLANDS, ONTARIO

TITLE
ECOLOGICAL LAND CLASSIFICATION AND SURVEY
LOCATIONS

CONSULTANT	YYYY-MM-DD	2018-02-07
DESIGNED	----	
PREPARED	JEM/BR	
REVIEWED	GW	
APPROVED	HM	

GOLDER

PROJECT NO.	CONTROL	REV.	FIGURE
1671160	0002	0	1



INNISVILLE
WETLANDS

KEY MAP



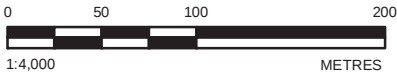
SCALE 1:400,000

LEGEND

- MONARCH (SPECIES AT RISK)
- EASTERN WOOD-PEWEE
- BARN SWALLOW ACTIVE NEST
- BAT STATION
- BREEDING BIRD STATION
- NOCTURNAL AMPHIBIAN STATION
- ROADWAY
- WATERCOURSE
- PROVINCIAL SIGNIFICANT WETLAND (PSW)
- AREA OF NATURAL AND SCIENTIFIC INTEREST (ANSI)
- ARNOTT PIT PROPOSED LICENSE BOUNDARY
- ARA STUDY AREA
- CAVANAGH PROPERTY BOUNDARY
- UNEVALUATED WETLANDS
- POTENTIALLY SIGNIFICANT WOODLAND

REFERENCE(S)

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4. PROJECTION: TRANSVERSE MERCATOR, DATUM: NAD 83, COORDINATE SYSTEM: UTM ZONE 18, VERTICAL DATUM: CGVD28



CLIENT

THOMAS CAVANAGH CONSTRUCTION LIMITED

PROJECT

NATURAL ENVIRONMENT LEVEL 1 AND 2 TECHNICAL REPORT
PROPOSED ARNOTT PIT, LANARK HIGHLANDS, ONTARIO

TITLE

SIGNIFICANT NATURAL FEATURES

CONSULTANT



YYYY-MM-DD	2018-07-30
DESIGNED	----
PREPARED	JEM/BR
REVIEWED	GW
APPROVED	HM

PROJECT NO.
1671160

CONTROL
0002

REV.
0

FIGURE
2

APPENDIX A

Correspondence with the MNRF

**Ministry of Natural
Resources and Forestry**

Kemptville District

10 Campus Drive
Postal Box 2002
Kemptville ON K0G 1J0
Tel.: 613 258-8204
Fax: 613 258-3920

**Ministère des Richesses
naturelles et des Forêts**

District de Kemptville

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Téléc.: 613 258-3920



Tue. Mar 28, 2017

Fergus Nicoll
Golder Associates
1931 Robertson Rd.
Ottawa, Ontario K2H 5B7
(613) 592-9600
Fergus_Nicoll@golder.com

Attention: Fergus Nicoll

Subject: Information Request - Developments
Project Name: Proposed Above Water Aggregate Pit, Lanark
Site Address: Lot 3 Concession 5, Lanark
Our File No. 2017_LAN-3965

Natural Heritage Values

The Ministry of Natural Resources and Forestry (MNR) Kemptville District has carried out a preliminary review of the above mentioned area in order to identify any potential natural resource and natural heritage values.

The following Natural Heritage values were identified for the general subject area:

- Pit, 15485
- Pit, 4247
- Pit, 4269
- Pit and Quarry, 4230
- Unevaluated Wetland (Not evaluated per OWES)

Municipal Official Plans contain information related to natural heritage features. Please see the local municipal Official Plan for more information, such as specific policies and direction pertaining to activities which may impact natural heritage features. For planning advice or Official Plan interpretation, please contact the local municipality. Many municipalities require environmental impact studies and other supporting studies be carried out as part of the development application process to allow the municipality to make planning decisions which are consistent with the Provincial Policy Statement (PPS, 2014).

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The MNRF strongly encourages all proponents to contact partner agencies and appropriate municipalities early on in the planning process. This provides the proponent with early knowledge regarding agency requirements, authorizations and approval timelines; Ministry of the Environment and Climate Change (MOECC) and the local Conservation Authority may require approvals and permitting where natural values and natural hazards (e.g., floodplains) exist.

As per the Natural Heritage Reference Manual (NHRM, 2010) the MNRF strongly recommends that an ecological site assessment be carried out to determine the presence of natural heritage features and species at risk and their habitat on site. The MNRF can provide survey methodology for particular species at risk and their habitats.

The NHRM also recommends that cumulative effects of development projects on the integrity of natural heritage features and areas be given due consideration. This includes the evaluation of the past, present and possible future impacts of development in the surrounding area that may occur as a result of demand created by the presently proposed project.

Wildland Fire

MNRF woodland data shows that the site contains woodlands. The lands should be assessed for the risk of wildland fire as per PPS 2014, Section 3.1.8 *"Development shall generally be directed to areas outside of lands that are unsafe for development due to the presence of hazardous forest types for wildland fire. Development may however be permitted in lands with hazardous forest types for wildland fire where the risk is mitigated in accordance with wildland fire assessment and mitigation standards"*. Further discussion with the local municipality should be carried out to address how the risks associated with wildland fire will be covered for such a development proposal. Please see the Wildland Fire Risk Assessment and Mitigation Guidebook (2016) for more information.

Significant Woodlands

Section 2.1.5 b) of the PPS states: *Development and site alteration shall not be permitted in significant woodlands unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.* The 2014 PPS directs that significant woodlands must be identified following criteria established by the Ontario Ministry of Natural Resources and Forestry, i.e. the Natural Heritage Reference Manual (NHRM), 2010. Based on criteria from the NHRM, the site has potential for significant woodlands. Where the local or County Official Plan has not yet updated significant woodland mapping to reflect the 2014 PPS, all wooded areas should be reviewed on a site specific basis for significance. The MNRF Kemptville District modelled locations of significant woodlands in 2011 based on NHRM criteria. The presence of significant woodland on site or within 120 metres should trigger an assessment of the impacts to the feature and its function from the proposed development.

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Significant Wildlife Habitat

Section 2.1.5 d) of the PPS states: *Development and site alteration shall not be permitted in significant wildlife habitat unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.* It is the responsibility of the approval authority to identify significant wildlife habitat or require its identification. The MNRF has several guiding documents which may be useful in identification of significant wildlife habitat and characterization of impacts and mitigation options:

- Significant Wildlife Habitat Technical Guide, 2000
- The Natural Heritage Reference Manual, 2010
- Significant Wildlife Habitat Mitigation Support Tool, 2014
- Significant Wildlife Habitat Criteria Schedule for Ecoregion 5E and 6E, 2015

The habitat of special concern species (as identified by the Species at Risk in Ontario list) and Natural Heritage Information Centre tracked species with a conservation status rank of S1, S2 and S3 may be significant wildlife habitat and should be assessed accordingly.

Aggregates

The above mentioned area is in proximity to a licenced aggregate operation.

The zone of influence around pits is 300 metres and the zone of influence around quarries is 500 metres, as identified by the Ministry of Environment and Climate Change D-Series guidelines. The guideline is applicable when a new sensitive land use (such as residential dwellings) is proposed within the influence area of a pit, quarry or mineral aggregate reserve.

To determine whether the proposed project will preclude or hinder the existing aggregate operation or the establishment of a new pit or quarry, the municipality may request a compatibility study.

The locations of licenced aggregate operations can be found online at <https://www.ontario.ca/environment-and-energy/find-pits-and-quarries>.

Species at Risk

A review of the Natural Heritage Information Centre (NHIC) and internal records indicate that there is a potential for the following threatened (THR) and/or endangered (END) species on the site or in proximity to it:

- American Eel (END)
- Sensitive Species (END)
- Barn Swallow (THR)
- Bobolink (THR)

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- Eastern Meadowlark (THR)

All endangered and threatened species receive individual protection under section 9 of the ESA and receive general habitat protection under Section 10 of the ESA, 2007. Thus any potential works should consider disturbance to the individuals as well as their habitat (e.g. nesting sites). General habitat protection applies to all threatened and endangered species. Note some species in Kemptville District receive regulated habitat protection. The habitat of these listed species is protected from damage and destruction and certain activities may require authorization(s) under the ESA. For more on how species at risk and their habitat is protected, please see: <https://www.ontario.ca/page/how-species-risk-are-protected>.

If the proposed activity is known to have an impact on any endangered or threatened species at risk (SAR), or their habitat, an authorization under the ESA may be required. It is recommended that MNRF Kemptville be contacted prior to any activities being carried out to discuss potential survey protocols to follow during the early planning stages of a project, as well as mitigation measures to avoid contravention of the ESA. Where there is potential for species at risk or their habitat on the property, an Information Gathering Form should be submitted to Kemptville MNRF at sar.kemptville@ontario.ca.

The Information Gathering Form may be found here:

<http://www.forms.ssb.gov.on.ca/mbs/ssb/forms/ssbforms.nsf/FormDetail?OpenForm&ACT=RDR&TAB=PROFILE&ENV=WWE&NO=018-0180E>

For more information on the ESA authorization process, please see:

<https://www.ontario.ca/page/how-get-endangered-species-act-permit-or-authorization>

One or more special concern species has been documented to occur either on the site or nearby. Species listed as special concern are not protected under the ESA, 2007. However, please note that some of these species may be protected under the Fish and Wildlife Conservation Act and/or Migratory Birds Convention Act. Again, the habitat of special concern species may be significant wildlife habitat and should be assessed accordingly. Species of special concern for consideration:

- Snapping Turtle (SC)

If any of these or any other species at risk are discovered throughout the course of the work, and/or should any species at risk or their habitat be potentially impacted by on site activities, MNRF should be contacted and operations be modified to avoid any negative impacts to species at risk or their habitat until further direction is provided by MNRF.

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Please note that information regarding species at risk is based largely on documented occurrences and does not necessarily include an interpretation of potential habitat within or in proximity to the site in question. Although this data represents the MNRF's best current available information, it is important to note that a lack of information for a site does not mean that additional features and values are not present. It is the responsibility of the proponent to ensure that species at risk are not killed, harmed, or harassed, and that their habitat is not damaged or destroyed through the activities carried out on the site.

The MNRF continues to strongly encourage ecological site assessments to determine the potential for SAR habitat and occurrences. When a SAR or potential habitat for a SAR does occur on a site, it is recommended that the proponent contact the MNRF for technical advice and to discuss what activities can occur without contravention of the Act. For specific questions regarding the Endangered Species Act (2007) or SAR, please contact MNRF Kemptville District at sar.kemptville@ontario.ca.

The approvals processes for a number of activities that have the potential to impact SAR or their habitat have recently changed. For information regarding regulatory exemptions and associated online registration of certain activities, please refer to the following website: <https://www.ontario.ca/page/how-get-endangered-species-act-permit-or-authorization>.

Please note: The advice in this letter may become invalid if:

- The Committee on the Status of Species at Risk in Ontario (COSSARO) re-assesses the status of the above-named species OR adds a species to the SARO List such that the section 9 and/or 10 protection provisions apply to those species; or
- Additional occurrences of species are discovered on or in proximity to the site.

This letter is valid until: Wed. Mar 28, 2018

The MNRF would like to request that we continue to be circulated on information with regards to this project. If you have any questions or require clarification please do not hesitate to contact me.

Sincerely,

Leanne Marcoux
A/Management Biologist
leanne.marcoux@ontario.ca

Encl.\

-ESA Infosheet
-NHIC/LIO Infosheet

APPENDIX B

Species at Risk Screening

Taxon	Common Name	Scientific Name	Endangered Species Act, Reg. 230/08 SARO List Status ¹	Species at Risk Act, Schedule 1 List of Wildlife SAR Status ²	COSEWIC Status ³	Global Rarity Rank ⁴	Provincial Rarity Rank ⁵	Ontario Habitat Descriptions	Potential to Occur on Site	Potential to Occur in Study Area
Amphibian	Western chorus frog - Great Lakes St. Lawrence / Canadian Shield population	<i>Pseudacris triseriata</i>	—	THR	THR	G5TNR	S3	In Ontario, habitat of this amphibian species typically consists of marshes or wooded wetlands, particularly those with dense shrub layers and grasses, as this species is a poor climber. They will breed in almost any fishless pond including roadside ditches, gravel pits and flooded swales in meadows. This species hibernates in terrestrial habitats under rocks, dead trees or leaves, in loose soil or in animal burrows. During hibernation, this species is tolerant of flooding (Environment Canada 2015).	Low - There is no wetland habitat on the Site.	Low- Although potential swamp habitat exists in Study Area, none were observed during tsurveys.
Arthropod	Monarch	<i>Danaus plexippus</i>	SC	SC	END	G5	S2N, S4B	In Ontario, monarch is found throughout the northern and southern regions of the province. This butterfly is found wherever there are milkweed (<i>Asclepius</i> spp.) plants for its caterpillars and wildflowers that supply a nectar source for adults. It is often found on abandoned farmland, meadows, open wetlands, prairies and roadsides, but also in city gardens and parks. Important staging areas during migration occur along the north shores of the Great Lakes (COSEWIC 2010).	High - Adults were identified during surveys.	High - Adults were identified during surveys.
Bird	Bald eagle	<i>Haliaeetus leucocephalus</i>	SC	—	NAR	G5	S2N	In Ontario, bald eagle nests are typically found near the shorelines of lakes or large rivers, often on forested islands. The large, conspicuous nests are typically found in large super-canopy trees along water bodies (Buehler 2000).	Low - There is no aquatic habitat or nest sites on the Site, and none were observed during surveys.	Low - There is no aquatic habitat or nest sites in the Study Area, and none were observed during surveys.
Bird	Bank swallow	<i>Riparia riparia</i>	THR	THR	THR	G5	S4B	In Ontario, bank swallow breeds in a variety of natural and anthropogenic habitats, including lake bluffs, stream and river banks, sand and gravel pits, and roadcuts. Nests are generally built in a vertical or near-vertical bank. Breeding sites are typically located near open foraging sites such as rivers, lakes, grasslands, agricultural fields, wetlands and riparian woods. Forested areas are generally avoided (Garrison 1999).	Low - No habitat or known nest locations were identified within the Site and none were observed during surveys.	Low - No habitat or known nesting Sites were identified within the Study Area, and none were observed during surveys.
Bird	Barn swallow	<i>Hirundo rustica</i>	THR	THR	THR	G5	S4B	In Ontario, barn swallow breeds in areas that contain a suitable nesting structure, open areas for foraging, and a body of water. This species nests in human made structures including barns, buildings, sheds, bridges, and culverts. Preferred foraging habitat includes grassy fields, pastures, agricultural cropland, lake and river shorelines, cleared right-of-ways, and wetlands (COSEWIC 2011). Mud nests are fastened to vertical walls or built on a ledge underneath an overhang. Suitable nests from previous years are reused (Brown and Brown 1999).	High - A nesting pair and an active nest was identified in the Barn on the Site.	High - In addition to the confirmed pair on the Site, there is additional potential nesting structures in the Study Area.
Bird	Black tern	<i>Chlidonias niger</i>	SC	—	NAR	G4	S3B	In Ontario, black tern breeds in freshwater marshlands where it forms small colonies. It prefers marshes or marsh complexes greater than 20 ha in area and which are not surrounded by wooded area. Black terns are sensitive to the presence of agricultural activities. The black tern nests in wetlands with an even combination of open water and emergent vegetation, and still waters of 0.5-1.2 m deep. Preferred nest sites have short dense vegetation or tall sparse vegetation often consisting of cattails, bulrushes and occasionally burreed or other marshland plants. Black terns also require posts or snags for perching (Weseloh 2007).	Low - No large open wetlands occur on the Site.	Low - No large open wetlands occur in the Study Area.

Taxon	Common Name	Scientific Name	Endangered Species Act, Reg. 230/08 SARO List Status ¹	Species at Risk Act, Schedule 1 List of Wildlife SAR Status ²	COSEWIC Status ³	Global Rarity Rank ⁴	Provincial Rarity Rank ⁵	Ontario Habitat Descriptions	Potential to Occur on Site	Potential to Occur in Study Area
Bird	Bobolink	<i>Dolichonyx oryzivorus</i>	THR	THR	THR	G5	S4B	In Ontario, bobolink breeds in grasslands or graminoid dominated hayfields with tall vegetation (Gabhauer 2007). Bobolink prefers grassland habitat with a forb component and a moderate litter layer. They have low tolerance for presence of woody vegetation and are sensitive to frequent mowing within the breeding season. They are most abundant in established, but regularly maintained, hayfields, but also breed in lightly grazed pastures, old or fallow fields, cultural meadows and newly planted hayfields. Their nest is woven from grasses and forbs. It is built on the ground, in dense vegetation, usually under the cover of one or more forbs (Renfrew et al. 2015).	Low - The meadow on the Site is likely too small for this species, and none were observed during surveys.	Low - The hayfield in the Study Area is potential habitat for this species, however none were observed during surveys.
Bird	Canada warbler	<i>Cardellina canadensis</i>	SC	THR	THR	G5	S4B	In Ontario, breeding habitat for Canada warbler consists of moist mixed forests with a well-developed shrubby understory. This includes low-lying areas such as cedar and alder swamps, and riparian thickets (McLaren 2007). It is also found in densely vegetated regenerating forest openings. Suitable habitat often contains a developed moss layer and an uneven forest floor. Nests are well concealed on or near the ground in dense shrub or fern cover, often in stumps, fallen logs, overhanging stream banks or mossy hummocks (Reitsma et al. 2010).	Low - There is no forested habitat on the Site.	Low - The forests in the Study Area are not the right structure for this species, and none were observed during surveys.
Bird	Cerulean warbler	<i>Setophaga cerulea</i>	THR	END	END	G4	S3B	In Ontario, breeding habitat of cerulean warbler consists of second-growth or mature deciduous forest with a tall canopy of uneven vertical structure and a sparse understory. This habitat occurs in both wet bottomland forests and upland areas, and often contains large hickory and oak trees. This species may be attracted to gaps or openings in the upper canopy. The cerulean warbler is associated with large forest tracks, but may occur in woodlots as small as 10 ha (COSEWIC 2010). Nests are usually built on a horizontal limb in the mid-story or canopy of a large deciduous tree (Buehler et al. 2013).	Low - There is no forested habitat on the Site.	Low - None were observed during surveys.
Bird	Chimney swift	<i>Chaetura pelagica</i>	THR	THR	THR	G5	S4B, S4N	In Ontario, chimney swift breeding habitat is varied and includes urban, suburban, rural and wooded sites. They are most commonly associated with towns and cities with large concentrations of chimneys. Preferred nesting sites are dark, sheltered spots with a vertical surface to which the bird can grip. Unused chimneys are the primary nesting and roosting structure, but other anthropogenic structures and large diameter cavity trees are also used (COSEWIC 2007).	Low - The chimney in the house on the Site has a woodstove insert. Further, none were observed during surveys.	Moderate - There are buildings in the Study Area that may have suitable habitat for this species, that were not surveyed.
Bird	Common nighthawk	<i>Chordeiles minor</i>	SC	THR	THR	G5	S4B	In Ontario, these aerial foragers require areas with large open habitat. This includes farmland, open woodlands, clearcuts, burns, rock outcrops, alvars, bogs, fens, prairies, gravel pits and gravel rooftops in cities (Sandilands 2007)	Low - There is no suitable open, low-vegetated habitat on the Site, and none were observed during surveys.	Moderate - The adjacent aggregate sites in the Study Area may provide suitable nesting habitat for this species.
Bird	Eastern meadowlark	<i>Sturnella magna</i>	THR	THR	THR	G5	S4B	In Ontario, eastern meadowlark breeds in pastures, hayfields, meadows and old fields. Eastern meadowlark prefers moderately tall grasslands with abundant litter cover, high grass proportion, and a forb component (Hull 2003). They prefer well drained sites or slopes, and sites with different cover layers (Roseberry and Klimstra 1970)	Low - The meadow on the Site is likely too small for this species, and none were observed during surveys.	Low - The hayfield in the Study Area is potential habitat for this species, however none were observed during surveys.
Bird	Eastern whip-poor-will	<i>Antrostomus vociferus</i>	THR	THR	THR	G5	S4B	In Ontario, whip-poor-will breeds in semi-open forests with little ground cover. Breeding habitat is dependent on forest structure rather than species composition, and is found on rock and sand barrens, open conifer plantations and post-disturbance regenerating forest. Territory size ranges from 3 to 11 ha (COSEWIC 2009). No nest is constructed and eggs are laid directly on the leaf litter (Mills 2007).	Low - There are no suitable open forest habitats on the Site.	Low- The forests in the Study Area are not of suitable structure for ths species.

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Bird	Eastern wood-pewee	<i>Contopus virens</i>	SC	SC	SC	G5	S4B	In Ontario, eastern wood-pewee inhabits a wide variety of wooded upland and lowland habitats, including deciduous, coniferous, or mixed forests. It occurs most frequently in forests with some degree of openness. Intermediate-aged forests with a relatively sparse midstory are preferred. In younger forests with a relatively dense midstory, it tends to inhabit the edges. Also occurs in anthropogenic habitats providing an open forested aspect such as parks and suburban neighborhoods. Nest is constructed atop a horizontal branch, 1-2 m above the ground, in a wide variety of deciduous and coniferous trees.	Low - There is no forested habitat on the Site.	High - This species was identified in the Study Area during surveys.
Bird	Golden-winged warbler	<i>Vermivora chrysoptera</i>	SC	THR	THR	G4	S4B	In Ontario, golden-winged warbler breeds in regenerating scrub habitat with dense ground cover and a patchwork of shrubs, usually surrounded by forest. Their preferred habitat is characteristic of a successional landscape associated with natural or anthropogenic disturbance such as rights-of-way, and field edges or openings resulting from logging or burning. The nest of the golden-winged warbler is built on the ground at the base of a shrub or leafy plant, often at the shaded edge of the forest or at the edge of a forest opening (Confer et al. 2011).	Low - There is no suitable successional habitat for this species on the Site.	Low - The small thicket in the Study Area is too dense for this species, and none were observed during surveys.
Bird	Grasshopper sparrow <i>pratensis</i> subspecies	<i>Ammodramus savannarum (pratensis subspecies)</i>	SC	SC	SC	G5	S4B	In Ontario, grasshopper sparrow is found in medium to large grasslands with low herbaceous cover and few shrubs. It also uses a wide variety of agricultural fields, including cereal crops and pastures. Close-grazed pastures and limestone plains (e.g. Carden and Napanee Plains) support highest density of this bird in the province (COSEWIC 2013).	Low - The meadow on the Site is likely too densely vegetated for this species and none were observed during surveys.	Low - The hayfield in the Study Area is likely too densely vegetated for this species, and none were observed during surveys.
Bird	Least bittern	<i>Ixobrychus exilis</i>	THR	THR	THR	G5	S4B	In Ontario, least bittern breeds in marshes, usually greater than 5 ha, with emergent vegetation, relatively stable water levels and areas of open water. Preferred habitat has water less than 1 m deep (usually 10 – 50 cm). Nests are built in tall stands of dense emergent or woody vegetation (Woodliffe 2007). Clarity of water is important as siltation, turbidity, or excessive eutrophication hinders foraging efficiency (COSEWIC 2009).	Low - No large open wetlands occur on the Site.	Low - No large open wetlands occur in the Study Area.
Bird	Loggerhead shrike	<i>Lanius ludovicianus (migrans subsp)</i>	END	END	END	G4	S2B	In Ontario, loggerhead shrike breeds in open country habitat characterized by short grasses with scattered shrubs or low trees. Unimproved pasture containing scattered hawthorns (<i>Crataegus</i> spp.) on shallow soils over limestone bedrock is the preferred habitat. Preferred nest sites include isolated hawthorns or red cedar. Males defend large territories of approximately 50 ha (Chabot 2007)	Low - There is no suitable savannah-like or pasture habitat on the Site and none were observed during surveys.	Low - there is no suitable savannah-like or pasture habitat in the Study Area and none were observed during surveys.
Bird	Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	SC	THR	THR	G5	S4B	In Ontario, red-headed woodpecker breeds in open, deciduous woodlands or woodland edges and are often found in parks, cemeteries, golf courses, orchards and savannahs (Woodliffe 2007). They may also breed in forest clearings or open agricultural areas provided that large trees are available for nesting. They prefer forests with little or no understory vegetation. They are often associated with beech or oak forests, beaver ponds and swamp forests where snags are numerous. Nests are excavated in the trunks of large dead trees (Smith et al. 2000).	Low- None were observed during surveys.	Low- None were observed during surveys.
Bird	Short-eared owl	<i>Asio flammeus</i>	SC	SC	SC	G5	S2N,S4B	In Ontario, short-eared owl breeds in a variety of open habitats including grasslands, tundra, bogs, marshes, clearcuts, burns, pastures and occasionally agricultural fields. The primary factor in determining breeding habitat is proximity to small mammal prey resources (COSEWIC 2008). Nests are built on the ground at a dry site and usually adjacent to a clump of tall vegetation used for cover and concealment (Gahbauer 2007).	Low-the fields on Site are primarily row crop, and none were observed during surveys.	Low - the hayfield in the Study Area provides minimal habitat, and none were observed during surveys.

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Bird	Wood thrush	<i>Hylocichla mustelina</i>	SC	THR	THR	G5	S4B	In Ontario, wood thrush breeds in moist, deciduous hardwood or mixed stands that are often previously disturbed, with a dense deciduous undergrowth and with tall trees for singing perches. This species selects nesting sites with the following characteristics: lower elevations with trees less than 16 m in height, a closed canopy cover (>70 %), a high variety of deciduous tree species, moderate subcanopy and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter (COSEWIC 2012).	Low - There is no forested habitat on the Site.	Low - None were observed during surveys.
Fish	American eel	<i>Anguilla rostrata</i>	END	—	THR	G4	S1?	In Ontario, American eel is native to the Lake Ontario, St. Lawrence River and Ottawa River watersheds. Their current distribution includes lakes Huron, Erie, and Superior and their tributaries. The Ottawa River population is considered extirpated. The preferred habitat of the American eel is cool water of lakes and streams with muddy or silty substrates in water temperatures between 16 and 19°C. The American eel is a catadromous fish that lives in fresh water until sexual maturity then migrates to the Sargasso Sea to spawn (Burridge et al. 2010; Eakins 2016).	Low - There is no suitable aquatic habitat on the Site	Low - There is no suitable aquatic habitat on the Site
Fish	Lake sturgeon - Great Lakes / Upper St. Lawrence population	<i>Acipenser fulvescens</i>	THR	—	THR	G3G4TNR	S2	In Ontario, lake sturgeon, a large prehistoric freshwater fish, is found in all the Great Lakes and in all drainages of the Great Lakes and of Hudson Bay. This species typically inhabits highly productive shoal areas of large lakes and rivers. They are bottom dwellers, and prefer depths between 5-10 m and mud or gravel substrates. Small sturgeons are often found on gravelly shoals near the mouths of rivers. They spawn in depths of 0.5 to 4.5 m in areas of swift water or rapids. Where suitable spawning rivers are not available, such as in the lower Great Lakes, they are known to spawn in wave action over rocky ledges or around rocky islands (Golder 2011).	Low - There is no suitable aquatic habitat on the Site	Low - There is no suitable aquatic habitat on the Site
Fish	River redborse	<i>Moxostoma carinatum</i>	SC	SC	SC	G4	S2	In Ontario, river redborse is known to occur in the Mississippi River, Ottawa River, Madawaska River, Grand River, Trent River, and Thames River systems. They inhabit moderate to large rivers. The majority of their time is spent in pool habitats with slow-moving water and abundant vegetation. Spawning occurs in areas of shallow, moderate to fast-flowing waters in riffle-run habitats with coarse substrates of gravel and cobble (DFO 2011).	Low - There is no suitable aquatic habitat on the Site	Low - There is no suitable aquatic habitat on the Site
Mammal	Eastern small-footed myotis	<i>Myotis leibii</i>	END	—	—	G3	S2S3	This species is not known to roost within trees, but there is very little known about its roosting habits. The species generally roosts on the ground under rocks, in rock crevices, talus slopes and rock piles. It occasionally inhabits buildings. Areas near the entrances of caves or abandoned mines may be used for hibernaculum, where the conditions are drafty with low humidity, and may be subfreezing (Humphrey 2017)	Low - There is no suitable maternity roost habitat for this species in the Study Area.	Low - There is no suitable maternity roost habitat for this species in the Study Area.
Mammal	Little brown myotis	<i>Myotis lucifugus</i>	END	END	END	G5	S4	In Ontario, this specie's range is extensive and covers much of the province. It will roost in both natural and man-made structures. Roosting colonies require a number of large dead trees, in specific stages of decay and that project above the canopy in relatively open areas. May form nursery colonies in the attics of buildings within 1 km of water. Caves or abandoned mines may be used as hibernacula, but high humidity and stable above freezing temperatures are required (Environment Canada 2015).	High - This species was identified during bat surveys.	High - This species was identified during bat surveys.
Mammal	Northern myotis	<i>Myotis septentrionalis</i>	END	END	END	G4	S3	In Ontario, this species' range is extensive and covers much of the province. It will usually roost in hollows, crevices, and under loose bark of mature trees. Roosts may be established in the main trunk or a large branch of either living or dead trees. Caves or abandoned mines may be used as hibernacula, but high humidity and stable above freezing temperatures are required (Environment Canada 2015).	Low - This species was not identified during bat surveys.	Low - This species was not identified during bat surveys.

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Mammal	Tri-colored bat	<i>Perimyotis subflavus</i>	END	END	END	—	S3?	In Ontario, tri-colored bat may roost in foliage, in clumps of old leaves, hanging moss or squirrel nests. They are occasionally found in buildings although there are no records of this in Canada. They typically feed over aquatic areas with an affinity to large-bodied water and will likely roost in close proximity to these. Hibernation sites are found deep within caves or mines in areas of relatively warm temperatures. These bats have strong roost fidelity to their winter hibernation sites and may choose the exact same spot in a cave or mine from year to year (Environment Canada 2015).	High - This species was identified during bat surveys.	High - This species was identified during bat surveys.
Reptile	Blanding's turtle - Great Lakes / St. Lawrence population	<i>Emydoidea blandingii</i>	THR	THR	END	G4	S3	In Ontario, Blanding's turtle will use a range of aquatic habitats, but favor those with shallow, standing or slow-moving water, rich nutrient levels, organic substrates and abundant aquatic vegetation. They will use rivers, but prefer slow-moving currents and are likely only transients in this type of habitat. This species is known to travel great distances over land in the spring in order to reach nesting sites, which can include dry conifer or mixed forests, partially vegetated fields, and roadsides. Suitable nesting substrates include organic soils, sands, gravel and cobble. They hibernate underwater and infrequently under debris close to water bodies (COSEWIC 2005).	Low - There are no suitable wetland habitats on the Site, and no known records on adjacent lands.	Low - Although there are small wetlands in the Study Area, they are limited habitat and there are no known records on adjacent lands.
Reptile	Eastern ribbonsnake - Great Lakes population	<i>Thamnophis sauritus</i>	SC	SC	SC	G5	S4	In Ontario, eastern ribbonsnake is semi-aquatic, and is rarely found far from shallow ponds, marshes, bogs, streams or swamps bordered by dense vegetation. They prefer sunny locations and bask in low shrub branches. Hibernation occurs in mammal burrows, rock fissures or even ant mounds (COSEWIC 2012).	Low- There are no suitable wetlands on or immediately adjacent to the Site.	Moderate - The forested wetlands in the Study Area are not suitable habitat for this species.
Reptile	Milksnake	<i>Lampropeltis triangulum</i>	NAR	SC	SC	G5	S4	In Ontario, milksnake uses a wide range of habitats including prairies, pastures, hayfields, wetlands and various forest types, and is well-known in rural areas where it frequents older buildings. Proximity to water and cover enhances habitat suitability. Hibernation takes place in mammal burrows, hollow logs, gravel or soil banks, and old foundations (COSEWIC 2014).	Moderate - Although this species was not identified durign surveys, it is cryptic and hard to observe and suitable habitat occurs on the Site.	Moderate - Although this species was not identified durign surveys, it is cryptic and hard to observe and suitable habitat occurs oin the Study Area.
Reptile	Northern map turtle	<i>Graptemys geographica</i>	SC	SC	SC	G5	S3	In Ontario, the northern map turtle prefers large waterbodies with slow-moving currents, soft substrates, and abundant aquatic vegetation. Ideal stretches of shoreline contain suitable basking sites, such as rocks and logs. Along Lakes Erie and Ontario, this species occurs in marsh habitat and undeveloped shorelines. It is also found in small to large rivers with slow to moderate flow. Hibernation takes place in soft substrates under deep water (COSEWIC 2012).	Low - There are no waterbodies on the Site.	Low - There are no suitable waterbodies in the Study Area.
Reptile	Snapping turtle	<i>Chelydra serpentina</i>	SC	SC	SC	G5	S3	In Ontario, snapping turtle uses a wide range of waterbodies, but shows preference for areas with shallow, slow-moving water, soft substrates and dense aquatic vegetation. Hibernation takes place in soft substrates under water. Nesting sites consist of sand or gravel banks along waterways or roadways (COSEWIC 2008).	Low - There are no waterbodies on the Site.	Low - There are no suitable waterbodies in the Study Area.
Reptile	Stinkpot or Eastern musk turtle	<i>Sternotherus odoratus</i>	SC	THR	SC	G5	S3	In Ontario, eastern musk turtle is very rarely out of water and prefers permanent bodies of water that are shallow and clear, with little or no current and soft substrates with abundant organic materials. Abundant floating and submerged vegetation is preferred. Hibernation occurs in soft substrates under water. Eggs are sometimes laid on open ground, or in shallow nests in decaying vegetation, shallow gravel or rock crevices (COSEWIC 2012).	Low - There are no waterbodies on the Site.	Low - There are no suitable waterbodies in the Study Area.

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Vascular Plant	American ginseng	<i>Panax quinquefolius</i>	END	END	END	G3G4	S2	In Ontario, American ginseng is found in moist, undisturbed and relatively mature deciduous woods often dominated by sugar maple. It is commonly found on well-drained, south-facing slopes. American ginseng grows under closed canopies in neutral, loamy soils (COSEWIC 2000).	Low - There is no forested habitat on the Site.	Low - Although the forests in the Study Area are potential habitat, none were observed during surveys.
Vascular Plant	Butternut	<i>Juglans cinerea</i>	END	END	END	G4	S3?	In Ontario, butternut is found along stream banks, on wooded valley slopes, and in deciduous and mixed forests. It is commonly associated with beech, maple, oak and hickory (Voss and Reznicek 2012). Butternut prefers moist, fertile, well-drained soils, but can also be found in rocky limestone soils. This species is shade intolerant (Farrar 1995).	Low- None were observed during surveys.	Low- None were observed during surveys.
Vascular Plant	Eastern prairie fringed-orchid	<i>Platanthera leucophaea</i>	END	END	END	G2G3	S2	In Ontario, eastern prairie fringed-orchid grows in wet prairies, fens, bogs, wet meadows, and wet successional fields. It grows in full sun in neutral to mildly calcareous substrates, and occasionally grows along roadsides or lake margins (Eastern Prairie Fringed-orchid Recovery Team 2010). This species is found only in southern Ontario, and only two locations are currently known on sand spits along the shore of Lake Erie.	Low - There is no suitable habitat on the Site, and none were observed during surveys.	Low - There is no suitable habitat in the Study Area, and none were observed during surveys.

Notes:

¹ *Endangered Species Act* (ESA), 2007 (O.Reg 242/08 last amended 14 Sept 2016 as O.Reg 308/16). Species at Risk in Ontario List, 2007 (O.Reg 230/08 last amended 2 June 2017 as O. Reg 167/17, s. 1.); Schedule 1 (Extirpated - EXP), Schedule 2 (Endangered - END), Schedule 3 (Threatened - THR), Schedule 4 (Special Concern - SC)

² *Species at Risk Act* (SARA), 2002. Schedule 1 (Last amended 02 Nov 2017); Part 1 (Extirpated), Part 2 (Endangered), Part 3 (Threatened), Part 4 (Special Concern)

³ Committee on the Status of Endangered Wildlife in Canada (COSEWIC) <http://www.cosewic.gc.ca/>

⁴ Global Ranks (GRANK) are Rarity Ranks assigned to a species based on their range-wide status. GRANKS are assigned by a group of consensus of Conservation Data Centres (CDCs), scientific experts and the Nature Conservancy. These ranks are not legal designations. G1 (Extremely Rare), G2 (Very Rare), G3 (Rare to uncommon), G4 (Common), G5 (Very Common), GH (Historic, no record in last 20yrs), GU (Status uncertain), GX (Globally extinct), ? (Inexact number rank), G? (Unranked), Q (Questionable), T (rank applies to subspecies or variety). Last assessed August 2011

⁵ Provincial Ranks (SRANK) are Rarity Ranks assigned to a species or ecological communities, by the Natural Heritage Information Centre (NHIC). These ranks are not legal designations. SRANKS are evaluated by NHIC on a continual basis and updated lists produced annually. SX (Presumed Extirpated), SH (Possibly Extirpated - Historical), S1 (Critically Imperiled), S2 (Imperiled), S3 (Vulnerable), S4 (Apparently Secure), S5 (Secure), SNA (Not Applicable), S#S# (Range Rank), S? (Not ranked yet), SAB (Breeding Accident), SAN (Non-breeding Accident), SX (Apparently Extirpated). Last assessed August 2011.

⁶ General Habitat Protection is applied when a species is newly listed as endangered or threatened on the SARO list under the ESA, 2007. The definition of general habitat applies to areas that a species currently depends on. These areas may include dens and nests, wetlands, forests and other areas essential for breeding, rearing, feeding, hibernation and migration. General habitat protection will also apply to all listed endangered or threatened species without a species-specific habitat regulation as of June 30, 2013 (ESA 2007, c.6, s.10 (2)). Regulated Habitat is species-specific habitat used as the legal description of that species habitat. Once a species-specific habitat regulation is created, it replaces general habitat protection. Refer to O.Reg 242/08 for full details regarding regulated habitat.

⁷ Refer to the individual species' federal recovery strategy for a full description of the critical habitat (http://www.sararegistry.gc.ca/sar/recovery/recovery_e.cfm)

General References:

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*Species Codes derived from the following sources: Birds – 53rd AOU Supplement (2012); Amphibians – Marsh Monitoring Program (Bird Studies Canada 2003); Fish – Golder; Reptiles – Golder.

* NHIC (Natural Heritage Information Centre); ROM (Royal Ontario Museum); OBBA (Ontario Breeding Bird Atlas); Herp Atlas (Reptiles and Amphibians of Ontario); Odonata Atlas (of Ontario); Mammal Atlas (of Ontario); BCI (Bat Conservation International); Butterfly Atlas (Ontario Butterfly Atlas)

'—' No status

APPENDIX C

List of Vascular Plants

Scientific Name	Common Name	Origin ^a	Global Rarity Status ^b	Ontario Rarity Status ^b	SARA ^c	ESA ^d
<i>Acer negundo</i>	Manitoba maple	(N)	G5	S5	—	—
<i>Acer saccharum</i>	Sugar maple	N	G5	S5	—	—
<i>Agrostis stolonifera</i>	Creeping bent	I	G5	S5	—	—
<i>Amaranthus retroflexus</i>	Redroot pigweed	I	GNR	SNA	—	—
<i>Ambrosia artemisiifolia</i>	Ragweed	N	G5	S5	—	—
<i>Anemone cylindrica</i>	Thimbleweed	N	G5	S4	—	—
<i>Arctium minus</i>	Common burdock	I	GNR	SNA	—	—
<i>Asclepias syriaca</i>	Common milkweed	N	G5	S5	—	—
<i>Asparagus officinalis</i>	Asparagus	I	G5?	SNA	—	—
<i>Bidens cernua</i>	Nodding beggar-ticks	N	G5	S5	—	—
<i>Bromus inermis</i>	Smooth brome	I	GNR	SNA	—	—
<i>Capsella bursa-pastoris</i>	Shepherd's-purse	I	GNR	SNA	—	—
<i>Cerastium fontanum</i>	Mouse-ear chickweed	I	GNR	SNA	—	—
<i>Chenopodium album</i>	Lamb's-quarters	I	G5T5	SNA	—	—
<i>Cirsium vulgare</i>	Bull thistle	I	GNR	SNA	—	—
<i>Conyza canadensis</i>	Horseweed	N	G5	S5	—	—
<i>Dactylis glomerata</i>	Orchard grass	I	GNR	SNA	—	—
<i>Dichanthelium acuminatum</i>	Small panic grass	N	G5T5	S4S5	—	—
<i>Echinochloa crusgalli</i>	Barnyard grass	I	GNR	SNA	—	—
<i>Elymus repens</i>	Quack grass	I	GNR	SNA	—	—
<i>Erigeron strigosus</i>	Rough fleabane	N	G5	S5	—	—
<i>Euthamia graminifolia</i>	Grass-leaved goldenrod	N	G5	S5	—	—
<i>Galium mollugo</i>	White bedstraw	I	GNR	SNA	—	—
<i>Hypericum ellipticum</i>	Pale St. John's-wort	N	G5	S5	—	—
<i>Hypericum perforatum</i>	Common St. John's-wort	I	GNR	SNA	—	—
<i>Juncus bufonius</i>	Toad rush	N	G5	S5	—	—
<i>Juncus sp.</i>	Rush	N	?	?	—	—
<i>Juniperus communis</i>	Common juniper	N	G5	S5	—	—
<i>Leonurus cardiaca</i>	Common motherwort	I	GNR	SNA	—	—
<i>Leucanthemum vulgare</i>	Ox-eye daisy	I	GNR	SNA	—	—
<i>Linaria vulgaris</i>	Butter-and-eggs	I	GNR	SNA	—	—
<i>Lobelia inflata</i>	Indian tobacco	N	G5	S5	—	—
<i>Lonicera tatarica</i>	Tartarian honeysuckle	I	GNR	SNA	—	—
<i>Lotus corniculatus</i>	Bird's-foot trefoil	I	GNR	SNA	—	—
<i>Lycopus americanus</i>	American water-horehound	N	G5	S5	—	—
<i>Malus pumila</i>	Apple	I	G5	SNA	—	—
<i>Matricaria discoidea</i>	Pineapple-weed	I	G5	SNA	—	—
<i>Medicago lupulina</i>	Black medick	I	GNR	S5	—	—
<i>Medicago sativa</i>	Alfalfa	I	GNR	S5	—	—
<i>Nepeta cataria</i>	Catnip	I	GNR	SNA	—	—
<i>Ostrya virginiana</i>	Ironwood	N	G5	S5	—	—
<i>Panic grass</i>	Panicum sp.	?	?	?	—	—
<i>Panicum capillare</i>	Witch grass	N	G5	S5	—	—
<i>Pastinaca sativa</i>	Parsnip	I	GNR	SNA	—	—
<i>Phalaris arundinacea</i>	Reed canary grass	N	G5	S5	—	—
<i>Phleum pratense</i>	Timothy	I	GNR	SNA	—	—
<i>Physalis heterophylla</i>	Clammy ground-cherry	N	G5	S4	—	—
<i>Picea glauca</i>	White spruce	N	G5	S5	—	—
<i>Pinus strobus</i>	White pine	N	G5	S5	—	—
<i>Plantago lanceolata</i>	Narrow-leaved plantain	I	G5	SNA	—	—
<i>Plantago major</i>	Common plantain	I	G5	SNA	—	—
<i>Poa annua</i>	Annual bluegrass	I	GNR	SNA	—	—
<i>Poa pratensis</i>	Kentucky bluegrass	I	G5T5?	SNA	—	—
<i>Populus tremuloides</i>	Trembling aspen	N	G5	S5	—	—
<i>Potentilla norvegica</i>	Rough cinquefoil	I	G5	S5	—	—
<i>Potentilla simplex</i>	Old-field cinquefoil	N	G5	S5	—	—
<i>Quercus rubra</i>	Red oak	N	G5	S5	—	—
<i>Rhamnus cathartica</i>	Common buckthorn	I	GNR	SNA	—	—
<i>Rubus idaeus</i>	Red raspberry	N	G5T5	S5	—	—
<i>Rudbeckia hirta</i>	Black-eyed susan	N	G5	S5	—	—
<i>Rumex acetosella</i>	sheep sorrel	I	GNR	SNA	—	—
<i>Salix alba</i>	White willow	I	G5TNR	SU	—	—
<i>Scirpus atrovirens</i>	Green bulrush	N	G5?	S5	—	—
<i>Setaria faberi</i>	Giant foxtail	I	GNR	SNA	—	—
<i>Setaria pumila</i>	Yellow foxtail	I	GNR	SNA	—	—
<i>Sinapis arvensis</i>	Charlock	I	GNR	SNA	—	—
<i>Solidago canadensis</i>	Canada goldenrod	N	G5T5	S5	—	—
<i>Solidago rugosa</i>	Rough goldenrod	N	G5	S5	—	—
<i>Sonchus asper</i>	Spiny sow-thistle	I	GNR	SNA	—	—
<i>Symphotrichum lanceolatum</i>	Panicled aster	N	G5T5	S5	—	—
<i>Symphotrichum novae-angliae</i>	New England aster	N	G5	S5	—	—
<i>Taraxacum officinale</i>	Common dandelion	I	G5	SNA	—	—
<i>Trifolium aureum</i>	Yellow hop-clover	I	GNR	SNA	—	—

Scientific Name	Common Name	Origin ^a	Global Rarity Status ^b	Ontario Rarity Status ^b	SARA ^c	ESA ^d
<i>Trifolium pratense</i>	Red clover	I	GNR	SNA	—	—
<i>Trifolium repens</i>	White clover	I	GNR	SNA	—	—
<i>Turritis glabra</i>	Tower mustard	N	G5	S5	—	—
<i>Typha latifolia</i>	Common cattail	N	G5	S5	—	—
<i>Ulmus americana</i>	White elm	N	G5?	S5	—	—
<i>Verbascum thapsus</i>	Common mullein	I	GNR	SNA	—	—
<i>Vitis riparia</i>	Riverbank grape	N	G5	S5	—	—
<i>Zanthoxylum americanum</i>	Prickly-ash	N	G5	S5	—	—

Notes:

^a Origin: N = Native; (N) = Native but not in study area region; I = Introduced

^b Ranks based upon determinations made by the Ontario Natural Heritage Information Centre

G = Global; S = Provincial; Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure

SNA = Not applicable for Ontario Ranking (e.g. Exotic species)

^c Canada Species at Risk Act (Schedule 1)

^d Ontario Endangered Species Act

APPENDIX D

List of Wildlife

Common Name	Scientific Name	Origin ^a	Global Rarity Status ^b	Ontario Rarity Status ^b	SARA ^c	ESA ^d	Site	Study Area
Mammals								
Coyote	<i>Canis latrans</i>	N	G5	S5	—	—	X	X
Big brown bat	<i>Eptesicus fuscus</i>	N	G5	S5	—	—	X	
Silver-haired bat	<i>Lasionycteris noctivagans</i>	N	G5	S4	—	—	X	
Hoary bat	<i>Lasiurus cinereus</i>	N	G5	S4	—	—	X	
Red bat	<i>Lasiurus borealis</i>	N	G5	S4	—	—	X	
Tricolored bat	<i>Perimyotis subflavus</i>	N	G5	S3?	—	—	X	
Little brown myotis	<i>Myotis lucifugus</i>	N	G5	S4	—	—	X	
Eastern chipmunk	<i>Tamias striatus</i>	N	G5	S5	—	—	X	X
Meadow vole	<i>Microtus pennsylvanicus</i>	N	G5	S5	—	—	X	
Porcupine	<i>Erethizon dorsatum</i>	N	G5	S5	—	—	X	
Raccoon	<i>Procyon lotor</i>	N	G5	S5	—	—	X	X
Red fox	<i>Vulpes vulpes</i>	N	G5	S5	—	—	X	X
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	N	G5	S5	—	—	X	X
Striped skunk	<i>Mephitis mephitis</i>	N	G5	S5	—	—	X	
White-tailed deer	<i>Odocoileus virginianus</i>	N	G5	S5	—	—	X	X
Birds								
American crow	<i>Corvus brachyrhynchos</i>	N	S5B	G5	—	—	X	X
American goldfinch	<i>Carduelis tristis</i>	N	S5B	G5	—	—	X	X
American redstart	<i>Setophaga ruticilla</i>	N	S5B	G5	—	—		X
American robin	<i>Turdus migratorius</i>	N	S5B	G5	—	—	X	X
Barn swallow	<i>Hirundo rustica</i>	N	S4B	G5	—	—	X	
Black-and-white warbler	<i>Mniotilta varia</i>	N	S4B	G5	—	—		X
Black-capped Chickadee	<i>Poecile atricapilla</i>	N	S5	G5	—	—	X	X
Blue Jay	<i>Cyanocitta cristata</i>	N	S5	G5	—	—	X	X
Cedar Waxwing	<i>Bombycilla cedrorum</i>	N	S5B	G5	—	—	X	
Chipping Sparrow	<i>Spizella passerina</i>	N	S5B	G5	—	—	X	X
Common Grackle	<i>Quiscalus quiscula</i>	N	S5B	G5	—	—	X	X
Cooper's Hawk	<i>Accipiter cooperii</i>	N	S4	G5	—	—		X
Downy Woodpecker	<i>Picoides pubescens</i>	N	S5	G5	—	—	X	
Eastern Phoebe	<i>Sayornis phoebe</i>	N	S5B	G5	—	—	X	
Eastern wood-pewee	<i>Contopus virens</i>	N	S4B	G5	—	—		X
European starling	<i>Sturnus vulgaris</i>	I	SNA	G5	—	—	X	X
Hairy woodpecker	<i>Picoides villosus</i>	N	S5	G5	—	—		X
Hermit thrush	<i>Catharus guttatus</i>	N	S5	G5	—	—		X
House wren	<i>Troglodytes aedon</i>	N	S5B	G5	—	—	X	X
Indigo bunting	<i>Passerina cyanea</i>	N	S4B	G5	—	—		X
Killdeer	<i>Charadrius vociferus</i>	N	S5B,S5N	G5	—	—	X	X
Mourning dove	<i>Zenaidura macroura</i>	N	S5	G5	—	—	X	X
Ovenbird	<i>Seiurus aurocapilla</i>	N	S4B	G5	—	—		X
Pileated woodpecker	<i>Dryocopus pileatus</i>	N	S5	G5	—	—		X
Purple finch	<i>Carpodacus purpureus</i>	N	S4B	G5	—	—		X
Red-eyed vireo	<i>Vireo olivaceus</i>	N	S5B	G5	—	—		X
Red-tailed hawk	<i>Buteo jamaicensis</i>	N	S5	G5	—	—	X	X
Red-winged blackbird	<i>Agelaius phoeniceus</i>	N	S4	G5	—	—		X
Ring-billed gull	<i>Larus delawarensis</i>	N	S5B,S4N	G5	—	—		X
Rock pigeon	<i>Columba livia</i>	N	SNA	G5	—	—	X	X
Ruby-throated hummingbird	<i>Archilochus colubris</i>	N	S5B	G5	—	—	X	
Savannah sparrow	<i>Passerculus sandwichensis</i>		S5B	G5	—	—		X
Song sparrow	<i>Melospiza melodia</i>	N	S5B	G5	—	—	X	X
Tree swallow	<i>Tachycineta bicolor</i>	N	S4B	G5	—	—		X
Warbling vireo	<i>Vireo gilvus</i>	N	S5B	G5	—	—	X	X
White-breasted nuthatch	<i>Sitta carolinensis</i>	N	S5	G5	—	—		X
Wild Turkey	<i>Meleagris gallopavo</i>	N	S5	G5	—	—	X	X
Wilson's snipe	<i>Gallinago delicata</i>	N	S5B	G5	—	—		X
Wood duck	<i>Aix sponsa</i>	N	S5	G5	—	—		X
Yellow warbler	<i>Setophaga petechia</i>	N	S5B	G5	—	—		X
Herpetiles								
American toad	<i>Anaxyrus americanus</i>	N	S5	G5	—	—	X	
Eastern gartersnake	<i>Thamnophis sirtalis</i>	N	S5	G5T5	—	—	X	
Red-bellied snake	<i>Storeria occipitomaculata</i>	N	S5	G5TG	—	—		X
Spring peeper	<i>Pseudacris crucifer</i>	N	S5	G5	—	—		X
Wood frog	<i>Lithobates sylvaticus</i>	N	S5	G5	—	—		X

Common Name	Scientific Name	Origin ^a	Global Rarity Status ^b	Ontario Rarity Status ^b	SARA ^c	ESA ^d	Site	Study Area
Dragonflies, Bumblebees, and Butterflies								
Cabbage white	<i>Pieris rapae</i>	I	G5	SNA	—	—	X	X
Calico pennant	<i>Celithemis elisa</i>	N	G5	S5	—	—	X	
Canada tiger swallowtail	<i>Papilio canadensis</i>	N	G5	S5	—	—		X
Clouded sulphur	<i>Colias philodice</i>	N	G5	S5	—	—	X	X
European skipper	<i>Thymelicus lineola</i>	I	G5	SNA	—	—	X	X
Dot-tailed whiteface	<i>Leucorrhinia intacta</i>	N	G5	S5	—	—	X	X
Monarch	<i>Danaus plexippus</i>	N	G5	S2N,S4B	SC	SC	X	X
Northern crescent	<i>Phycoides pascoensis</i>	N	G5	S5	—	—	X	X
White admiral	<i>Sympetrum obtrusum</i>	N	G5	S5	—	—	X	X

Notes:

^a Origin: N = Native; (N) = Native but not in study area region; I = Introduced.

^b Ranks based upon determinations made by the Ontario Natural Heritage Information Centre (2017).

G = Global; S = Provincial; Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.

SNA = Not applicable for Ontario Ranking (e.g. Exotic species)

^c Canada *Species at Risk Act* (Schedule 1) SC= Special Concern, THR = Threatened, END = Endangered

^d Ontario *Endangered Species Act* SC= Special Concern, THR = Threatened, END = Endangered

APPENDIX E

Curriculum Vitae

Education

M.Sc. Applied Marine
Science, University of
Plymouth, Devon, UK, 1998

B.Sc. (Honours) Biology,
Laurentian University,
Sudbury, Ontario, 1996

Certifications

PADI Master Scuba Diver
Trainer, 2000

Small Craft Boat Operator,
2003

Small Non-pleasure Vessel
Basic Safety - MED A3,
2011

Canadian Red Cross First
Aid and CPR, 2012

WHMIS Training, 1990,
2001, 2004

Professional Affiliations

Professional Association of
Diving Instructors (PADI)

Director, Ontario Stone
Sand and Gravel
Association (OSSGA) Board
of Directors

HEATHER MELCHER

Principal/Senior Ecologist

PROFESSIONAL SUMMARY

Heather Melcher is a Principal, Senior Ecologist and Project Manager/Director with Golder Associates. Heather has over 18 years of experience working in a number of sectors including transportation, oil and gas, transmission, land development, power, aggregates and mining. Her experience lies in designing, managing and carrying out environmental impact assessments within provincial and federal frameworks and environmental land use policies for projects of various size and complexity. She leads a team of ecologists and multi-disciplinary project teams to holistically assess potential project impacts through integration of components. Heather works closely with provincial and federal agencies to help her clients navigate changing planning and species at risk (SAR) legislation. Heather has experience developing rehabilitation plans for disturbed sites and biodiversity plans that integrate the ecology of a smaller site into the regional system as well as developing compensation habitat plans and mitigation plans for SAR. Heather is also a recognized expert witness for Local Planning Appeal Tribunal (LPAT) hearings in Ontario.

PROJECT EXPERIENCE – CONSTRUCTION MATERIALS

EWL Ltd., Gordon Lake Quarry and Borrow Area *Kenora, Ontario, Canada*

Natural environment component lead for permit applications under the Aggregate Resources Act (ARA). The aggregate areas are in support of rehabilitation activities associated with the decommissioning of the former Gordon-Werner Lake Mine. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting data and integrating with hydrogeological and surface water data, and producing a Natural Environment Level 1/2 (NEL 1/2) technical report. Responsible for negotiations with the Ministry of Natural Resources and Forestry (MNRF) and Ministry of Environment, Conservation and Parks (MECP) regarding woodland caribou and SAR bats, preparation and submission of online permitting forms under the Endangered Species Act (ESA), development of mitigation plans and coordination with construction team.

Lafarge Canada Inc., McGill Pit *Kemptville, Ontario, Canada*

Natural environment component lead for a below water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting data and integrating with hydrogeological and surface water data, working with the planner in developing progressive and final rehabilitation plans, attending agency and public meetings and producing an NEL 1/2 report and municipal Environmental Impact Study (EIS) report. Responsible for negotiations with the MNRF regarding SAR

issues and developing mitigation and habitat compensation plans for butternut. Participated in an Ontario Municipal Board (OMB) hearing as an expert witness.

Colacem Cement Plant

L'Original, Ontario, Canada

Natural environment component lead for the Colacem Cement Plant assessment. Responsibilities included designing and coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with physical resource data, liaising with the planner and developing an EIS for the municipal approval process. Worked with MNRF and South Nation Conservation on significant natural heritage feature and SAR issues and with Fisheries and Oceans Canada (DFO) on a Fisheries Act authorization for removal of fish habitat. Currently preparing for participation in a LPAT (formerly the OMB) hearing as an expert witness.

CBM Ltd. (a division of Votorantim Cimentos), Dance Pit Extension

North Dumfries, Ontario, Canada

Project manager and natural environment senior reviewer and technical advisor for an above water pit licence application under the ARA. Responsibilities included working with the natural environment component lead to analyse and interpret terrestrial and aquatic data and integrate with hydrogeological and surface water data. Working with the planner in developing a rehabilitation plan, liaising with the Grand River Conservation Authority, the MNRF and MECP, the Region of Waterloo, the Municipality of North Dumfries and the City of Cambridge, and attending agency and public meetings. Project management roles and responsibilities include coordinating and managing the activities of a multi-disciplinary team including hydrogeologists, surface water engineers, noise, air quality, visual assessment and vibration specialists, public consultation and Indigenous community engagement specialists, and archaeologists.

CBM Ltd. (a division of Votorantim Cimentos), Lanci Pit Extension

Aberfoyle, Ontario, Canada

Project manager and natural environment senior reviewer and technical advisor for an above water pit licence application under the ARA. Responsibilities included working with the natural environment component lead to analyse and interpret terrestrial and aquatic data and integrate with hydrogeological and surface water data. Working with the planner in developing a rehabilitation plan, liaising with the Grand River Conservation Authority, the MNRF, the municipality, and attending agency and public meetings. Project management roles and responsibilities include coordinating and managing the activities of a multi-disciplinary team including hydrogeologists, surface water engineers, noise scientists, archaeologists, and an Indigenous Community engagement team.

Cavanagh Construction Ltd., Henderson II Quarry

Ottawa, Ontario, Canada

Natural environment component lead for a below water quarry licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting data and integrating with hydrogeological and surface water data, working with the planner in developing a rehabilitation plan, attending agency and public meetings as well producing an NEL 1/2 report and municipal EIS report. Responsible for negotiations with the MNRF regarding SAR issues and developing compensation plans.

Tackaberry Sand and Gravel Ltd., Perth Quarry

Perth, Ontario, Canada

Natural environment component lead for a below water quarry licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting data and integrating with hydrogeological and surface water data, working with the planner in developing a rehabilitation plan, attending agency and public meetings as well producing an NEL 1/2 report and Environmental Impact Statement report for the municipality. Responsible for negotiations with the MNRF regarding SAR issues and developing compensation plans for the removal of SAR habitat. Worked with Rideau Valley Conservation Authority and Mississippi Valley conservation Authority on headwater drainage feature assessment and mitigation plans.

Greenfield Aggregates Sherk Pit

Waterloo, Ontario, Canada

Natural environment component lead for a below water pit licence application under the ARA. Responsibilities included terrestrial and aquatic data analysis, interpretation and integration with hydrogeological and surface water data, working with the planner to develop a rehabilitation plan as well as producing an NEL 1/2 report and municipal EIS report. Responsibilities also included responding to public and agency comments following submission.

Lafarge Canada Inc., French Settlement Pit

Ottawa, Ontario, Canada

Natural environment component lead for a below water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with hydrogeological and surface water data, working with the planner to develop a progressive and final rehabilitation plan (natural conditions) as well as producing an NEL 1/2 report and municipal EIS report. Consulted with regulatory agencies and attended public open houses.

Lafarge Canada Inc., Sunningdale Pit

London, Ontario, Canada

Natural environment component lead for a below water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with hydrogeological and surface water data, working with the planner to develop a progressive and final rehabilitation plan (natural conditions) as well as producing an NEL 1/2 report and EIS. Consulted with regulatory agencies and attended public open houses. Developed mitigation and habitat compensation plans under the ESA for barn swallow.

Lafarge Canada Inc., Limebeer Pit

Caledon, Ontario, Canada

Project manager and natural environment component lead for a below water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with hydrogeological and surface water data, working with the planner to develop a progressive and final rehabilitation plan (natural conditions) as well as producing an NEL 1/2 report and EIS. Consulted with regulatory agencies, attended public open houses, and addressed agency and public comments. Project manager roles and responsibilities included coordinating and managing the activities and budgets of a multi-disciplinary team including hydrogeologists, groundwater modelling experts, surface water engineers, and noise and air quality specialists.

Lafarge Canada Inc., Avening Pit Extension

Creemore, Ontario, Canada

Project manager and natural environment component lead for an above water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with hydrogeological and surface water data, working with the planner and the agricultural sub-consultant to develop a progressive and final rehabilitation plan (agricultural conditions) as well as producing an NEL 1/2 report and EIS. Project manager roles and responsibilities included coordinating and managing the activities and budgets of a multi-disciplinary team including hydrogeologists, surface water engineers, and noise and air quality specialists.

Floyd Preston Ltd.

Eastern Ontario, Canada

Natural environment component lead for a quarry licence application in eastern Ontario. Liaised with client, coordinated field data collection, mentored intermediate staff in data analysis and interpretation and prepared an NEL 1 report.

PROJECT EXPERIENCE – SPECIES AT RISK

EWL Management Ltd Madawaska Mine Decommissioning

Faraday, Ontario, Canada

Natural environment component lead for SAR permitting for bats, including little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*) and tricolor bat (*Perimyotis subflavus*). Responsibilities included submission of online permitting documents under the ESA, consultation with the MNRF and MECP, development of a mitigation plan and providing direction to the construction team.

TransCanada - Various Sites in Ontario

Ontario, Canada

Natural environment component lead for annual SAR and migratory bird monitoring at numerous sites across Ontario since 2012. In support of TransCanada's right-of-way maintenance brushing program. Provide SAR advice and liaise with MNRF to develop construction monitoring protocols for SAR and migratory birds. Lead crews to complete monitoring on an annual basis.

Lafarge Canada Ltd.

Various Locations, Ontario, Canada

Natural environment component lead for annual SAR monitoring and reporting at aggregate sites across Ontario following registration. Species surveys include Blanding's turtle, loggerhead shrike, least bittern and gray ratsnake. Developed survey protocols with several MNRF district offices and lead crews to complete monitoring.

Leader Resources Services Ltd.

Various Locations, Ontario, Canada

Project manager for a number of wind power projects under the Ontario Renewable Energy Approvals Act (REA). Worked with the client and the MNRF to develop protocols and coordinate field surveys. Completed and submitted ESA permitting applications and compensation plans.

Lafarge Canada Ltd.

Various Locations, Ontario, Canada

Project manager and natural environment component lead for a number of licence applications for proposed new and expanded aggregate extraction operations (pits and quarries) in Ontario under the ARA. Responsibilities included developing survey protocols, negotiating with the MNRF, registering for activities under the ESA (Notice of Activity), completing Information Gathering Forms (IGF), preparing and submitting permit applications and developing compensation plans.

PROJECT EXPERIENCE – TRANSMISSION

Hydro One Circuit B5C/B6C Line Refurbishment EA

Westover to Burlington, Ontario, Canada

Natural environment component lead for a provincial Class Environmental Assessment for a 40 km line refurbishment. Responsibilities included designing the field program (terrestrial and aquatic), analyzing data, integrating the ecological data with other physical resource discipline data, completing the effects assessment, consulting with regulatory agencies including two district MNRF offices, Hamilton Conservation Authority, Conservation Halton, Grand River Conservation Authority, Niagara Escarpment Commission, and participating in the public consultation process. Provided input into alternatives assessment for temporary hydro line bypass.

Wataynikaneyap Power Phase 2 Transmission Line

Northwestern Ontario, Canada

Senior advisor and technical reviewer for the wildlife component of permitting. Worked with the permitting lead and the wildlife component lead to design field programs, consult and negotiate with the MNRF and Environment and Climate Change Canada/Canadian Wildlife Service (ECCC/CWS), and prepare technical supporting documents for permitting and permit applications under the ESA, the Public Lands Act, and the federal Species at Risk Act (SARA). Key responsibilities included providing senior leadership and technical guidance and review for all deliverables.

Nextbridge East-West Tie Transmission Line

Wawa to Thunder Bay, Ontario, Canada

Senior advisor and technical reviewer for wildlife permitting for the construction and operation of a 450 km transmission corridor. Worked with the permitting lead and the wildlife component lead to design field programs, consult and negotiate with the MNRF and ECCC/CWS, and prepare technical supporting documents for permitting and permit applications under the ESA, the Public Lands Act, and the SARA. Key responsibilities included providing senior leadership and technical guidance and review for all deliverables.

PROJECT EXPERIENCE – TRANSPORTATION

MTO Calamity Creek Highway 11 Culvert Replacement Group 'C' Class EA

Temiskaming, Ontario, Canada

Acting environmental manager for the replacement of the Calamity Creek Culvert (47-273/C) located on Highway 11 in the City of Temiskaming Shores, District of Temiskaming. Responsibilities included regular liaison with the MTO, the contractor and Golder's internal team including ecologists, surface water engineers, archaeologists, cultural heritage specialists, and hydrogeologists. Deliverables included a Consultation Plan, an Environmental Screening

Document (ESD), which documented the results of all factor-specific environmental studies and consultation undertaken for the project, and an Environmental Management Plan (EMP), which detailed how the environmental mitigation and monitoring commitments made in the ESD would be implemented during construction.

Ninth Line Municipal Class EA

Halton Region, Ontario, Canada

Senior natural environment technical lead. Responsibilities included leading a team of ecologists and overseeing field collection of terrestrial and aquatic data, analysis and interpretation, liaising with prime engineering firm and agencies including the municipality, senior technical review of natural environment study report.

Regional Road 57 Municipal Class EA

Clarington, Ontario, Canada

Senior natural environment technical lead. Responsibilities included leading a team of ecologists and field collection of terrestrial and aquatic data, analysis and interpretation, liaising with prime engineering firm and agencies, senior technical review of natural environment study report.

Markham GO Station Road Realignment Municipal Class EA

Markham, Ontario, Canada

Senior natural environment technical lead. Responsibilities included leading a team of ecologists and overseeing field collection of terrestrial and aquatic data, analysis and interpretation, liaising with prime engineering firm and agencies, senior technical review of natural environment study report.

PROJECT EXPERIENCE – WASTE

Capital Region Resource Recovery Centre (CRRRC)

Ottawa, Ontario, Canada

Natural environment component lead for a provincial EA for a resource recovery centre on a 175 hectare site), including a landfill, contaminated soil management and recycling components. Responsibilities included designing the field program (terrestrial and aquatic), analysing data, integrating the ecological data with other discipline data, completing the effects assessment, consulting with regulatory agencies including the Conservation Authority, MNRF and DFO on habitat and species concerns, working with the client and engineering team on the project design, watercourse crossings, reviewing the stormwater management plan and participating in the public consultation process.

PROJECT EXPERIENCE – POWER

Trillium Power Wind Corporation

Lake Ontario, Ontario, Canada

Project manager for an offshore wind power project in Lake Ontario under O. Reg. 359/09 Renewable Energy Approvals (REA). Responsibilities included coordinating and managing a multi-disciplinary team including noise specialists, biologists, archaeologists, public consultation specialists, aboriginal engagement specialists, visual impact assessment specialists and geophysicists. Liaised with provincial and federal agencies and participated in public open houses. Reporting satisfied both provincial and federal (CEAA) requirements.

Leader Resources Services Corporation

Various Locations, Ontario, Canada

Project manager and project director/senior technical advisor for a number of ongoing wind farm projects under O. Reg. 359/09 REA. Responsibilities include coordinating and managing a multi-disciplinary team including noise specialists, natural heritage specialists, archaeologists, cultural heritage specialists, public consultation specialists and aboriginal engagement specialists. Liaising with client and agencies, attended regulatory agency meetings and participated in public open houses.

Mann Engineering/EffiSolar

Various Locations, Ontario, Canada

Natural heritage component lead for four 10 MW ground-mounted PV solar farms in southeastern Ontario under O. Reg. 359/09 REA. Coordinated field programs and carried out data analysis and report production. Liaised with provincial agencies.

SkyPower Corp.

Various Locations, Ontario, Canada

Project manager for eight wind power park projects in Renfrew County, Prince Edward County and Parry Island, Ontario. Coordinated field programs and managed a multi-disciplinary team including hydrogeologists, biologists, surface water engineers, noise and air quality experts, socio-economic and public consultation coordinators, liaised with client and agencies, organized public open houses including assisting with preparation of panels, analysed data, and compiled results into an Environmental Screening Report/Environmental Impact Statement for submission to regulatory agencies.

Algonquin Power

Amherst Island, Ontario, Canada

Project manager and field coordinator for wind power project in Prince Edward County. Coordinated field programs and multi-disciplinary team including hydrogeologists, biologists, surface water engineers, noise and air quality experts, socio-economic and public consultation coordinators, liaised with client and agencies, analysed data, and compiled results into documents to be submitted to regulatory agencies in support of the RES III RFP under the Ontario Power Authority Standing Offer Program.

SkyPower Corp.

Various Locations, Ontario, Canada

Project manager for several solar power projects across Ontario, including Napanee and Norfolk. Coordinated or conducted field programs and data collection, coordinated and managed the activities of a multi-disciplinary team. Completed reports addressing the Ministry of the Environment Screening Criteria for Energy Projects to be submitted to regulatory agencies.

OptiSolar Inc.

Various Locations, Ontario, Canada

Project manager for several solar power projects across Ontario, including Sarnia, Tilbury and Petrolia. Coordinated or conducted field programs and data collection, coordinated and managed the activities of a multi-disciplinary team including noise, archaeology, surface water, traffic and natural environment assessments. Completed reports to be submitted to regulatory agencies in support of planning/zoning applications.

PROJECT EXPERIENCE – NUCLEAR

Canadian Waste Management Office (NWMO) Deep Geologic Repository (DGR) Project Follow-up Monitoring

Kincardine, Ontario, Canada

Project manager and senior technical lead for follow-up wildlife and vegetation monitoring at the DGR site. The scope of work included SAR turtle visual encounter surveys (VES; also known as basking surveys), SAR snake emergence and egg-laying surveys, and rare plant surveys.

Canadian Nuclear Laboratories (CNL) Whiteshell Research and Development Complex Decommissioning EA

Pinawa, Manitoba, Canada

Natural environment component lead for a federal EA. Responsibilities included obtaining and analysing terrestrial and aquatic data including for species at risk, providing recommendations for additional permitting and

mitigation for potential effects to wildlife and sensitive habitats, working with CNL on construction designs and developing technical reports.

Canadian Nuclear Laboratories (CNL) Port Hope Remediation

Port Hope, Ontario, Canada

Natural environment component lead for permitting for remediation of Port Hope Harbour, Ganaraska River and other watercourses in Port Hope. Responsibilities included liaising with the Ganaraska River Conservation Authority, MNRF, DFO, and Canadian Nuclear Safety Commission and preparing applications and obtaining permits for dredging, bank stabilization, sediment remediation and removal and work on Crown lands.

Bruce Power Units 3&4 Restart

Kincardine, Ontario, Canada

Worked with a team to establish Valued Ecosystem Components and appropriate study areas. Coordinated bioscience field technicians and interpreted data on fish impingement, entrainment, fishing pressure and temperature and velocity effects on aquatic habitat and biota, including bass spawning surveys. Worked with a team of biologists to determine the potential for warm water discharges to affect waterfowl use of nearby areas, and evaluated effects on the white-tailed deer population due to vehicle strikes. Prepared technical reports.

Pickering Nuclear 'A' Return to Service Follow-up and Monitoring

Pickering, Ontario, Canada

Coordinated aquatic field technicians and interpreted data on impingement, entrainment, fishing pressure, waterfowl surveys, and temperature and velocity effects on aquatic habitat and biota, including bass spawning surveys. Worked with a team of biologists to evaluate the effects of wildlife-vehicle interactions on nearby roadways on terrestrial biota populations. Prepared annual monitoring reports.

PROJECT EXPERIENCE – MINING

EWL Management Ltd. Dyno Mine Rehabilitation

Bancroft, Ontario, Canada

Natural environment component lead for an environmental and health risk assessment of decommissioned uranium mine. Worked with a multi-disciplinary team including surface water engineers, geotechnical engineers, and risk specialists. Designed and coordinated bioscience field technicians to carry out the natural environment workplan. Tasks included fish habitat assessment and characterization of the aquatic environment, and collection of benthic, fish, sediment and aquatic plant tissue samples in affected and reference lakes and watercourses in support of the human health and ecological risk assessment. In addition, collection of small mammal and plant

tissue samples and characterization of wildlife habitat was included. Responsible for analysis and interpretation of data, as well as report preparation and liaising with stakeholders and government agencies.

EWL Management Ltd. Coldstream \ Mine Rehabilitation

Thunder Bay, Ontario, Canada

Natural environment component lead for an environmental and health risk assessment of a decommissioned copper mine. Worked with a multi-disciplinary team including surface water engineers, geotechnical engineers, and risk specialists. Designed and coordinated bioscience field technicians to carry out the natural environment work plan. Tasks included fish habitat assessment and characterization of the aquatic environment, and collection of benthic, fish, sediment and aquatic plant tissue samples in affected and reference lakes and watercourses in support of the human health and ecological risk assessment. In addition, collection of plant tissue samples and characterization of wildlife habitat was included. Responsible for analysis and interpretation of data, as well as report preparation and liaising with stakeholders and government agencies.

PROJECT EXPERIENCE – OIL AND GAS

Enbridge Pipelines Inc. Line 9

Southern Ontario, Canada

Project manager for natural environment component of pipeline maintenance project in southern Ontario. Coordinated Species at Risk (SAR) screening and natural heritage feature mapping, site investigations, permit requirements and constraint mapping in support of brushing and other maintenance activities.

TransCanada Bear Creek Rehabilitation

Ontario, Canada

Natural environment component lead for Bear Creek rehabilitation following washout and exposure of the pipeline in the creek bed. Completed baseline existing conditions reporting including fish and fish habitat, SAR and riparian habitat to meet Conservation Authority, MNRF and DFO requirements. Worked with Golder's hydrology team to obtain Conservation Authority permits, develop a rehabilitation plan suitable for the existing conditions and fish community, and recommended appropriate mitigation during construction.

TransCanada Greater Golden Horseshoe Facilities Modifications

Ontario, Canada

Natural environment component lead for an environmental and socio-economic assessment for modifications to a number of facilities under the National Energy Board (NEB). Responsibilities included designing the field program (vegetation, wetlands, wildlife, fish and fish habitat), analysing data, completing the baseline and effects assessment, liaising with agencies and permitting.

TransCanada Eastern Mainline Project

Ontario, Canada

Vegetation and wetland component lead for an environmental and socio-economic assessment for a 392 km new construction pipeline in southern Ontario under the National Energy Board (NEB). Responsibilities included designing the field program, analysing data, completing the baseline and effects assessment, liaising and negotiating with the MNRF, Environment and Climate Change Canada (ECCC) and local Conservation Authorities, preparing permit applications, and addressing Information Requests (IRs).

TransCanada Parkway West Connection

Milton, Ontario, Canada

Natural environment component lead for an environmental and socio-economic assessment for a new pipeline connection under the NEB. Responsibilities included designing the field program (vegetation, wetlands, wildlife, fish and fish habitat), analysing data, completing the baseline and effects assessment, liaising with agencies and permitting.

TransCanada Vaughan Mainline Extension

Ontario, Canada

Senior technical reviewer and advisor for the vegetation, wetland and wildlife components for an environmental and socio-economic assessment for a new construction pipeline in southern Ontario under the NEB. Responsible for liaising with all agencies, developing environmental protection plans, designing and coordinating baseline, construction and post-construction monitoring programs.

TransCanada Kings North Connection

Ontario, Canada

Senior technical reviewer and advisor for the vegetation, wetland and wildlife components for an environmental and socio-economic assessment for a new construction pipeline in southern Ontario under the NEB. Responsible for liaising with all agencies, developing environmental protection plans, compensation habitat for SAR, designing and coordinating baseline, construction and post-construction monitoring programs.

TransCanada LNG Facility

Trois Rivieres, Quebec, Canada

Aquatic technical component lead. Designed and conducted inland fisheries field programs for a liquefied natural gas facility and associated distribution pipelines. The programs included aquatic habitat assessments of all watercourse pipeline crossings, and an assessment of habitat and water quality of inland lakes in the vicinity of the facility. Interpreted data and prepared technical reports.

Education

*H.B.Sc. (Env) Honours
Environmental Science,
University of Guelph,
Guelph, ON, 2004*

Certifications

*MNRF Ecological Land
Classification - Training
Certificate,
2004*

*MNRF Ontario Wetland
Evaluation System -
Training Certificate,
2005*

*MNRF Butternut Health
Assessor ,
2011*

*Canadian Environmental
Assessment Act Orientation
- Training Certificate,
2011*

Languages

English – Fluent

Golder Associates Ltd. – Ottawa**Terrestrial Ecologist**

Gwendolyn has been providing ecological consulting services since 2004, with particular knowledge in the field of terrestrial ecology. Gwendolyn is certified in both the Ministry of Natural Resources and Forestry (MNRF) Ecological Land Classification (ELC) and Wetland Evaluation systems, as well as being an MNRF certified Butternut Health Assessor.

Gwendolyn has strong field skills in plant and wildlife identification, terrestrial monitoring, applying ELC and wetland evaluation principles, and she possesses a strong understanding of planning regulations and policies in a natural heritage context. She is experienced in a broad range of environmental services, including terrestrial monitoring and assessment, wildlife inventory, floral inventory, habitat assessment, agency liaison and client relations.

Gwendolyn has authored numerous environmental impact statements, species at risk studies, natural heritage assessments, environmental constraints analyses, and letters of compliance for a variety of sectors, including residential developments, recreational developments, aggregates and energy projects (including renewable energy). She has also provided terrestrial ecology expertise on a wide range of projects, including work for government agencies and peer review services.

Employment History**Golder Associates Ltd. – Ottawa, ON**

Ecologist and Project Manager (2011 to Present)

Stantec Consulting Ltd. – Guelph, ON

Ecologist and Project Manager (2004 to 2011)

Provided a range of terrestrial ecology services, including managing projects and natural heritage components of Environmental Assessments for numerous sectors, including land development, transportation, renewable energy and aggregate industries, as well as government agencies.

Hamilton Region Conservation Authority – Hamilton, ON

Ecological Land Classification Technician (2004 to 2004)

Conservation Halton – Milton, ON

Student Ecologist (2003 to 2003)

PROJECT EXPERIENCE – ENERGY**Hydro One - Bruce to
Milton Transmission
Reinforcement Project**
Ontario, Canada

This project required a complete Environmental Assessment (EA) for the proposed installation of a new 180 km long double-circuit 500kV transmission line from the Bruce Power Complex to Hydro One's existing Milton Switching Station. Gwendolyn assisted in the preparation of the Natural Heritage component of the EA through planning and execution of various ecology field surveys, and through liaison with First Nations stakeholders. Work included Ecological Land Classification, wetland boundary delineation according to OWES, wildlife and plant inventory, and identification of significant wildlife habitat or habitat for species at risk within the proposed corridor and adjacent lands. Provided input as to suitable mitigation for sensitive environmental features along the proposed route.

**TransCanada - Eastern
Mainline Project**
Ontario, Canada

TransCanada Pipelines Limited proposes to construct and operate new natural gas pipeline facilities along its existing Canadian Mainline between Markham, Ontario and the community of Iroquois, Ontario. The preliminary scope of the Project includes up to approximately 370 km of pipeline and related components, including valve sites and new and modified compression facilities at existing compressor stations along the proposed route. Work included designing and undertaking portions of the environmental field program, as well as contributing to reporting for the Environmental Assessment (EA) pursuant to the requirements of the National Energy Board Act and CEAA 2012.

PROJECT EXPERIENCE – AGGREGATES**Arnott Pit**
Ontario, Canada

Prepared a Natural Environment Level II report for Thomas Cavanagh Construction Ltd. according to the Aggregate Resources Act for an aggregate pit. Work included discussions with the MNRF, field studies, and authoring the final report. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation plans.

Rideau Road Quarry
Ottawa, ON, Canada

Prepared a Natural Environment Level II report for R.W.Tomlinson Ltd. according to the Aggregate Resources Act for a small limestone quarry expansion. Work included discussions with the MNRF, field studies, and authoring the final report. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation plans.

Canaan Quarry
Ontario, Canada

Prepared a Natural Environment Level I report for Cornwall Sand and Gravel according to the Aggregate Resources Act for a limestone quarry expansion. Work included a review of all published materials relating to the natural heritage features at the site, undertaking a scoped in-field review of the on-site features, and authoring the final report.

Karson Kennedy Pit
Ontario, Canada

Prepared a Natural Environment Level II report for Karson Aggregates according to the Aggregate Resources Act for a small sand pit project. Work included discussions with the MNRF, designing and undertaking the field studies, and authoring the final report. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation and rehabilitation plans. Worked with the Mississippi Valley Conservation Authority to develop an environmental monitoring program.

PROJECT EXPERIENCE – ECOLOGY PEER REVIEW SERVICES**City of Kingston**
Kingston, Ontario,
Canada

Retained by the City of Kingston to provide environmental peer review services. Reviewed an Environmental Impact Study (EIS) for the severance of a parcel of land from the Little Cataraqui Creek Conservation Area, and provided comments with respect to the adequacy of scope and appropriateness of conclusions made in the report.

County of Peterborough
Peterborough, Ontario,
Canada

Retained in 2010 by the County of Peterborough to provide environmental peer review services. Reviewed Environmental Impact Studies (EIS) for residential and recreational developments within the County, and provided comments with respect to the adequacy of scope, and appropriateness of conclusions made in the reports.

County of Frontenac
Frontenac, Ontario,
Canada

Retained in 2008/2009 by the County of Frontenac to provide environmental peer review services. Reviewed Environmental Impact Studies (EIS) for residential and recreational developments within the County, and provided comments with respect to the adequacy of scope, and appropriateness of conclusions made in the reports.

PROJECT EXPERIENCE – ECOLOGY**Ottawa Police Services
- South Campus**
Ottawa, ON, Canada

Prepared an Environmental Impact Study (EIS) for the proposed South Campus institutional development project. Located adjacent to the Rideau River, the assessment included consideration of a number of Species at Risk as well as fish habitat and surface water setbacks.

**Des Allumettes Bridge
Replacement**
Ottawa, ON, Canada

Golder was retained to review the existing natural environment conditions in the study area, to identify potential interactions between the project and those natural features, and to recommend appropriate mitigation measures to be employed prior to and during construction.

**Jean D'Arc Boulevard
(North Service Road)
Sidewalk Installation**
Ottawa, ON, Canada

Golder was retained to undertake a Species at Risk (SAR) Screening for the Site in order to identify potential interactions between the project and SAR, and to identify appropriate mitigation measures for implementation prior to and during construction.

**Prince of Wales Drive -
Coordinated Network
Modifications**
Ottawa, ON, Canada

Golder was retained to assess the existing natural environment within the study area, identify potential impacts to those features, and recommend mitigation measures for implementation prior to and during construction.

Jockvale Bridge SAR Study

Ottawa, ON, Canada

When a Species at Risk (barn swallow) was confirmed by construction staff at the bridge construction site, Golder was retained to engage with the Ministry of Natural Resources and Forestry in order to chart a path forward for construction, while respecting the Endangered Species Act.

Species at Risk Studies - Various ProjectsVarious Location,
Ontario, Canada

Gwendolyn has been involved in the design and undertaking of numerous studies for various Species At Risk in Ontario, and assessments of their habitats. Surveys followed accepted, standardized protocols and habitats were assessed against established criteria, where available. Species for which these types of studies have been undertaken include, but are not limited to: Fowler's Toad, Western Chorus Frog, Jefferson Salamander, Black Rat Snake, Eastern Hog-nosed Snake, Massasauga Rattlesnake, Short-eared Owl, Barn Swallow, Bobolink, Eastern Meadowlark, Peregrine Falcon, Least Bittern, West Virginia White, American Badger, Little Brown Bat and Northern Myotis, Eastern Foxsnake, Spiny Softshell, Blanding's Turtle, Butternut, American Hart's Tongue Fern, and American Ginseng. Gwendolyn has successfully navigated the over-all benefit permitting process under the Endangered Species Act for butternut and has performed work under the new O.Reg. 242/08 for American Ginseng. Gwendolyn's work with SAR has involved close liaison with the MNR, experts from academia, and involvement of public interest groups such as the Sierra Club of Canada and local Field Naturalist clubs.

O'Brien House Bat Maternity Colony StudyGatineau Park, QC,
Canada

Golder was retained to assess the presence or absence of SAR bats using this historic building for maternity roosting. The study included daytime surveys to assess potential habitat and search for evidence of bats, while nighttime surveys focused on visually locating bats exiting the structure, according to standard protocols. Remote acoustic detection units were used to determine species present. Collaborated with the National Capital Commission (NCC), who is the landowner.

Former CFB Rockcliffe
Ottawa, Ontario, Canada

Golder provided multi-disciplinary support to the redevelopment of the former CFB Rockcliffe site to a multi-use urban development. In support of the application to the City of Ottawa by Canada Lands Company, the Natural Environment team prepared the environmental impact statement and the tree conservation report, based on the proposed development plan. The evaluation of natural heritage features for this project site included the integration of provincial and federal regulations and associated best practices for mitigation of potential impacts. Adjacent lands owned by the National Capital Commission were also reviewed as part of this project.

National Equestrian Park

Ottawa, Ontario, Canada

The National Equestrian Park in Ottawa is undergoing some exciting changes under new management by Wesley Clover Parks. Golder has been supporting the natural environment studies to meet the needs of municipal, provincial and federal stakeholders, including development of the compensation plan for Bobolink. The recent developments have included an outdoor festival and concert venue and a FIFA 2-Star Soccer facility.

Greystone Village - Former Oblates Property

Ottawa, Ontario, Canada

Golder worked with the Regional Group on this exciting redevelopment of the historic Oblates property in Ottawa, along the Rideau River. The site was assessed for natural heritage values, and an Environmental Impact Study and Tree Conservation Report were prepared.

**Connaught Range
Turtle Nesting Study**
Ottawa, ON, Canada

Golder was retained by PWGSC to assess current SAR turtle nesting at the Connaught Range, and design a strategy to prevent future nesting, while at the same time offering alternate nesting habitat. Golder's plan was designed in consideration of rigorous shooting range requirements, while offering a safe nesting area for turtles away from the active range.

**Environmental
Management Plan for
Urban Expansion
Lands Areas 9a and 9b**
Ottawa, Ontario, Canada

Prepared an Environmental Management Plan (EMP) for two parcels of land, which included coordination and incorporation of materials from a number of external partners. The EMP provided a framework for future development of the area through a range of detailed studies, and included extensive consultation with City and Conservation Authority staff.

**Brockville Employment
Lands**
Brockville, Ontario,
Canada

Designed a natural heritage study of a 130 acre property in the City of Brockville, with the intention of determining the potentially developable area in consideration of the natural environment features present at the Site, on behalf of the City of Brockville. Results were presented in a preliminary Environmental Impact Study for consideration as part of a Secondary Plan study for the Site.

**Claridge Lands - 4789
Bank Street**
Ottawa, Ontario, Canada

Golder was retained by Claridge Homes to prepare an Environmental Impact Study (EIS) and Tree Conservation report, including all necessary fieldwork, for this Site. Golder worked with the client, City of Ottawa, South Nation Conservation and the Ministry of Natural Resources and Forestry to provide solutions that met the clients needs as well as natural heritage policy requirements at the municipal and provincial levels.

**Remer Lands EIS and
Environmental
Management Plan**
Ottawa, Ontario, Canada

Golder provided natural heritage expertise in assisting the Regional Group to clear conditions for this draft-approved subdivision in Ottawa. This challenging project included a full inventory of the flora and fauna at the site in order to prepare an Environmental Management Plan, Environmental Impact Study and Tree Conservation Report for the site. Golder worked with the client, City of Ottawa, South Nation Conservation and the Ministry of Natural Resources and Forestry to navigate this challenging project and provide solutions that met the clients needs as well as natural heritage policy requirements at the municipal and provincial levels.

**McMachen Pit - SAR
Works**
Rideau Lakes, Ontario,
Canada

Designed and undertook a baseline study and transplantation plan for a sensitive plant Species at Risk on the client's proposed aggregate pit expansion lands in accordance with O.Reg. 242/08 under the Endangered Species Act. This project will involve annual follow-up monitoring of the transplanted individuals to assess their health and continued vigour. This project requires a detailed understanding of plant physiology and ecology, as well as a firm grasp of provincial legislation and regulations associated with Species at Risk.

Dallan Lands - EIS
Guelph, Ontario, Canada

Prepared an Environmental Impact Study for this proposed residential development. Multi-year field inventories related to flora and fauna were performed, including species at risk (Jefferson Salamander), and wetland boundaries were evaluated in co-operation with the Grand River Conservation Authority. Review of potential impacts was undertaken and presented in an Environmental Impact Statement. On-going consultation with public interest groups, University of Guelph experts, and City staff to develop a design plan in respect of complicated natural heritage features.

Richmond Hill Subdivisions - Monitoring
Richmond Hill, Ontario, Canada

Collected data and samples for an on-going monitoring program. Tasks included undertaking annual vegetation monitoring using a standardized methodology, analyzing collected data and comparing it with previous years results to identify changes.

Activa Waterloo West Side Lands - Monitoring
Waterloo, Ontario, Canada

Pre-construction monitoring on the subject lands was initiated in 1999 and continued during pre-construction years, with the intention of providing baseline environmental information prior to area grading and construction. This program addressed the City of Waterloo's development monitoring requirements, implemented for Laurel Creek and other watercourses within the City. The scope of work for the terrestrial monitoring included photographic and descriptive inventories of 22 stations on the subject lands. Terrestrial monitoring was conducted once per year with results analyzed, catalogued and compared with previous observations where applicable.

Simpson Lands EIS and Terrestrial Monitoring
Waterloo, Ontario, Canada

Designed an on-going terrestrial monitoring program for the subject lands based on City of Waterloo and GRCA guidelines. Monitoring of vegetation communities, changes in species compositions, and disturbance levels was undertaken, interpreted, and reported. Requirements for the EIS field program were designed and discussed with relevant agencies. An EIS was prepared that considered the proposed plan of development, the potential environmental impacts related to the plan, and discussed mitigation measures for each potential impact.

Buffalo Springs EIS Update and Homeowners' Manual
Oro-Medonte, Ontario, Canada

Prepared an EIS as well as an Environmental Stewardship Guide for new homeowners, which aimed to acquaint residents with their natural surroundings and educate them as to how to protect those areas through their daily actions. Liaised with the Ministry of Natural Resources and local Conservation Authority throughout this project. Conducted surveys using standardized methodology for Butternut.

Gordon Creek Developments - EIS
Guelph, Ontario, Canada

Designed a fieldwork program in order to assess natural heritage features within the study area, and presented the Terms of Reference for the study to the City of Guelph Environmental Advisory Committee. Provided input to the project design based on findings of the field program, and authored an Environmental Impact Statement for the proposed development. The site contained a number of significant features, including Provincially Significant Wetland and wildlife corridors. Liaised with the City of Guelph and the Conservation Authority.

**Clerview
Environmental
Constraints Analysis
and EIS**

Guelph, Ontario, Canada

Performed a preliminary environmental constraints analysis for the subject lands, using published resources and an initial field investigation to identify constraints to development. Wetland boundaries on site were delineated according to the methodology outlined in the Ontario Wetland Evaluation System. Information was presented to the client in report format. The constraints analysis was used in the production of the draft plan of subdivision, for which an EIS was prepared. The field program and report format for the EIS was presented to and negotiated with the Guelph Environmental Advisory Committee (EAC). A full three-season field program was undertaken, and findings were reported in the EIS. The draft plan was reviewed to identify potential environmental impacts to the adjacent natural areas, and mitigation measures were recommended. The final EIS will be presented to the Guelph EAC.

**University of Waterloo
Northwest Campus EIS**Waterloo, Ontario ,
Canada

Undertook a review and assessment of the natural heritage components associated with the subject lands, including floral, faunal and community investigations. The information gathered was used to create an updated Greenspace System on the subject lands and to propose trail linkages between the site and adjacent lands. Reviewed the draft plan of development in relation to the subject lands in order to identify potential environmental effects and recommend mitigation measures.

**Activa Branchton -
Dundas Lands EIS**Cambridge, Ontario ,
Canada

Compiled three seasons worth of field data, including information on flora and fauna. Reviewed field data in conjunction with the preliminary design plan in order to recommend changes to elements of the plan to reflect consideration for the surrounding natural environment. Identified potential environmental effects related to the final design plan and recommended mitigation measures in the final Environmental Impact Statement.

**Victoria South Golf
Course Environmental
Constraints Analysis
and EIS**

Guelph, Ontario, Canada

Completed a natural heritage review of the subject lands, and inventoried the site using Ecological Land Classification, as well as collecting data on flora and fauna. Completed an Environmental Constraints Analysis to present the findings of both the review and field inventories for consideration during preliminary site design for a recreational golf facility. Upon receipt of the preliminary design plan, a Terms of Reference was prepared and submitted to the City of Guelph Environmental Advisory Committee outlining the proposed approach for a complete Environmental Assessment for the proposed development. Review of potential impacts was undertaken and presented in an Environmental Impact Statement.

**City of Hamilton Nature
Counts Program**

Ontario, Canada

Performed ELC within the City of Hamilton's boundary, from Ancaster to Puslinch. Designated Areas of Natural and Scientific Interest (ANSI) were inventoried for flora, fauna and disturbance level, and classified using ELC. Other tasks included air photo interpretation, field navigation and leadership.

PROJECT EXPERIENCE – RENEWABLE ENERGY**Clarington Wind Power Project**Clarington, Ontario,
Canada

Retained by Leader Resources Services Corp. to complete various studies in support of the REA application for an onshore Class 4 wind turbine generating project. These included a Natural Heritage Assessment, a Water Body Assessment, Endangered Species Act Permit Applications, Environmental Effects Monitoring Plan and a Noise Study Report. Golder successfully completed a thorough records review as well as field investigations. Wildlife and wildlife habitat investigations focused on bat maternity roosting habitat, grassland bird habitat, landbird migratory stopover areas, marsh bird breeding habitat, amphibian breeding habitat and snake hibernacula. Use of the property by avian wildlife was assessed over several years during various seasons including breeding and migration. Species at risk (SAR) habitat was identified and focused field surveys were completed as required. Completion of the Natural Heritage Assessment was approved by the MNR.

Lindsay-Ops Landfill Site Renewable Energy Generation FacilityKawartha Lakes,
Ontario, Canada

Retained by the City of Kawartha Lakes to conduct the site investigation component of a Natural Heritage Assessment (NHA) as per section 26 of Ontario Regulation (O. Reg.) 359/09 for a proposed biogas facility at the Lindsay-Ops Landfill site, City of Kawartha Lakes, Ontario. A Site Investigation Report was prepared based on these investigations, followed by an Evaluation of Significance (EOS) and Environmental Impact Statement (EIS) report as per sections 27 and 38 (2) of O. Reg. 359/09.

South Branch Wind FarmSouth Dundas, Ontario,
Canada

Environmental compliance monitoring during construction of this wind project for EDP Renewables - North America. Undertook a review of all environmental approvals and permits associated with the Project and prepared a comprehensive Compliance Manual based on the review. Golder also reviewed construction plans and procedures prepared by the Contractor for the Project in order to assess their compliance with agency guidelines and their related Acts, Codes and Regulations. Golder conducted monthly construction monitoring events to monitor compliance. Following the completion of Project construction, and all associated monitoring events, Golder will be preparing a Compliance Assessment Summary Report.

Melancthon II - Natural Heritage ComponentShelburne, Ontario,
Canada

Completed a review of the natural heritage features within the study area for the Melancthon II Wind Project for Canadian Hydro Developers Inc. Work included contact and discussion with various agencies to obtain information on significant natural features. Also, field reconnaissance was undertaken within the study area to apply Ecological Land Classification for Southern Ontario. Prepared a Technical Appendix on the Natural Heritage features of the study area, to support the Environmental Screening Report for this project. This project was undertaken prior to implementation of the REA process.

**Kingsbridge II - Natural
Heritage Component**Goderich, Ontario,
Canada

Undertook a review of natural heritage features within the study area for the Kingsbridge II Wind Project near Goderich, Ontario. Various agencies were contacted to obtain information on significant natural features within the study area. This information, along with data collected in the field, was presented in a Technical Appendix that formed part of the larger Environmental Screening Report for this project. This project was undertaken prior to implementation of the REA process.

**Multiple Renewable
Energy Projects**Multiple Location,
Ontario, Canada

Assisted in design and implementation of field programs and subsequent reporting in support of REA applications for a number of wind farms in Ontario, including: Wolfe Island Wind Project (Wolfe Island, ON); Port Alma Wind Farm (Port Alma, ON); Grand Renewable Energy Park (Haldimand County, ON); St. Columban Wind Farm (Huron County, ON); Summerhaven Wind Energy Centre (Haldimand County, ON); Suncor Energy Adelaide Wind Power Project (Middlesex County, ON); and Armow Wind Project (Bruce County, ON). Many of these projects included surveys for species at risk utilizing standardized protocols.

PROJECT EXPERIENCE – TRANSPORTATION**Highway 11/17 Route
Planning - MTO**Kakabeka Falls, Ontario,
Canada

Route Planning Study for the future four-laning of Highway 11/17 between Kakabeka Falls and Shabaqua Corners. The purpose of the study was to review and evaluate various route alternatives for a new four-lane divided Highway 11/17. At completion of the study, a preferred route will be selected and designated. Terrestrial investigations characterized vegetation communities in the study area according to Ecological Land Classification (ELC) for southern Ontario, and the Forest Ecosystems of Central Ontario. Observations of ecological linkages, wildlife and wildlife habitats were also made. Sensitive vegetation communities within a provincial park were reviewed. Fieldwork and reporting were undertaken according to MTO regulations and guidelines.

**Highway 11 Access
Review - MTO**Muskoka, Ontario,
Canada

Planning, preliminary design and environmental assessment study to upgrade Highway 11 to a fully controlled access freeway, from Muskoka Road 117 to north of Alpine Ranch Road, in the Town of Bracebridge and the District Municipality of Muskoka. The study included identifying a plan to eliminate all at grade intersections and entrances and providing access to the highway at interchange locations only. Terrestrial investigations characterized vegetation communities in the vicinity of each interchange location according to Ecological Land Classification (ELC) for southern Ontario, and the Forest Ecosystems of Central Ontario. Observations of ecological linkages, wildlife and wildlife habitats were also made. Fieldwork and reporting were undertaken according to MTO regulations and guidelines.

**Highway 69 Site
Selection of Highway
Maintenance Patrol
Yards – MTO**

Parry Sound to Sudbury,
Ontario, Canada

This study was undertaken in order to assess a number of alternative locations for patrol yards within the study area, and to identify preferred alternatives at three locations. Performed Ecological Land Classification within each identified patrol yard alternative. Identification of flora and fauna, and habitat descriptions. The study area contained significant features including Provincially Significant Wetlands and required surveys and habitat assessments for Massasauga Rattlesnake, which was present in the study areas. Fieldwork and reporting conducted in accordance with MTO regulations and guidelines. Concurrent with the submission of the Fisheries and Aquatic Ecosystems Report, a Terrestrial Ecosystems Report was submitted to characterize existing conditions, and to address predicted impacts and required mitigation to on-site vegetation communities, terrestrial wildlife and their habitats, and adjacent ecological linkages.

**Highway 11 at the
South Entrance of
Powassan – MTO**

Powassan, Ontario,
Canada

This study was carried out to update a Preliminary Design Report that recommended interchange locations for this stretch of Highway 11. Performed Ecological Land Classification along the study corridor. Identification of flora and fauna, and habitat description. The study area contained significant features, a variety of habitats, and cultural communities. Fieldwork and reporting conducted in accordance with MTO regulations and guidelines. Concurrent with the submission of the Fisheries and Aquatic Ecosystems Report, a Terrestrial Ecosystems Report was submitted to characterize existing conditions, and to address predicted impacts and required mitigation to on-site vegetation communities, terrestrial wildlife and their habitats, and adjacent ecological linkages.

**Veuve River Bridge
and Amable du Fond
River Bridges in
Sudbury and North
Bay - MTO**

Multiple Sites, Ontario,
Canada

This study was carried out as part of the preliminary design for improvements to these two bridges located on Highways 535 and 630, respectively. Terrestrial investigations characterized vegetation communities in the vicinity of each bridge according to Ecological Land Classification (ELC) for southern Ontario, and the Forest Ecosystems of Central Ontario. Observations of ecological linkages, wildlife and wildlife habitats were also made. Fieldwork and reporting were undertaken according to MTO regulations and guidelines. Concurrent with the submission of the Fisheries and Aquatic Ecosystems Report, a Terrestrial Ecosystems Report was submitted to characterize existing conditions, and to address predicted impacts and required mitigation to on-site vegetation communities, terrestrial wildlife and their habitats, and adjacent ecological linkages. Fieldwork and reporting were undertaken according to MTO regulations and guidelines.

**Highway 6 (Hanlon
Expressway)
Improvements from
South of Maltby Road
to the Speed River –
MTO**
Sudbury, Ontario,
Canada

The purpose of this study was to identify the location and configuration for new interchanges to provide access to the Hanlon Expressway. Performed Ecological Land Classification along the study corridor. Identification of flora and fauna, and habitat description. The study area contained a wide range of upland forest habitats, wetlands and cultural communities. Fieldwork and reporting conducted in accordance with MTO regulations and guidelines. Concurrent with the submission of the Fisheries and Aquatic Ecosystems Report, a Terrestrial Ecosystems Report was submitted to characterize existing conditions, and to address predicted impacts and required mitigation to on-site vegetation communities, terrestrial wildlife and their habitats, and adjacent ecological linkages.

**Highway 17 at the West
Junction of Municipal
Road 55 - MTO**
Sudbury, Ontario,
Canada

The purpose of this study was to identify the location and configuration for a new interchange to provide access to the west junction of Sudbury Municipal Road 55 from Highway 17. This work also included the planning for the future four-lane alignment of Highway 17, and the preliminary design of an interim two-lane Highway 17. Performed Ecological Land Classification along the study corridor. Identification of flora and fauna, and habitat description. The study area contained a wide range of upland forest habitats, wetlands, an agricultural reserve, and cultural communities. Fieldwork and reporting conducted in accordance with MTO regulations and guidelines. Concurrent with the submission of the Fisheries and Aquatic Ecosystems Report, a Terrestrial Ecosystems Report was submitted to characterize existing conditions, and to address predicted impacts and required mitigation to on-site vegetation communities, terrestrial wildlife and their habitats, and adjacent ecological linkages.

**Highway 17 Southwest
By-Pass - MTO**
Sudbury, Ontario,
Canada

The purpose of this study was to identify a four-lane highway plan for this section of Highway 17, through the Sudbury area, with access restricted to interchange locations only. Performed Ecological Land Classification along the study corridor. Identification of flora and fauna, and habitat description. The study area contained a variety of upland and wetland habitats, including Areas of Natural and Scientific Interest. Fieldwork and reporting conducted in accordance with MTO regulations and guidelines. Concurrent with the submission of the Fisheries and Aquatic Ecosystems Report, a Terrestrial Ecosystems Report was submitted to characterize existing conditions, and to address predicted impacts and required mitigation to on-site vegetation communities, terrestrial wildlife and their habitats, and adjacent ecological linkages.

**Future Highway 11/17 –
MTO**North Bay, Ontario,
Canada

This study was carried out to update previous studies that have been undertaken since the early 1960s to investigate ways to increase safety and efficiency on Highway 11/17 through the North Bay area. Performed Ecological Land Classification along the study corridor. Identification of flora and fauna, and habitat description. The study area contained significant features including Provincially Significant Wetlands, a variety of upland habitats, and cultural communities. Fieldwork and reporting conducted in accordance with MTO regulations and guidelines. Concurrent with the submission of the Fisheries and Aquatic Ecosystems Report, a Terrestrial Ecosystems Report was submitted to characterize existing conditions, and to address predicted impacts and required mitigation to on-site vegetation communities, terrestrial wildlife and their habitats, and adjacent ecological linkages.

**Highway 23 Widening -
MTO**Palmerston to Harriston,
Ontario, Canada

The purpose of this project was to identify any improvements necessary to ensure that Highway 23, between Palmerston and the West limits of Harriston, met expected operational needs and standards. Performed Ecological Land Classification along the study corridor, identification of flora and fauna, and habitat description. The study area consisted mainly of agricultural land with remnant upland deciduous forest. Fieldwork and reporting conducted in accordance with MTO regulations and guidelines. Concurrent with the submission of the Fisheries and Aquatic Ecosystems Report, a Terrestrial Ecosystems Report was submitted to characterize existing conditions, and to address predicted impacts and required mitigation to on-site vegetation communities, terrestrial wildlife and their habitats, and adjacent ecological linkages.

**Highway 26 Widening -
MTO**Thornbury to Meaford,
Ontario, Canada

Retained by the Ministry to assess possible design alternatives and develop the preliminary design for recommended improvements to Highway 26 in the study area. The project included the review and assessment of pavement condition, drainage, intersections, entrances, illumination, and highway alignment. Performed Ecological Land Classification along the study corridor. Identification of flora and fauna, and habitat description. The study area contained Areas of Natural and Scientific Interest, prominent valleys, cliff features, and high quality fruit-crop lands. Fieldwork and reporting conducted in accordance with MTO regulations and guidelines. Concurrent with the submission of the Fisheries and Aquatic Ecosystems Report, a Terrestrial Ecosystems Report was submitted to characterize existing conditions, and to address predicted impacts and required mitigation to on-site vegetation communities, terrestrial wildlife and their habitats, and adjacent ecological linkages.

**Aquatic and Terrestrial
Biology Retainer
Services - MTO**Southern Ontario,
Canada

Provided terrestrial biology support for Natural Sciences work associated with ten proposed culvert repair projects, located throughout the Southwestern Region. The purpose of the assignment was to document the existing aquatic ecological features and to provide an assessment of migratory bird use in the vicinity of each culvert. Agency and field data were then considered in terms of the proposed culvert repairs, and recommendations for appropriate environmental protection measures were provided.

TRAINING

Ontario Stream Assessment Protocol (OSAP) - Headwater Drainage Features

Ministry of Natural Resources and Forestry, 2017

Wetland Creation Workshop

Toronto Zoo, 2010

MNRF Data Sensitivity Training

Ministry of Natural Resources and Forestry, 2014

Habitat Restoration Planning and Implementation

Northwest Environmental Training Centre, 2014

St. John's Ambulance First Aid Training

2017

PROFESSIONAL AFFILIATIONS

Ontario Vernal Pool Association

Field Botanists of Ontario



golder.com