REPORT

Natural Environment Report

Proposed Aberfoyle South Pit Expansion

Submitted to:

CBM Aggregates, a division of St. Marys Cement Inc. (Canada)

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1.0 INTRODUCTION

WSP Canada Inc. (WSP) was retained by CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada) to complete technical studies as part of the application of a new Class “A” licence (Pit Below Water) under the *Aggregate Resources Act* (ARA) for the property located at 6947 Concession Road 2, Township of Puslinch, Wellington County, Ontario (Figure 1).

1.1 Purpose

This report specifically addresses the requirements of a Natural Environment Technical Report (NER) (Aggregate Resources of Ontario Provincial Standards, Section 2.2) that will accompany the applications for a Class “A” Pit Below Water. This report also meets the requirements of an Environmental Impact Assessment (EIA) as per the County of Wellington Official Plan (OP) and the Grand River Conservation Authority (GRCA) EIS guidelines (GRCA 2005). A Terms of Reference (ToR) was submitted on October 12, 2021 and updated and resubmitted on September 7, 2023,to the County of Wellington, the Township of Puslinch, and the GRCA (Appendix A).

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

Site (Figure 2) - the total land area within the property owned by CBM that is proposed for licensing under the ARA. The site is approximately 44 ha.

Extraction Limit (Figure 2) – The total area within the site in which aggregate is proposed for extraction. The total area of the Extraction Limit is approximately 27 ha.

Study Area (Figure 2) - The study area for the NER assessment is defined in the Aggregate Resources of Ontario Provincial Standards, Section 2.2 as the site and surrounding 120 m. Because the predicted groundwater drawdown is not expected to extend beyond the site boundaries (WSP 2023) 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.
- The rehabilitation potential of the site after extraction.

1.2 Site and Adjacent Lands

1.2.1 Site Description

The site is located on the south side of Concession 2 in a rural setting in the Township of Puslinch. A large portion of the site is covered by open agricultural field. There are also woodlands in the south, east, northwest, and northcentral portions of the site which are part of the Mill Creek-Puslinch Provincially Significant Wetland (PSW). There are also several structures in the western residential portion of the site, including a house, large barn, and two garage/shed buildings with aluminum cladding. Although the house is currently vacant, the agricultural fields on site are still actively cultivated. Mill Creek and three tributaries of Mill Creek are also located on the site (Figure 2).

1.2.2 Adjacent Lands

The Mill Creek-Puslinch PSW covers a large portion of the study area. There are small areas of cultural meadow in the southern and western portions of the study area, as well as rural residences along Concession Rd 2 in the northern and western portions of the study area, and along Sideroad 20 South in the southeast corner of the study area. Dufferin Aggregates Millcreek Pit is located to the northeast of the study area, while CBM's McMillan Pit is located to the east of the study area (Figure 2).

2.0 ENVIRONMENTAL POLICY CONTEXT

The site is located in the Township of Puslinch (the Township) and the County of Wellington (the County). 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 1990a) and the Aggregate Resources of Ontario Standards (MNRF 2020)
- The Provincial Policy Statement (MMAH 2020)
- The *Fisheries Act* (Canada 1985)
- The *Migratory Birds Convention Act* (Canada 1994)
- The *Species at Risk Act* (Canada 2002)
- The *Endangered Species Act* (Ontario 2007)
- The Growth Plan for the Greater Golden Horseshoe (MMAH 2019)
- The Township of Puslinch Zoning By-Law (2018)
- The County of Wellington Official Plan (2021)
- The GRCA Reg. 150/06 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 2.9.

2.1 Aggregate Resources Act

Applicants are required under the ARA Provincial Standards (MNRF 2020) to prepare a Natural Environment Report (NER). The NER is required to identify the designated natural heritage features and areas on, and within 120 m of the site, as defined in the Provincial Policy Statement (PPS) with guidance from supporting technical manuals prepared by the Ministry of Natural Resources and Forestry (MNRF) (MNR 2000; MNR 2010; MNRF 2014; MNRF 2015). Where any of these features/areas have been identified, the report must identify and evaluate any negative impacts on the natural features/areas, including their ecological functions, and identify any proposed preventative, mitigative or remedial measures. The report must also identify if the site or any of the features/areas are located within a natural heritage system that has been identified by a municipality in ecoregions 6E and 7E or by the province as part of a provincial plan.

2.2 Provincial Policy Statement

The PPS was issued under Section 3 of *The Planning Act*. The natural heritage policies of the PPS 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
    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
    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.
- 2.1.8 Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5 and 2.1.6 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. All projects undertaking work in or near-water must comply with the provisions of the *Fisheries Act*.

Measures to protect fish habitat include avoiding in-water work (i.e., below the high-water mark) and work on the banks or shoreline of watercourse/waterbody, as well maintaining riparian vegetation. Any project that is unable to avoid impacts to fish or fish habitat will require a project review (DFO 2019). If it is determined through the Fisheries and Oceans Canada (DFO) review process that the project will result in death of fish or the harmful alteration, disruption, or destruction of fish habitat (HADD), an authorization under the *Fisheries Act* is required. This includes projects that have the potential to obstruct fish passage or impacts flows.

Proponents of projects requiring a *Fisheries Act* Authorization are required to also submit a Habitat Offsetting Plan, which provides details of how the death of fish and/or HADD to fish habitat will be offset, as well as outlining associated costs and monitoring commitments. Proponents also have a duty to notify DFO of any unforeseen activities that cause harm to fish and outline the steps taken to address them.

2.4 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (MBCA) (Canada 1994) prohibits the killing or capturing of migratory birds, as well as any damage, destruction, removal, or disturbance of active nests. It also allows the Canadian government to pass and enforce regulations to protect various species of migratory birds, as well as their habitats. While Environment and Climate Change Canada (ECCC) can issue permits allowing the destruction of nests for scientific or agricultural purposes, or to prevent damage being caused by birds, it does not typically allow for permits in the case of industrial or construction activities.

2.5 Species at Risk

2.5.1 Species at Risk Act

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).

It is prohibited to kill, harm, harass, capture, possess, collect, buy, sell, or trade individuals, as well as damage or destroy the residence of a species listed as extirpated, endangered, or threatened on Schedule 1 of the *Species at Risk Act* (SARA). Furthermore, species that are included on Schedule 1 as extirpated, endangered or threatened are afforded protection of species-specific critical habitat on federal lands once critical habitat is defined in a recovery strategy. Any alterations to critical habitat on federal lands require a permit under Section 73(3) of SARA. A permit may only be issued if the following conditions are met:

- all reasonable alternatives to the activity that would reduce the impact on the species have been considered and the best solution has been adopted
- all feasible measures will be taken to minimize the impact of the activity on the species or its critical habitat or the residences of its individuals
- the activity will not jeopardize the survival or recovery of the species

Although species listed as special concern are not afforded the same degree of legal protection, Section 65 of SARA requires that a management plan be developed that includes measures for the conservation of the species and their habitats, and it is expected that federal landowners will implement these measures on their lands.

On private or provincially-owned lands, only aquatic species listed as endangered, threatened, or extirpated and migratory birds are protected under SARA, unless ordered by the Governor in Council.

2.5.2 Endangered Species Act

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 provincial *Endangered Species Act* (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 in Ontario (SARO) List is contained in Ontario Regulation (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 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 where alterations to the habitat of protected species may be considered.

2.6 Growth Plan for the Greater Golden Horseshoe

The Growth Plan for the Greater Golden Horseshoe was issued under *The Places to Grow Act*. The Growth Plan is intended, in coordination with other provincial plans, to establish a unique land use planning framework for the Greater Golden Horseshoe that supports the achievement of complete communities, a thriving economy, clean and healthy environment and social equity. A Natural Heritage System (NHS) for the Greater Golden Horseshoe was developed and mapped under the Growth Plan in February 2018, which will support planning for the protection of the region's natural heritage and biodiversity. Until the County completes their conformity exercise, the Growth Plan NHS mapping does not apply and NHS mapping is deferred to County NHS mapping (i.e., Greenlands System) provided in the County OP.

The entire site and majority of the study area is within the proposed NHS of the Growth Plan as approved in February 2018. Notwithstanding the NHS policies, Section 4.2.8.2 states that new mineral aggregate operations within the NHS for the Growth Plan are subject to specific policies. However, the proposed licence application is an expansion of an existing extraction operation and is therefore not subject to the environmental prohibitions outlined in Growth Plan 4.2.8.2 (a). Regardless of the Growth Plan NHS mapping, the proposed extraction area has been delineated to avoid and protect adjacent significant natural features.

2.7 Township of Puslinch

The Township's Zoning By-law No. 023-18 prohibits the use of land and erection and use of buildings and structures except for certain purposes, and regulates the type of construction and use of buildings and structures.

The majority of the site is zoned Natural Environment by the Township, which is intended to identify flood prone areas, hazardous lands, and natural heritage features. These areas correspond with the Core Greenlands designation in the County of Wellington Official Plan. Uses permitted within the Natural Environmental zoning area

are generally limited to agricultural, conservational, and recreational, in addition to some existing uses. No buildings or structures are permitted within 30 m of a Natural Environment Zone.

Two small agricultural fields northeast and southwest of the residential property in the western portion of the site are zoned agricultural. Uses permitted within the Agricultural zoning area are generally limited to agricultural, residential, recreational, and wayside pits, in addition to some existing uses.

Amendments to the Zoning By-law may permit changes to the zoning designations and permitted uses.

2.8 County of Wellington

Lands within the Mineral Aggregate Resource Overlay are areas of high potential for mineral aggregate extraction. The site is not located within the Mineral Aggregate Resources Overlay. However, aggregate operations are not limited to this Overlay. New or expanded mineral aggregate operations shall only be established through amendment to the Mineral Aggregate Area designation on Schedule A of the OP. Schedule A7 (Puslinch) of the County's OP delineates the County's Greenlands System, which overlaps the entire site and majority of the study area. The Greenlands System is further divided into two categories: Core Greenlands and Greenlands. The majority of the site is also designated as Core Greenlands, with the exclusion of the agricultural fields northeast and southwest of the residential property which are designated as Greelands. However, the OP also states that Greenland System mapping may need to be refined by more detailed mapping for individual sites.

Core Greenlands are defined as areas with greater sensitivity or significance and include PSWs, all other wetlands, habitat of endangered or threatened species and fish habitat. Core Greenlands may also include hazardous lands, which are areas that are subject to flooding or erosion hazards, or hazardous sites that may be unsafe for development.

Greenlands includes fish habitat, significant wildlife habitat, Areas of Natural and Scientific Interest (ANSI), streams and valleylands, woodlands, environmentally sensitive areas, and waterbodies.

Where development is proposed within or adjacent to the County's Greenlands System an EIA must be completed. Development is not permitted within PSWs or within habitat of endangered or threatened species except in accordance with provincial and federal requirements. In other Greenlands or Core Greenlands features, aggregate extraction is a permitted use within Mineral Aggregate Areas subject to appropriate rezoning, licensing, and the policies of the OP (e.g., where it is demonstrated there will be no adverse impacts to the features or their ecological functions).

2.9 Grand River Conservation Authority

The study area is located within the jurisdiction of the GRCA. The entire site and study area are located within GRCA regulated limits according to available mapping (GRCA 2021), and the agricultural fields on site are mapped as part of the Mill Creek floodplain. Development is generally to be directed away from floodplains or hazard lands where conditions would pose a risk to public health and safety or property (Wellington 2018). Aggregate extraction may be permitted within the floodplain subject to an impact assessment that demonstrates there will be no risk to public health or property.

3.0 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed extraction area is approximately 27 ha in size. The proposed extraction area limit was established by applying 30 m setbacks from all watercourses, provincially significant wetlands and / or property limits as applicable, and a 60 m offset from Mill Creek.

The maximum depth of extraction is expected to be approximately 20 m below the current ground surface to a lowest elevation of 285 metres above sea level (masl).

Aggregate extraction will initially begin above the water table in the west-central portion of the extraction area and proceed westward towards the western edge. Aggregate extraction by dragline will then begin below the water table in the westernmost part of the extraction area and proceed in an easterly direction. Above water table and below water table extraction will then proceed generally concurrently in an eastward direction until aggregate extraction has been completed, creating ponding conditions effectively throughout the operational period.

The raw aggregate will be temporarily stockpiled on-site and, in the case of the below water aggregate that is extracted, this will allow the pore water within the aggregate to drain back to the emerging pit pond prior to transport of the raw aggregate feedstock off-site for processing. The raw aggregate will be processed at the nearby CBM Aberfoyle South Pit operation.

For the purposes of this assessment, it is assumed that aggregate extraction will take place on the Aberfoyle South Expansion over a period of approximately 6 years, with a maximum annual aggregate extraction rate of 1 million tonnes per year. Site operations will not involve any pumping or active dewatering and there will be no direct off-site discharge of water to any watercourse or wetland. Within the extraction area, all drainage will be directed internally to the emerging pit pond.

4.0 METHODS

4.1 Background Review

The investigation of existing conditions 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. A number of resources were used, including:

- Natural Heritage Information Centre (NHIC) database, maintained by the MNRF (NHIC 2023)
- Land Information Ontario (LIO) geospatial data (MNRF 2023a)
- Species at Risk Public Registry (ECCC 2023)
- O. Reg. 230/08 Species at Risk in Ontario (SARO) List (Ontario 2023)
- 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 2019)
- Bat Conservation International (BCI) range maps (BCI 2023)
- Ontario Butterfly Atlas (Jones et al. 2023)
- eBird species maps (eBird 2023)

- Vascular Plants Atlas (Leslie 2018)
- MNRF LIO Aquatic Resources Area Layer (MNRF 2023b)
- MNRF Fish On-Line (MNRF 2023c)
- DFO Aquatic SAR Mapping (DFO 2023)
- iNaturalist occurrence records (iNaturalist 2023)
- County of Wellington Official Plan (2021)
- Wellington County Draft Natural Heritage System Interactive Mapping Tool (Wellington 2018)
- Wetland Data Record and Evaluation Report for Galt Creek Wetland (now known as Mill Creek-Puslinch Wetland) (Coulson et al. 1984)
- Mill Creek Subwatershed Plan (CH2M et al. 1996)
- Mill and MacCrimmon Creek Review of Flow Requirements for Fish Habitat (Portt and Blackport 2002)
- Mill Creek Cumulative Impact Assessment, 2005 (Golder 2006)
- Grand River Characterization Report (LESPRTT 2008)
- Grand River Watershed: State of Water Resources (GRCA 2020)
- Cumulative Effects in the Mill Creek Subwatershed (Dhiyebi et al. 2018)
- Monitoring Report for CBM – St. Mary's Cement McMillian Pit (8Trees 2018)
- Ecological and Aquatic Monitoring Report for Roszell Pit (Dance Environmental 2019)
- Mill Creek Coordinated Monitoring Report, 2018 (LRG Environmental 2019)
- GRCA Interactive Mapping (GRCA 2021)
- High-resolution 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 development, MNRF LIO data were used to create base layer mapping for the study area. A geographic query of the NHIC database was conducted to identify element occurrences of any natural heritage features, including wetlands, ANSIs, life science sites, rare vegetation communities, rare species (i.e., species ranked S1-S3 by NHIC), species designated under the ESA or SARA, and other natural heritage features within the study area.

Information requests were also submitted to the Guelph District MNRF and MECP on May 16, 2019. A response was received from the MNRF on June 25, 2019 (Appendix B). No response from the MECP was received as of the date of this report.

4.2 SAR Screening

SAR considered for this report includes those species listed in the ESA and 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 the field surveys or background data review) and good quality habitat is present.

Searches were conducted during all 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 the results of the field surveys. Any habitat identified during the field surveys with potential to provide suitable conditions for additional SAR not already identified through the desktop screening was also assessed and recorded. All probability ratings were updated based on the results of the field surveys.

4.3 Field Surveys

The habitats and communities on the site and in the study area, where accessible, were characterized through field surveys. The following sections outline the methods used for each of the field surveys. 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 Proposed Aberfoyle South Pit Expansion Study Area

Date	Type of Survey
April 24, 2018	Anuran Call Count (ACC) Survey #1, Amphibian Egg Mass Survey #1, Turtle Habitat Assessment, Visual Encounter Survey (VES)
May 9, 2018	ACC #2, Amphibian Egg Mass Survey #2, VES
May 29, 2018	Breeding Bird Survey (BBS) #1, VES
May 29-June 22, 2018	Bat Acoustic Survey
June 18, 2018	ACC #3, VES
June 22, 2018	BBS #2, VES
June 26, 2018	Ecological Land Classification (ELC), Botanical Inventory #1, Fish Habitat Survey, VES, Woodland / Wetland boundary delineation
June 29, 2018	BBS #3, ELC, Botanical Inventory #1 - continued, Fish Habitat Survey, VES, Woodland / Wetland boundary delineation

Date	Type of Survey
August 31, 2018	ELC, Botanical Inventory #2, VES
October 7, 2021	Botanical Inventory #3, VES
March 5, 2023	Black Ash Survey
August 14, 2023	Wetland/Woodland Delineation, VES
September 12, 2023	Wetland staking and delineation (with the GRCA and consultant for the Township of Puslinch).

4.3.1 Plant Community Surveys and Botanical Inventory

Plant communities on the site and in the study area were first delineated at a desktop level using high-resolution aerial imagery, then ground-truthed in the field (where accessible) 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 study area, where accessible, for a thorough survey of species and communities. Information on dominant plant species and plant community structure and composition was recorded in order to better define and refine the plant community polygons.

The botanical inventory included area searches in all naturally-occurring habitats in the study area, where accessible. The searches were conducted by systematically walking through all habitats in a meandering fashion, generally paralleling the principal (long) axis of a natural area, where feasible, and ensuring that the full width of the area was examined. Based on the plant communities in the study area, the surveys were completed in early summer, late summer and fall. Butternut (*Juglans cinerea*) were specifically searched for during the botanical inventory. A list of all plant species identified during all of the field surveys were compiled (Appendix C).

The boundary of the Mill Creek-Puslinch Wetland (PSW) adjacent to the site was delineated according to the protocols of the Ontario Wetland Evaluation System (OWES) (MNRF 2022). The GRCA agreed that the boundary matched the existing GRCA mapping, so could be used as the true boundary, and a formal survey was not required. The dripline of the woodland varied only slightly from the boundary of the PSW and was not surveyed separately. The setback from the PSW to the proposed extraction area was determined using the more conservative of the two boundaries (the wetland edge and the dripline) and is therefore sufficient protection for both features.

4.3.2 Anuran Call Count Survey

Anuran (frog and toad) call count surveys were conducted at five stations on the site and within the study area (Figure 2). Surveys followed protocols from the Marsh Monitoring Program method for vocalizing frog surveys (BSC 2008). This method involves collection of call data from fixed stations over three survey periods during the spring and early summer (April to early July), with an interval of at least 15 days between surveys. Surveys began one half-hour after sunset and ended by midnight during evenings with appropriate weather conditions (i.e., little wind and a minimum air temperature of 5˚C, 10˚C, and 17˚C for each respective survey period).

Each station consisted of a semi-circle with a 100 m radius from the centre point (where the observer stands), and each survey was three minutes in duration. All frogs and toads seen or heard were noted on pre-printed

datasheets. Frogs and toads heard or seen outside of the 100 m radius were also noted, including estimated distance (where possible).

4.3.3 Turtle Habitat Assessment

A habitat assessment for turtles was conducted concurrently with the first round of anuran surveys on the site and within the study area to assess the potential for aquatic, overwintering or nesting habitat. The following parameters were evaluated when determining potential for turtle habitat:

- Presence and depth of water
- Presence and abundance of aquatic vegetation
- Substrate type and density of vegetation in adjacent upland habitats
- Presence of basking objects or locations (e.g., logs, rocks, hummocks, clear shoreline)

Because there were no locations identified on the site or within the study area that were assessed to have moderate or high potential to support turtles, no further investigations (i.e., turtle visual encounter surveys, turtle nesting surveys) were necessary.

4.3.4 Amphibian Egg Mass Survey

Amphibian egg mass surveys were conducted at seven permanent or vernal pond locations on the site and within the study area that were assessed to have potential to support amphibian breeding (Figure 2). Surveys were based on protocols from the Sampling Protocol for Determining the Presence of Jefferson Salamanders (*Ambystoma jeffersonianum*) in Ontario (JSRT 2013). This method involves visually surveying potential breeding ponds from the edge or shoreline for egg masses during the early spring breeding period (generally March to early May). Surveys are to be conducted under weather conditions that allow for appropriate visibility (i.e., daylight and no rain). The perimeter of each potential breeding pond on the site was surveyed. All egg masses, larvae and adults seen or heard were recorded on pre-printed datasheets.

4.3.5 Breeding Bird Survey

Breeding bird point count surveys for songbirds and other diurnal birds were conducted at ten stations on the site and within the study area (Figure 2). Surveys followed protocols from the Canadian Breeding Bird Survey (Downes and Collins 2003), and the OBBA (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).

4.3.6 Bat Survey

Field survey methods were based on guidance from the MNRF document Survey Protocol for Species at Risk Bats within Treed Habitats (MNRF 2017) and Bat and Bat Habitat: Guidelines for Wind Power Projects (MNR 2011a).

4.3.6.1 Habitat Assessment

A habitat assessment was conducted concurrently with plant community surveys in woodland features within the study area to assess the potential for bat maternity roost habitat. Evidence of snag or live trees with suitable roosting features, such as cavities, peeling bark, leaf clumps or squirrel nests were identified and recorded. Other features, such as rock piles or exposed bedrock with crevices, that may be used by non-tree roosting bats were also identified and recorded. Anthropogenic structures in the study area were also assessed from the exterior and interior (where possible and safe to access) for suitable roosting features such as presence of chimneys, loose boards, condition of soffits, and potential entrance/egress points.

4.3.6.2 Acoustic Survey

All of the forested habitat in the study area is part of the Mill Creek-Puslinch PSW and accordingly, must remain outside of the proposed extraction area in accordance with the policies of the PPS (MMAH 2020) and Growth Plan (MMAH 2019). Therefore, acoustic surveys were not completed within these habitats and were instead focused on the anthropogenic buildings in the northwest corner of the study area. Two passive full-spectrum bat detectors were deployed in this area: one on the south side of the barn and one adjacent to the shed (Figure 2). The detectors were programmed to record between a half hour before sunset and a half hour after sunset. The detectors recorded for a total of 14 nights.

4.3.6.3 Data Analysis

Acoustic data were filtered in Sonobat Data Wizard to remove noise files, and the high-grade noise scrubber setting was used. The data were analyzed and auto-classified using SonoBat 4.2.1 nnE. The Sonobat program is specifically intended for discrimination of bats to the species level wherever possible, and validation of the species-level classification was conducted by WSP'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 was 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.

Bat passes cannot always be identified to species level. This can be due to either poor quality of the recording (i.e., high signal to noise ratio), or ambiguity of the call type. Some bat species have very similar calls and all bats have variability in their call repertoires. Some bat calls are quite diagnostic and can be confidently identified to species while other bat passes can only be identified to a Genus or to a group of species.

4.3.7 Fish and Fish Habitat Survey

A qualitative fish habitat assessment was conducted for Mill Creek and its five tributaries on the site and in the study area (Figure 2). Habitat morphology types were assessed according to methods modified from O'Neil and Hildebrand (1986).

Habitat parameters collected, where present, included:

- description of general habitat characteristics (i.e., permanence, stream pattern, confinement, channel form, stage, turbulence)
- channel morphology (i.e., riffle, run, pool, chute, rapids)

- connectivity to other watercourses and/or waterbodies and previously unidentified or unmapped waterbodies/watercourses
- wetted and bankfull width and depth
- amount (%) and type of upland, riparian, and in-water vegetation
- amount (%) and type of in-water cover (i.e., organic/woody debris, substrate, vegetation, turbidity, depth/surface turbulence)
- amount (%) and type of overhead cover (i.e., organic/woody debris, undercut banks, ledges, overhanging vegetation)
- amount (%) and type of substrate (i.e., bed rock, boulder, cobble, gravel, sand, silt, clay)
- stability of the bank (i.e., erosional, slumping, depositional, stable) and bank/soil composition
- presence of fish species or specialized habitats (i.e., spawning habitats, over wintering, rearing/nursery, migratory routes) or features such as rocky shoals, islands, boulder gardens, gravel beds, deep pools, aquatic vegetation beds, rapids, etc.
- identification of ground water upwellings, springs, watercress, and iron staining
- description of barriers to fish movements, height of barriers (m) and permanence of barriers
- description of existing infrastructure, such as culverts or bridges (i.e., type, size, condition)
- description of fish habitat potential in each watercourse. Fish habitat is defined in subsection 2 (1) of the *Fisheries Act* as all waters frequented by fish and any other areas upon which fish depend directly or indirectly to carry out their life processes, including but not limited to: spawning, nursery/rearing, food supply and migration.
- observations of any fish and aquatic species

4.3.8 Visual Encounter Surveys

Visual Encounter Surveys (VES) comprised of general wildlife surveys were completed based on guidelines from several resources (Pyle 1984; Bookhout 1994; McDiarmid 2012; MNRF 2013a; MNRF 2016). VES included track and sign surveys, area searches, and incidental observations, concurrent with other field surveys. The full range of habitats across the site and study area were searched, where accessible, 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, 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 field surveys were recorded.

Visual encounter surveys for reptiles and amphibians, as well as reptile and amphibian habitat (with a focus on SAR) were conducted in the study area. All suitable habitats for reptiles and amphibians were searched (e.g., flipping logs and other types of cover objects, observations in piles of rocks) and all reptiles and amphibians observed were identified and recorded.

An assessment of the site and vicinity for potential habitat for Blanding's turtle (*Emydoidea blandingii*), designated threatened under the ESA, was also conducted.

4.4 Analysis of Significance and Sensitivity and Impact Assessment

An assessment was conducted to determine if any significant environmental features or SAR exist, or have moderate or high potential to exist, in the study area and assess whether the proposed extraction 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.

Field data collected in conjunction with the background data compilation was also analysed and integrated with the hydrogeological and surface water studies to complete a potential impact assessment. Impacts were identified as direct (those that will occur on the site) and indirect (those affecting features and functions off-site) in the context of both municipal and provincial policy considerations. The water balance completed as part of the surface water assessment was reviewed and an assessment of the potential impacts of that water balance on natural features on, and in the vicinity of, the site was conducted.

5.0 EXISTING CONDITIONS

5.1 Ecosystem Setting and Regional Context

The study area is located in Ecoregion 6E (Lake Simcoe – Rideau), which covers just over 6% of southern Ontario (Crins et al. 2009). Ecoregion 6E is underlain by bedrock of dolomite and limestone and is characterized by gently rolling surface terrain interspersed by drumlin fields and moraines. Soils are primarily mineral-based and dominated by Gray Brown Luvisols and Melanic Brunisols. The majority of the region is covered by cropland or pasture (57%), with 16% covered by forest and 4% covered by water (Crins et al. 2009).

The study area is located in the Horseshoe Moraines physiographic region. The Horseshoe Moraines region has two distinct landforms consisting of kames (stony ridges) and sand and gravel terraces of valley floors. Dominant soils in this region include coarse, stony till (Chapman and Putnam 1984).

5.2 Mill Creek Watershed

5.2.1 Watershed Characterization

The Mill Creek watershed is a subwatershed of the Middle Grand River watershed (LESPRTT 2008).

Mill Creek is generally defined as a low-gradient, meandering channel. Downstream of Highway 401 into the study area, Mill Creek is dominated by areas of flats with moderate stream velocity, variable canopy cover and dominant substrates of sand or silt. Input sources in this area were determined to be a combination of lateral inputs from wetlands and groundwater upwelling (CH2M et al. 1996). Rehabilitation efforts were historically completed along Lower Mill Creek (which stretches between Highway 401 and Shade's Mill Reservoir), and included pollarding, debris clean-up, instream cover and flow deflectors (CH2M et al. 1996).

The reaches of Mill Creek that traverse the study area were characterized primarily by a flat stream morphology (80-94%), with occasional pools (6-10%), and rare incidences of runs (1-9%) or riffles (1%). Stream cover was mostly open and substrates characterized by sand (39-41%) and silt (43-46%), with lower components of gravel (6-10%), detritus (2-7%), rubble (2-5%), clay (1%) and boulder (1%). Seeps were identified in the reach of Mill

Creek entering the northeast corner of the study area. Benthic invertebrate surveys indicate excellent water quality on the site with most dominant organisms being caddisfly, mollusc, and mayfly (CH2M et al. 1996).

Mill Creek watershed historically had 30% natural or semi-natural habitat cover characterized by a variety of plant communities including mixed, deciduous, and coniferous forest and swamp, upland and lowland thicket, old field, marsh, coniferous plantations, and a few rare occurrences of fen (CH2M et al. 1996). As of 2003, Mill Creek was estimated to have approximately 38% forest cover (GRCA 2003). The Middle Grand River watershed is estimated to have 7.5% cover by wetland and 15% cover by forest (GRCA 2020).

The site and study area are located in the Mill Creek Wetlands functional unit, which has minimal recharge function, significant storage capacity attenuating high flows and sustaining low flows, local discharge areas, intermittent/perennial streams conveying base, bankfull, riparian and flood flows, wetlands that attenuate contaminants associated with surface runoff, significant brook trout habitat, and provides the largest contiguous forest block with interior forest habitat in South Wellington (CH2M et al. 1996).

Mill Creek was historically dominated by native brook trout (*Salvelinus fontinalis*) which was progressively replaced by brown trout (*Salmo trutta*) through stocking efforts conducted between 1940 and 1970 (CH2M et al. 1996). Currently, brown trout represents the dominant salmonid species in the main channel of Mill Creek, while brook trout is found in the smaller coldwater tributaries (LRG Environmental 2019).

Challenges identified in the broader Grand River watershed impacting fish health include population growth, conflicting land uses, water quantity and use, and habitat degradation (LESPRTT 2008).

5.2.2 Watershed Impact Assessments

Numerous studies, including monitoring reports and cumulative impact assessments, have determined that there have been no attributable adverse impacts on stream flow, water quality, temperature or fish populations in Mill Creek resulting from below-water aggregate extraction in the subwatershed.

A functional analysis of the impact of aggregate extraction on flow requirements for fish habitat was completed for the DFO in three creeks within the Mill Creek watershed. The assessment concluded no sustained or significant changes in brown trout abundance were observed in Mill Creek between Concession 7 and Concession 2 as a result of below water aggregate operations. However, groundwater discharge to Mill Creek south of Highway 401 was identified as integral to the survival of trout populations downstream (Portt and Blackport 2002).

A cumulative impact assessment was conducted in 2004-2005 to assess the potential local effects of the numerous existing below-water aggregate operations within the Mill Creek subwatershed. The assessment considered the impacts of aggregate extraction on stream flow, stream temperature and sensitive fish populations (including brook trout and brown trout) in Mill Creek. The assessment concluded that there were no detectable adverse effects on these parameters within Mill Creek as a result of aggregate extraction (Golder 2006).

An assessment of the individual monitoring studies completed by industries operating within the Mill Creek watershed concluded that the methods used were robust and the ecological data generated was of high quality. Cumulatively, the studies have concluded that there has been no detectable change in the coldwater fishery in Mill Creek over time (Dhiyebi et al. 2018).

Water quality monitoring involving collection of benthic macroinvertebrates has been conducted in a tributary of Mill Creek (identified as Tributary #1 on Figure 2) approximately 550 m west of the McMillan Pit (located east of the study area) from 1997 – 2018. Species composition in the tributary has remained consistent over the 21 year

monitoring period, representing organisms common to a coldwater creek with high riparian canopy cover. Overall, the creek was assessed as unimpaired and contains high quality habitat based on the presence of sensitive species. No adverse impacts to water quality in the tributary as a result of aggregate extraction were identified (8Trees 2018).

Water quality and temperature, hydrogeology and fisheries in Mill Creek between Highway 401 and Concession 2 (at the northeast corner of the study area) have been monitored annually since 1994 as part of a long-term monitoring program. Water temperature data recorded in 2018 in Mill Creek in the northeast corner of the study area demonstrated that the summer (i.e., June to August) water temperature of Mill Creek as it enters the northeast corner of the study area ranged between approximately 12°C and 24°C. Recorded water temperatures at this location are generally cooler than temperatures recorded upstream near Highway 401 due to ground water input, inflow of two coldwater tributaries, and increased riparian cover providing shading. Temperatures recorded in 2018 were within the range previously reported for the creek during the monitoring program (LRG Environmental 2019).

Ongoing spawning and population surveys monitor the health of the trout fishery in Mill Creek. Based on the results of the 2018 survey, spawning activity in Mill Creek was determined to be lower than in previous years. The reduced number of redds observed (which is indicative of spawning activity) was largely attributed to beaver activity which can alter water flow and levels and impact spawning activity and success. No links connecting the reduced spawning activity to aggregate extraction were identified (LRG Environmental 2019).

In January 2019, a jet fuel spill on the eastbound lanes of Highway 401 at Highway 6 North resulted in jet fuel entering Mill Creek. Water quality monitoring completed as part of the water resources assessment for the proposed extraction (WSP 2023) sampled for petroleum hydrocarbons and volatile organic compounds (VOCs) at four groundwater monitoring wells and one surface water station on the site. No petroleum hydrocarbons were detected in the groundwater. Of the VOCs, trace amounts of toluene were detected in several monitoring wells. However, in all cases concentrations of toluene were below MECP standard limits for potable groundwater condition. A surface water sample collected around the time of the jet fuel spill near Mill Creek exceeded MECP standards for F2 at 190 µg/L (WSP 2023).

Overall, monitoring concluded that there had been no measurable changes in water quality and no reduction in fish habitat or fisheries production in Mill Creek resulting from aggregate extraction (LRG Environmental 2019). Peer review comments on this monitoring emphasized the importance of sustaining groundwater flow to Mill Creek amid an observed trend of declining groundwater levels at certain monitoring wells (Harden 2019).

5.3 Hydrogeology

Based on field investigations and monitoring completed as part of the Water Report Level 1/2 (WSP 2023), the groundwater levels in the overburden aquifer on the site were determined to vary between +/- 1 m or less annually. The highest groundwater elevations typically occur during late spring / early summer and the lowest groundwater elevation typically occur during late summer. This pattern is consistent with an unconfined aquifer that receives the bulk of its recharge after the spring freshet. Very short term increases or “spikes” in groundwater levels correlate to major precipitation events and melts, suggesting that the overburden aquifer can respond rapidly to recharge inputs.

Shallow horizontal groundwater flow within the proposed extraction area is generally observed to be from the northeast to the southwest, with some flow southwards towards Mill Creek. The primary discharge zone for

shallow groundwater is Mill Creek, although its tributaries may intercept a relatively small portion of groundwater flow prior to joining with the creek (WSP 2023).

Under typical groundwater conditions, the highest groundwater elevations on the property were observed to be 303.5 masl in the northeast corner of the property near Mill Creek and 303.8 masl between Tributaries 3 and 5 in the northwest part of the property along Concession 2. The lowest groundwater elevations on the property were observed on the western side of the property near the confluence of Tributaries 3, 4 and 5 (WSP 2023).

The groundwater temperature data was monitored from April 2018 to December 2022 for the six overburden monitoring wells. The shallowest wells exhibit the greatest seasonal fluctuation in temperature, with MW18-01B (well screen mid-point at 4.7 mbgs) exhibiting a seasonal fluctuation of approximately +/- 3.5 °C from a mean temperature of about 8.5 °C. The deepest wells exhibit the least seasonal fluctuation, with MW18-04 and MW18-05 (well screen mid-point at 10.4 mbgs) exhibiting season fluctuations of approximately +/- 1 °C from a mean temperature of about 9 °C. The peak high and low groundwater temperatures in the shallow wells occurred in October and April, respectively, whereas the peak high and low temperature in the deeper wells occurred in December and July, respectively. These shifts in peak times versus depth are simply a result of the time it takes for temperature fluctuations in the air to propagate into the ground from the surface (WSP 2023).

A more detailed discussion of hydrogeologic resources is provided in a separate report, entitled Water Report Level 1/2 (WSP 2023).

5.4 Surface Water Resources

The predominant surface water feature in the study area is Mill Creek, which directly drains the majority of the site area (Figure 2). Mill Creek enters at the northeast corner of the study area and flows southerly and then westerly through the study area before it exits through the southern study area boundary. Mill Creek is a major tributary of the Grand River, draining an area of approximately 104 km^2 with about 66 km^2 of this area located upstream of the study area. Throughout the summer, Mill Creek sustains considerable flow from groundwater contributions delivered by the surrounding glaciofluvial outwash deposits, which maintain cool water temperatures (CH2M Gore & Storrie Ltd. 1996).

There are several other surface water features on the site and in the study area (Figure 2):

- One tributary of Mill Creek on the site (i.e., Tributary #3 in the northwest corner)
- Four tributaries of Mill Creek off-site, within the study area (i.e., Tributary #1 in the southeast corner, Tributary #2 in the northeast corner, Tributaries #4 and #5 in the northwest corner, and Tributary #6 in the east). Tributary #4, #5 and #6 are intermittent surface water features
- A small pond, off-site, in the southwest corner of the study area
- A small pond, off-site, on a residential property to the north of Concession Rd 2, within the study area

Water level and water temperature in Mill Creek and Tributary #3 were monitored quarterly between late spring 2018 to 2022 as part of the water assessment (WSP 2023). Generally, the continuous water level records were marked by low water levels during the summer and early fall. Winter water levels generally remained low, marked with high water events likely caused by short melt events. Water levels through the spring were moderate to high following the freshet. Water levels in the fall were marked with responses to large precipitation events. Tributary #3 originates in the Mill Creek-Puslinch PSW approximately 330 m north of the property, flowing first through the

Mill Creek-Puslinch PSW and then through the northwest portion of the Site before re-entering the Mill Creek-Puslinch PSW and joining Mill Creek approximately 530 m west of the property. On-site hydraulic and geomorphic investigations for Tributary #3 concluded that the tributary is a perennial/intermittent water feature that is characterized by a narrow channel and high riparian cover. The estimated wetted width ranges between 2-5 m with an average wetted depth of approximately 0.3 m (see the Water Report Level 1/2 [WSP 2023] for more details on this feature).

Water temperatures in both watercourses followed a typical seasonal trend, where temperatures warm through the spring as air temperatures consistently remain above 0°C. This warming continues until mid-summer when daily air temperatures begin to drop. These temperatures drop rapidly through the fall and remain around 0°C through the winter until the spring freshet. Instantaneous maximum water temperature measurements recorded in Tributary #3 were between 23°C and 29.15°C, and in Mill Creek were between 23.00°C and 23.81°C..

Instantaneous flow measurements were collected from June 2018 to December 2022 as part of the water assessment (WSP 2023). Similar to the continuous water level record, the continuous flow record at all stations was marked by low flows during the summer and early fall. Winter flows generally remained low, marked with high flow events likely caused by short melt events. Flows through the spring were moderate to high following the freshet. Flows in the fall were marked with responses to large precipitation events.

The water assessment (WSP 2023) determined that Mill Creek and its tributaries are mainly fed by groundwater flow through most of the year with runoff playing a smaller role in seasonal fluctuations. Tributary #3 has a slightly higher portion of seasonal runoff. Because the period of the baseflow analysis was short (2018 - 2022), there is some uncertainty in the proportion of runoff, interflow and baseflow predicted by the analysis. Tributary #3 is an intermittent watercourse.

According to GRCA mapping (GRCA 2021), the majority of the extraction area falls within the floodplains of Mill Creek and its associated tributaries. If regional flooding were to occur, the extraction pit pond would be overtopped, however, no damage would occur as the pit will already be partially flooded. Any excess water that enters the pit will report back to Mill Creek through infiltration. Additionally, during a regional flooding event, the pit will provide additional storage for water to prevent increased flooding downstream of the site.

A more detailed discussion of surface water resources is provided in a separate report, entitled Water Report Level 1/2 (WSP 2023).

5.5 Vegetation

5.5.1 Regional Setting

The study area is located in the Great Lakes – St. Lawrence Forest Region and the Huron-Ontario subregion. The natural upland forest cover in this region is dominated by sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), basswood (*Tilia americana*), white ash (*Fraxinus americana*), white oak (*Quercus alba*), bur oak (*Quercus macrocarpa),* eastern hemlock (*Tsuga canadensis*) and eastern white pine (*Pinus strobus*). The lowland areas are characterized by forests of silver maple (*Acer saccharinum*), American elm (*Ulmus americana*), red elm (*Ulmus rubra),* black ash (*Fraxinus nigra*) and eastern white cedar (*Thuja occidentalis*) (Rowe 1972).

5.5.2 Plant Communities

Based on the field surveys conducted, 12 ELC community types were identified in the study area in addition to residential areas and agricultural fields. The ELC communities are shown on Figure 2 and ELC communities on the site are briefly described in Table 2.

Table 2: Plant Communities in the Proposed Aberfoyle South Pit Expansion Study Area

ELC Community	Field Description	SRANK[a]
UPLAND		
CUM1-1 Goldenrod Forb Meadow	A small meadow community in the northwest corner of the property boundary, just outside the study area, dominated by dense Canada goldenrod (*Solidago canadensis*) and tall goldenrod (*Solidago altissima*) in association with common milkweed (*Asclepias syriaca*), wild carrot (*Daucus carota*), common mullein (*Verbascum thapsus*) and a few scattered trembling aspen (*Populus tremuloides*) saplings.	n/a
FOD5-6 Sugar Maple-Basswood Deciduous Forest (part of Mill Creek-Puslinch PSW)	Off-site, a small upland forest located along a small ridge at the northern edge of the large swamp in the southern portion of the study area. The forest was dominated by sugar maple and basswood with white birch (*Betula papyrifera*), and the sparse understory was dominated by balsam fir (*Abies balsamea*) and American elm. Groundcover was sparse to moderate and dominated by low vines such as poison ivy (*Toxicodendron radicans*) and Virginia creeper (*Parthenocissus quinquefolia*) in addition to meadow horsetail (*Equisetum pratense*), goldenrod and woodland strawberry (*Fragaria vesca*).	S5
CUP3-2 White Pine Coniferous Plantation	Off-site, a plantation of white pine in the southwest corner of the study area.	n/a
WETLAND		
SWD2-2 Green Ash Deciduous Swamp (part of Mill Creek-Puslinch PSW)	Off-site, two narrowly separated swamp communities in the north-central portion of the study area. The swamp was dominated by green ash (*Fraxinus pennsylvanica*), trembling aspen and silver maple with associates of white cedar, willow, American elm, and hawthorn. The majority of the green ash canopy was dead resulting in a discontinuous canopy cover. The understory was sparse to moderate and dominated by wild raisin (*Viburnum nudum var. cassinoides*) and green ash in association with red elderberry (*Sambucus canadensis*) and serviceberry. Ground cover was dense and dominated by horsetail and sensitive fern (*Onoclea sensibilis*) with bittersweet nightshade (*Solanum dulcamara*), spotted water hemlock (*Cicuta maculata*), white avens (*Geum canadense*) and goldenrod. There were also several small openings characterized by meadow marsh. The community was characterized by larger trees and abundant standing snags (largely due to die-off of the ash trees) and deadfall.	S5

ELC Community	Field Description	SRANK[a]
SWD5-1 Black Ash Deciduous Swamp (part of Mill Creek-Puslinch PSW)	Off-site, a swamp community located in the northwest portion of the study area. The community was dominated by black ash and silver maple with associates of American elm, green ash, red maple, and trembling aspen. The sparse understory was dominated by Virginia creeper and shrubs such as alternate-leaved dogwood (*Cornus alternifolia*), red elderberry, raspberry (*Rubus idaeus*) and common buckthorn. The ground layer was moderate and dominated by jewelweed (*Impatiens capensis*) in association with ferns, horsetail, graceful sedge (*Carex gracillima*) and bittersweet nightshade. Evidence of ephemeral pools with standing water up to 15 cm deep were observed. Trees were predominately less than 30 cm DBH with few standing snags and abundant deadfall.	S5
SWD6-2 Silver Maple Deciduous Swamp (part of Mill Creek-Puslinch PSW)	Off-site, a large swamp community covering the southern portion of the study area. The swamp was dominated by silver maple with black ash and trembling aspen, and associates of white birch and white cedar. The sparse understory was dominated by black ash saplings, serviceberry, and various vines. The dense ground layer was dominated by meadow rue (*Thalictrum pubescens*), sensitive fern and jewelweed with numerous sedges, horsetail, bulblet fern (*Cystopteris bulbifera*), yellow lady's slipper (*Cypripedium parviflorum*) and pockets of spotted water hemlock. Areas of shallow standing water were observed throughout the swamp. The community is mature with larger trees up to 50 cm DBH (and a few larger), occasional standing snags and abundant deadfall.	S5
SWM1-1a White Cedar – Hardwood Mixed Swamp (part of Mill Creek-Puslinch PSW)	Off-site, located in the northwest corner of the study area, this swamp was dominated by white cedar with yellow birch (Be*tula alleghaniensis*), black ash, American elm, tamarack (*Larix laricina*) and green ash associates. The understory was largely absent and the moderate to dense ground layer was dominated by jewelweed, meadow horsetail and red raspberry in association with sensitive and cinnamon ferns (*Osmunda cinnamomea*), sedges, Canada mayflower (*Maianthemum canadense*) and fragrant bedstraw (*Galium triflorum*). There was also a small, speckled alder (*Alnus incana*) thicket swamp inclusion along a shallow tributary in the center of the swamp. The hydro corridor bisecting the northern portion of the community was dominated by meadow species such as common milkweed, bittersweet nightshade, goldenrod, Philadelphia fleabane (*Erigeron philadelphicus*) and trembling aspen saplings. Trees were generally small (i.e., less than 30 cm DBH) with very few snags and abundant deadfall.	S5
SWM1-1b White Cedar – Hardwood Mixed Swamp (part of Mill Creek-Puslinch PSW)	Off-site, located along the eastern portion of the study area, this community was dominated by white cedar with green ash, yellow birch, and eastern hemlock (*Tsuga canadensis*). The understory layer was moderate and consisted of several dogwoods, speckled alder, common buckthorn, Tartarian honeysuckle (*Lonicera tatarica*), and Canada yew (*Taxus canadensis*). The ground layer was moderate to dense and dominated by jewelweed with coltsfoot (*Tussilago farfara*), meadow horsetail, swamp milkweed (*Asclepias incarnata*), sensitive fern, numerous sedges, wild sarsaparilla (*Aralia nudicaulis*) and Jack-in-the-pulpit (*Arisaema triphyllum*). Small pockets of standing water were observed, and the topography of the community was hummocky. Trees were mature but generally less than 50 cm DBH with very few standing snags and abundant deadfall.	S5

ELC Community	Field Description	SRANK[a]
SWC Coniferous Swamp	Off-site, coniferous swamp communities located in the west and north portions of the study area.	n/a
SWM Mixed Swamp	Off-site, mixed swamp communities located in the southwest, north, and northeast portions of the study area.	n/a
SWT2 Thicket Swamp Inclusion	A small thicket swamp inclusion (approx. 0.1 ha in size) located in the northeast corner of the site characterized by red-osier dogwood (*Cornus sericea*), willows, and speckled alder. Ground cover was dense and dominated by sedges and bittersweet nightshade, bordered by barnyard grass (*Echinochloa crusgalli*) and wool-grass (*Scirpus cyperinus*). Standing water with an average depth of 0.2 m was recorded in the early spring.	n/a
SWT2-1 Alder Thicket Swamp Inclusion	A small alter thicket swamp inclusion (approx. 0.2 ha in size) in the northeast corner of the site characterized by speckled alder, common buckthorn, willow spp., red-osier dogwood, and nannyberry (*Viburnum lentago*) around a dense patch of phragmites. Scattered immature trees consisting of American elm, trembling aspen, white ash, and balsam poplar (*Populus balsamifera*) were recorded. The ground layer consisted of narrow-leaved cattail (*Typha angustifolia*), timothy (*Phleum pratense*), dark green bulrush (*Scirpus atrovirens*), numerous sedges, and bittersweet nightshade. No open water was observed during field surveys.	S5
CUM/MAS Cultural Meadow / Marsh Inclusion	A small marsh inclusion (approx. 0.05 ha in size) in the south-central portion of the site characterized by narrow-leaved cattail and dark green bulrush, surrounded by a cultural meadow dominated by Canada goldenrod and wild carrot. Standing water in the marsh varied in depth from 0.1 m (early spring) to 0.6 m (late fall).	n/a

[a] An 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 2019). 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, which often applies to anthropogenic, culturally-influenced, or high-level ELC communities (i.e., FOD).

5.5.3 Vascular Plants

A total of 153 vascular plant species were identified during the botanical, and other, surveys completed in the study area (Appendix C). Of these, 82% are native species and 12% are exotic species. The remaining 6% were unable to be identified to the species level due to plant condition (i.e., browsed) or difficulty in taxonomic differentiation. The high proportion of native species is consistent with the high level of natural cover on the site and low level of disturbance observed within these features (which may be influenced by the wetness of these communities deterring use for recreational activities). As noted, the botanical inventories were completed in early summer, late summer and fall, the timing of which was deemed appropriate as most of the natural plant communities present within the study area are wetlands. One small deciduous forest community is present outside of the site, in the study area, and the early summer botanical inventory still captured spring ephemeral species including jack-in-the-pulpit (*Arisaema triphyllum*), Virginian waterleaf (*Hydrophyllum virginianum*), and red trillium (*Trillium erectum*), indicating the botanical inventories were conducted at the appropriate times of the year.

Significant and Sensitive Species

All of the plant species identified are secure and common, widespread, and abundant in Ontario and globally (S4 or S5; G5) or are unranked alien species (SNA; GNR). None of the plant species identified in the desktop SAR screening as having ranges which overlap the study area were found during the botanical, or other, field surveys (Appendix D).

Black ash is provincially ranked S3 (vulnerable) and was recorded in several plant communities during the field surveys (Appendix C), including SWD5-1, SWM1-1a, SWD6-2, SWD2-2 off-site, within the study area (Figure 2). Black ash was also recorded in the thicket swamp (SWT2-1) community on the site at the north edge of the extraction area. However, all black ash trees recorded in this community were observed to be dead. Two dead standing trees between 15 and 20 cm DBH were recorded in the thicket swamp (SWT2-1) during field surveys. Black ash grows throughout Ontario in moist ecosystems and is commonly found in northern swampy woodlands (MNRF 2019). This species typically grows on mucky or peaty soils and is considered a facultative wetland species (Reznicek et al. 2011). Black ash is also designated as endangered under the ESA. However, the Minister has issued a temporary suspension of individual and habitat protections for black ash until January 25, 2024 (Ontario 2022). Black ash is discussed further in Section 6.1.

5.6 Wildlife

5.6.1 Amphibians

A total of six amphibian species were observed during anuran call count, egg mass, or other, surveys conducted on the site (Appendix E).

Four amphibian species were observed during anuran call count surveys. Spring peeper (*Pseudacris crucifer*) and wood frog (*Lithobates sylvaticus*) were the most frequently detected and abundant amphibian species recorded, followed by American toad (*Anaxyrus americanus*) and gray treefrog (*Hyla versicolor*) (Table 3). The deciduous swamp (SWD6-2) that is part of Mill Creek-Puslinch PSW off-site, in the southern portion of the study area has the highest abundance of breeding amphibians recorded during surveys, followed closely by the series of small, flooded depressions in the agricultural field in the northeastern corner of the site (Figure 2). The pond located off-site to the north of Concession 2, as surveyed from the roadside, had the lowest level of amphibian breeding evidence. This pond appeared to be anthropogenic in nature and may therefore have less desirable habitat features (i.e., deeper water, lack of aquatic vegetation, lack of egg attachment sites).

Table 3: Anuran Call Count Survey Results for the Proposed Aberfoyle South Pit Expansion Study Area

Survey Station	Habitat	Species[1] and Abundance[2]			
		AMTO	GRTF	SPPE	WOFO
1	Small pond surrounded by deciduous swamp	—	1	—	3-5
2	Flooded depression in agricultural field	3	—	—	5
3	Several small, flooded depressions in agricultural field	1	—	FC	2
4	Pond on residential property	3	—	—	—
5	Deciduous swamp	3	—	5	4

[1] Species: AMTO = American toad; GRTF = Gray treefrog; SPPE = spring peeper; WOFO = Wood frog
[2] Abundance: numbers represent individuals; FC = full chorus (i.e., calls overlap and are unable to be counted individually)

The results of the egg mass surveys are presented in Table 4. No egg masses potentially belonging to Jefferson salamander or its complex salamander species were identified during the egg mass surveys. One egg mass was observed at a single survey station (#5) and was determined to be either wood frog or northern leopard frog (*Lithobates pipiens*). Wood frog tadpoles were also observed at a single survey station (#7), and several adult individuals of American toad, spring peeper, green frog and northern leopard frog were also observed at two survey stations (#2 and #6).

Table 4: Results of the Amphibian Egg Mass Survey in the Proposed Aberfoyle South Pit Expansion Study Area

Survey Station	Pond Description	Habitat Features	Amphibian or Egg Mass Observations
1	Isolated temporary ponding created by meltwater and surface run-off in an agricultural field. Measured approximately 10 x 15 m with an average water depth of 0.05 m. Water stagnant and observed to be completely dry by early May. Planted through with crop.	No fish observed or likely to be present due to isolated condition. Approximate cover of submerged egg attachment sites was 80% (consisting of hay). Adjacent habitat consisted of agricultural field and there was no canopy cover.	None
2	Isolated temporary ponding created by meltwater and surface run-off in an agricultural field. Measured approximately 5 x 20 m with an average water depth of 0.3 m. Water stagnant. Planted through with crop.	No fish observed or likely to be present due to isolated condition. Approximate cover of submerged egg attachment sites was 100% (30% woody debris, such as branches and 70% herbaceous, including hay). Adjacent habitat consisted of agricultural field and there was no canopy cover.	One adult green frog.
3	Isolated temporary ponding created by meltwater and surface run-off in an agricultural field. Measured approximately 4 x 12 m with an average water depth of 0.3 m. Water stagnant. The feature began to dry and average water depth decreased to 0.1 m by early May. Planted through with crop.	No fish observed or likely to be present due to isolated condition. Approximate cover of submerged egg attachment sites was 90% (10% woody debris, such as branches and 80% herbaceous, including hay). Adjacent habitat consisted of agricultural field and there was no canopy cover.	None
4	Isolated temporary ponding created by meltwater and surface run-off in an agricultural field. Measured approximately 4 x 10 m with a water depth up to 0.5 m. The feature began to dry and was reduced to approximately 3 x 5 m in size with average water depth of 0.1 m by early May. Water stagnant. Planted through with crop.	No fish observed or likely to be present due to isolated condition. Approximate cover of submerged egg attachment sites was 90% (20% woody debris, such as branches and 70% herbaceous, including hay). By early May, cover of egg attachment sites decreased to approximately 40% (25% woody and 15% herbaceous). Adjacent habitat consisted of agricultural field and there was no canopy cover.	None

Survey Station	Pond Description	Habitat Features	Amphibian or Egg Mass Observations
5	A flooded moat that extended up to a distance of 10 m around a small, isolated thicket swamp in an agricultural field. Average water depth was 0.2 m and water was stagnant.	No fish observed or likely to be present due to isolated condition. Approximate cover of submerged egg attachment sites was 70% (5% woody debris, such as branches and 65% herbaceous). Adjacent habitat consisted of agricultural field and thicket swamp, providing 2% canopy cover.	One egg mass was observed floating free in the water in early May. The egg mass was assessed to be either wood frog or northern leopard frog based on the size, shape and number of eggs.
6	Small, isolated permanent pond at edge of mixed and deciduous swamp that measured approximately 25 x 20 m with average water depth of 0.5 m. Water stagnant.	No fish observed or likely to be present due to isolated condition. Approximate cover of submerged egg attachment sites was 30% (20% woody debris, such as branches and logs and 10% herbaceous), mainly around the pond edges. Adjacent habitat consisted of agricultural field and swamp, providing 40% canopy cover. There was abundant leaf litter in the pond.	Adult American toad, spring peeper and northern leopard frog. No amphibian egg masses observed.
7	Isolated temporary ponding created by meltwater and surface run-off in an agricultural field. Measured approximately 4 x 6 m with an average water depth of 0.1 m. Water stagnant. Majority of feature planted through with crop.	No fish observed or likely to be present due to isolated condition. Approximate cover of submerged egg attachment sites was 30% (2% woody debris, such as branches and logs and 28% herbaceous). Adjacent habitat consisted of agricultural field and there was no canopy cover.	Numerous tadpoles were observed in the water in early May and determined to be wood frog. No amphibian egg masses observed.

Significant and Sensitive Species

All of the amphibian species identified through the anuran call count, egg mass, or other, surveys are secure and common, widespread, and abundant in Ontario and globally (S5; G5). None of the amphibian SAR species with ranges that overlap the site (Appendix D) were observed during field surveys.

5.6.2 Breeding Birds

A total of 52 bird species were observed during breeding bird, or other, surveys conducted in the study area (Appendix E). Song sparrow (*Melospiza melodia*), red-winged blackbird (*Agelaius phoeniceus*), and barn swallow (*Hirundo rustica*) were the most frequently detected bird species during breeding bird surveys. Song sparrow is found in open woodlands and often builds nests near water, while red-winged blackbird breeds in marshes. Barn swallow is common in rural agricultural landscapes where there are barn structures for nesting and open farmland for foraging (Cornell 2019).

Significant and Sensitive Species

All of the bird species identified through the breeding bird, or other, surveys are secure and common, widespread, and abundant in Ontario and globally (S4 or S5; G5), or SNA (not applicable – species is not a target for conservation). Four of the bird species observed during field surveys are designated under the ESA: bank swallow (*Riparia riparia*), barn swallow, bobolink (*Dolichonyx oryzivorus*) and eastern wood-pewee (*Contopus virens*).

Bank swallow, designated threatened under the ESA, breeds in a variety of natural and anthropogenic habitats (e.g., lake bluffs, stream banks, sand, and gravel pits) located near open foraging sites such as waterbodies, fields, wetlands, and riparian woods. Forested areas are generally avoided (Garrison 1999). A single bank swallow was observed flying over the site during field surveys. No suitable nesting habitat was identified on the site or within the study area. There are several active aggregate operations to the east of the study area which may contain stockpiles for nesting and the individual observed during field surveys was likely foraging in the area. Further discussion is not warranted.

Bobolink, designated threatened under the ESA, 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 and has a low tolerance for presence of woody vegetation (Renfrew et al. 2015). Although bobolink was observed during the first breeding bird survey, there is no suitable habitat on the site or in the study area to support breeding habitat for this species. Furthermore, no individuals were observed during any of the subsequent surveys. Further discussion is not warranted.

Barn swallow, designated special concern under the ESA, 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 and forages over grassy fields, pastures, agricultural cropland, shorelines, and wetlands (COSEWIC 2011). Suitable nests from previous years may be reused (Brown and Brown 1999). Numerous barn swallow were observed foraging over the agricultural fields on site during field surveys and were confirmed to be nesting in the barn off-site, in the northwestern portion of the study area (Figure 2).

Eastern wood-pewee, designated special concern under the ESA, 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. Also occurs in anthropogenic habitats providing an open forested aspect, such as parks and

suburban neighborhoods (COSEWIC 2012). Several males were observed singing in the large deciduous / mixed swamp (SWD6-2 and SWM1-1) off-site, in the southern portion of the study area during the first breeding bird survey. Another male was observed singing in the deciduous swamp (SWD5-1) during the same survey (Figure 2). Eastern wood-pewee was assessed to be a possible breeder off-site in the study area.

Barn swallow and eastern wood-pewee are discussed further in Section 6.7.

5.6.3 Bats

5.6.3.1 Habitat Assessment

Overall, snag density in woodlands across the study area was assessed to be low. Two swamp communities in the study area, green ash deciduous swamp (SWD2-2) and silver maple deciduous swamp (SWD6-2) (Figure 2), were characterized as mature communities with larger trees, moderate to high snag density, and higher structural complexity. These two communities were assessed to have moderate potential to provide maternity roost habitat for tree roosting bats, including the endangered bat species little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*) and tri-colored bat (*Perimyotis subflavus*).

Little brown myotis will roost in both natural and man-made structures. Natural roosting colonies require a number of large dead trees, in specific stages of decay and that project above the canopy in relatively open areas (ECCC 2018). Northern myotis usually roosts 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 (ECCC 2018). Tri-colored bat may roost in foliage, in clumps of old leaves, hanging moss or squirrel nests. They typically feed over aquatic areas with an affinity to large-bodied water and will likely roost in close proximity to these (ECCC 2018).

The barn and outbuildings off-site, in the northwest portion of the study area (Figure 2) were assessed to have moderate potential to provide suitable anthropogenic maternity roosting habitat for little brown myotis.

No large rock piles or other exposed bedrock was observed on the site or within the study area to provide maternity roosting habitat for the endangered bat species eastern small-footed myotis (*Myotis leibii*). Eastern small-footed myotis is not known to roost within trees. The species generally roosts on the ground under rocks, in rock crevices, talus slopes and rock piles and occasionally inhabits buildings (Humphrey 2017).

No potential hibernaculum features for bats were identified on the site or within the study area.

As discussed in Section 4.3.5, all woodland habitat in the study area is contained within the Mill Creek-Puslinch PSW and must therefore be excluded from the proposed extraction area. The proposed extraction area is also set back 30 m from the woodland. As such, no acoustic detectors were deployed in the forested habitats (Figure 2), and further discussion is not warranted.

5.6.3.2 Acoustic Survey

In total, seven bat species were identified during the acoustic survey: hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), little brown myotis, northern myotis and eastern small-footed myotis. Additional bat passes were identified as unknown myotis species, high frequency unknown species, low frequency unknown species and big brown bat or silver-haired bat passes. The mean bat passes per night with standard deviation for all bat species at the stationary detectors is provided in Table 5. The total and maximum number of passes of myotis species is provided in Table 6.

Table 5: Mean (Standard Deviation) Bat Passes per Night at Acoustic Monitoring Stations from May 29-June 22, 2018[1]

Survey Station	# of Nights Surveyed	Total Passes per Night (all bats)	Bat Species or Call Frequency Type												
			HiF total[2]	LoF total[2]	LoF Unknown Species[3]	HiF Unknown Species[4]	Hoary Bat	Silver-haired Bat	Big Brown Bat	Red Bat	Big Brown or Silver-haired Bat	Unknown Myotis	Little Brown Myotis	Northern Myotis	Small-footed Myotis
1	14	130.64(149.99)	50.07(58.88)	80.57(97.58)	9.57(9.72)	8.93(8.67)	1(1.04)	3.21(3.89)	48.86(73.27)	0.93(1.07)	17.93(16.83)	14.86(19.1)	24.79(32.69)	0.07(0.27)	0.5(0.94)
2	14	262.36(221.5)	90.71(79.43)	171.64(162.66)	16.79(17.26)	7.36(8.63)	1(0.88)	1.71(2.09)	126.21(123.32)	1.21(2.55)	25.93(23.55)	19.43(11.86)	57.29(62.73)	0.07(0.27)	5.36(3.5)

[1] - Results presented in the format of X (Y), where X = mean number of bats passes per night and Y = standard deviation

[2] - HiF = High Frequency; LoF = Low Frequency

[3] - Recordings classified as bats with low frequency calls but could not be classified to the species level, typically including hoary bat, big brown bat and silver-haired bat

[4] - Recordings classified as bats with high frequency calls but could not be classified to the species level, typically including red bat, tricolored bat and all bats in the myotis genera

Table 6: Total Passes and Maximum Passes within One Night for SAR Bats at Acoustic Monitoring Stations May 29-June 22, 2018[1]

Survey Station	Bat Species or Call Frequency Type									
	Total Unknown HiF[1]	Max Unknown HiF[1]	Total Myotis Species	Max Myotis Species	Total Little Brown Myotis	Max Little Brown Myotis	Total Northern Myotis	Max Northern Myotis	Total Eastern Small-footed Myotis	Max Eastern Small-footed Myotis
1	125	28	208	77	347	132	1	1	7	3
2	103	29	272	48	802	201	1	1	75	14

[1] - HiF = High Frequency; LoF = Low Frequency

Overall, mean bat activity ranged from 130 passes per night at Station 1 to 260 passes per night at Station 2. All seven bat species recorded during the survey were detected at both survey stations, with the most frequently recorded bat species being big brown bat.

There was also a high number of SAR or potential SAR bat passes recorded at both survey stations. Little brown myotis represented the majority of confirmed SAR passes at both survey stations. A small number of eastern small-footed myotis were recorded at both survey stations, and only two northern myotis individuals were recorded (one at each survey station). Unknown high-frequency bat species passes (which are potentially indicative of Myotis species) were also recorded at both survey stations.

The number of bat passages recorded by a detector may include multiple passes by the same bat individual and therefore are only indicative of presence/absence, rather than the number of bats that are potentially using the study area. The results of the acoustic survey, combined with the habitat assessment, indicate that there is a high potential the barn and outbuildings on the site provide bat maternity roost habitat.

Significant and Sensitive Species

Four of the bat species observed during the field surveys are secure and common in Ontario (S4), while northern myotis and little brown myotis are ranked S3 (vulnerable) and eastern small-footed myotis is ranked S2S3 (imperiled to vulnerable). Globally, two species (big brown bat and eastern small-footed myotis) are ranked G4 or G5 (secure and common), three species (hoary bat, red bat, and silver-haired bat) are ranked G3G4 (vulnerable to apparently secure), one species (little brown myotis) is ranked G3 (vulnerable) and one species (northern myotis) is ranked G1G2 (critically imperiled to imperiled) (Appendix E).

Three of the bat species observed during the acoustic surveys are also designated endangered under the ESA: little brown myotis, northern myotis and eastern small-footed myotis.

Based on the level and pattern of activity recorded for little brown myotis during the acoustic survey, it is likely that this species uses the barn and outbuildings off-site, in the northwest portion of the study area for maternity roosting.

Although only two passes were confirmed to belong to northern myotis, it is possible that some of the passes identified as unknown myotis may be northern myotis as well. Although there is potential that northern myotis may roost in the barn and outbuildings off-site, in the northwest portion of the study area in small numbers, this species may also have been detected while feeding or commuting over the study area.

Two deciduous swamps off-site in the north and south portions of the study area (i.e., SWD2-2, SWD6-2) were also assessed to have moderate potential to provide maternity roost habitat for little brown myotis and northern myotis. Individuals may also forage over the agricultural fields on the site, as well as over Mill Creek off-site, within the study area.

Eastern small-footed myotis was detected at both survey stations but was detected more frequently at Station 2. The highest level of activity recorded for this species was during the first hour after sunset when bats are typically emerging from roosts. Eastern small-footed myotis is thought to be among the first bat species to emerge from roosts and may do so during daylight hours when bats can navigate by sight rather than echolocation (which is recorded by the detectors). Therefore, it is possible that overall activity of this species was higher than is suggested by the acoustic data. Station 2 was located adjacent to a discarded pile of construction debris and other materials off-site, in the northwest portion of the study area which may provide suitable roosting habitat for small-footed myotis. This species may also roost in the barn or outbuildings on off-site in the northwest portion of

the study area, and individuals may forage over the agricultural fields on the site, as well as over Mill Creek off-site, within the study area.

Although no tri-colored bat individuals were observed during field surveys, the acoustic surveys targeted buildings within the study area, which are not preferred habitat for this species. The deciduous and mixed swamps off-site within the north, south and east portions of the study area may provide suitable maternity roosting habitat for this species.

Little brown myotis, northern myotis, eastern small-footed myotis and tri-colored bat are discussed further in Section 6.1.

5.6.4 Fish and Fish Habitat

A summary of the qualitative fish habitat survey results for Mill Creek and tributaries within the study area (Figure 3) are provided in Appendix F.

Mill Creek has a coldwater thermal regime and is known to support several fish species, including blacknose dace (*Rhinichthys atratulus*), bluntnose minnow (*Pimephales notatus*), brook stickleback (*Culaea inconstans*), central mudminnow (*Umbra limi*), common shiner (*Luxilus cornutus*), creek chub (*Semotilus atromaculatus*), fathead minnow (*Pimephales promelas*), rainbow darter (*Etheostoma caeruleum*), rock bass (*Ambloplites rupestris*), and white sucker (*Catostomus commersonii*) (MNRF 2021b). It also supports sensitive coldwater species such as brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis fontinalis*) (MNRF 2021b).

MNRF data indicate that Tributaries #1, #2, #3, and #4 have a coldwater thermal regime and support a similar fish community as recorded in the main branch of Mill Creek (MNRF 2021b). Small-bodied fish were observed in Tributary #3 during field surveys.

No MNRF data was available for Tributary #5 or Tributary #6. Because Tributary #5 is connected to Tributary #3 and no barriers were observed, Tributary #5 was assessed to have potential to support fish. No fish were observed in Tributary #6 during the survey and the tributary was assessed to have low potential to support fish due to the low flow / intermittent conditions.

Significant and Sensitive Species

All the fish species recorded in Mill Creek in the study area are considered secure and common in Ontario and globally (S5; G5). No fish SAR were assessed to have ranges that overlap the study area (Appendix D). Mill Creek and its tributaries support several coldwater fish species, including brown trout, that may be sensitive to thermal changes.

5.6.5 Other Wildlife

Three arthropods and four mammals (other than bats) were observed during field surveys conducted in the study area (Appendix E): cabbage white butterfly (*Pieris rapae*), ebony jewelwing (*Calopteryx maculata*), firefly, gray squirrel (*Sciurus carolinensis*), racoon (*Procyon lotor*), red squirrel (*Tamiasciurus hudsonicus*) and white-tailed deer (*Odocoileus virginianus*). Furbearer species, including muskrat (*Ondatra zibethicus*) and mink (*Neovison vison*), have also been recorded in the Mill Creek-Puslinch PSW off-site, within the study area (Coulson et al. 1984), although were not observed during field surveys.

The small pond in the southwest corner of the study area (Figure 2) is small and generally shallow with abundant leaf litter and sparse aquatic vegetation. The pond was assessed to have low potential to support turtles.

Flooded areas on either side of the driveway off-site, in the northwest corner of the study area (Figure 2) have created shallow marsh habitats characterized by dense cattail and duckweed with water up to 0.5 m in depth recorded in the early summer. These marshes, as well as Mill Creek off-site within the study area, may provide suitable aquatic habitat for turtle species such as painted turtle (*Chrysemys picta marginata*) and snapping turtle (*Chelydra serpentina*). Evidence of turtle nesting was observed along the driveway leading to the residential area (RES) in the northwest portion of the study area (Figure 2) during field surveys and was assessed likely to be from snapping turtle. There are occurrence records for both species in the vicinity of the study area (iNaturalist 2021) and snapping turtle is known to occur in the Mill Creek-Puslinch PSW (Coulson et al. 1984). Movement of turtles between habitat features in the study area is most likely to occur through Mill Creek-Puslinch PSW or along Mill Creek and its tributaries.

Although the study area is within the range of Blanding's turtle, no individuals were observed during the field surveys and there are no occurrence records within 9 km of the site (iNaturalist 2021; NHIC 2021; Ontario Nature 2021). However, the shallow marshes off-site, in the northwest corner of the study area and Mill Creek off-site within the study area exhibit characteristics (i.e., slow moving water, mucky bottom, high cover) preferred by Blanding's turtle. Any overland movement of Blanding's turtle from existing known populations to the study area is most likely to occur from the south, as Highway 401 to the north represents a significant movement barrier. There is a generally continuous forested corridor connecting several PSWs between the study area and occurrence records approximately 9 km to the south, including Valens Wetland Complex, Beverly Swamp Wetland Complex, and Sheffield Rockton Wetland Complex.

Mill Creek-Puslinch PSW has been identified as having regional significance as deer winter cover (Coulson et al. 1984).

Significant and Sensitive Species

All of the species observed during general wildlife surveys are secure and common in Ontario and globally (S5; G5) or SNA (not applicable – species is not a target for conservation) (Appendix E).

Snapping turtle, designated special concern under the ESA, has been recorded in the Mill Creek-Puslinch PSW (Coulson et al. 1984). Although no individuals were observed during field surveys, there was nesting activity off-site, within the study area, likely attributed to snapping turtle.

None of the other wildlife SAR with ranges that overlap the study area (Appendix D) were observed on the site or in the study area during field surveys.

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 Ecoregion 6E (MNRF 2015)

6.1 Habitat of Endangered or Threatened Species

General habitat protection is provided by the ESA to all threatened and endangered species. General habitat is defined as the area on which a species depends directly or indirectly to carry out life processes, including reproduction, rearing, hibernation, migration or feeding. 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. A habitat regulation outlines specific habitat features and associated buffers that are protected, and also specifies the geographic area(s) of the province where the habitat regulation applies. In some cases, a General Habitat Description (GHD) may also be prepared to help define and refine the area of protected habitat in advance of a habitat regulation.

Four species designated threatened or endangered under the ESA were observed during field surveys and assessed to have suitable habitat on the site and within the study area (Section 5.0): black ash, eastern small-footed myotis, little brown myotis and northern myotis. One additional species was assessed to have potential to occur off-site, within the study area, based on availability of potentially suitable habitat: tri-colored bat.

The County prohibits development or site alteration within significant habitat of endangered or threatened species except in accordance with provincial or federal requirements. Development or site alteration may be permitted adjacent to the habitat (i.e., within 120 m) where it is demonstrated there will be no adverse impacts on the habitat or its ecological function. Under the Growth Plan policies, expansions to existing mineral aggregate operations may be permitted within, and adjacent to, habitat of endangered or threatened species in accordance with provincial or federal requirements.

Little Brown Myotis and Northern Myotis

There is no habitat regulation or GHD for little brown myotis, or northern myotis and both species receive general habitat protection under the ESA. The provincial recovery strategy provides recommended criteria to be used in preparing a habitat regulation. For anthropogenic maternity roosting sites, habitat is best defined by the physical structure providing roosting habitat. For natural maternity roosting sites, habitat is best defined by the extent of the ELC community in which the roost, or potential roost, occurs.

The recovery strategy also recommends that foraging resources (e.g., woodlands, wetlands, waterbodies) within 2,400 m of the maternity roost site for little brown myotis and within 450 m of the maternity roost site for northern myotis be considered regulated habitat. Agricultural fields are not considered to be foraging habitat under these recommendations.

The barn and outbuildings off-site, in the northwest portion of the study area were assessed to have high potential to provide maternity roost habitat for little brown myotis, and moderate potential to provide maternity roost habitat

for northern myotis (Section 5.5.3.2). Two deciduous swamps off-site, in the north and south portions of the study area (i.e., SWD2-2, SWD6-2) were also assessed to have moderate potential to provide maternity roost habitat for both species (Section 5.5.3.1). Foraging resources within 2,400 m (little brown myotis) and 450 m (northern myotis) of the barn and deciduous swamps include Mill Creek and its tributaries (including Tributary #3 on the site), Mill Creek Puslinch PSW off-site to the north of Concession 2 and west of County Road 35, and ponds off-site to the east (Figure 3).

All potential maternity roost habitat is off-site and outside of the proposed extraction area and will not be directly impacted. The proposed extraction area will be set back 30 m from the PSW, and no adverse impacts to the hydrological or hydrogeological conditions sustaining the deciduous swamps or any off-site foraging habitat to the north and west (i.e., Mill Creek-Puslinch PSW, Mill Creek and its tributaries and other woodlands) are anticipated (Section 7.2). Tributary #3 is on site, but outside of the proposed extraction area. Minimal seasonal impacts to Tributary #3 are anticipated (Section 7.1), but this is not expected to impact the ability of the watercourse to provide foraging habitat for these bat species. Progressive and final rehabilitation of the site will also create suitable foraging habitat for the future. Further analysis is not warranted.

Eastern Small-footed Myotis

There is no habitat regulation or GHD for eastern small-footed myotis and it receives general habitat protection under the ESA. The provincial recovery strategy provides recommended criteria to be used in preparing a habitat regulation. For anthropogenic roosting sites, habitat is best defined by the physical structure providing roosting habitat and the airspace immediately surrounding the structure that permits unobstructed entry or exit to the roost. In addition, suitable foraging habitat (e.g., woodlands, wetlands, waterbodies) within 565 m of the roost should be considered part of the protected habitat. Agricultural fields are not considered to be foraging habitat under these recommendations.

The debris pile adjacent to Bat Station #2 off-site within the northwest portion of the study area (Figure 2) was assessed to have high potential to provide maternity roost habitat for eastern small-footed myotis. The barn and shed off-site, within the northwest portion of the study area, may also provide suitable roosting habitat for this species. Foraging resources within 565 m of the debris pile, barn and shed include Mill Creek and its tributaries (including Tributary #3 on the site) and Mill Creek Puslinch PSW off-site to the north of Concession 2 (Figure 3).

Potential maternity roost habitat is off-site and outside of the proposed extraction area and will not be directly impacted. The proposed extraction area will be set back 30 m from the PSW, and no adverse impacts to the hydrological or hydrogeological conditions sustaining the PSW or any off-site foraging habitat to the north and west (i.e., Mill Creek-Puslinch PSW, Mill Creek and its tributaries and other woodlands) are anticipated (Section 7.2). Tributary #3 is on site, but outside of the proposed extraction area. Minimal seasonal impacts to Tributary #3 are anticipated (Section 7.1), but this is not expected to impact the ability of the watercourse to provide foraging habitat for this bat species. Progressive and final rehabilitation of the site will create additional suitable foraging habitat for the future. Further analysis is not warranted.

Tri-colored Bat

There is no habitat regulation or GHD for tri-colored bat and it receives general habitat protection under the ESA. The provincial recovery strategy provides recommended criteria to be used in preparing a habitat regulation. For natural maternity roosting sites, habitat is best defined by the extent of the ELC community in which the roost, or potential roost, occurs. The recovery strategy also recommends that foraging resources (e.g., woodlands,

wetlands, waterbodies) within 920 m of the maternity roost site be considered regulated habitat. Agricultural fields are not considered to be foraging habitat under these recommendations.

Two deciduous swamps off-site, in the north and south portions of the study area (i.e., SWD2-2, SWD6-2) were assessed to have moderate potential to provide maternity roost habitat for tri-colored bat (Section 5.5.3.1). Foraging resources within 920 m of the deciduous swamps include Mill Creek and its tributaries (including Tributary #3 on the site), Mill Creek Puslinch PSW off-site to the north of Concession 2 and ponds off-site to the east (Figure 3).

All potential maternity roost habitat is off-site and outside of the proposed extraction area and will not be directly impacted. The proposed extraction area will be set back 30 m from the PSW, and no adverse impacts to the hydrological or hydrogeological conditions sustaining the deciduous swamp communities or any off-site foraging habitat to the north and west (i.e., Mill Creek-Puslinch PSW, Mill Creek and its tributaries and other woodlands) are anticipated (Section 7.2). Tributary #3 is on site, but outside of the proposed extraction area. Minimal seasonal impacts to Tributary #3 are anticipated (Section 7.1), but this is not expected to impact the ability of the watercourse to provide foraging habitat for this bat species. Progressive and final rehabilitation of the site will create suitable foraging habitat for the future. Further analysis is not warranted.

Black Ash

Black ash does not receive individual or habitat protections until January 25, 2024 (Ontario 2022). There is no habitat regulation or GHD for black ash.

Although black ash was observed in the thicket swamp (SWT2-1) at the north edge of the site, all individuals in this community were dead due to emerald ash borer. Therefore, no adverse impacts to black ash in this community are anticipated as a result of the proposed extraction.

Habitat for black ash also overlaps with the Mill Creek-Puslinch PSW located off-site, within the study area. The proposed extraction limit will be setback a minimum of 30 m from Mill Creek-Puslinch PSW and no direct impacts (i.e., loss of habitat) are expected. Further, no adverse impacts to the hydrologic or hydrogeologic functions sustaining the form of Mill Creek-Puslinch PSW are anticipated (Section 7.2). With the implementation of best management practices (Section 8.2.1) and mitigation measures (Section 8.2.2), no adverse impacts on black ash or its habitat contained within the PSW are expected due to the proposed extraction. Further analysis is not warranted.

6.2 Fish Habitat

Mill Creek and its tributaries on the site and within the study area support a coldwater fish community (Figure 3). Development is not permitted within or adjacent to (i.e., within 30 m) fish habitat except in accordance with provincial and federal requirements. Furthermore, County policies state that all streams are protected from development or site alteration that would result in adverse impacts to the feature or its ecological function (Wellington 2021).

Potential impacts to fish habitat are discussed in Section 7.1.

6.3 Significant Wetlands

Significant wetlands are areas identified as provincially significant using evaluation procedures established by the Province, as amended from time to time (MNRF 2022). Wetlands are assessed based on a range of criteria, including biology, hydrology, societal value, and special features.

There are no PSWs on the site. Off-site, Mill Creek-Puslinch PSW overlaps the south, east and northwest portions of the study area (Figure 1). Mill Creek-Puslinch PSW is a large wetland covering 1,422 ha with a catchment basin of approximately 94 km^2 and is composed primarily of swamp (95%) with a small amount of marsh (5%). Approximately 40% of the PSW is palustrine (i.e., has permanent or intermittent outflow) and 60% is riverine (i.e., located within or adjacent to a river or permanent stream). The PSW also has an approximately 50% split of mineral and organic soils (Coulson et al. 1984).

According to GRCA mapping (GRCA 2021) there are also six small unevaluated wetland patches in the agricultural field in the northeast and south-central portion of the site (Figure 4). Each of these mapped unevaluated wetland patches were assessed in the field by certified Ontario Wetland Evaluation System (OWES) assessors to confirm if they meet the definition of wetland as outlined in the PPS (Table 7).

Table 7: Field Assessment Summary of Mapped GRCA Unevaluated Wetlands

Unevaluated Wetland Patch	Field Assessment	Photo	Wetland (Y/N)
1	Confirmed to be alder thicket swamp (SWT2-1) inclusion, measuring approximately 0.2 ha in size.		Y
2	Confirmed to be thicket swamp (SWT2) inclusion measuring approximately 0.1 ha in size.		Y
3	Temporary ponding in depression of agricultural field. Planted through with crop.		N

Unevaluated Wetland Patch	Field Assessment	Photo	Wetland (Y/N)
4	Temporary ponding in depression of agricultural field. Planted through with crop.		N
5	Temporary ponding in depression of agricultural field. Planted through with crop.		N
6	Western portion assessed to be temporary ponding in low-lying area of agricultural field. This area was planted through with crop. Eastern portion confirmed to be a small marsh (MAS) measuring approx. 0.05 ha in size within a cultural meadow inclusion.	 Western portion  Eastern portion	Y (eastern portion)

Of the six mapped unevaluated wetland patches, three were confirmed to be wetlands based on the field assessment: #1, #2 and the eastern portion of #6. Unevaluated wetland patch #2 (i.e., SWT2) and the southern boundary of unevaluated wetland patch #1 (i.e., SWT2-1) are within the proposed extraction area. Unevaluated wetland patch #6 is outside of the extraction area.

According to OWES (MNRF 2022), wetland units smaller than 2 ha are not assessed for significance except where a qualified evaluator has determined the wetland provides important ecological benefit. Both unevaluated wetland patch #1 and #2 (i.e., SWT2-1, SWT2) are isolated features surrounded by active agricultural crop field and had a high level of disturbance. One endangered tree species, black ash, was observed in unevaluated wetland patch #1 (i.e., SWT2-1). However, all individuals were dead and no other significant habitat functions for fish or wildlife, and no SAR or rare wildlife species, were observed during field surveys that would warrant evaluation for significance. Similarly, no significant habitat functions for fish or wildlife, no SAR and no rare wildlife or plant species were observed during field surveys in unevaluated wetland patch #6 (i.e., MAS) that would warrant evaluation for significance. Unevaluated wetland patch #6 is currently separated from Mill Creek-Puslinch PSW by cultural meadow. None of the three unevaluated wetland patches #1, #2 or #6 were associated with surface water features.

Development and site alteration are not permitted within significant wetlands according to both the PPS and County. Development may be permitted adjacent to (i.e., within 120 m) significant wetlands where it is demonstrated there will be no adverse impacts to the feature or its ecological functions.

Unevaluated wetlands are considered both a KNHF and KHF under the Growth Plan. Although expansions to existing mineral aggregate operations may be permitted within KNHFs or KHFs and their vegetation protection zones, the expansion must be consistent with Policy 4.2.8.2 (b), which requires that any KNHF and KHF lost through extraction be replaced with an equivalent feature during rehabilitation and as early as possible in the life of the operation. The County generally provides protection for unevaluated wetlands and development that would seriously impair the future ecological functions of these wetlands is prohibited.

Potential impacts to significant wetlands are discussed in Section 7.2 and potential impacts to unevaluated wetlands are discussed in Section 7.3.

6.4 Significant Woodlands

Woodlands can vary in their level of significance at the local, regional, and provincial levels. Significant woodlands are areas which are ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to their contribution to the broader landscape because of their 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 2020). Guidelines for determining significance of woodlands are presented in the NHRM (MNR 2010). Significant woodlands may also be defined and designated by the local planning authority.

According to the County's OP (Wellington 2021), significant woodlands in the Rural System are defined as natural woodlands that are 4 ha or larger, or plantations over 10 ha in size. Significant woodlands are mapped broadly as part of the Greenlands system on Schedule A7 of the County's OP (Wellington 2021). There are no significant woodlands on the site.

Off-site, all of the forest and swamp communities delineated within the study area (i.e., SWD2-2, SWD5-1, SWD6- 2, SWM1-1, SWM, SWC, SWM, SWD, FOD5-6 and CUP3-2) are part of one large woodland feature (Figure 3) which is designated as part of the Greenlands system according to Schedule A7 of the County's OP. The majority of the woodland feature within the study area overlaps Mill Creek-Puslinch PSW.

The off-site woodland is also considered significant provincially for meeting the following criteria as outlined in the NHRM (MNR 2010):

- Size
- Interior forest habitat
- Proximity to other woodlands or habitats (i.e., fish habitat)
- Linkages
- Water protection
- Uncommon characteristics (i.e., possible old growth forest, habitat for restricted plant species, habitat for rare species or SAR)
- Social value

Significant woodlands are considered a KNHF of the Growth Plan. Although expansions to existing mineral aggregate operations may be permitted within KNHFs and their vegetation protection zones, the development must also be consistent with the policies of the PPS and conform to the County's OP. The entirety of the significant woodland off-site, within the study area, is part of the Mill Creek-Puslinch PSW and aggregate extraction is not permitted within this natural heritage feature type. Extraction may be permitted adjacent to (i.e., within 120 m) the PSW (and therefore the significant woodland) where it is demonstrated there will be no negative impacts to the feature or its ecological functions. The County also prohibits development within or adjacent to significant woodlands unless it is demonstrated there will be no negative impacts to the feature or its ecological function.

Potential impacts to significant woodlands are discussed in Section 7.2.

6.5 Significant Valleylands

General guidelines for determining significance of valleylands are presented in the NHRM (MNR 2010). Significant valleylands may also be defined and designated by the local planning authority.

The County does not define or map significant valleylands as part of the OP. Based on the criteria as outlined in the NHRM (MNR 2010), there are no significant valleylands, on the site or within the study area. Further analysis is not warranted.

6.6 Significant Areas of Natural and Scientific Interest

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

SWH is one of the more complicated natural heritage features to identify and evaluate. The NHRM (MNR 2010) includes criteria and guidelines for designating SWH. The SWHTG and the SWHMiST (MNR 2000 and MNRF 2014) can also be used to help decide what areas and features should be considered SWH. These documents were used as reference material for this study.

There are five general types of SWH: seasonal concentration areas, migration corridors, rare vegetation communities, specialized habitats, and habitat for species of conservation concern (SOCC). The specific habitats

considered in this report are evaluated based on the criteria outlined in the Ecoregion 6E Criterion Schedule (MNRF 2015).

SWH is considered a KNHF under the Growth Plan. Although expansions to existing mineral aggregate operations may be permitted within KNHFs and their vegetation protection zones, the development must also be consistent with the policies of the PPS and conform to the County's OP. According to the PPS, development is permitted within SWH where it is demonstrated there will be no negative impacts to the feature or its ecological functions. Similarly, the County permits development and site alteration within, or adjacent to (i.e., 120 m), SWH where it can be demonstrated there will be no adverse impacts to the feature or its ecological functions (Wellington 2021). However, where SWH overlaps the Mill Creek-Puslinch PSW, aggregate extraction is not permitted, and a setback of 30 m will be implemented (Section 6.3).

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 (MNR 2000) and Ecoregion 6E Criterion Schedule (MNRF 2015) identifies the following 12 types of seasonal concentrations of animals:

- winter deer yards and congregation areas
- colonial bird nesting sites
- waterfowl stopover and staging areas
- shorebird migratory stopover areas
- landbird migratory stopover areas
- raptor winter feeding and roosting areas
- reptile hibernacula
- turtle wintering areas
- bat hibernacula
- bat maternity colonies
- bat migratory stopover areas
- migratory butterfly stopover areas

There are no large, non-agricultural open fields in the study area to provide terrestrial waterfowl stopover or staging areas. No shorebird migratory or aquatic waterfowl stopover areas were identified in the study area during field surveys. There are no large areas of forest with adjacent meadow habitat in the study area to support raptor wintering areas. No exposed bedrock or rock piles that extend below the frost line that would support bat or reptile hibernacula were identified in the study area during field surveys. No colonial bird nesting sites were identified in the study area during field surveys. Because the study area is further than 5 km from Lake Ontario, migratory butterfly stopover areas and landbird migratory stopover areas are not applicable.

There is a designated deer wintering area that overlaps the Mill Creek-Puslinch PSW off-site in the north, west, east, and south portions of the study area (Figure 3).

The green ash deciduous swamp (SWD2-2) and silver maple deciduous swamp (SWD6-2) within Mill Creek-Puslinch PSW off-site, in the north and south portions of the study area (Figure 2) were assessed to have moderate potential to provide maternity roost habitat for tree roosting bats (Section 5.5.3.1).

The deer wintering area and candidate bat maternity roost habitat are located off-site and outside of the proposed extraction area and will not be directly impacted. The proposed extraction area will be set back 30 m from the PSW, and no adverse impacts to the hydrological or hydrogeological conditions sustaining the PSW are anticipated (Section 7.2). With the implementation of best management practices (Section 8.2.1) and mitigation measures (Section 8.2.2), no adverse impacts are expected due to the proposed extraction. Further analysis is not warranted.

6.7.2 Specialized Habitats

Specialized habitats are microhabitats that provide a critical resource to some groups of wildlife. Examples include salt licks for ungulates and groundwater seeps for wild turkeys.

The SWHTG (MNR 2000) and Ecoregion 6E Criterion Schedule (MNRF 2015) defines seven specialized habitats that may be considered SWH. They are:

- habitat for area-sensitive species
- amphibian breeding habitat (woodlands and wetlands)
- turtle nesting habitat
- specialized raptor nesting habitat
- waterfowl nesting areas
- bald eagle and osprey habitat
- seeps and springs

No bald eagle or osprey individuals, and no nests, were observed during field surveys. No specialized raptor nesting habitat was identified on the site or in the study area.

Although amphibian breeding was confirmed at two locations on the site and three locations off-site within the study area (Section 5.6.1), the breeding evidence threshold as defined in the Ecoregion 6E Criterion Schedule was not met to confirm these locations as SWH.

Although wood duck (*Aix sponsa*) and mallard (*Anas platyrhynchos*), two indicator species of waterfowl nesting area SWH, were observed during field surveys, the two small ponds off-site, within the southwest and north portions of the study area each measure less than 0.1 ha in size and are unlikely to support a large number of waterfowl. Furthermore, the threshold number of nesting pairs for the two indicator species was not met in order to confirm any areas of waterfowl nesting SWH. No suitable waterfowl nesting area habitat was identified on the site or within the study area.

Evidence of seeps and springs were observed in Tributary #3 on the site, Mill Creek and Tributary #1 off-site, within the study area (Section 5.5.4) and are likely present throughout the Mill Creek-Puslinch PSW off-site, within the study area, as well. Potential impacts to seeps and springs are discussed further in Sections 7.1 and 7.2.

The large woodland off-site, in the southern portion of the study area (consisting of SWD6-2, SWM1-1, SWM, SWD and FOD5-6 which are part of Mill Creek-Puslinch PSW) is contiguous with woodland to the south and contains approximately 7.4 ha of interior forest habitat (defined as forest at least 200 m from the edge) that may support area sensitive breeding bird species. Three indicator species were observed in this woodland habitat during breeding bird surveys: blue-headed vireo (*Vireo solitarius*), ovenbird (*Seiurus aurocapilla*), and veery (*Catharus fuscescens*). Ovenbird was assessed to be a probable breeder and blue-headed vireo and veery were assessed to be possible breeders in this woodland. The woodland/PSW is located off-site and outside of the proposed extraction area and will not be directly impacted. The proposed extraction area will also be set back 30 m from the woodland/PSW, and no adverse impacts to the hydrological or hydrogeological conditions sustaining the woodland/PSW are anticipated (Section 7.2). With the implementation of best management practices (Section 8.2.1) and mitigation measures (Section 8.2.2), no adverse impacts to habitat for area-sensitive species SWH are expected due to the proposed extraction. Further analysis is not warranted.

6.7.3 Animal Movement 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 Ecoregion 6E Criterion Schedule (MNRF 2015) defines two types of animal movement corridors that may be considered SWH:

- Amphibian movement corridors (if amphibian breeding habitat SWH is present)
- Deer movement corridors (if deer wintering area SWH is present)

There are no mapped movement corridors on the site or within the study area. Although no amphibian breeding habitat SWH was identified on site or in the study area (Section 6.7.2), amphibians were detected in the deciduous swamp that is part of Mill Creek-Puslinch PSW off-site, in the southern portion of the study area. As the habitats in the vicinity of this feature will not be impacted by the extraction, no impacts to amphibian movement corridors are anticipated.

A deer wintering area was identified off-site in the north, west, east, and south portions of the study area (Section 6.7.1; Figure 3). According to the Ecoregion 6E Criterion Schedule (MNRF 2015), corridors should be a minimum of 200 m wide and be unbroken by roads and residential areas. The deer wintering area extends up to Concession 2 to the north, County Rd 35 to the west and Sideroad 20 to the east (Figure 3). As such, deer movement corridors can only be assessed to the south of the study area. There is a cultural plantation and hedgerow immediately south of the deer wintering area that is likely to function as a deer movement corridor between the wintering area and the woodland immediately north of Concession 1 (Figure 3).

Due to the large size of the woodland habitat off-site, within the study area, it is more likely to function as core habitat (e.g., deer wintering area, interior forest habitat) rather than a movement corridor for general wildlife at the local scale. At a landscape scale, the woodland off-site, within the study area is part of a larger natural heritage system that extends northwards to Highway 401 (a major movement barrier), eastwards to Highway 6, westwards

to Cambridge and southwards towards Hamilton. This natural heritage system is likely to function as a regional movement corridor for wildlife. Overall, animal movement corridors around the site, in the study area, associated with the woodlands and the Mill Creek Puslinch Wetland Complex will be maintained during operations. Progressive rehabilitation will be ongoing and following final rehabilitation, the site will serve to enhance and offer additional connections with the off-site habitats/corridors. It is expected that the slight increase in traffic along Concession Road 2 will not translate to a significant increase in wildlife road mortalities.

The potential regional movement corridor is located over 600 m to the south of the extraction limit and no direct or indirect impacts (e.g., noise) are anticipated that would affect the form or function of the potential corridor (Section 7.2). Further analysis is not warranted.

6.7.4 Rare Habitat

This category includes vegetation communities that are considered rare in the province. Generally, communities assigned an SRANK of S1 to S3 (extremely rare to rare-uncommon) by the NHIC could qualify. It is assumed that these habitats are at risk and that they are also more likely to support rare species and other features that are considered significant.

No rare vegetation communities were identified on the site or in the study area during the field surveys. No further analysis is warranted.

6.7.5 Habitat for Species of Conservation Concern

Species that are considered SOCC include 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
- 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.

The SWHTG (MNR 2000) and Ecoregion 6E Criterion Schedule (MNRF 2015) defines five specialized habitats for SOCC that may be considered SWH. They are:

- marsh bird breeding habitat
- open country bird breeding habitat
- shrub/early successional bird breeding habitat
- terrestrial crayfish

- special concern and rare wildlife species

No marsh, open country or shrub/early successional bird breeding habitat was identified on the site or in the study area during field surveys. No habitat for terrestrial crayfish was identified on the site or in the study area during field surveys.

As discussed in Section 5, two special concern species (barn swallow and eastern wood-pewee) were observed on the site or within the study area during field surveys. Although not directly observed, evidence of another special concern species (snapping turtle) was also observed off-site within the study area during field surveys.

Four additional special concern or rare wildlife species were assessed to have moderate potential to occur on the site or within the study area based on availability of potential suitable habitat (Appendix D): monarch (*Danaus plexippus*), black dash (*Euphyes conspicua*), yellow-banded bumble bee (*Bombus terricola*), eastern ribbonsnake (*Thamnophis sauritius*).

Habitat or potential habitat for eastern wood-pewee snapping turtle and eastern ribbonsnake overlaps with the Mill Creek-Puslinch PSW located off-site, within the study area. The proposed extraction limit will be setback a minimum of 30 m from Mill Creek-Puslinch PSW and no direct impacts (i.e., loss of habitat) are expected. Further, no adverse impacts to the hydrologic or hydrogeologic functions sustaining the form of Mill Creek-Puslinch PSW are anticipated (Section 7.2). With the implementation of best management practices (Section 8.2.1) and mitigation measures (Section 8.2.2), no adverse impacts on habitat for SOCC contained within the PSW are expected due to the proposed extraction. Further analysis is not warranted.

Barn swallow was observed flying over the site during field surveys and barn swallow nests were observed in the barn off-site, in the northwest portion of the study area. The agricultural fields on the site within 200 m of the barn (Figure 2) may also provide suitable foraging habitat for barn swallow. The barn is located outside of the proposed licensed and extraction area and is not expected to be removed and no adverse impacts to nesting habitat is anticipated. The agricultural field to the north of Tributary #3 on site will be retained and continue to provide foraging habitat. Progressive and final rehabilitation of the site will create suitable foraging habitat for the future. There is also additional suitable foraging habitat (i.e., open agricultural fields and open water) for barn swallow within 1 km of the site to the northwest, south, east, and northeast (Figure 2). No adverse impacts to barn swallow are anticipated as a result of the proposed extraction. Further analysis is not warranted.

Field edges, roadsides and riparian habitats on the site and in the study area may provide suitable habitat for monarch, yellow-banded bumble bee and black dash. Minimal habitat contained within field edges and roadsides on the site will be removed as part of the proposed extraction. The majority of riparian habitat is off-site and outside of the extraction area and is not expected to be directly or indirectly impacted (Section 7.1 and 7.2). Riparian habitat along Tributary #3 in the northwest portion of the site will also be enhanced as part of progressive and final rehabilitation, which may improve local habitat conditions. The agricultural field to the north of Tributary #3 on site will also be retained and continue to provide habitat, and there is additional suitable habitat (i.e., field edges, cultural meadow, and riparian habitat) within 1 km of the site to the north, south, east, and west (Figure 2). No adverse impacts to the regional populations of monarch, yellow-banded bumble bee and black dash are expected. Further analysis is not warranted.

6.8 Core Greenlands Area

The majority of the site is designated as Core Greenlands by the County, excluding the agricultural fields northeast and southwest of the residential property which are designated as Greenlands (Figure 2). The Core

Greenlands designation includes PSWs, all other wetlands, habitat of endangered or threatened species, fish habitat and hazardous lands. However, the OP also states that Greenland System mapping may need to be refined by more detailed mapping for individual sites.

Discussion related to Core Greenlands features including PSWs, other wetlands, habitat of endangered or threatened species and fish habitat is provided in Sections 6.1 – 6.4.

The agricultural fields in the east portion of the site are mapped as part of the Core Greenlands area. These fields are actively planted and harvested for crop production (i.e., corn and wheat at the time of field investigations). According to GRCA mapping (GRCA 2021) the agricultural fields are mapped as part of the Mill Creek floodplain and are included as part of the Core Greenlands mapping for being hazardous lands. Development is generally to be directed away from hazardous lands where conditions would pose a risk to public health and safety or property (Wellington 2018). As previously discussed (Section 5.4), the flood storage function provided by these agricultural fields will be replaced by the pond that will be created as part of the proposed extraction. Further, the pit pond is expected to provide additional storage for water to prevent increased flooding downstream of the site.

As part of progressive and final rehabilitation the habitat structure and function, ecosystem function and services, and biodiversity in this area will be increased and/or enhanced (Section 8.1).

Because flood storage function will be retained on site and the overall function of the area is expected to be improved as part of progressive and final rehabilitation, no increase in risk to public health and safety or property is expected due to the proposed extraction.

7.0 IMPACT ANALYSIS

7.1 Fish Habitat

Mill Creek

Aggregate extraction will initially begin above the water table in the west-central portion of the extraction area and proceed westward towards the western edge. Aggregate extraction by dragline will then begin below the water table in the westernmost part of the extraction area and proceed in an easterly direction. Above water table and below water table extraction will then proceed generally concurrently in an eastward direction until aggregate extraction has been completed, creating ponding conditions effectively throughout the operational period.

Aggregate extraction will result in a gradual drawdown of the water table at the site boundary of up to 2.5 m. Water table drawdown along Mill Creek during the final three years of extraction will be in the range of 1 to 2 m. Baseflow contributions from groundwater to Mill Creek observed at surface water monitoring station SW-3 (at the south boundary of the site) will be reduced by 1.7% due to some groundwater volume replacing the aggregate that will be extracted.

Post-rehabilitation, there will be a localized flattening of the water table due to the formation of the pit pond. The water table will be lowered by approximately 0.8 m at the northeastern extent of the pond, and will increase by approximately 0.65 m at the southwestern extent of the pond. Baseflow contributions from groundwater to Mill Creek observed at SW-3 will be reduced by 2% due to the evaporation of water from the pond. Groundwater levels around the rehabilitated pond are predicted to exhibit less seasonal variability, resulting in smaller seasonal fluctuations in baseflow in comparison to existing conditions. This reduced variability is expected to lead to higher baseflow during dry periods, and lower baseflow during wet periods of the season. This is likely to benefit the

aquatic ecology of Mill Creek by providing a more consistent baseflow throughout the year and maintaining habitat.

The water balance assessment (WSP 2023) determined that overall, there will be a decrease in water surplus of 9.9% per year for the site under operational conditions. Rehabilitated conditions are expected to have a decrease in surplus of 10% compared to existing conditions. Runoff volumes to Mill Creek are expected to decline, however, baseflow to Mill Creek is expected to slightly increase as a result of the increase in infiltration from the rehabilitated pond. This change from site runoff to infiltration is expected to decrease peak runoff flows from the site while at the same time moderating the magnitude of baseflow fluctuations at nearby receptors.

The change in the temperature of groundwater reporting to Mill Creek is predicted to be less than 1°C. No negative impacts on coldwater fish habitat in Mill Creek are anticipated.

Tributary #3

The proposed extraction will reduce the amount of runoff contributing to Tributary #3 by reducing its existing catchment area. This runoff will flow towards the pit, ultimately reporting to Mill Creek as baseflow. Therefore, Tributary #3 will face a loss of runoff and potential infiltration due to the extraction pit.

Localized groundwater drawdown during operations is expected to result in a temporary reduction in baseflow to Tributary #3 during operations by approximately 29%. Based on over four years of baseline monitoring between 2018 and 2022 as part of the water assessment (WSP 2023), Tributary #3 was characterized as a perennial water feature with pooling at certain times of the year. During this monitoring period, Tributary #3 was recorded as being completely dry on four occasions during the summers of 2018, 2020, 2021 and 2022. Drawdown associated with the proposed extraction is expected to extend this seasonally dry period in Tributary #3 during operations, but will not result in permanent drying. No specialized habitats (e.g., spawning) were identified in Tributary #3.

Groundwater modelling indicates that once the rehabilitated condition is reached, baseflow changes along Tributary #3 will vary from an increase of up to 1% in some areas to a decrease of 7.5% in other areas, primarily due to localized water table flattening. Seasonal fluctuations in baseflow are expected to be lower in magnitude than those observed under current existing conditions, which may lead to higher baseflow during dry periods, and lower baseflow during wet periods of the season during post-rehabilitation. This is likely to benefit the aquatic ecology of Tributary #3 by providing a more consistent baseflow throughout the year and maintaining habitat.

The change in the temperature of groundwater reporting to Tributary #3 is predicted to be less than 1 °C. No negative impacts on coldwater fish habitat in Tributary #3 are anticipated.

Overall, although the contributions from the site are changing, no adverse impacts are predicted to Mill Creek or the majority of its tributaries within the study area as a result of changes in water resources. Because changes to the baseflow of Tributary #3 are expected, a DFO Request for Review will be required for the Project. Under the Aggregate Resources of Ontario Provincial Standards, the ARA application will also be circulated to the DFO for review. Potential impacts to Tributary #3, including ecological functions, will be addressed through the DFO Request for Review process and will also conform to County OP policies.

7.2 Significant Wetlands and Significant Woodlands

Because all areas of significant woodland within the study area are also part of the Mill Creek-Puslinch PSW, the impact assessment for these two features have been combined.

Mill Creek-Puslinch PSW and the significant woodland are located off-site and outside of the proposed extraction limit and no direct impacts to the features are anticipated. A vegetation protection zone (i.e., setback) is required to prevent adverse indirect impacts to Mill Creek-Puslinch PSW and significant woodland. Setbacks should be of a sufficient distance to protect wetland form and functions (e.g., hydrological, hydrogeological, wildlife habitat) and woodland form and functions (e.g., hydrological, hydrogeological) from potential development impacts, including direct removal, edge effects, and screening of human disturbances (e.g., noise, light) (Beacon 2012). The proposed extraction limit will be setback 30 m from Mill Creek-Puslinch PSW and significant woodland and is considered sufficient to avoid adverse impacts to the form and function of the PSW (Figure 2).

The 30 m setback, as measured from the dripline of Mill Creek-Puslinch PSW / significant woodland, is expected to be sufficient to protect the woodland root zone. Municipalities such as the City of Toronto (Toronto 2016), City of Guelph (Guelph 2019) and Centre Wellington (Centre Wellington 2018) recommend minimum tree protection distances based on the tree DBH, which can extend up to 6 m from the tree trunk for trees measuring up to 100 cm DBH. Larger protection distances are recommended for woodland or ravine features where the combined root network may be larger. Protection distances for woodland or ravine features may extend up to 12 m from the outside of the tree trunk for trees measuring up to 100 cm DBH (Toronto 2016; Guelph 2019). The significant woodland on the site is composed of large, mature trees generally measuring between 30 cm and 50 cm DBH, with some larger individuals. The proposed 30 m setback is greater than the minimum protection distance recommended by municipalities and is consistent with the minimum distance recommended by the Growth Plan.

Because berms may be proposed within the 30 m setback area, the critical root zone for the woodland was also evaluated. The critical root zone is the area where the majority of root fibres are located. Disturbance in this area may impact the survival of the tree. The critical root zone, as defined by the International Society of Arboriculture, is equal to a 1 ft radius from the tree trunk for each inch of tree DBH (i.e., 0.3 m radius for each 2.5 cm) (PNWISA 2021). Similarly, the City of Ottawa recommends a 10 cm radius for each 1 cm DBH (Ottawa 2021). For trees measuring between 30 cm and 50 cm DBH, the critical root zone would be from 3 m up to 6 m from the tree trunk. Based on this calculation, any berms located within the 30 m setback area will be located a minimum of 5 m from the dripline of the woodland.

The majority of the 30 m setback will be reforested as part of the rehabilitation plan. A minimum of 70% of the planted species will consist of coniferous species which are more effective at dampening anthropogenic noise. This will ultimately result in a vegetated buffer that will provide increased protection of the wetland form and function compared to a unvegetated or sparsely vegetated buffer. The similarity in structure between Mill Creek-Puslinch PSW / significant woodland and the reforestation area will create a soft edge at the interface, which will be an ecological improvement over the hard edge that currently exists between the interface of Mill Creek-Puslinch PSW / significant woodland and the adjacent agricultural crop field (MNR 2011b).

Baseline conditions indicate that Mill Creek-Puslinch PSW / significant woodland currently has a very high composition of native species (Section 5.5.) and this biological integrity should be protected during and post-extraction. The soft edge transition zone between the PSW / significant woodland and reforestation area will help mitigate potential for invasive species migration into the core of the feature. Cadenasso and Pickett (2001) demonstrated that a thinned/sparsely vegetated or “open” edge allowed for higher volume of seed dispersal as well as further distance of dispersal into the forest interior compared to an intact or “vegetated” edge.

As discussed above, no changes to the form of Mill Creek-Puslinch PSW / significant woodland are anticipated. The proposed 30 m setback is also expected to be sufficient to maintain or enhance existing wildlife habitat functions (e.g., deer wintering area, interior forest habitat, potential bat roosting habitat).

Flood storage function provided by Mill Creek-Puslinch PSW is not expected to be impacted as no removal of wetland is proposed. As previously discussed, (Sections 5.4 and 6.8), the pond created by the proposed extraction is expected to replace the existing flood storage function provided by adjacent agricultural fields and is expected to provide additional storage for water to prevent increased flooding downstream of the site.

Mill Creek-Puslinch PSW is currently supported by groundwater and surface water inputs from the surrounding area to maintain its hydroperiod. While aggregate extraction will result in decreased runoff to these wetland areas, the potential impact to the Mill Creek-Puslinch PSW due to reduced runoff are expected to be mitigated by the infiltration surplus from the rehabilitated pit.

South of the proposed extraction area Mill Creek is believed to act as an indicator of water levels in Mill Creek-Puslinch PSW. During operations, there is expected to be a 1.7% reduction of baseflow to the PSW as a result of the groundwater volume replacing the aggregate that will be extracted. However, the majority of the catchment area for this portion of the PSW is located east of Mill Creek. Groundwater drawdown is not expected to extend east of the creek. Therefore, the majority of existing baseflow contributions to the PSW will continue unaltered throughout operations. Post-rehabilitation, baseflow to the PSW is predicted to show a net gain in groundwater discharge of up to 489 mm/yr south of the extraction area as a result of water table flattening and the formation of the pit pond. Groundwater levels in the southwest corner of the study area are also expected to increase post-rehabilitation due to the formation of the pit pond. Therefore, no significant change in available water to the Mill Creek-Puslinch PSW south of the proposed extraction area is predicted (WSP 2023).

To the north of the proposed extraction area, Tributary #3 is believed to act as an indicator of water levels in Mill Creek-Puslinch PSW (i.e., SWD2-2 communities; Figure 2). Surface runoff to Tributary #3 is not expected to change significantly as a result of the proposed extraction. However, the pit pond is expected to decrease the shallow groundwater levels in this area. This may temporarily affect the hydroperiod in Mill Creek-Puslinch PSW off-site at the north end of the study area (WSP 2023). Post-rehabilitation, the portion of PSW north of the extraction area is predicted to show a net decrease in groundwater discharge of up to 173 mm/yr north of the extraction area. The plant community characterizing Mill Creek-Puslinch PSW in this area (i.e., SWD2-2) is dominated by species with a coefficient of wetness of -3 (Appendix C), which are known as facultative wetland species. Facultative wetland species usually occur in wetlands but are occasionally found in non-wetlands (Oldham et al.1995). As such, the plant community is likely to be tolerant of these short-term fluctuations. Toronto and Region Conservation Authority (TRCA) has assessed SWD2-2 plant communities to be tolerant of hydrological changes (TRCA 2017). Further, due to the effects of emerald ash borer, a large portion of the canopy cover has already died off. This has created an open canopy and increased exposure of the understory and ground layer to sunlight. As a result, it is likely that this community will ultimately transition from a swamp to a swamp thicket or meadow marsh community under existing conditions. As discussed in Section 5.5.2, the community already contains meadow marsh inclusions. These community types are also assessed to be tolerant of up to moderate hydrological changes (TRCA 2017). Given that surface runoff to the PSW is not expected to change, the existing wetland community has a certain level of resilience based on the existing species composition, and the existing wetland community is likely already in a state of transition, no residual adverse impacts to Mill Creek-Puslinch PSW as a result of the proposed extraction are anticipated.

Overall, the proposed extraction is not predicted to have adverse impacts on the local surface water hydrology of Mill Creek-Puslinch PSW, via land use changes, surface water drainage alterations and / or pit operation. The runoff lost from downsizing of the catchments will largely be offset by water directed to the rehabilitated pond, most of which will report to Mill Creek-Puslinch PSW as baseflow.

With the implementation of best management practices (Section 8.2.1) and mitigation measures (Section 8.2.2), no adverse impacts on Mill Creek-Puslinch PSW / significant woodland are expected due to the proposed extraction. Further analysis is not warranted.

7.3 Non-Significant Wetlands

Approximately 0.3 ha of thicket swamp inclusion wetland habitat (i.e., SWT2 and SWT2-1) in the northeast corner of the site is expected to be removed as part of the proposed extraction. The marsh inclusion (CUM/MAS) in the southcentral portion of the site is located outside of the extraction limit and is not expected to be directly impacted. In accordance with the Growth Plan, the 0.3 ha loss of non-significant wetland habitat, which is considered a KNHF, will be replaced through progressive rehabilitation (Section 8.1).

7.4 Cumulative Effects

Since aggregate extraction is a temporary land use, the site will undergo progressive rehabilitation and will be returned to natural cover and wildlife habitats post-extraction. As such no natural environment cumulative effects are expected.

A cumulative effects assessment in terms of water, completed for the proposed pit operation on the Aberfoyle South Pit Expansion, consisted of an initial on-site assessment, and assessment of local scale cumulative effects, and an assessment of Subwatershed/Watershed scale cumulative effects, as per the guidance provided in GRCA (2010). Based on this assessment, there are no cumulative effects predicted for water resources locally or within in the Mill Creek subwatershed as a result of below water sand and gravel extraction at the proposed Aberfoyle South Pit Expansion Project Site. This assessment is consistent with previous cumulative effects assessments carried out in the Mill Creek Subwatershed by others.

8.0 REHABILITATION / MITIGATION / MONITORING

8.1 Rehabilitation Concept

The post-extraction rehabilitation plan has been designed to fit into the overall regional context and complement the existing topography and terrestrial and aquatic features in the area as well as provide linkages to the rehabilitation plans of adjacent and other CBM operations in the region, thereby providing an overall benefit for the area (Figure 5). The design of the rehabilitation plan has also considered the following:

- Potential to increase biodiversity of the site post-extraction (aligns with Ontario's Biodiversity Strategy [OBD 2011])
- Potential to align with local restoration or rehabilitation targets and objectives, where feasible
- Potential to improve and/or enhance habitat connectivity across the site
- Potential to create habitat features to support the existing local wildlife community and/or attract additional wildlife and increase productivity

Because the extraction is below-water, the overall final rehabilitation plan will consist of a pond surrounded by nearshore, riparian, and upland habitats. To be consistent with the rehabilitation policies of the Growth Plan for the Greater Golden Horseshoe, a minimum of 35% of the non-aquatic portion of the licence boundary will be rehabilitated to forest cover. Proposed rehabilitation of the extraction area will proceed progressively through each phase.

The proposed final rehabilitation plan includes the creation of a pond with an irregular shoreline, wetlands and terrestrial habitats comprised of backfilled areas, overburden slopes, and terrestrial nodal plantings. Shallow shoreline widths and depths in the pond will be varied to promote maximum diversity within the habitat for fish and wildlife. The natural influx of external organic matter (i.e., leaf litter) will be promoted along shoreline areas through management of forest edges and minimization of cleared areas between the extraction area and Mill Creek-Puslinch PSW to the south.

Plantings (i.e., nodal plantings) included in the rehabilitation plan should focus on locally native, non-invasive species that create habitat in the short term and promote natural succession processes. Aquatic plants will include shrubs such as red-osier dogwood (*Cornus sericea*) and slender willow (*Salix petiolaris*), and herbaceous plants such as water plantain (*Alisma plantago-aquatica*), lake sedge (*Carex lacustris*), swamp milkweed (*Asclepias incarnata*), softstem bulrush (*Schoenoplectus tabernaemontani*), and common cattail (*Typha* spp.). Shallow emergent marsh vegetation (i.e., herbaceous species listed above) will be planted in water ±0.15 m deep and be interspersed with cover structures (e.g., boulders and root wads) areas along the shoreline. Basking logs, nesting platforms and boxes will be created for turtle, waterfowl, and swallows respectively.

Above-water side slopes will be rough graded to a 3:1 aspect to ensure stability. The slopes will be seeded with a mix of grasses and legumes consisting of native, non-invasive species. The setback area and slope of the above-ground extraction area will be planted with a higher density of trees to achieve the 35% minimum forest cover in accordance with the Growth Plan and create a transitional zone between the adjacent Mill Creek-Puslinch PSW and the rehabilitated pit. This transitional zone will also increase overall woodland cover, improve the buffer to Mill Creek-Puslinch PSW and Mill Creek, enhance the existing wildlife movement corridor and enhance ecological conditions of the significant valleyland. To facilitate a natural connection with the existing wetland, plantings should include species characteristic of the Mill Creek-Puslinch PSW as well as a transitional upland / wetland interface, and that are suited to the planting conditions (i.e., soil texture and moisture). It is further recommended that a minimum of 70% of the planted trees consist of coniferous species. Species planted on the slope and in the setback area may include white cedar, white spruce (*Picea glauca*), sugar maple, red maple, white birch, and American basswood on the north-facing slope (which is expected to be cooler and more moist), and white pine, white cedar, Norway spruce (*Picea abies*), European larch (*Larix decidua*), trembling aspen, and balsam poplar on the south, east and west-facing slopes. Shrubs such as serviceberry, nannyberry, ninebark (*Physocarpus opulifolius*), dogwoods, highbush cranberry (*Viburnum opulus*), elderberry, choke cherry (*Prunus virginiana*), chokeberry, willows and others may be used to add diversity and increase pollinator/wildlife diversity, particularly in the transition between wetland and upland areas.

Wetlands will be created in the setback areas to a depth of ±0.15 -1.0 m deep, and will include the placement of organic material, topsoil, substrates and cover materials. Aquatic vegetation and cover will be included to create and promote habitat for amphibian breeding and for other aquatic organisms. The wetlands will also have varying depths, with shallow shoreline areas of planted emergent herbaceous vegetation, and deeper pool areas.

As part of progressive rehabilitation, setback areas will be planted with nodal planting cells and two rows of trees will be planted along the Concession 2 Road frontage. The new wetland areas shall be created in accordance with the Wetland Area Detail shown on Figure 5. The wetlands shall be created prior to the removal of the non-PSW in Phase 4 associated with extraction and berm construction to comply with the Growth Plan directive to rehabilitate as early as possible in the life of the operation.

8.2 Mitigation

8.2.1 General Best Management Practices

Standard Best Management Practices to be followed during site preparation and operations to mitigate damage to the adjacent natural features include the following:

- Clearly demarcate and maintain recommended setbacks on the site plan.
- To comply with the MBCA, avoid removal of vegetation during the active season for breeding birds (April 15 – August 15), unless construction disturbance is preceded by a nesting survey conducted by a qualified biologist. If any active nests are found during the nesting survey, a buffer will be installed around the nest to protect against disturbance. Vegetation within the protection buffer cannot be removed until the young have fledged the nest.

8.2.2 Significant Wetland and Woodland

The following mitigation measures are recommended to minimize adverse indirect impacts on the adjacent significant wetland and significant woodland (i.e., Mill Creek-Puslinch PSW):

- Implement a 30 m setback from Mill Creek-Puslinch PSW / significant woodland
- If gradients indicate there is potential for runoff to enter Mill Creek-Puslinch PSW, implementation of sediment and erosion controls will occur prior to commencement of operations to prevent the runoff of suspended solids into Mill Creek-Puslinch PSW. In particular, in such areas where potential runoff exists, silt fencing (or similar) will be installed along the dripline of Mill Creek-Puslinch PSW in those areas prior to commencement of activities within 30 m of Mill Creek-Puslinch PSW, including site preparation and vegetation clearing. The sediment and erosion control measures will be actively monitored and maintained for the duration of the proposed operations. Following rehabilitation of the areas adjacent to the PSW, the control measures will be removed.
- Where installed, silt fencing will be maintained for the duration of the operations phase adjacent to Mill Creek-Puslinch PSW and will include regular inspections for signs of damage or deterioration.
- Following rehabilitation adjacent to Mill Creek-Puslinch PSW, any silt fencing or other erosion/sediment controls that had been installed, will be removed from the site.
- To avoid compacting the soil in the setback area (which can negatively impact tree roots) the use of heavy machinery should be minimized within 5 m of the dripline (where potential for root damage is most likely), particularly during wet periods (e.g., spring) when soil may already be saturated.
- Any berms located within the 30 m setback area must be located a minimum of 5 m from the dripline of the woodland to protect the critical root zone for the woodland.
- A minimum 35% of the non-aquatic portion of the licensed area will be rehabilitation to forest cover.

8.2.3 Fish Habitat

- A DFO Request for Review will be submitted for Tributary #3.
- All requirements identified by DFO will be implemented.

8.2.4 Non-significant Wetlands

- Replace 0.3 ha of wetland habitat as part of progressive rehabilitation.

8.3 Monitoring

Monitoring as recommended in the Water Report Level 1/2 (WSP 2023) will be implemented for the proposed extraction.

9.0 SUMMARY AND RECOMMENDATIONS

The proposed expansion of the existing CBM Aberfoyle South Pit Expansion has been assessed for potential ecological impacts under the ARA Provincial Standards (Section 2.1), the Provincial Policy Statement (Section 2.2), Growth Plan for the Greater Golden Horseshoe (Section 2.6), policies of the Township of Puslinch (Section 2.7) and County of Wellington (Section 2.8), as well as other relevant legislation, including the *Fisheries Act* (Section 2.3), MBCA (Section 2.4) and ESA (Section 2.5).

Based on these analyses, potential temporary impacts to perennial fish habitat within Tributary #3 on site may occur as a result of the proposed extraction. Mitigation and permitting requirement will be confirmed through consultation with DFO through the Request for Review process. No other negative impacts to the significant natural features and functions in the study area are expected. In addition, an ecologically based rehabilitation plan and preventive mitigation measures that will enhance the natural heritage system have been developed. These conclusions are based on the following recommendations:

- Sediment/erosion controls will be implemented adjacent to natural features during site preparation and as needed during operations, as required
- Mitigation as described in Section 8.2 will be implemented
- Monitoring as described in the Water Report Level 1/2 will be implemented
- Standard Best Management Practices to control noise and dust impacts on adjacent natural features will be implemented
- The site will be rehabilitated in accordance with the requirements of the rehabilitation plan developed with ecological concepts from this report

10.0 LIMITATIONS

This report was prepared for the exclusive use of CBM Aggregates, a division of St. Marys Cement (Canada). The report, which specifically includes all tables, figures, and appendices, is based on data and information collected by WSP Canada Inc. and is based solely on the conditions of the properties at the time of the work, supplemented by historical information and data obtained by WSP Canada Inc. as described in this report.

WSP Canada Inc. has relied in good faith on all information provided and does not accept responsibility for any deficiency, misstatements, or inaccuracies contained in the report as a result of omissions, misinterpretation, or fraudulent acts of the persons contacted or errors or omissions in the reviewed documentation.

The services performed, as described in this report, were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. WSP Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, WSP Canada Inc. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

11.0 CLOSURE

We trust this report meets your current needs. If you have any further questions regarding this report, please contact the undersigned. Curriculum Vitae are provided in Appendix G.

Signature Page

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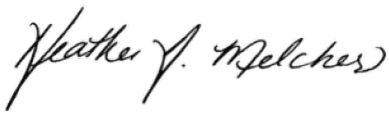

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https://golderassociates.sharepoint.com/sites/21291g/deliverables/natural environment report/final/1791470-r-revd-aberfoyle south ner-24oct2023.docx

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FIGURES

DUFFERIN AGGREGATE
MILL CREEK PIT

CONCESSION ROAD 2

CONCESSION ROAD 2

Mill Creek

Tributary 2

Tributary 3

Tributary 5

Tributary 4

Tributary 1

Mill Creek

Mill Creek

MILL CREEK
PUSLINCH
WETLAND COMPLEX

SIDEROAD 20 SOUTH

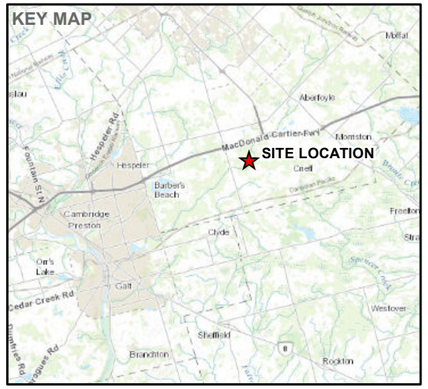
FAIRCHILD CREEK
HEADWATERS
WETLAND COMPLEX

CBM
(AQU

LEGEND

- WATERCOURSE
- ROAD
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA
- STUDY AREA
- WOODED AREA
- WATERBODY

KEY MAP



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3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH PIT EXPANSION - NATURAL ENVIRONMENT REPORT

TITLE
SITE LOCATION PLAN

CONSULTANT
wsp

YYYY-MM-DD	2023-10-31
DESIGNED	ST
PREPARED	CGE/SO
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
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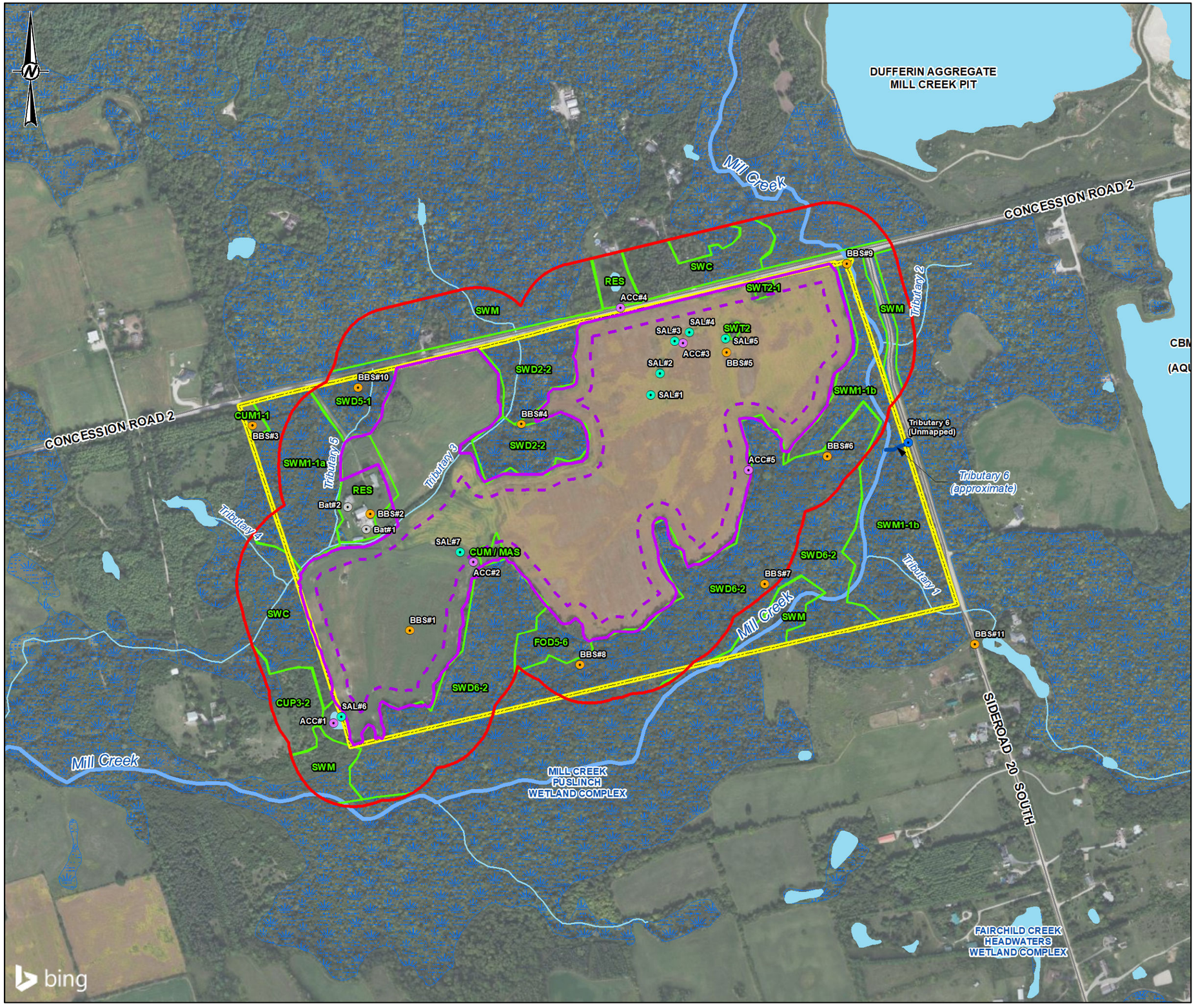

LEGEND

SURVEY STATION LOCATION

- AMPHIBIAN EGG MASS SURVEY STATION
- ANURAN CALL COUNT SURVEY STATION
- BAT DETECTOR SURVEY STATION
- BREEDING BIRD SURVEY STATION
- UNMAPPED TRIBUTARY LOCATION
- UNMAPPED WATERCOURSE
- WATERCOURSE
- ROAD
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- WATERBODY
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA
- STUDY AREA
- ELC BOUNDARY

ELC Code	Description
CUM	Cultural Meadow
CUM / MAS	Cultural Meadow / Marsh Inclusion
CUM1-1	Goldenrod Forb Meadow
FOD	Deciduous Forest
FOD5-6	Sugar Maple-Basswood Deciduous Forest
CUP3	Pine Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
SWD	Deciduous Swamp
SWD2-2	Green Ash Deciduous Swamp
SWD5-1	Black Ash Deciduous Swamp
SWD6-2	Silver Maple Deciduous Swamp
SWM	Mixed Swamp
SWM1-1	White Cedar – Hardwood Mixed Swamp
SWC	Coniferous Swamp
SWT2	Thicket Swamp
SWT2-1	Alder Thicket Swamp
RES	Residential
OAGM	Agricultural Crop Field

0 100 200 300 400

1:7,500 METRES

REFERENCE(S)

1. BASEDATA: MNRF LIO, OBTAINED 2019
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3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT

CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT

ABERFOYLE SOUTH PIT EXPANSION - NATURAL ENVIRONMENT REPORT

TITLE

ECOLOGICAL LAND CLASSIFICATION AND SURVEY STATIONS

CONSULTANT

wsp

YYYY-MM-DD	2023-10-31
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APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
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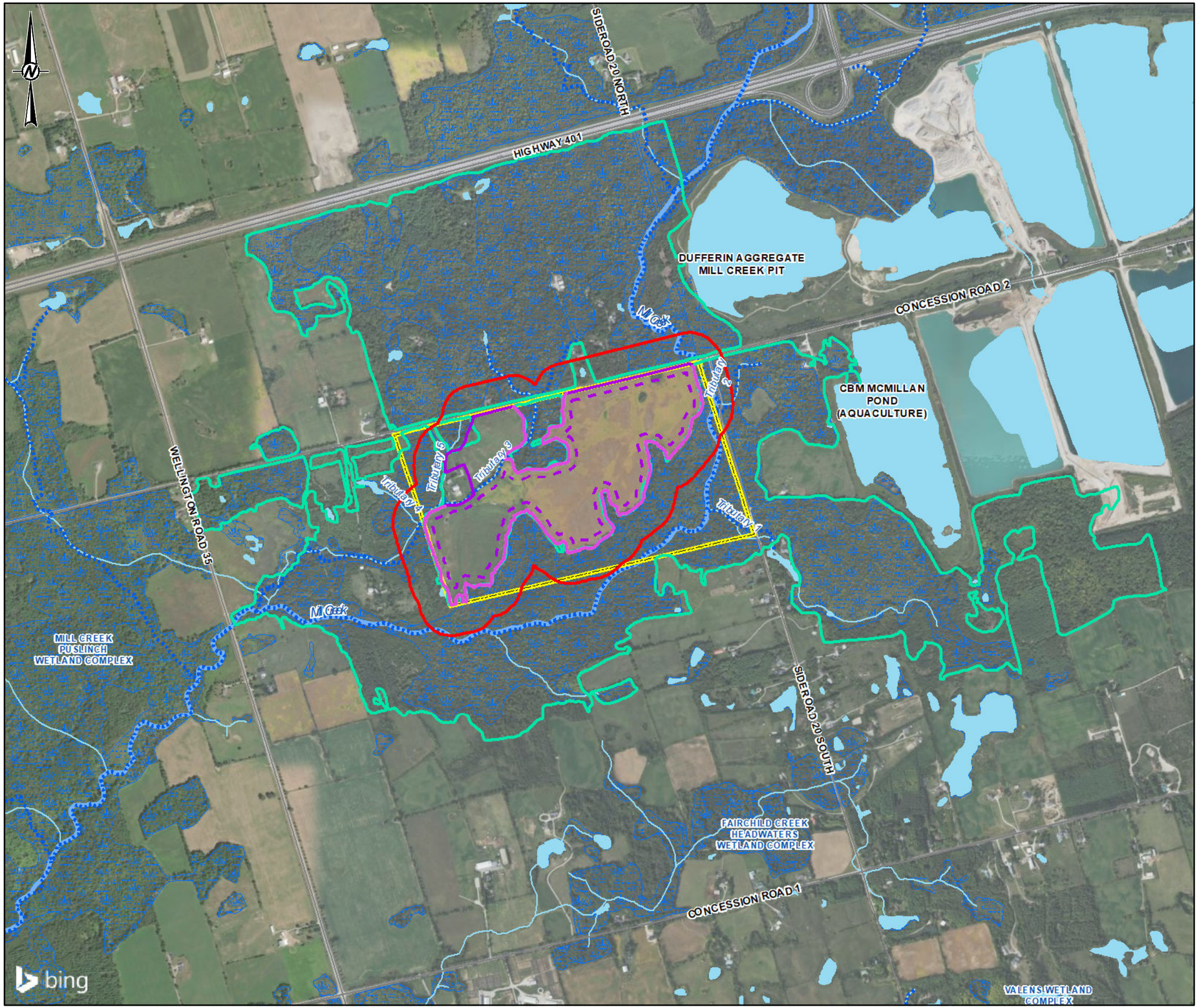

LEGEND

- WATERCOURSE
- ROAD
- COLD THERMAL REGIME
- FIELD VERIFY PROVINCIALLY SIGNIFICANT WETLAND EDGE
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- WATERBODY
- SIGNIFICANT WOODLAND
- PROPERTY BOUNDARY
- PROPOSED EXTRACTION AREA
- STUDY AREA

0 250 500 750 1,000

1:15,000 METRES

REFERENCE(S)

1. BASEDATA: MNRF LIO, OBTAINED 2019
2. IMAGERY SOURCE: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
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3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT

CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT

ABERFOYLE SOUTH PIT EXPANSION - NATURAL ENVIRONMENT REPORT

TITLE

SIGNIFICANT NATURAL HERITAGE FEATURES

CONSULTANT

wsp

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APPROVED	HM

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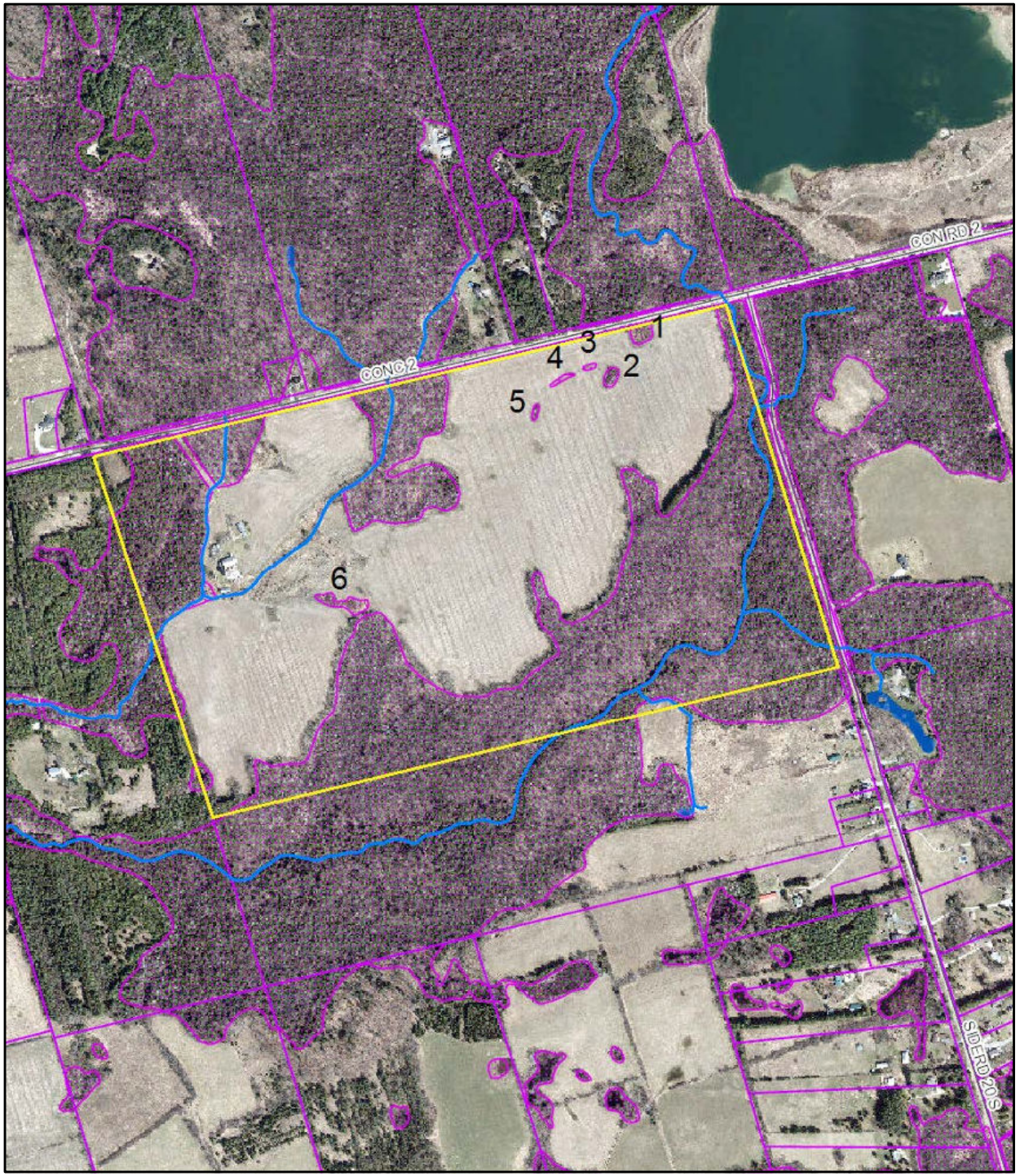

Legend

- Regulation Limit (GRCA)
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Floodplain (GRCA)
  - Engineered
  - Estimated
  - Approximate
  - Special Policy Area
- Slope Valley (GRCA)
  - Steep
  - Oversteep
  - Steep
- Slope Erosion (GRCA)
  - Oversteep
  - Toe
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)

NOT TO SCALE

REFERENCE(S)

1. GRCA WETLAND MAPPING OBTAINED USING THE GRCA (GRAND RIVER CONSERVATION AUTHORITY). 2021. MAP YOUR PROPERTY INTERACTIVE MAPPING. [ACCESSED 25 OCTOBER 2021]. (HTTPS://MAPS.GRANDRIVER.CA/WEB-GIS/PUBLIC/?THEME=MYP&BBOX=548795,4804039,585737,4824192).

CLIENT

CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT

ABERFOYLE SOUTH PIT EXPANSION - NATURAL ENVIRONMENT REPORT

TITLE

GRAND RIVER CONSERVATION AUTHORITY WETLAND MAPPING

CONSULTANT

wsp

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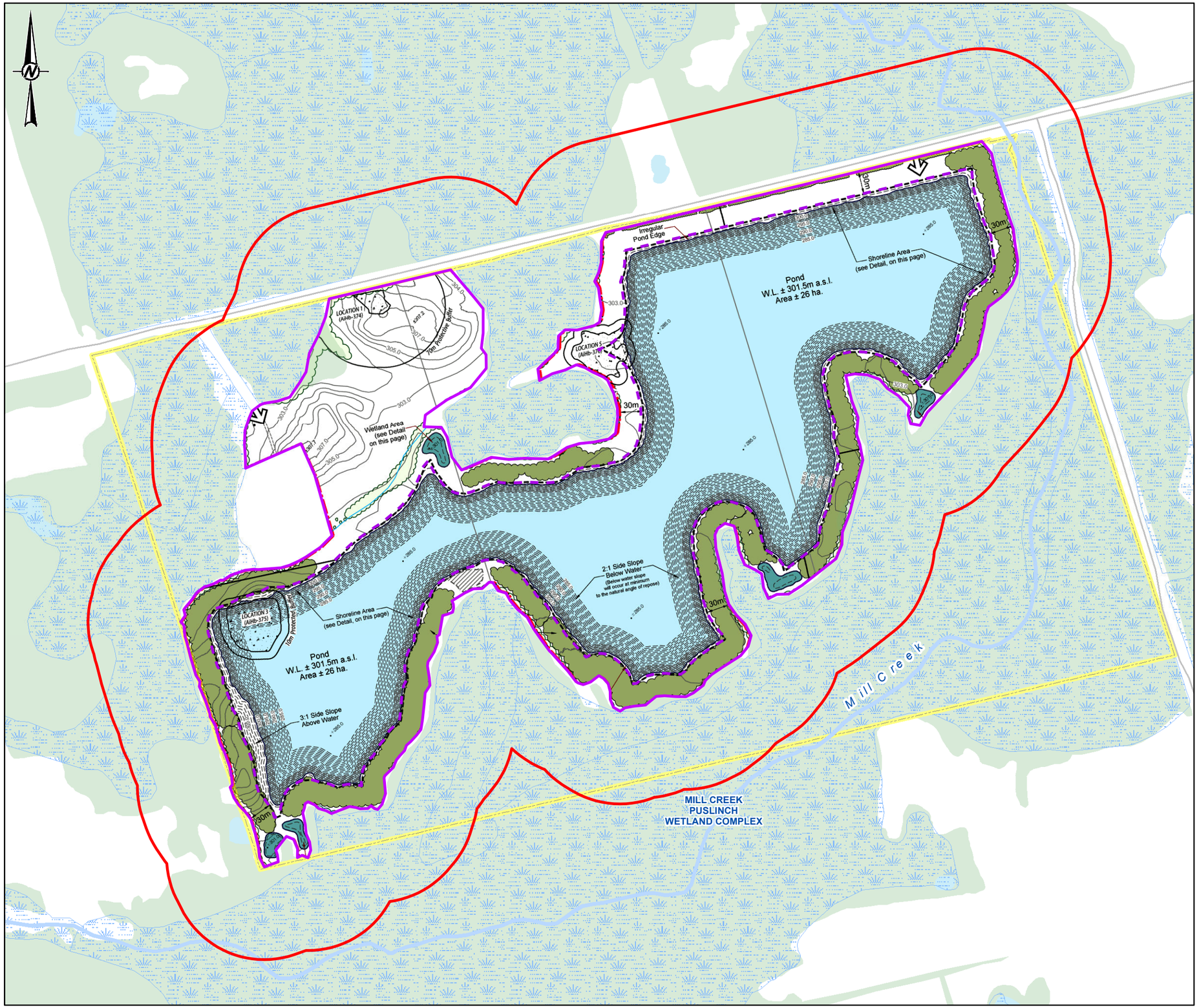

LEGEND

- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- LICENCE BOUNDARY / SITE BOUNDARY
- PROPOSED EXTRACTION AREA
- STUDY AREA
- WOODED AREA

REHABILITATION LEGEND

- Contour with Elevation — METRES ABOVE SEA LEVEL
- Existing Fence — POST & WIRE FENCE UNLESS OTHERWISE NOTED
- Existing Vegetation
- Private Laneway
- Access
- Provincially Significant Wetland — ON-SITE VERIFIED IN FIELD BY WSP 2021 AND OFF-SITE FROM ONTARIO GEOHUB
- Unevaluated Wetland — GRCA OPEN DATA
- Archaeological Site — SITE RECOMMENDED FOR FURTHER ARCHAEOLOGICAL FIELD WORK
- Proposed Contour — METRES ABOVE SEA LEVEL (m A.S.L.)
- Proposed Elevation — REHABILITATED ELEVATION
- Proposed Tree Planting Areas — LOCATION APPROXIMATE
- Post Extraction Pond
- Proposed Shoreline Area — (SEE DETAIL ON THIS PAGE)
- Proposed Wetland Area — (SEE DETAIL ON THIS PAGE)

0 100 200 300 400

1:4,985 METRES

REFERENCE(S)

1. BASEDATA: MNRF LIO, OBTAINED 2019
2. REHABILIATION PLAN PROVIDED BY MHBC OCTOBER 2023
3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT

CBM AGGREGATES, A DIVISION OF ST. MARYS CEMENT INC. (CANADA)

PROJECT

ABERFOYLE SOUTH PIT EXPANSION - NATURAL ENVIRONMENT REPORT

TITLE

REHABILITATION PLAN

CONSULTANT

wsp

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APPENDIX A

Terms of Reference

TECHNICAL MEMORANDUM

DATE September 7, 2023 **Project No.** 1791470

TO CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada)

FROM Heather Melcher **EMAIL heather.melcher@wsp.com**

TERMS OF REFERENCE FOR NATURAL ENVIRONMENT AND WATER RESOURCES TECHNICAL STUDIES FOR THE CBM ABERFOYLE SOUTH PIT EXPANSION, TOWNSHIP OF PUSLINCH, ONTARIO

WSP Canada Inc. (WSP; formerly Golder Associates Ltd. [Golder]) has been retained by CBM Aggregates (CBM), a division of St. Marys Cement Inc. (Canada) to carry out technical studies in support of Planning Act applications to the Township of Puslinch and the County of Wellington and an application to the Ministry of Natural Resources and Forestry (MNRF) for a Class "A" licence (Pit Below Water) under the *Aggregate Resources Act* (ARA) for the property located at 6947 Concession Road 2, Township of Puslinch, Wellington County, Ontario (the site; Figure 1). The site will be an expansion to CBM's existing Aberfoyle South Pit.

The technical studies for the ARA licence application and Planning Act applications will include a number of disciplines, including hydrogeology, surface water and natural environment.

The technical requirements of these supporting studies are outlined in the County of Wellington Official Plan (2021) and the Aggregate Resources of Ontario Provincial Standards: A Compilation of the Four Standards Adopted by Ontario Regulation 244/97 Under the Aggregate Resources Act (2020). Golder's proposed approach to the project has been developed to meet these requirements.

The above studies will be integrated to ensure that any key linkages between the hydrogeological and hydrological components, and the receiving natural environment features, are holistically evaluated to support the completion of the potential impact assessments for the proposed expansion of the pit and the development of appropriate mitigation measures, if required.

Integrated Water Resource Assessment

The following provides the proposed scope of the water resources program consisting of hydrogeology (groundwater) and hydrology (surface water) components.

Hydrogeology

The program for hydrogeology consists of the following:

- A review of publicly available data and reports relevant to the Site and subwatershed.
- A review of the Grand River Source Protection Plan (GRCA 2021) and any other applicable policies.

- A field investigation program that includes:
  - Borehole drilling, grain size analysis and monitoring well installation (see Figure 1)
  - Baseline groundwater quality monitoring (general water quality parameters including major ions, metals, and petroleum hydrocarbons)
  - Hydraulic conductivity testing (single well response tests) of the monitoring wells installed as part of the field program
  - Groundwater level and temperature monitoring (dataloggers to record water level and temperature hourly and downloaded quarterly)
- A review of local groundwater users based on the Ministry of the Environment, Conservation and Parks (MECP) Water Well Information System (WWIS) and Permit To Take Water (PTTW) databases.
- A private well survey of properties surrounding the site was originally planned for 2020 or 2021. The purpose of such a survey was to supplement the MECP WWIS information and "ground truth" the current condition of neighbouring resident's water supply wells. Activities would have included door-to-door visits and subsequent interactions between field staff and residents. Participation would be entirely voluntary. However, as a result of ongoing COVID-19 concerns this task has been postponed for the time being. It is proposed that this activity be completed at later date prior to any aggregate extraction taking place on the site.
- In conjunction with surface water studies, the development of a Site water budget for Existing, Operations and Rehabilitated Scenarios to determine pre-and post-development surplus, runoff, and infiltration rates.
- The construction and calibration of a 3D numerical groundwater flow model based on the "Tier 3 Model" with high resolution refinement of the model mesh within the immediate area of the site, and subsequent predictive simulations to estimate potential water flow impacts of the proposed below-water extraction on surrounding groundwater and surface water receptors.
- The development of a groundwater analytical model to predict the potential for thermal impacts to local watercourses, including Mill Creek, taking into account the Grand River Conservation Authority (GRCA) Cumulative Effects Assessment Best Practices Paper (GRCA 2010).
- Analysis and qualitative hydrogeologic impact assessment.
- An assessment of groundwater vulnerability and potential changes to water chemistry.
- An analysis of potential cumulative effects in light of the presence of other nearby aggregate operations, taking into account the GRCA Cumulative Effects Assessment Best Practices Paper (GRCA 2010).
- Development of a monitoring plan for groundwater.
- The results of the hydrogeological assessment will be summarized in a Maximum Predicted Water Table Report and a Level 1 and 2 Water Report that fulfills the current County of Wellington Official Plan policies and ARA requirements.

Surface Water Resources

An assessment of surface water resources in the area of the site, as well as adjoining areas that may be affected by proposed expansion, will be completed to allow for quantification of potential effects. The surface water resources assessment consists of the following:

- Background review of the available information pertaining to within approximately 500 metres of the site. the information reviewed will consist of:

i) Aerial photographs and topographic, physiographic, and geologic mapping

ii) Published water resources reports

iii) Any existing permits or monitoring reports from the site, and nearby lands (e.g., Mill Creek Pit)

- Review of GRCA floodplain data for the site, and assessment of potential impacts of extraction on flood elevations on-site and both upstream and downstream.
- Site reconnaissance to identify and confirm drainage features and catchment boundaries adjacent to the pit. The site reconnaissance is also used to corroborate the findings of the information review and identify local features that were not apparent from the background review.
- A water budget and pit water balance using a Thornthwaite water budget tool, developed for the existing pit footprint area (footprint) and the proposed expansion lands. The Thornthwaite water budget information will be used to develop an annual pit water balance for the existing operation. A future pit water balance will be estimated by including future footprint and land-use information.
- The floodplain assessment will provide appropriate flooding intervals through mapping and elevations for the site and the study area.
- The in-stream water level, temperature and flow monitoring in Mill Creek and associated tributaries in the vicinity of the site will allow Golder to characterise the creek reaches and therefore better understand potential effect of the proposed extraction on site. The in-stream water level monitors will be paired with stream piezometer monitoring stations and visited quarterly.
- An effects assessment on features within the catchment of the site that documents the magnitude and significance of expected changes in the water budget of the site.
- Development of a monitoring plan for surface water.
- A report that describes the surface water assessments, including a description of existing and proposed conditions and expected effects, and will ultimately be included as an appendix to the Level 1 and 2 Water Report.

Natural Environment Assessment

Golder is undertaking a work program for a natural environment assessment to evaluate the natural features in the vicinity of the site (see Figure 1). Golder will assess the potential impacts of the proposed below water

extraction on those features and their ecological functions and, if necessary, recommend measures to prevent or mitigate negative impacts on any significant features. The proposed program consists of the following:

- Background data compilation and review of existing documents and information sources which will be focused on designated features in the vicinity of the site. This will include a review of relevant County of Wellington and Provincial policies.
- Review of the water balance completed as part of the surface water assessment, as described above, and assessment of the potential impacts of that water balance on natural features on, and in the vicinity of, the site.
- Species at Risk (SAR) screening focussing on those species listed under the Ontario *Endangered Species Act* (ESA) and federal *Species at Risk Act* (SARA). First completed at a desktop exercise using up to date air photos, and then updated based on the results of the field surveys.
- Communication with the MECP and MNRF for additional information regarding SAR, fisheries data and the Mill Creek Puslinch Provincially Significant Wetland.
- Field surveys including:

i) Plant community assessment using the Ecological Land Classification (ELC) system for southern Ontario (Lee et al. 1998).

ii) Delineate/confirm the boundaries of natural heritage features including wetlands and woodlands using a handheld GPS. Note that wetlands were delineated using Ontario Wetland Evaluation System (OWES). The wetland boundary will be verified in the field with the Grand River Conservation Authority (GRCA). The woodland boundary will be verified in the field with the County and/or Township. CBM will have the boundaries surveyed by a registered surveyor.

iii) Three season botanical inventory, including surveys for butternut and black ash.

iv) Three rounds of anuran call count surveys following protocols from the Marsh Monitoring Program method for vocalizing frog surveys (BSC 2008)

v) Two rounds of amphibian habitat assessment and egg mass surveys following protocols from the Sampling Protocol for Determining the Presence of Jefferson Salamanders (*Ambystoma jeffersonianum*) in Ontario (JSRT 2013)

vi) Assessment of the site and vicinity as habitat for Blanding's turtle.

vii) Three rounds of breeding bird surveys following protocols from the Canadian Breeding Bird Survey (Downes and Collins 2003), and the Ontario Breeding Bird Atlas (Cadman et al. 2007)

viii) Bat habitat and acoustic surveys based on guidance from the MNRF document Survey Protocol for Species at Risk Bats within Treed Habitats (MNRF 2017) and Bat and Bat Habitat: Guidelines for Wind Power Projects (MNR 2011).

ix) Wildlife habitat assessment and general wildlife surveys (Visual Encounter Surveys) following provincially accepted methods (Bookhout 1994; McDiarmid 2012; MNRF 2016; MNRF 2017; Pyle 1994).

x) A qualitative fish habitat assessment in Mill Creek and tributaries on the site and in the vicinity, using MTO Fisheries Assessment Protocols and Golder's Technical Procedures (unpublished file information). These protocols include a description of aquatic habitat (e.g., permanence, stage, confinement), habitat mapping of key habitat features (e.g., riffles, pools, woody debris) and characteristics (e.g., wetted and bankfull width/depth, substrate types, cover, seepage areas), a description of riparian and/or aquatic vegetation, identifying locations of any critical fish habitat areas or barriers to fish movement and observations of any fish and aquatic species.

- Assessment of Significant Wildlife Habitat, per the Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (2015).
- Assessment of linkages and connectivity for wildlife.
- Analysis of the data collected in conjunction with the background data compilation and integration with the hydrogeological and surface water studies to complete a potential impact assessment.
- Development of the final rehabilitation, including appropriate setbacks, upland and wetland plantings, creation of wetlands and wildlife habitat, and a monitoring plan, where appropriate.
- One single natural environment report that includes a description of existing conditions through the desktop review and results of the field surveys, an assessment of impacts on all natural features, as outlined in the Provincial Policy Statement (MMAH 2020), the rehabilitation plan, a description of any mitigation and monitoring, and will meet the requirements of:
  - Natural Environment Report (NER), based on ARA standards (Ontario 2020).
  - Environmental Impact Assessment (EIA) for the County of Wellington (Wellington 2021).
  - Environmental Impact Study guidelines and submission standards for Wetlands of the GRCA (2005).

Closing

We trust this Terms of Reference meets with your approval. If you have any questions or comments, please do not hesitate to contact the undersigned.

WSP Canada Inc.

Heather Melcher, MSc
Director, Ecology and Water Resources

George Schneider, MSc, PGeo
Principal, Senior Hydrogeologist

HM/GS/ld

Attachments: Figure 1: Study Area, Groundwater and Surface Water Monitoring Locations

References

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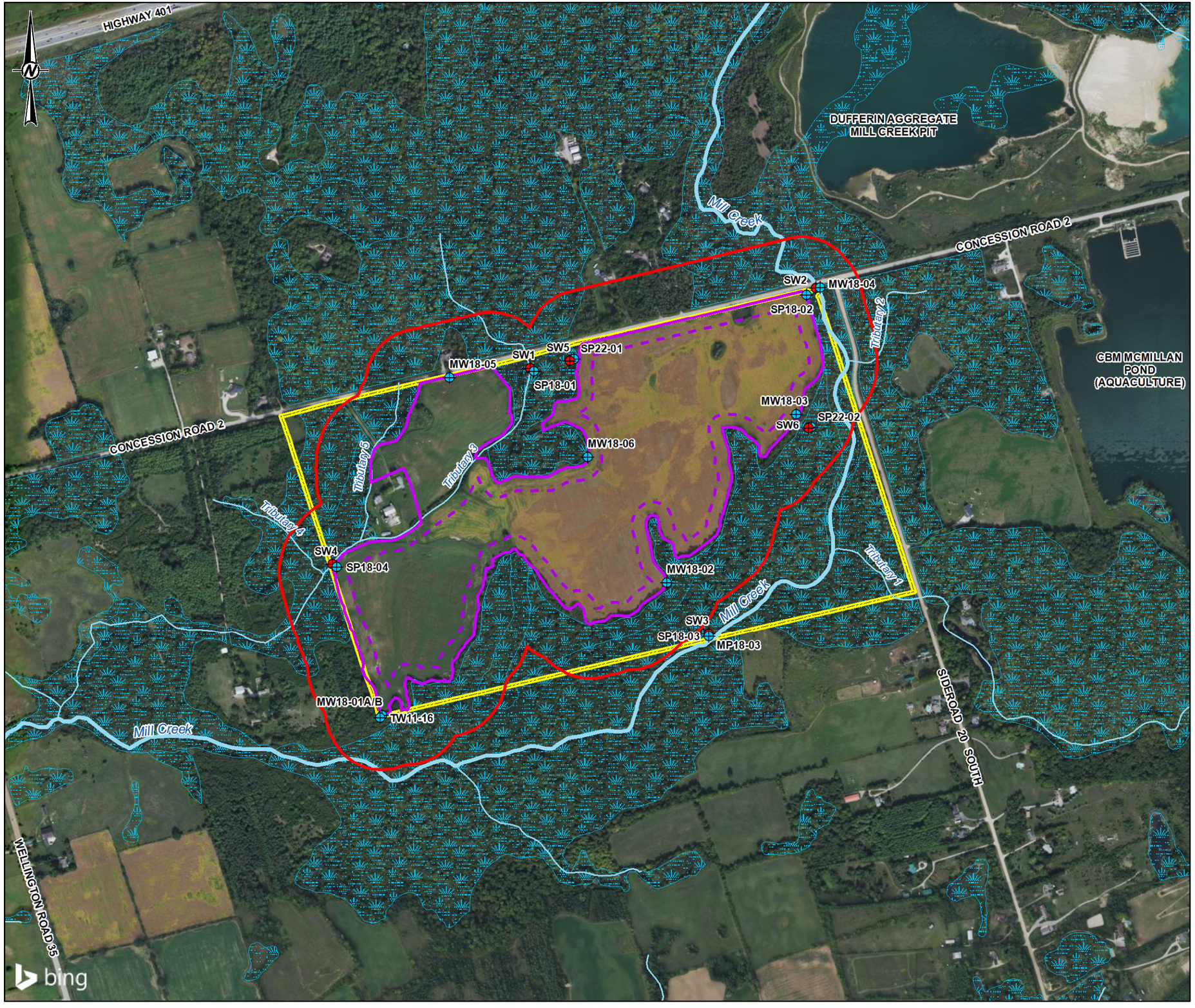
FIGURE 1

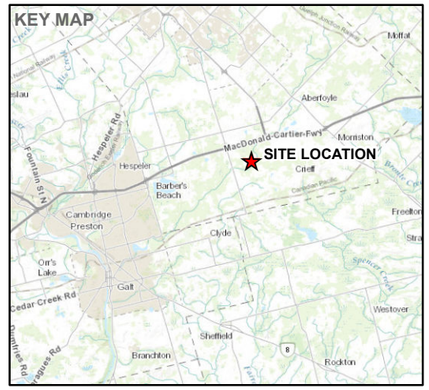
Study Area

Groundwater and Surface Water Monitoring Locations



LEGEND

- GROUNDWATER MONITOR
- SURFACE WATER MONITOR
- WATERCOURSE
- PROVINCIALLY SIGNIFICANT WETLAND (EVALUATED)
- PROPERTY BOUNDARY
- PROPOSED EXTRACTION AREA
- LICENCE BOUNDARY / SITE BOUNDARY
- STUDY AREA



DRAFT

0 100 200 300 400

1:8,500 METRES

REFERENCE(S)

1. GROUNDWATER LEVATIONS SELECTED MARCH 12, 2020.
2. BASEDATA: MNRF LIO, OBTAINED 2019
3. IMAGERY SOURCE: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

IMAGE SEPTEMBER 2016
4. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM

CLIENT
ST. MARYS CEMENT INC. (CANADA)

PROJECT
ABERFOYLE SOUTH PIT EXPANSION

TITLE
STUDY AREA, GROUNDWATER AND SURFACE WATER MONITORING LOCATIONS

CONSULTANT

wsp

YYYY-MM-DD	2020-12-04
DESIGNED	SO/PGM
PREPARED	ST
REVIEWED	DH
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 25mm

Path: S:\Clients\CBM_Aggregates\Aberfoyle_P1699_PROJ\1791470_CBM40_PROD\0006_Natural_Environment_Level_1_2\1791470-0006-CH-0005.mxd

APPENDIX B

MNRF Correspondence

From: ESA Guelph (MNRF)
To: Sabourin, Amber
Subject: RE: Natural Heritage Information Request - Lake Pit
Date: June 25, 2019 10:04:23 AM
Attachments: image001.jpg
image002.jpg
Mill Creek Wetland Record_2nd edition_complete.pdf

EXTERNAL EMAIL

Hello Amber
Please see the attached wetland data record for Mill Creek Wetland. Please let me know if you have any questions.
Melinda

MELINDA J. THOMPSON, B.A. Hon, M.Sc.
MANAGEMENT BIOLOGIST | ONTARIO MINISTRY of NATURAL RESOURCES and FORESTRY | GUELPH DISTRICT OFFICE
1 Stone Road West, Guelph, Ontario, N1G 4Y2 | ☎ 519.826.6543 | melinda.thompson@ontario.ca

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From: Sabourin, Amber <Amber_Sabourin@golder.com>
Sent: May 16, 2019 11:06 AM
To: ESA Guelph (MNRF) <ESAGUELPH@ontario.ca>
Subject: Natural Heritage Information Request - Lake Pit

Good morning,

Please find attached a completed natural heritage information request form for a site located in Puslinch, Ontario. A map of the site boundary is also attached for reference. We will also be contacting the MECP separately for species at risk.

Please let me know if you require any additional information in order to fulfill this request.
Best regards,
Amber

Amber Sabourin (H.B.Sc (Env))
Ecologist

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LinkedIn | Facebook | Twitter

Work Safe, Home Safe

APPENDIX C

Vascular Plants List

Vascular Plants List

Scientific Name	Common Name	Origin[a]	S Rank[b]	G Rank[b]	ESA[c]	CW[d]	Location[e]
Trees (22 taxa)							
Abies balsamea	Balsam Fir	N	S5	G5	—	-3	C, D, H
Acer rubrum	Red Maple	N	S5	G5	—	0	A, C, G, H
Acer saccharinum	Silver Maple	N	S5	G5	—	-3	A, C, E, H
Acer saccharum	Sugar Maple	N	S5	G5	—	3	D, H
Betula alleghaniensis	Yellow Birch	N	S5	G5	—	0	B, C, G, H
Betula papyrifera	White Birch	N	S5	G5	—	3	A, C, D, F, G, H
Fagus grandifolia	American Beech	N	S4	G5	—	3	H
Fraxinus americana	White Ash	N	S4	G5	—	3	F, H
Fraxinus nigra	Black Ash	N	S4	G5	END (temporary suspension of protection until Jan 2024)	-3	A, B, C, E, F
Fraxinus pennsylvanica	Green Ash	N	S4	G5	—	-3	A, B, C, D, E, F, G, H
Larix laricina	Tamarack	N	S5	G5	—	-3	B, H
Liriodendron tulipifera	Tulip Tree	N	S4	G5	—	3	C
Malus pumila	Common Apple	I	SNA	G5	—	5	B, C
Populus balsamifera	Balsam Poplar	N	S5	G5	—	-3	B, E, F, I
Populus tremuloides	Trembling Aspen	N	S5	G5	—	0	A, B, C, E, F, H, I, J
Prunus serotina	Black Cherry	N	S5	G5	—	3	H
Salix nigra	Black Willow	N	S4	G5	—	-5	I
Salix alba	White Willow	I	SNA	G5	—	-3	A
Thuja occidentalis	White Cedar	N	S5	G5	—	-3	A, B, C, E, F, G, H
Tilia americana	American Basswood	N	S5	G5	—	3	A, B, C, D, E, F, G, H
Tsuga canadensis	Eastern Hemlock	N	S5	G5	—	3	H
Ulmus americana	American Elm	N	S5	G5	—	-3	A, B, C, D, E, F, H, I
Small trees, shrubs and woody vines (35 taxa)							
Alnus incana	Speckled Alder	N	S5	G5T5	—	-3	B, F, I, H
Amelanchier sp.	Serviceberry sp.	—	—	—	—	—	B, C
Apocynum androsaemifolium	Spreading Dogbane	N	S5	G5	—	5	B
Aronia melanocarpa	Black Chokeberry	N	S5	G5	—	-3	A
Clematis virginiana	Virgin's-bower	N	S5	G5	—	0	E
Cornus alternifolia	Alternate-leaved Dogwood	N	S5	G5	—	3	A, F, H
Cornus obliqua	Silky Dogwood	N	S5	G5T5	—	-3	F
Cornus rugosa	Round-leaved Dogwood	N	S5	G5	—	5	B, G
Cornus sericea	Red Osier Dogwood	N	S5	G5	—	-3	E, F, G, H, I

Vascular Plants List

Scientific Name	Common Name	Origin[a]	S Rank[b]	G Rank[b]	ESA[c]	CW[d]	Location[e]
Crataegus sp.	Hawthorn sp.	—	—	—	—	—	E
Dirca palustris	Eastern Leatherwood	N	S4	G4	—	0	D
Frangula alnus	Glossy Buckthorn	I	SNA	GNR	—	0	E, G, H
Ilex verticillata	Winterberry	N	S5	G5	—	-3	A, F, H
Lindera benzoin	Northern Spicebush	N	S4	G5	—	-3	C
Lonicera tatarica	Tatarian Honeysuckle	I	SNA	GNR	—	3	D, G
Parthenocissus quinquefolia	Virginia Creeper	N	S4?	G5	—	3	A, C, D, E, F, H
Rhamnus cathartica	Common Buckthorn	I	SNA	GNR	—	0	A, B, C, E, F, H
Ribes americanum	Wild Black Currant	N	S5	G5	—	-3	E
Ribes rubrum	Red Currant	I	SNA	G4G5	—	5	A
Rubus allegheniensis	Allegheny Blackberry	N	S5	G5	—	3	H
Rubus idaeus	Red Raspberry	N	S5	G5	—	3	A, B, C, D, E, H
Rubus pubescens	Dwarf Raspberry	N	S5	G5	—	-3	E, H
Salix discolor	Pussy Willow	N	S5	G5	—	-3	F
Salix eriocephala	Heart-leaved Willow	N	S5	G5	—	-3	E
Salix sp.	Willow sp.	—	—	—	—	—	B, I
Sambucus canadensis	Red Elderberry	N	S5	G5	—	3	A, F
Solanum dulcamara	Bittersweet Nightshade	I	SNA	GNR	—	0	A, C, E, F, G, I, H
Symphoricarpos albus	Common Snowberry	N	S5	G5	—	3	G, H
Taxus canadensis	Canada Yew	N	S4	G5	—	3	G, H
Toxicodendron radicans	Poison-ivy	N	S5	G5	—	0	B, C, D, H
Viburnum lentago	Nannyberry	N	S5	G5	—	0	F, H
Viburnum nudum var. cassinoides	Northern Wild-raisin	N	S5	G5T5	—	-3	E
Viburnum opulus ssp. trilobum	Highbush Cranberry	N	S5	GNR	—	-3	F, H
Viburnum sp.	Viburnum sp.	—	—	—	—	—	C
Vitis riparia	Riverbank Grape	N	S5	G5	—	0	B, C, E, F, H, I
Graminoids (26 taxa)							
Calamagrostis canadensis	Bluejoint Reedgrass	N	S5	G5T5	—	-5	F
Carex aquatilis	Water Sedge	N	S5	G5T5	—	-5	F
Carex bebbii	Bebb's Sedge	N	S5	G5	—	-5	C, F, H
Carex gracilescens	Slender Loose-flowered Sedge	N	S4	G5?	—	5	H
Carex gracillima	Graceful Sedge	N	S5	G5	—	3	A, C
Carex hystericina	Porcupine Sedge	N	S5	G5	—	-5	H
Carex interior	Inland Sedge	N	S5	G5	—	-5	H
Carex intumescens	Bladder Sedge	N	S5	G5	—	-3	B, C, D
Carex lacustris	Lake Sedge	N	S5	G5	—	-5	E
Carex lupulina	Hop Sedge	N	S5	G5	—	-5	H

Vascular Plants List

Scientific Name	Common Name	Origin[a]	S Rank[b]	G Rank[b]	ESA[c]	CW[d]	Location[e]
Carex lurida	Sallow Sedge	N	S4S5	G5	—	-5	F
Carex retrorsa	Retrorse Sedge	N	S5	G5	—	-5	B, C, F
Carex stipata	Awl-fruited Sedge	N	S5	G5	—	-5	F, H
Carex stricta	Tussock Sedge	N	S5	G5	—	-5	C, G, H
Carex vulpinoidea	Fox Sedge	N	S5	G5	—	-5	C, F
Echinochloa crusgalli	Barnyard Grass	I	SNA	GNR	—	-3	F, I
Glyceria grandis	Tall Mannagrass	N	S5	G5	—	-5	F
Glyceria striata	Fowl Manna Grass	N	S5	G5	—	-5	C, H
Phalaris arundinacea	Reed Canary Grass	N	S5	G5	—	-3	F, H, I
Phleum pratense	Timothy	I	SNA	GNR	—	3	F
Phragmites australis ssp. australis	European Reed	I	SNA	G5T5	—	-3	F
Scirpus atrovirens	Dark Green Bulrush	N	S5	G5	—	-5	F, H
Scirpus cyperinus	Wool-grass	N	S5	G5	—	-5	I
Setaria pumila	Yellow Foxtail	I	SNA	GNR	—	0	F
Typha angustifolia	Narrow-leaved Cattail	N	SNA	G5	—	-5	F, H
Typha latifolia	Broad-leaved Cattail	N	S5	G5	—	-5	K
Ferns and Allies (10 taxa)							
Athyrium filix-femina	Common Lady Fern	N	S5	G5	—	0	B, H
Athyrium filix-femina var. angustum	Northeastern Lady Fern	N	S5	G5T5	—	0	H
Cystopteris bulbifera	Bulblet Fern	N	S5	G5	—	-3	A, C
Dryopteris carthusiana	Spinulose Wood Fern	N	S5	G5	—	-3	E, H
Equisetum arvense	Field Horsetail	N	S5	G5	—	0	F
Equisetum pratense	Meadow Horsetail	N	S5	G5	—	-3	A, B, C, D, E, F, G, H
Matteuccia struthiopteris	Ostrich Fern	N	S5	G5	—	0	C
Onoclea sensibilis	Sensitive Fern	N	S5	G5	—	-3	A, B, C, E, F, G, H, I
Osmunda cinnamomea	Cinnamon Fern	N	S5	G5	—	-3	B, H
Pteridium aquilinum	Bracken Fern	N	S5	G5	—	3	F
Forbs (61 taxa)							
Anemone canadensis	Canada Anemone	N	S5	G5	—	-3	A, B, F, H
Aralia nudicaulis	Wild Sarsaparilla	N	S5	G5	—	3	H
Arisaema triphyllum	Jack-in-the-pulpit	N	S5	G5	—	-3	G, H
Asarum canadense	Wild Ginger	N	S5	G5	—	5	C
Asclepias incarnata	Swamp Milkweed	N	S5	G5	—	-5	G
Asclepias syriaca	Common Milkweed	N	S5	G5	—	5	F, J
Bidens sp.	Beggarticks sp.	—	—	—	—	—	G
Caltha palustris	Yellow Marsh Marigold	N	S5	G5	—	-5	H
Cardamine pensylvanica	Pennsylvania Bittercress	N	S5	G5	—	-3	K

Vascular Plants List

Scientific Name	Common Name	Origin[a]	S Rank[b]	G Rank[b]	ESA[c]	CW[d]	Location[e]
Cerastium arvense	Chickweed	I	S4	G5	—	3	C
Cicuta maculata	Spotted Water-hemlock	N	S5	G5	—	-5	C, E, G, H
Cirsium muticum	Swamp Thistle	N	S5	G5	—	-5	H
Clematis occidentalis	Purple Clematis	N	S4	G5	—	5	F
Cypripedium parviflorum	Yellow Lady's Slipper	N	S5	G5	—	0	C
Daucus carota	Wild Carrot	I	SNA	GNR	—	5	F, J
Epilobium hirsutum	Hairy Willowherb	I	SNA	GNR	—	-3	F
Erigeron philadelphicus	Philadelphia Fleabane	N	S5	G5	—	-3	F
Euthamia graminifolia	Grass-leaved Goldenrod	N	S5	G5	—	0	F
Eutrochium maculatum	Spotted Joe Pye Weed	N	S5	G5	—	-5	F, H
Fragaria vesca	Woodland Strawberry	N	S5	G5	—	3	A, B, D
Fragaria virginiana	Common Strawberry	N	S5	G5	—	3	F, G
Galium aparine	Cleavers	N	S5	G5	—	3	H
Galium asprellum	Rough Bedstraw	N	S5	G5	—	-5	H
Galium trifidum	Small Bedstraw	N	S5	G5	—	-3	C
Galium triflorum	Fragrant Bedstraw	N	S5	G5	—	3	B
Geranium robertianum	Herb-Robert	N	S5	G5	—	3	A
Geum canadense	White Avens	N	S5	G5	—	0	A, E
Geum sp.	Avens sp.	—	—	—	—	—	H
Hydrophyllum virginianum	Virginia Waterleaf	N	S5	G5T5	—	0	H
Impatiens capensis	Jewelweed	N	S5	G5	—	-3	A, B, C, F, G, H
Iris versicolor	Blue Flag	N	S5	G5	—	-5	F, H
Laportea canadensis	Wood Nettle	N	S5	G5	—	-3	H
Lemna minor	Lesser Duckweed	N	S5?	G5	—	-5	K
Leucanthemum vulgare	Oxeye Daisy	N	SNA	GNR	—	5	F
Lythrum salicaria	Purple Loosestrife	I	SNA	G5	—	-5	H
Maianthemum canadense	Canada Mayflower	N	S5	G5	—	3	B, H
Maianthemum racemosum	False Solman's Seal	N	S5	G5	—	3	C, G
Maianthemum trifolium	Three-leaved Solomon's Seal	N	S5	G5	—	-5	H
Mitella sp.	Bishop's Cap sp.	—	—	—	—	—	H
Myosotis laxa	Small Forget-me-not	N	S5	G5	—	-5	H
Nasturtium officinale	Watercress	N	SNA	GNR	—	-5	H
Oxalis montana	Common Wood-sorrel	N	S5	G5	—	3	C
Ranunculus acris	Tall Buttercup	I	SNA	G5	—	0	B, H
Rudbeckia hirta	Black-eyed Susan	N	S5	G5	—	3	F
Sagittaria latifolia	Broad-leaved Arrowhead	N	S5	G5	—	-5	F, H
Solidago altissima	Tall Goldenrod	N	S5	G5	—	3	F, H, J

Vascular Plants List

Scientific Name	Common Name	Origin[a]	S Rank[b]	G Rank[b]	ESA[c]	CW[d]	Location[e]
Solidago canadensis	Canada Goldenrod	N	S5	G5	—	3	D, J, K
Solidago rugosa	Rough Stem Goldenrod	N	S5	G5	—	0	E, C, G, H
Sonchus oleraceus	Common Sow-thistle	I	SNA	GNR	—	3	F
Spiraea alba	White Meadowsweet	N	S5	G5T5	—	-3	H
Streptopus lanceolatus	Eastern Rose Twisted-stalk	N	S5?	G5T5	—	3	H
Symphyotrichum puniceum	Purple-stem Aster	N	S5	G5	—	-5	E, F, H
Symphyotrichum novae-angliae	New England Aster	N	S5	G5	—	-3	K
Taraxacum officinale	Common Dandelion	N	SNA	G5	—	3	H
Thalictrum pubescens	Tall Meadow-rue	N	S5	G5	—	-3	A, B, C, E, F, G, H
Tiarella cordifolia	Heart-leaved Foam-flower	N	S5	G5	—	3	H
Trillium erectum	Red Trillium	N	S5	G5	—	3	A, H
Tussilago farfara	Colt's-foot	I	SNA	GNR	—	3	C, D, F, G, H
Verbascum thapsus	Common Mullein	I	SNA	GNR	—	5	J
Viola sp.	Violet sp.	—	—	—	—	—	A, B, C, H

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

[b] Ranks based upon determinations made by the Natural Heritage Information Centre (2019).
G = Global; S = Provincial; Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.
NA = Not applicable [used mainly for abundance of non-natives; NR = Not ranked [used mainly for non-natives];
Q = Taxonomic questions not fully resolved; T = sub-specific taxon (taxa) present in the province; U = Uncertain.

[c] *Endangered Species Act* (ESA), 2007. General (O.Reg 242/08 last amended 31 March 2022 as O. Reg. 328/22). Species at Risk in Ontario List (O.Reg 230/08 last amended 25 January 2023 as O. Reg. 9/23)
END= Endangered; SC = Special Concern; THR = Threatened.

[d] Coefficient of Wetness: wetness values assigned to each plant species that help to determine if a particular community is considered a wetland based on the Floristic Quality Assessment System for Southern Ontario (Oldham et al. 1995)
-5 = obligate wetland species (species that occur almost always in wetlands)
-4 to -2 = facultative wetland species (species that usually occur in wetlands, but are occasionally found in non-wetlands)
-1 to 1 = facultative species (species that are equally likely to occur in wetlands or non-wetlands)
2 to 4 = faculative upland species (species that usually occur in non-wetlands, but may occasionally be found in wetlands)
5 = obligate upland species (species that almost never occur in wetlands)

[e] Locations:
A = Black Ash Deciduous Swamp (SWD5-1)
B = White Cedar – Hardwood Mixed Swamp (SWM1-1a)
C = Silver Maple Deciduous Swamp (SWD6-2)
D = Sugar Maple-Basswood Deciduous Forest (FOD5-6)
E = Green Ash Deciduous Swamp (SWD2-2)
F = Alder Thicket Swamp Inclusion (SWT2-1)
G/H = White Cedar – Hardwood Mixed Swamp (SWM1-1b)
I = Thicket Swamp Inclusion (SWT2)
J = Goldenrod Forb Meadow (CUM1-1)
K = Other

APPENDIX D

Species at Risk Screening

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Amphibian	Jefferson salamander	*Ambystoma jeffersonianum*	END	END	END	S2	In Ontario, Jefferson salamander is found only in southern Ontario, along southern portions of the Niagara Escarpment and western portions of the Oak Ridges Moraine. Jefferson salamander prefers moist, well-drained deciduous and mixed forests with a closed canopy. It overwinters underground in mammal burrows and rock fissures, and moves to vernal pools and ephemeral wetlands in the early spring to breed. Breeding ponds are typically located in or near to forested habitats, and contain submerged debris (i.e., sticks, vegetation) for egg attachment sites. Ephemeral breeding pools need to have water until at least mid-summer (mid to late July) (Jefferson Salamander Recovery Team 2010).	Low	Breeding ponds must persist for the duration of larval development, which can last 2 to 4 months after hatching (COSEWIC 2010). The majority of ephemeral pools in the agricultural field on site dry before this period and are planted through with crop. Although the pond in the southwest corner of the study area persists long enough to support breeding, no individuals or egg masses were observed during field surveys. In addition, although Jefferson salamander has been historically known to occur in Wellington County south of Guelph, this population is considered to be likely extirpated, with last observations from 1989 (Jefferson Salamander Recovery Team 2010).
Amphibian	Jefferson X Blue-spotted salamander, Jefferson genome dominates	*Ambystoma hybrid pop. 1*	—	—	—	S2	In Ontario, Jefferson x blue-spotted salamander prefers moist, well-drained deciduous and mixed forests with a closed canopy. It overwinters underground in mammal burrows and rock fissures, and moves to vernal pools and ephemeral wetlands in the early spring to breed. Breeding ponds are typically located in or near to forested habitats, and contain submerged debris (i.e., sticks, vegetation) for egg attachment sites. Ephemeral breeding pools need to have water until at least mid-summer (mid to late July) (Jefferson Salamander Recovery Team 2010).	Low	Although potential breeding ponds were observed on the site and in the study area, no individuals or egg masses were observed during field surveys.
Amphibian	Western chorus frog - Great Lakes St. Lawrence / Canadian Shield population	*Pseudacris triseriata*	—	THR	THR	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	Although there is potential breeding habitat on the site and in the study area, no individuals were observed during field surveys.
Arthropod	Black dash	*Euphyes conspicua*	—	—	—	S3	This small skipper primarily inhabits large graminoid meadow marshes, but can also be found in open areas along small streams. The main larval host is tussock sedge (*Carex stricta*) (Layberry et al. 1998).	Moderate	There are no large graminoid meadow marshes on the site or in the study area. Open riparian areas along Mill Creek and its tributaries, particularly near the intersection of Conc 2 and Sideroad 20.
Arthropod	Monarch	*Danaus plexippus*	SC	SC	END	S2N, S4B	In Ontario, monarch is found throughout the northern and southern regions of the province. This butterfly is found wherever there are milkweed (*Asclepias* 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).	Moderate	Field edges, roadsides and riparian habitats on the site and in the study area may provide suitable foraging habitat. Milkweed plants were also observed in the study area during field surveys and may provide suitable host sites.

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Arthropod	Rusty-patched bumble bee	*Bombus affinis*	END	END	END	S1	In Ontario, rusty-patched bumble bee is found in areas from the southern Great Lakes – St. Lawrence forest region southwards into the Carolinian forest. It is a habitat generalist, but it is typically found in open habitats, such as mixed farmland, savannah, marshes, sand dunes, urban and lightly wooded areas. It is cold –tolerant and can be found at high elevations. Most recent sightings in Ontario have been in oak savannah habitat with well-drained, sandy soils and moderately open canopy. It requires an abundance of flowering plants for forage. This species most often builds nests underground in old rodent burrows, but also in hollow tree stumps and fallen dead wood (Colla and Taylor-Pindar 2011). The only recent sightings in Ontario are from the Pinery Provincial Park.	Low	This species is only known to occur within Pinery Provincial Park in southwestern Ontario.
Arthropod	West Virginia white	*Pieris virginiensis*	SC	—	—	S3	In Ontario, west Virginia white is found primarily in the central and southern regions of the province. This butterfly lives in moist, mature, deciduous and mixed woodlands, and the caterpillars feed only on the leaves of toothwort (*Cardamine* spp.), which are small, spring-blooming plants of the forest floor. These woodland habitats are typically maple-beech-birch dominated. This species is associated with woodlands growing on calcareous bedrock or thin soils over bedrock (Burke 2013).	Low	There were no toothwort host plants observed on the site or off-site in the study area. In addition, this species has only been historically recorded in the region (Jones et al. 2019).
Arthropod	Yellow-banded bumble bee	*Bombus terricola*	SC	SC	SC	S2	This species is a forage and habitat generalist. Mixed woodlands are commonly used for nesting and overwintering, but it also occupies various open habitats including native grasslands, farmlands and urban areas. It is an early emerging species, making it likely an important pollinator of early blooming wild flowering plants (e.g., wild blueberry) and agricultural crops (e.g., apple). Nest sites are mostly abandoned rodent burrows (COSEWIC 2015).	Moderate	Field edges, roadsides and riparian habitats on the site and in the study area may provide suitable foraging habitat. The swamps and forests on site and in the study area may also provide habitat for nesting and overwintering.
Bird	Bald eagle	*Haliaeetus leucocephalus*	SC	—	NAR	S2N,S4B	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 are no lakes or large rivers on the site or in the study area to provide suitable habitat for this species. In addition, no individuals were observed during field surveys.
Bird	Bank swallow	*Riparia riparia*	THR	THR	THR	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).	Moderate	Although bank swallow was observed during field surveys, the individuals were flying over the site. In addition, no suitable bluffs or exposed sandy banks were observed on the site to provide nesting habitat.

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Bird	Barn swallow	*Hirundo rustica*	SC	THR	SC	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	Barn swallow were observed on the site during field surveys and were confirmed to be nesting in the barn on site. Adjacent agricultural fields may also provide suitable foraging habitat.
Bird	Black tern	*Chlidonias niger*	SC	—	NAR	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	There are no suitable marshes on the site or in the study area to provide suitable breeding habitat. In addition, no individuals were observed during field surveys.
Bird	Bobolink	*Dolichonyx oryzivorus*	THR	THR	THR	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).	Moderate	Although bobolink was observed during field surveys, there is no suitable nesting habitat on site or in the study area, and breeding was not confirmed during the field surveys.
Bird	Canada warbler	*Cardellina canadensis*	SC	THR	SC	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	Although the mixed swamp on site may provide suitable breeding habitat, no individuals were observed during field surveys.
Bird	Eastern meadowlark	*Sturnella magna*	THR	THR	THR	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	There are no large open grasslands or hay fields on the site or in the study area to provide suitable nesting habitat. In addition, no individuals were observed during field surveys.

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Bird	Eastern wood-pewee	*Contopus virens*	SC	SC	SC	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 (COSEWIC 2012).	High	Eastern wood-pewee was observed on the site during field surveys. The mixed and deciduous swamp on the site and in the study area provides suitable breeding habitat for this species.
Bird	Golden-winged warbler	*Vermivora chrysoptera*	SC	THR	THR	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 regenerating shrubland or scrub habitat on the site or in the study area to provide suitable breeding habitat. In addition, no individuals were observed during field surveys.
Bird	Grasshopper sparrow *pratensis* subspecies	*Ammodramus savannarum* (pratensis subspecies)	SC	SC	SC	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	There are no large open grasslands or hay fields on the site or in the study area to provide suitable nesting habitat. In addition, no individuals were observed during field surveys.
Bird	Henslow's sparrow	*Ammodramus henslowii*	END	END	END	SHB	In Ontario, Henslow's sparrow breeds in large grasslands with low disturbance, such as lightly grazed and ungrazed pastures, fallow hayfields, grassy swales in open farmland, and wet meadows. Preferred habitat contains tall, dense grass cover, typically over 30 cm high, with a high percentage of ground cover, and a thick mat of dead plant material. Henslow's sparrow generally avoids areas with emergent woody shrubs or trees, and fence lines. Areas of standing water or ephemerally wet patches appear to be important. This species breeds more frequently in patches of habitat greater than 30 ha and preferably greater than 100 ha (COSEWIC 2011).	Low	There are no large open grasslands or hay fields on the site or in the study area to provide suitable nesting habitat. In addition, no individuals were observed during field surveys.
Bird	Red-headed woodpecker	*Melanerpes erythrocephalus*	END	END	END	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	The mixed and deciduous swamp on the site is likely too dense to provide suitable breeding habitat. However, woodland edges and the smaller woodland pockets along the northern edge of the site may provide suitable nesting or roosting habitat. However, no individuals were observed during field surveys.

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Bird	Wood thrush	*Hylocichla mustelina*	SC	THR	THR	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 limited upland forest habitat (the preferred habitat for this species) on the site and in the study area. In addition, no individuals were observed during field surveys.
Mammal	Eastern small-footed myotis	*Myotis leibii*	END	—	—	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)	High	Eastern small-footed myotis was recorded on the site during acoustic surveys. Junk piles and buildings on the site were assessed to be likely to support suitable maternity roost habitat for this species. No known or potential hibernaculum features were identified on the site or in the study area.
Mammal	Gray fox	*Urocyon cinereoargenteus*	THR	THR	THR	S1	While the Ontario range of this species extends across much of southern and southeastern Ontario, the only known population in the province is on Pelee Island, with very rare sightings elsewhere in the province at points close to the border with the United States. This species inhabits deciduous forests and marshes and will den in a variety of features including rock outcroppings, hollow trees, burrows or brush piles, usually where dense brush provides cover and in close proximity to water. This species is considered a habitat generalist (COSEWIC 2015).	Low	This species is currently only known to occur on Pelee Island.
Mammal	Little brown myotis	*Myotis lucifugus*	END	END	END	S3	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 (ECCC 2018).	High	Little brown myotis was recorded on the site during acoustic surveys and determined likely to be roosting in the buildings on site. In addition, the deciduous and mixed swamp and forest on the site and in the study area may provide suitable maternity roost habitat. No known or potential hibernaculum features were identified on the site or in the study area.
Mammal	Northern myotis	*Myotis septentrionalis*	END	END	END	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 (ECCC 2018).	High	Northern myotis was recorded on the site during acoustic surveys and assessed to have moderate potential to roost in the buildings on site. In addition, deciduous and mixed swamp and forest on the site and in the study area may provide suitable maternity roost habitat. No known or potential hibernaculum features were identified on the site or in the study area.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Mammal	Tri-colored bat	*Perimyotis subflavus*	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 (ECCC 2018).	Moderate	Although no individuals were observed during field surveys, acoustic detectors were focused on buildings, which do not represent preferred habitat for this species. The deciduous and mixed swamps on the site and in the study area may provide suitable maternity roosting habitat. No known or potential hibernaculum features were identified on the site or in the study area.
Mammal	Woodland vole	*Microtus pinetorum*	SC	SC	SC	S3?	In Ontario, woodland vole is associated with mature deciduous forests with soft, often sandy soils and a deep litter and humic layer, suitable for burrowing. Common associates include oaks, hickory, black walnut, American beech and tulip tree. This species is often found at woodland edges near roads, railway tracks and field edges. Woodland vole is restricted to the Carolinian forest zone (COSEWIC 2010).	Low	The site and study area are generally too wet to provide suitable habitat for woodland vole.
Reptile	Blanding's turtle - Great Lakes / St. Lawrence population	*Emydoidea blandingii*	THR	END	END	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 2016).	Low	The wetland on the site and in the study area does not contain permanent standing water deep enough to support Blanding's turtle. Other aquatic features on the site, including the pond in the southwest corner of the site, are either temporary or too shallow to provide suitable aquatic habitat for Blanding's turtle. No individuals were observed during field surveys.
Reptile	Eastern ribbonsnake - Great Lakes population	*Thamnophis sauritius*	SC	SC	SC	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).	Moderate	The wetland on the site and in the study area may provide suitable wetland habitat. The wetland contains shallow pools of water throughout the summer and Mill Creek and several tributaries traverse the community.
Reptile	Midland painted turtle	*Chrysemys picta marginata*	—	SC	SC	S4	In Ontario, painted turtles use waterbodies, such as ponds, marshes, lakes and slow-moving creeks, with a soft bottom and abundant basking sites and aquatic vegetation. This species hibernates on the bottom of waterbodies (Ontario Nature 2018).	Moderate	The wetland on the site and in the study area does not contain permanent standing water deep enough to support this turtle. Other aquatic features on the site, including the pond in the southwest corner of the site, are either temporary or too shallow to provide suitable aquatic habitat for snapping turtle. Mill Creek may provide suitable aquatic habitat on the site and in the study area.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Reptile	Milksnake	*Lampropeltis triangulum*	NAR	SC	SC	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	The wetland, agricultural fields and rural residential property on the site and in the study area may provide suitable habitat.
Reptile	Northern map turtle	*Graptemys geographica*	SC	SC	SC	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	The wetland on the site and in the study area does not contain permanent standing water deep enough to support this turtle. Other aquatic features on the site, including the pond in the southwest corner of the site, are either temporary or too shallow to provide suitable aquatic habitat for northern map turtle. In addition, there are no occurrence records in the vicinity of the study area (Ontario Nature 2021; iNaturalist 2021).
Reptile	Snapping turtle	*Chelydra serpentina*	SC	SC	SC	S4	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).	Moderate	The wetland on the site and in the study area does not contain permanent standing water deep enough to support this turtle. Other aquatic features on the site, including the pond in the southwest corner of the site, are either temporary or too shallow to provide suitable aquatic habitat for snapping turtle. Mill Creek may provide suitable aquatic habitat on the site and in the study area. In addition, evidence of turtle nesting was observed along the driveway and was likely snapping turtle.
Vascular Plant	American chestnut	*Castanea dentata*	END	END	END	S1S2	In Ontario, American chestnut occurs in mixed or deciduous forests in the Carolinian zone (Farrar 1995). It is often found in communities with dense canopy cover and often associated with oak and maple. This tree grows primarily on acidic, sand or gravel soils (Boland et al. 2012).	Low	The majority of the treed area on the site and in the study area is characterized by swamp that is too wet to provide suitable growing conditions. In addition, no individuals were observed during the field surveys.
Vascular Plant	American ginseng	*Panax quinquefolius*	END	END	END	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 well-drained soils of glaciary origin that have a neutral pH (ECCC 2018).	Low	The majority of the treed area on the site and in the study area is characterized by swamp that is too wet to provide suitable growing conditions. In addition, no individuals were observed during the field surveys.
Vascular Plant	American hart's-tongue fern	*Asplenium scolopendrium*	SC	SC	SC	S3	In Ontario, hart's-tongue fern grows on thin calcareous soils on or near dolomitic limestone of the Niagara Escarpment, and occasionally on open talus/scree slopes. Most populations are found on steep, moderately moist slopes that face north to northeast and are under a hardwood canopy cover (Environment Canada 2013).	Low	Forest and swamp habitat on the site and in the study area are generally flat to hummocky, with deep soils and a lack of steep slopes with northern exposure to provide preferred growing conditions. In addition, no individuals were observed during the field surveys.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Vascular Plant	Black ash	*Fraxinus nigra*	END (temporary suspension of protection until Jan 2024)	—	THR	S3	Found throughout Ontario in moist ecosystems; commonly found in northern swampy woodlands (MNRF 2018). This species typically grows on mucky or peaty soils and is considered a facultative wetland species (Reznicek et al. 2011).	High	Black ash was observed in several of the swamp communities characterizing Mill Creek-Puslinch PSW on the site during field surveys.
Vascular Plant	Butternut	*Juglans cinerea*	END	END	END	S2?	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	The majority of forest cover on the site and in the study area is too wet to provide preferred growing conditions for butternut. Although upland portions of the study area may provide suitable habitat, no individuals were observed during field surveys.
Vascular Plant	False hop sedge	*Carex lupuliformis*	END	END	END	S1	In Ontario, false hop sedge occurs in marshes, riverine swamps, borders of vernal pools, and wet depressions of forests. It occasionally occurs in shallow water or very wet floodplain forests. Usually grows under a moderately open canopy but can tolerate high levels of sunshine. Substrates are calcareous or neutral and include moist wet mucks, silt loams, or alluvial deposits with a sandy texture (Environment Canada 2014).	Low	The swamp on site is densely vegetated and generally wet throughout, rather than containing isolated pools or marshes with fluctuating water levels, and is unlikely to provide preferred growing conditions. In addition, no individuals were observed during field surveys, and all known extant populations in the province are from Elgin, Essex, and Middlesex counties in southwestern Ontario (MNRF 2017).
Vascular Plant	Ram's-head lady's-slipper	*Cypripedium arietinum*	—	—	—	S3	Ram's-head lady's-slipper can be found in moist coniferous swamps, dry sandy woods and limestone barrens Oldham and Brinker 2009).	Low	Although the coniferous swamp on site may provide suitable habitat, no individuals were observed during field surveys.

[1] *Endangered Species Act* (ESA), 2007. General (O.Reg 242/08 last amended 1 April 2021 as O. Reg 228/21). Species at Risk in Ontario List (O.Reg 230/08 last amended 26 January 2022 as O. Reg. 24/22); 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 15 February 2023); 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] 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 updated November 2019.

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APPENDIX E

Wildlife List

Scientific Name	Common Name	SRANK[a]	GRANK[a]	Status[b]
Amphibians				
American Toad	*Anaxyrus americanus*	S5	G5	—
Gray Treefrog	*Hyla versicolor*	S5	G5	—
Green Frog	*Lithobates clamitans*	S5	G5	—
Northern Leopard Frog	*Lithobates pipiens*	S5	G5	—
Spring Peeper	*Pseudacris crucifer*	S5	G5	—
Wood Frog	*Lithobates sylvaticus*	S5	G5	—
Arthropods				
Cabbage White	*Pieris rapae*	SNA	G5	—
Ebony Jewelwing	*Calopteryx maculata*	S5	G5	—
Firefly sp.	—	—	—	—
Birds				
Alder Flycatcher	*Empidonax alnorum*	S5B	G5	—
American Crow	*Corvus brachyrhynchos*	S5B	G5	—
American Goldfinch	*Carduelis tristis*	S5B	G5	—
American Kestrel	*Falco sparverius*	S4	G5	—
American Robin	*Turdus migratorius*	S5B	G5	—
Bank Swallow	***Riparia riparia***	**S4B**	**G5**	**THR**
Barn Swallow	***Hirundo rustica***	**S4B**	**G5**	**SC**
Black-capped Chickadee	*Poecile atricapillus*	S5	G5	—
Blue Jay	*Cyanocitta cristata*	S5	G5	—
Blue-headed Vireo	*Vireo solitarius*	S5B	G5	—
Bobolink	***Dolichonyx oryzivorus***	**S4B**	**G5**	**THR**
Brown-headed Cowbird	*Molothrus ater*	S4B	G5	—
Canada Goose	*Branta canadensis*	S5	G5	—
Cedar Waxwing	*Bombycilla cedrorum*	S5B	G5	—
Chipping Sparrow	*Spizella passerina*	S5B	G5	—
Common Grackle	*Quiscalus quiscula*	S5B	G5	—
Common Loon	*Gavia immer*	S5B, S5N	G5	—
Common Raven	*Corvus corax*	S5	G5	—
Common Yellowthroat	*Geothlypis trichas*	S5B	G5	—
Eastern Kingbird	*Tyrannus tyrannus*	S4B	G5	—
Eastern Phoebe	*Sayornis phoebe*	S5B	G5	—
Eastern Wood-pewee	***Contopus virens***	**S4B**	**G5**	**SC**
European Starling	*Sturnus vulgaris*	SNA	G5	—
Gray Catbird	*Dumetella carolinensis*	S4B	G5	—
Great Crested Flycatcher	*Myiarchus crinitus*	S4B	G5	—
House Finch	*Haemorhous mexicanus*	SNA	G5	—
House Sparrow	*Passer domesticus*	SNA	G5	—
House Wren	*Troglodytes aedon*	S5B	G5	—
Indigo Bunting	*Passerina cyanea*	S4B	G5	—

Scientific Name	Common Name	SRANK[a]	GRANK[a]	Status[b]
Killdeer	*Charadrius vociferus*	S5B, S5N	G5	—
Mallard	*Anas platyrhynchos*	S5	G5	—
Mourning Dove	*Zenaida macroura*	S5	G5	—
Mourning Warbler	*Geothlypis philadelphia*	S4B	G5	—
Northern Cardinal	*Cardinalis cardinalis*	S5	G5	—
Northern Flicker	*Colaptes auratus*	S4B	G5	—
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S4B	G5	—
Northern Waterthrush	*Parkesia noveboracensis*	S5B	G5	—
Ovenbird	*Seiurus aurocapilla*	S4B	G5	—
Red-bellied Woodpecker	*Melanerpes carolinus*	S4	G5	—
Red-eyed Vireo	*Vireo olivaceus*	S5B	G5	—
Red-winged Blackbird	*Agelaius phoeniceus*	S4	G5	—
Rock Pigeon	*Columba livia*	SNA	G5	—
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	S4B	G5	—
Savannah Sparrow	*Passerculus sandwichensis*	S4B	G5	—
Song Sparrow	*Melospiza melodia*	S5B	G5	—
Turkey Vulture	*Cathartes aura*	S5B	G5	—
Veery	*Catharus fuscescens*	S4B	G5	—
White-breasted Nuthatch	*Sitta carolinensis*	S5	G5	—
Wild Turkey	*Meleagris gallopavo*	S5	G5	—
Wood Duck	*Aix sponsa*	S5	G5	—
Yellow Warbler	*Setophaga petechia*	S5B	G5	—
Yellow-bellied Sapsucker	*Empidonax flaviventris*	S5B	G5	—
Mammals				
Big Brown Bat	*Eptesicus fuscus*	S4	G5	—
Eastern Grey Squirrel	*Sciurus carolinensis*	S5	G5	—
Eastern Small-footed Myotis	***Myotis leibii***	**S2S3**	**G4**	**END**
Hoary Bat	*Lasiurus cinereus*	S4	G3G4	—
Little Brown Myotis	***Myotis lucifugus***	**S3**	**G3**	**END**
Northern Myotis	***Myotis septentrionalis***	**S3**	**G1G2**	**END**
Northern Raccoon	*Procyon lotor*	S5	G5	—
Red Bat	*Lasiurus borealis*	S4	G3G4	—
Red Squirrel	*Tamiasciurus hudsonicus*	S5	G5	—
Silver-haired Bat	*Lasionycteris noctivagans*	S4	G3G4	—
White-tailed Deer	*Odocoileus virginianus*	S5	G5	—

[a] Ranks based upon determinations made by the Ontario Natural Heritage Information Centre (2019)
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)

[b] Status: *Endangered Species Act*, 2007. General (O.Reg 242/08 last amended 31 March 2022 as O. Reg. 328/22). Species at Risk in Ontario List (O.Reg 230/08 last amended 25 January 2023 as O. Reg. 9/23); Schedule 1 (Extirpated - EXP), Schedule 2 (Endangered - END), Schedule 3 (Threatened - THR), Schedule 4 (Special Concern - SC)

Bolded text indicates species at risk.

APPENDIX F

Fish Habitat Survey Results

Feature	Bankfull		Wetted		Water Temperature (°C)	Morphology / Flow	Instream Cover	Substrates	Riparian Cover	Other comments	Fish Observed
	Mean Width (m)	Max Depth (m)	Mean Width (m)	Max Depth (m)							
Mill Creek	6	0.4	5	0.2	14	Meandering Moderate flow with areas of riffles and runs	10% provided by boulders, woody debris and undercut banks	gravel (85%) with sand (10%) and boulders (5%)	Canopy (10%) understory (80%) and ground cover (80%) layers Common milkweed, common buckthorn, willows, American elm, red-osier dogwood, purple loosestrife (*Lythrum salicaria*) and goldenrods	Watercress (*Nasturtium officinale*) was observed in the creek which is indicative of groundwater inputs. Banks slightly stable to unstable with some evidence of undercut banks on right upstream bank.	None observed during the survey. Mill Creek has a coldwater thermal regime and is known to support several fish species, including blacknose dace (*Rhinichthys atratulus*), bluntnose minnow (*Pimephales notatus*), brook stickleback (*Culaea inconstans*), central mudminnow (*Umbra limi*), common shiner (*Luxilus cornutus*), creek chub (*Semotilus atromaculatus*), fathead minnow (*Pimephales promelas*), rainbow darter (*Etheostoma caeruleum*), rock bass (*Ambloplites rupestris*), and white sucker (*Catostomus commersonii*) (MNDMNRF 2021b). It also supports sensitive coldwater species such as brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis fontinalis*) (MNDMNRF 2021b).
Tributary #1	3	0.5	2	0.3	12	Meandering High flow with areas of riffles and runs	20% provided by woody debris and undercut banks	gravel (80%) with sand (20%)	Canopy (90%), understory (40%) and ground cover (30%) Yellow birch, jewelweed and white cedar	Watercress was observed in the tributary which is indicative of groundwater inputs. Banks stable.	None observed during the survey. MNDMNRF data indicate this tributary has a coldwater thermal regime and supports a similar fish community as recorded in the main branch of Mill Creek (MNDMNRF 2021b).
Tributary #2	2.5	0.3	1.5	0.2	15	Straight Low flow	Duckweed	gravel (90%) with sand (10%)	Canopy (80%), understory (60%) and ground cover (100%) Common milkweed, goldenrods, field horsetail (*Equisetum arvense*), white cedar, jewelweed, bittersweet nightshade and American el	The bottom of the culvert on the west side of Sideroad 20 was observed to be above the water level at the time of the survey and may present a seasonal barrier to fish movement. Banks stable.	None observed during the survey. MNDMNRF data indicate this tributary has a coldwater thermal regime and supports a similar fish community as recorded in the main branch of Mill Creek (MNDMNRF 2021b).

Feature	Bankfull		Wetted		Water Temperature (°C)	Morphology / Flow	Instream Cover	Substrates	Riparian Cover	Other comments	Fish Observed
	Mean Width (m)	Max Depth (m)	Mean Width (m)	Max Depth (m)							
Tributary #3	2	0.4	1	0.2	16	Straight Low flow	10% by vegetation, which consisted of Pennsylvania bittercress (*Cardamine pensylvanica*), broad-leaved arrowhead (*Sagittaria latifolia*), broad-leaved cattail (*Typha latifolia*)	gravel (70%) with sand (29%) and boulder (1%)	Canopy (5%), understory (10%) and ground cover (40%) layers Grasses, including reed canary grass (*Phalaris arundinacea*)	Watercress was observed in the tributary which is indicative of groundwater inputs. Existing farm lane crossing with concrete box culvert measuring 1 m high and 2 m wide.	Small-bodied fish were observed. MNDMNRF data indicate this tributary has a coldwater thermal regime and supports a similar fish community as recorded in the main branch of Mill Creek (MNDMNRF 2021b).
Tributary #4	—	—	—	—	—	—	—	—	—	Located off-site, in the study area and was therefore not assessed in the field. However, it is likely to have similar fish habitat characteristics as the other tributaries of Mill Creek assessed on the site: moderate to high riparian cover, cool to coldwater, low flow and coarse substrates.	MNDMNRF data indicate this tributary has a coldwater thermal regime and supports a similar fish community as recorded in the main branch of Mill Creek (MNDMNRF 2021b).
Tributary #5	4.5	0.3	2.5	0.1	15	Straight Stagnant (June) Low flow (Oct)	50% provided by instream vegetation and occasional woody debris. Instream vegetation included lesser duckweed (*Lemna minor*) and aquatic grasses	muck (100%)	Canopy (50%), understory (10%) and ground cover (10%) layers Red elderberry, black ash, goldenrods, jewelweed and grasses	Banks stable.	None observed during the survey. No MNDMNRF data available.
Tributary #6	1	0.1	0.3	0.05	17	Meandering Low flow (intermittent feature)	5% provided by boulders	sand (50%) and silt (50%)	Canopy (30%), understory (50%) and ground cover (90%) layers Jewelweed, willowherb (*Epilobium* sp.), round-leaved dogwood (*Cornus rugosa*), white cedar, green ash, basswood and American elm	Unmapped watercourse crossing Sideroad 20 that was identified during the field surveys. Banks stable.	No fish were observed during the survey and the tributary was assessed to have low potential to support fish due to the low flow / intermittent conditions. No MNDMNRF data available.

APPENDIX G

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, 2016

Languages

English – Fluent

WSP Canada Inc. – Mississauga

Senior Ecologist, Director Ecology and Water – Ontario Earth & Environment

Heather Melcher is Director of Ecology and Water Resources – Ontario Earth & Environment, Senior Ecologist and Project Manager with WSP. Heather has over 22 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 Ontario Land Tribunal (OLT) hearings.

Employment History

WSP Canada Inc. – Mississauga, Ontario

Director, Ecology and Water Resources – Ontario Earth & Environment (2022 to Present)

Golder Associates Ltd. – Mississauga, Ontario

Principal, Senior Ecologist (2004 to 2022)

Project manager, project director and/or technical lead or advisor on multi-disciplinary projects of varying size and complexity. Leads a team of ecologists in Ontario and responsible for business development as a global client lead.

ESG International – Guelph, Ontario

Ecologist/Environmental Planner (2002 to 2003)

Specialized in resource management and land use planning. Worked with clients, residential and commercial land developers, land planners and regulatory agencies to obtain permits and approvals, specifically within the framework of Niagara Escarpment and Oak Ridges Moraine legislation. Compiled, assessed and reported on marine data collected for international projects.

CBCL Ltd – Halifax, Nova Scotia

Ecologist/Environmental Planner (2001 to 2002)

Intermediate project manager responsible for designing and implementing environmental effects monitoring, environmental impact assessment, and natural heritage projects. Developed and implemented marine and freshwater fisheries and benthic investigations, aquatic habitat assessments, and water quality and sediment assessments. Liaised with clients and regulatory agencies (federal and provincial), to obtain development permits and approvals.

PROJECT EXPERIENCE – CONSTRUCTION MATERIALS

CBM Aggregates (a division of St. Marys Cement Inc. (Canada)), Caledon Pit / Quarry
Caledon, Ontario, Canada

Project manager and natural environment component lead for a below water pit / quarry licence application under the Aggregate Resources Act (ARA) and an EIS under the Planning Act. Surveys completed to support the natural environment component included fish and fish habitat, breeding birds, bats, anuran (frog and toad), turtle, species at risk, vegetation community, botanical, wetland and woodland delineation. As project manager, coordinated schedules and budget, and led public, Indigenous and agency consultation. Other discipline studies to support the project included hydrogeology, resource evaluation, karst assessment, surface water, blasting design, noise, air quality, archaeology, cultural heritage, visual assessment.

Alamos Island Gold, Aggregate Pit T06-07
Dubreuilville, Ontario, Canada

Senior advisor/technical reviewer for a below water pit permit application under the ARA. Provided direction and oversight for terrestrial and aquatic studies, including the following surveys: nightjar passive acoustic, amphibian call count, fish and fish habitat, breeding bird, vegetation community and botanical. Reviewed all draft and final deliverables.

Scotian Materials Limited
Halifax, Nova Scotia, Canada

Senior technical lead (biophysical) for the provincial environmental assessment to support the expansion of an existing quarry. Studies completed to support the project included fish and fish habitat, species at risk, flora and fauna and wetland surveys. The technical lead for the impact assessment for the natural environment and the completion of supporting permit/approval applications. Scope included the completion of wetland and wildlife management plans.

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

Natural environment component lead for permit applications under the ARA. The aggregate areas are in support of rehabilitation activities associated with the decommissioning of the former Gordon-Werner Lake Mine. Coordinated aquatic and terrestrial field data collection and analysis, interpreted and integrated data with hydrogeological and surface water components, and developed 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. Prepared and submitted permitting applications under the Endangered Species Act (ESA), developed mitigation plans and coordinated 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 and an EIS under the Planning Act. Coordinated aquatic and terrestrial field data collection and analysis, interpreted and integrated data with hydrogeological and surface water components and completed a comprehensive, integrated impact assessment. Developed progressive and final rehabilitation plans, participated in agency and public consultation and produced an NEL 1/2 report and municipal Environmental Impact Study (EIS) report. Led negotiations with the MNRF regarding SAR issues and developed mitigation and habitat compensation plans for butternut. Participated in an Ontario Municipal Board (OMB) hearing as an expert witness.

Colacem Cement
L'Orignal, Ontario, Canada

Natural environment component lead for the Colacem Cement Plant. Included an EIS under the Planning Act Designed and coordinated aquatic and terrestrial field data collection and analysis, interpreted and integrated data with physical resource components. Developed 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. Participated in a LPAT (formerly the OMB) hearing as an expert witness.

CBM Aggregates (a division of St. Marys Cement Inc. (Canada)), Dance Pit Expansion
North Dumfries, Ontario, Canada

Project manager and natural environment technical advisor for an above water pit licence application under the ARA and an EIS under the Planning Act. Worked with the natural environment component lead to collect, analyse, interpret and integrate terrestrial and aquatic data with hydrogeological and surface water components. Developed a rehabilitation plan, consulted 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 participated in agency and public consultation. Coordinated and managed 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. Managed and tracked overall project budget and schedule.

CBM Aggregates (a division of St. Marys Cement Inc. (Canada)), Lanci Pit Expansion
Aberfoyle, Ontario, Canada

Project manager and natural environment technical advisor for an above water pit licence application under the ARA and an EIS under the Planning Act. Worked with the natural environment component lead to analyse, interpret and integrate terrestrial and aquatic data with hydrogeological and surface water components. Developed a rehabilitation plan, consulted with the Grand River Conservation Authority, the MNRF, the municipality, and participated in agency and public consultation. Coordinated and managed the activities of a multi-disciplinary team including hydrogeologists, surface water engineers, noise scientists, archaeologists, and an Indigenous Community engagement team. Managed and tracked overall project budget and schedule.

Cavanagh Construction Ltd., Henderson II Quarry
Ottawa, Ontario, Canada

Natural environment component lead for a below water quarry licence application under the ARA and an EIS under the Planning Act. Coordinated aquatic and terrestrial field data collection and analysis, interpreted and integrated data with hydrogeological and surface water components and completed a comprehensive integrated impact assessment. Developed a rehabilitation plan, participated in agency and public consultation and developed an NEL 1/2 report and municipal EIS report. Led negotiations with the MNRF regarding SAR issues and developed 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 and an EIS under the Planning Act. Coordinated aquatic and terrestrial field data collection and analysis, interpreting and integrated data with hydrogeological and surface water components. Developed a rehabilitation plan, participated in agency and public consultation and developed an NEL 1/2 report and municipal EIS. Led negotiations with the MNRF regarding SAR issues and developed compensation plans for the removal of 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 and an EIS under the Planning Act. Analysed and integrated terrestrial and aquatic data with hydrogeological and surface water components, completed a comprehensive and integrated impact assessment. Developed a rehabilitation plan and an NEL 1/2 report and municipal EIS report. Participated in consultation with the Region and the Ecological and Environmental Advisory Committee (EEAC).

Lafarge Canada Inc., French Settlement Pit
Ottawa, Ontario, Canada

Natural environment component lead for a below water pit licence application under the ARA and an EIS under the Planning Act. Coordinated aquatic and terrestrial field data collection and analysis. Interpreting and integrated data with hydrogeological and surface water components. Developed a progressive and final rehabilitation plan and an NEL 1/2 report and municipal EIS report. Consulted with regulatory agencies and participated in public consultation process.

Lafarge Canada Inc., Sunningdale Pit
London, Ontario, Canada

Natural environment component lead for a below water pit licence application under the ARA and an EIS under the Planning Act. Coordinated aquatic and terrestrial field data collection and analysis. Interpreting and integrated data with hydrogeological and surface water components. Completed a comprehensive and integrated impact assessment. Developed a progressive and final rehabilitation plan and an NEL 1/2 report and EIS. Consulted with regulatory agencies and participated in public consultation process. 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 and an EIS under the Planning Act. Coordinated aquatic and terrestrial field data collection and analysis. Interpreting and integrated data with hydrogeological and surface water components. Completed a comprehensive and integrated impact assessment. Developed a progressive and final rehabilitation plan and an NEL 1/2 report and EIS. Consulted with regulatory agencies, participated in public consultation process. Coordinated and managed the activities, schedule and budget 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 and an EIS under the Planning Act. Coordinated aquatic and terrestrial field data collection and analysis. Interpreting and integrated data with hydrogeological and surface water components. Completed a comprehensive and integrated impact assessment. Developed a progressive and final rehabilitation plan and an NEL 1/2 report and EIS. Coordinated and managed the activities, schedule and budget 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 under the ARA and an EIS under the Planning Act. 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). Prepared and submitted permitting documents under the ESA, led consultation with the MNRF and MECP, developed a mitigation plan and provided direction to the construction team.

TransCanada - Various Sites in Ontario
Ontario, Canada

Natural environment component lead for multi-year 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 multi-year 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. Developed survey protocols, consulted with the MNRF, registered for activities under the ESA (Notice of Activity), completed Information Gathering Forms (IGF), prepared and submitted permit applications and developed 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. Designed the field program (terrestrial and aquatic), analysed and integrated data with other physical resource disciplines. Completed a comprehensive and integrated impact assessment. Led consultation 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 and developed reports.

Wataynikaneyap Power Phase 2 Transmission Line
Northwestern Ontario, Canada

Senior advisor and technical reviewer for the wildlife component of permitting for a 300 km transmission corridor. 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). Provided 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. Provided 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. Regular consultation 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. Led a team of ecologists, analysed and interpreted terrestrial and aquatic data and completed impact assessment. Liaised with prime engineering firm and agencies including the municipality and the MNRF. Provided senior technical review of natural environment study report and permitting documents.

Regional Road 57 Municipal Class EA
Clarington, Ontario, Canada

Senior natural environment technical lead. Led a team of ecologists, analysed and interpreted terrestrial and aquatic data and completed impact assessment. Liaised with prime engineering firm and agencies. Provided senior technical review of natural environment study report.

Markham GO Station Road Realignment Municipal Class EA
Markham, Ontario, Canada

Senior natural environment technical lead. Led a team of ecologists, analysed and interpreted terrestrial and aquatic data and completed impact assessment. Liaised with prime engineering firm and agencies. Provided senior technical review of natural environment study report.

PROJECT EXPERIENCE – SERVICING/INFRASTRUCTURE

Peel Wastewater Treatment Plan
Region of Peel, Ontario, Canada

Teamed with GM BluePlan Engineering Limited on Region of Peel project. Project manager and senior advisor and technical reviewer for the natural environment component for a Schedule C Municipal Class Environmental Assessment for the capacity expansion of the central Mississauga wastewater system. Managed a multi-disciplinary team including natural environment, surface water and geomorphology, archaeology, cultural heritage, and geotechnical engineering. Assessed alternatives, designed the natural environment field program for the preferred options, and worked with the component lead to analyse and interpret data for the sewer pipeline and shaft locations. Public and agency, including Toronto and Region Conservation Authority, Credit Valley Conservation, consultation. Provided senior leadership and technical guidance and review for all natural environment deliverables.

Port Credit East Wastewater Servicing Optimization
Mississauga, Ontario, Canada

Teamed with GM BluePlan Engineering Limited on Region of Peel project. Project director and senior advisor and technical reviewer for the natural environment component for a Schedule C Municipal Class Environmental Assessment for alternative wastewater strategies for the existing Elmwood, Hiawatha and Rosemere sewage pumping station services areas, and to develop an integrated servicing strategy to support existing servicing needs and projected growth. Assessed alternatives, designed the natural environment field program for the preferred options and worked with the component lead to analyse and interpret data for the sewer pipeline and shaft locations. Public and agency, including Credit Valley Conservation, consultation. Provided senior leadership and technical guidance and review for all natural environment deliverables.

Clarksburg Master Servicing Plan
Clarksburg, Ontario, Canada

Senior advisor and technical reviewer for the natural environment component for a Class Environmental Assessment. Worked with the component lead to design field program and analyse and interpret data. Provided senior leadership and technical guidance and review for all deliverables.

Cambridge Zone 3
Cambridge, Ontario, Canada

Senior advisor and technical reviewer for the natural environment component for a Class Environmental Assessment for regional water system upgrades in Cambridge and North Dumfries. Worked with the component lead to design field program and analyse and interpret data. Provided senior leadership and technical guidance and review for all deliverables.

Town of Blue Mountains Water Supply Master Plan
Blue Mountains, Ontario, Canada

Senior advisor and technical reviewer for the natural environment component for a Class B Environmental Assessment. Worked with the component lead to design field program and analyse and interpret data. Provided senior leadership and technical guidance and review for all deliverables.

Region of Peel East to West Wastewater Diversion Strategy
Peel Region, Ontario, Canada

Senior advisor and technical reviewer for the natural environment component for a Class Environmental Assessment. Worked with the component lead to design field program and analyse and interpret data. Provided senior leadership and technical guidance and review for all deliverables.

PROJECT EXPERIENCE – WASTE

County of Simcoe Landfills and Transfer Stations
Various Sites in the County of Simcoe, Ontario, Canada

Senior natural environment technical lead for a number of landfill sites. Assisted the County with landuse planning, due diligence for new properties, approvals and permits for expansions and changing uses. Coordinated field investigations including wetland boundary delineation. Consulted with Conservation Authorities, Niagara Escarpment Commission and MNRF.

Humberstone Landfill
Niagara, Ontario, Canada

Senior advisor and technical reviewer for a provincial EA in support of a landfill expansion. Worked with the natural environment component lead to design field programs, consult with provincial agencies and prepare technical reports. Provided senior leadership and technical guidance and review for all deliverables.

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. Designed the field program (terrestrial and aquatic), analysed and integrated data with other disciplines, completed an impact assessment. Consulted with regulatory agencies including the Conservation Authority, MNRF and DFO. Provided input to the project design, obtained permits and participated in the public consultation process.

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 multi-year 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, rare plant surveys, data comparisons between years of data collection, and reporting.

Canadian Nuclear Laboratories (CNL) Whiteshell Research and Development Complex Decommissioning EA
Pinawa, Manitoba, Canada

Natural environment component lead for a federal EA. Developed Valued Ecosystem Components (VEC) and pathways of effects assessment. Analysed existing conditions terrestrial and aquatic data for the regional, local and site study area including for SAR, provided recommendations for additional permitting and mitigation for potential effects to wildlife and sensitive habitats. Provided input to construction design and developed technical reports.
Natural environment component lead for a federal EA. Developed Valued Ecosystem Components (VEC) and pathways of effects assessment. Analysed existing conditions terrestrial and aquatic data for the regional, local and site study area including for SAR, provided recommendations for additional permitting and mitigation for potential effects to wildlife and sensitive habitats. Provided input to construction design and developed 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 as well as remediation on land-based properties. Liaised with the Ganaraska River Conservation Authority, MNRF, DFO, and Canadian Nuclear Safety Commission, completed pathways of effects assessment, impact assessment and prepared applications and obtaining permits for dredging, bank stabilization, sediment remediation, SAR, and removal and work on Crown lands. SAR screenings, permitting and guidance for disturbance to terrestrial SAR habitats.

Bruce Power Units 3&4 Restart
Kincardine, Ontario, Canada

Worked with a team to establish VEC and appropriate study areas. Coordinated 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

Multi-year monitoring program. 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 – RENEWABLE ENERGY

Trillium Power Wind Corporation
Lake Ontario, Ontario, Canada

Project manager and natural environment lead for an offshore wind power project in Lake Ontario under O. Reg. 359/09 Renewable Energy Approvals (REA). Coordinated and managed a multi-disciplinary team comprised of noise specialists, biologists, archaeologists, public consultation specialists, aboriginal engagement specialists, visual impact assessment specialists and geophysicists. Designed terrestrial and aquatic field surveys, including avian, bat and fisheries assessments. Led provincial and federal agency consultation and participated in public open houses. Impact assessment and reporting, designed to satisfy both provincial and federal (CEAA) requirements, was underway when the project was curtailed.

Leader Resources Services Corporation
Various Locations, Ontario, Canada

Project manager and project director/senior technical advisor for four wind farm projects under O. Reg. 359/09 REA in Huron County, Ontario. Coordinated and managed a multi-disciplinary team comprised of noise specialists, natural heritage specialists, archaeologists, cultural heritage specialists, public consultation specialists and aboriginal engagement specialists. Led regulatory agency consultation specifically regarding SAR, avian and bat issues, and participated in public consultation process. Directed and reviewed all baseline natural environment impact assessment, mitigation and monitoring reporting, including species at risk, waterbodies, and wildlife/habitat (with a focus on birds and bats). Completed REA-specific project reports.

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. Designed and coordinated field programs for terrestrial and aquatic ecosystems, including SAR. Completed impact assessment, mitigation and monitoring plans and reports and led provincial agency consultation.

SkyPower Corp.
Various Locations, Ontario, Canada

Project manager for eight wind power park projects in Renfrew County, Prince Edward County and Parry Island, Ontario. Designed and coordinated natural environment field programs, including terrestrial (avian, bats, SAR, wildlife/habitats) and aquatic. Managed a multi-disciplinary team including hydrogeologists, biologists, surface water engineers, noise and air quality experts, socio-economic and public consultation coordinators. Led provincial agency and public consultation. Completed natural environment impact assessment, mitigation and monitoring plans and reports and REA-specific project reports.

Algonquin Power
Amherst Island, Ontario, Canada

Project manager and natural environment component lead for wind power project in Prince Edward County. Designed and coordinated field programs for terrestrial (avian, bats, SAR) and aquatic ecosystems. Managed a multi-disciplinary team including hydrogeologists, biologists, surface water engineers, noise and air quality experts, socio-economic and public consultation coordinators. Led provincial and federal agency consultation and participated in public consultation. Completed natural environment impact assessment, mitigation and monitoring plans and reports and REA-specific project reports.

SkyPower Corp.
Various Locations, Ontario, Canada

Project manager for four solar power projects across Ontario, including Napanee and Norfolk. Designed, coordinated and conducted field programs and data collection. Coordinated and managed the activities of a multi-disciplinary team including noise, archaeology, and surface water. Completed screening reports to provincial and municipal standards.

OptiSolar Inc.
Various Locations, Ontario, Canada

Project manager for three solar power projects across Ontario, including Sarnia, Tilbury and Petrolia. Designed, coordinated and 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. Completed screening reports to provincial and municipal standards.

PROJECT EXPERIENCE – MINING

Alamos Island Gold, Mine Expansion Feasibility Study
Dubreuilville, Ontario, Canada

Senior advisor/technical reviewer for terrestrial and aquatic baseline studies for a feasibility study for a potential mine expansion. Studies included collection of baseline data and surveys for the following: fish and fish habitat, water quality, caribou, species at risk, breeding bird, marsh bird, waterfowl nesting and stopover, nightjar (eastern-whip-poor-will and common nighthawk) turtle, amphibian, bat habitat, moose late winter habitat, and significant wildlife habitat. Provided direction for the workplan and reviewed all draft and final deliverables.

Agnico Eagle Mines Limited, Upper Beaver Mine
Kirkland Lake, Ontario, Canada

Senior advisor/technical reviewer for terrestrial and aquatic components of a gap analysis and scoping study for environmental data required to support a potential federal impact assessment (IA) and federal agency approvals, including Species at Risk Act and Fisheries Act authorization. Oversight of review of historical studies and recommendation for future studies to support the IA and permitting. Reviewed all draft and final deliverables. Developed permitting roadmap and presented all project results to the client.

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 & GAS

Enbridge Bayview Avenue Pipeline Replacement
Toronto, Ontario, Canada

Natural environment component lead for pipeline replacement project. Coordinated SAR screening, natural heritage feature mapping, site investigations, impact assessment, tree inventory, DFO self-assessment, consultation with MECP, registration of activities (NoA) under the Endangered Species Act and development of mitigation plan. Worked with team to obtain Toronto and Region Conservation Authority (TRCA) permits. Oversaw restoration and completed final inspections.

Enbridge Pipelines Inc. Line 9
Southern Ontario, Canada

Project manager for natural environment component of pipeline maintenance project in southern Ontario. Coordinated SAR screening and natural heritage feature mapping, site investigations, identification of 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). Designed the field program, analysed data, completed the baseline and effects assessment and reporting. Consulted and negotiated with the MNRF, Environment and Climate Change Canada (ECCC) and local Conservation Authorities, prepared permit applications, and addressed 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. Designed the field program (vegetation, wetlands, wildlife, fish and fish habitat), analysed data, completed the baseline and effects assessment, led consultation with agencies and obtained permits.
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. Consulted with provincial and federal agencies, designed and coordinated baseline, construction and post-construction monitoring programs and developed environmental protection plans.
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. Consulted with provincial and federal agencies, designed compensation habitat for SAR, designed and coordinated baseline, construction and post-construction monitoring programs and developed environmental protection plans.
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.

PROFESSIONAL AFFILIATIONS

Professional Association of Diving Instructors (PADI)

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

PUBLICATIONS

Conference Proceedings

Melcher, Heather. 2021. *Public Engagement in the Time of COVID-19*. Ontario Stone Sand and Gravel Annual General Meeting and Conference, February. Online.

Melcher, Heather and Amber Sabourin. 2019. *The Use of Remote Sensing in Natural Environment Surveys*. Ontario Stone Sand and Gravel Association Annual General Meeting and Conference, February. Niagara Falls, Canada.

Melcher, Heather. 2015. *Bats and the Aggregate Industry*. Ontario Stone Sand and Gravel Association Annual General Meeting and Conference, February. Toronto, Canada.

Melcher, Heather. 2014. *Changes to the Ontario Endangered Species Act and Implications to the Aggregate Industry*. Ontario Stone Sand and Gravel Association Annual General Meeting and Conference, February. Ottawa, Canada.

Other

Melcher, Heather. 2001; 2002. Effects of Agricultural Inputs of Faecal Coliforms on the Shellfish Industry in Prince Edward Island. Annual Monitoring Report. Prince Edward Island.

Education

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

Certifications

Federal Reliability Clearance

Ecological Land Classification – MNRF Training Certificate, 2004

Ontario Wetland Evaluation System – MNRF Training Certificate, 2005

MNRF Butternut Health Assessor, 2011

Languages

English – Fluent

WSP Canada Inc. – Ottawa

Lead Terrestrial Ecologist and Project Manager

Gwendolyn has been providing ecological consulting services since 2004, with particular knowledge in the field of terrestrial ecology. Supported by her depth of experience, Gwendolyn thrives on anticipating and providing pro-active solutions for clients' needs as they navigate the natural environment approvals process. She is skilled at agency and community liaison, and prides herself on providing creative, efficient and positive outcomes for her clients.

Gwendolyn has authored numerous environmental impact statements, natural environment reports, species at risk studies, natural heritage assessments, and due diligence reports for a variety of sectors, including residential development, recreational development, aggregates, energy projects (transmission lines, pipelines and renewable energy), as well as for municipalities, and federal and provincial agencies. She has also provided terrestrial ecology peer review services.

Gwendolyn's expertise is founded on years of direct in-field experience, where she gained extensive skills in identifying and understanding the ecology of Ontario's flora, fauna, and plant communities. Gwendolyn is certified in both the Ministry of Natural Resources and Forestry (MNRF) Ecological Land Classification (ELC) and Ontario Wetland Evaluation System (OWES), as well as being an MNRF certified Butternut Health Assessor.

Employment History

WSP Canada Inc. (formerly Golder Associates Ltd.) – Ottawa, ON

Lead Ecologist and Project Manager (2011 to Present)

Gwendolyn is the senior terrestrial ecologist located in the Ottawa office where she provides a range of services, including designing field programs and managing projects for numerous client sectors. Gwendolyn is also responsible for pursuing opportunities and building client relationships in Eastern Canada.

Stantec Consulting Ltd. – Guelph, ON

Ecologist and Project Manager (2004 to 2011)

Gwendolyn provided a range of terrestrial ecology services, including designing and carrying out detailed field programs, natural features monitoring and species at risk surveys. Gwendolyn was also responsible for managing projects for a range of client sectors.

PROJECT EXPERIENCE – ECOLOGY

Species at Risk - Various Projects
Various Locations, ON

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, Eastern Whip-poor-will, Peregrine Falcon, Least Bittern, West Virginia White, American Badger, Little Brown Bat, Northern Myotis, Tri-coloured Bat, Eastern Small-footed 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 and registered activities under the Act. Gwendolyn's work with SAR has involved close liaison with the MNRF, experts from academia, and involvement of public interest groups such as the Sierra Club of Canada and local Field Naturalist clubs.

City of Hamilton Nature Counts Program
Hamilton, ON

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. Purpose of the study was to map vegetation communities in all large, natural habitats in the watershed. Gwendolyn acted as field crew lead.

PROJECT EXPERIENCE – AGGREGATES

Gilbert Quarry
South Frontenac, ON

Prepared a Natural Environment Report for G. Tackaberry and Sons Construction Company Ltd.'s proposed Gilbert Quarry extraction area expansion within the licensed area of their existing quarry. Gwendolyn acted as the Lead Ecologist.

Stittsville II Quarry Extension
Ottawa, ON

Prepared a Natural Environment Report for R.W. Tomlinson Ltd. according to the Aggregate Resources Act for a limestone quarry expansion. Work included discussions with the MNRF and MECP, field studies, and authoring the reporting. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation plans. Work included evaluation of wetlands according to the updated Ontario Wetland Evaluation System (OWES). Gwendolyn acted as the natural environment component lead.

Bank Street Quarry Extension
Ottawa, ON

Prepared a Natural Environment Level II report for Thomas Cavanagh Construction Ltd. according to the Aggregate Resources Act for a small limestone quarry expansion. Work included discussions with the MNRF and MECP, field studies, and authoring the reporting. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation plans. Gwendolyn acted as the natural environment component lead.

Highland Line Pit
Lanark, ON

Prepared a Natural Environment Report for Thomas Cavanagh Construction Ltd. according to the Aggregate Resources Act for a new sand pit operation. Work included discussions with the MNRF and MECP, field studies, and authoring the reporting. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation plans. Gwendolyn acted as the natural environment component lead.

West Carleton Quarry Extension
Ottawa, ON

Prepared a Natural Environment Report for Thomas Cavanagh Construction Ltd. according to the Aggregate Resources Act for a small limestone quarry expansion. Work included discussions with the MNRF and MECP, field studies, and authoring the reporting. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation plans. Gwendolyn acted as the natural environment component lead.

Navan Quarry Extension
Ottawa, ON

Prepared a Natural Environment Level II report for Lafarge Canada Inc. according to the Aggregate Resources Act for a limestone quarry expansion. Work included discussions with the MNRF and MECP, field studies, and authoring the reporting. Integration of various studies by multiple disciplines to determine potential impacts of extraction and preparation of appropriate mitigation plans. Gwendolyn acted as the natural environment component lead.

Arnott Pit
Lanark, ON

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. Gwendolyn acted as the natural environment component lead.

Rideau Road Quarry Extension
Ottawa, ON

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. Gwendolyn acted as the natural environment component lead.

Canaan Quarry Extension
Ottawa, ON

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. Gwendolyn acted as the natural environment component lead.

Karson Kennedy Pit
Ottawa, ON

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. Gwendolyn acted as the natural environment component lead.

McMachen Pit Species at Risk
Rideau Lakes, ON

Designed and undertook a baseline study and mitigation plan for a sensitive Species at Risk on G. Tackaberry and Sons Construction Company Ltd.'s proposed aggregate pit expansion lands in accordance with O.Reg. 242/08 under the Endangered Species Act. Gwendolyn acted as the natural environment component lead.

PROJECT EXPERIENCE – ECOLOGY PEER REVIEW SERVICES

2040 Laval Street Development
Clarence-Rockland, ON

Retained in 2023 by the City of Clarence-Rockland to conduct a peer review of an Environmental Impact Statement for the proposed residential development of 2040 Laval Street, Clarence-Rockland. Provided a letter commenting on the adequacy of scope and appropriateness of conclusions made in the report. Gwendolyn acted as the Lead Ecologist and project manager.

1401 Caron Street Development
Clarence-Rockland, ON

Retained in 2023 by the City of Clarence-Rockland to conduct a peer review of an Environmental Impact Statement for the proposed residential development of 1401 Caron Street, Clarence-Rockland. Provided a letter commenting on the adequacy of scope and appropriateness of conclusions made in the report. Gwendolyn acted as the Lead Ecologist and project manager.

Ottawa International Airport Pit
Ottawa, ON

Retained in 2020 by Thomas Cavanagh Construction Ltd. to provide a peer review of a Natural Environment Level II report prepared for the proposed aggregate pit to be developed on the Ottawa International Airport Lands. The site is on federal lands so federal policies had to be addressed in the typically provincial context of an NELII report. Provided a letter commenting on the adequacy of scope and appropriateness of conclusions made in the report. Gwendolyn acted as the Lead Ecologist and project manager.

City of Kingston - Davis Tannery Lands
Kingston, ON

Retained in 2019 by the City of Kingston to review an Environmental Impact Study (EIS) for the proposed remediation and development of the former Davis Tannery lands on the Cataraqui River in the City of Kingston. Provided a letter commenting on the adequacy of scope and appropriateness of conclusions made in the report. Gwendolyn acted as the Lead Ecologist and project manager.

City of Kingston - CRCA Severance
Kingston, ON

Retained by the City of Kingston to provide environmental peer review services. Retained in 2016 by the City of Kingston to review 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. Gwendolyn acted as the Lead Ecologist and project manager.

County of Peterborough
Peterborough, ON

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. Gwendolyn acted as the Lead Ecologist and project manager.

County of Frontenac
Frontenac, ON

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. Gwendolyn acted as the Lead Ecologist and project manager.

PROJECT EXPERIENCE – LAND DEVELOPMENT

Victoria Island and Timberslide Remediation Project
Ottawa, ON

Golder was retained by the National Capital Commission to support the multi-million-dollar remediation program for Victoria Island, a federal brownfield in the Ottawa River between Ontario and Quebec. Project objective was to rehabilitate the island as part of the transition of stewardship of the Site to the Algonquins of Ontario. Golder provided a range of services, including Ecological Characterisation Reporting for each phase of the remediation work, and completion of a DFO Request for Project Review and habitat restoration plan for the watercourse associated with the historic Timberslide. Gwendolyn was the component lead for terrestrial natural environment.

Ottawa New Edinburgh Club Boathouse Renewal
Ottawa, ON

As part of the National Capital Commission's renewal project for the Ottawa New Edinburgh Club (ONEC) boathouse, a heritage building, Golder completed a range of services including Ecological Characterization Reports for the boathouse and also the servicing area, an Environmental Effects Evaluation, and worked with the NCC to prepare and submit a federal *Species at Risk Act* permit application for butternut and SAR bats. Gwendolyn was the project manager, and lead for the ecology services.

Gatineau Park Trail Improvements
Chelsea, QC

Golder was retained by the National Capital Commission (NCC) to prepare an Ecological Characterization Report in support of proposed trail improvements at Trails 5, 27 and 29 within Gatineau Park (federal lands). Work included mapping of vegetation communities, a fish habitat assessment, and targeted searches for species at risk or their potential habitat along the trails. The final report outlined the existing natural environment and identified mitigation measures to be employed to protect those features from potential negative impacts. Gwendolyn acted as the Lead Ecologist and project manager.

Champlain Node Park Improvements
Ottawa, ON

Golder was retained by the National Capital Commission (NCC) to prepare an Ecological Characterization Report and Environmental Effects Evaluation (EEE) in support of proposed amenity improvements at the Champlain Node park along the Ottawa River (federal lands). Work included mapping of vegetation communities, a shoreline and fish habitat assessment, a detailed tree inventory and mapping of invasive species, a wetland assessment according to federal guidelines, and targeted botanical and wildlife surveys. The final report outlined the existing natural environment and identified mitigation measures to be employed to protect those features from potential negative impacts. Gwendolyn acted as the Lead Ecologist and project manager.

Lac Leamy Park Trail and Shoreline Restoration
Gatineau, QC

Golder was retained by the National Capital Commission (NCC) to prepare an Ecological Characterization Report in support of proposed trail and shoreline improvements along the Gatineau River within the Lac Leamy Park boundary (federal lands). Work included mapping of vegetation communities, a shoreline and fish habitat assessment, and targeted botanical and wildlife surveys. The final report outlined the existing natural environment and identified mitigation measures to be employed to protect those features from potential negative impacts. Gwendolyn acted as the Lead Ecologist and project manager.

University of Waterloo Northwest Campus EIS
Waterloo, ON

Gwendolyn was retained by the University of Waterloo to 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. Gwendolyn acted as the Lead Ecologist and project manager.

TRAINING

Ontario Stream Assessment Protocol (OSAP) - Headwater Drainage Features
Ministry of Natural Resources and Forestry, 2017

Habitat Restoration Planning and Implementation
Northwest Environmental Training Centre, 2014

Wetland Creation Workshop
Toronto Zoo, 2010

MNRF Data Sensitivity Training
Ministry of Natural Resources and Forestry, 2014

St. John's Ambulance First Aid Training
2020

Defensive Driver Training
2021

Surface Miner Training
2021

PROFESSIONAL AFFILIATIONS

Ontario Vernal Pool Association

Field Botanists of Ontario

wsp.com