NATURAL ENVIRONMENT REPORT (Level I & II)

Aggregate Resources Act Application

Kelly Pit, Municipality of Huron East

22 December 2020

TERRASTORY

environmental consulting inc.

NATURAL ENVIRONMENT REPORT (Level I &II)

Aggregate Resources Act Application
Kelly Pit, Municipality of Huron East

Prepared for:

Brad Knight
Municipality of Huron East
72 Main Street
Seaforth, ON N0K 1W0

Prepared by:

Terrastory Environmental Consulting Inc.
171 Glen Road
Hamilton, ON L8S 3N2
905.745.5398

Tristan Knight, M.E.S., M.Sc.
Senior Ecologist | President

Project No.: 1954
22 December 2020

TERRASTORY
environmental consulting inc.

TABLE OF CONTENTS

Figures

Tables

Appendices

1 INTRODUCTION

1.1 Study Background

Terrastory Environmental Consulting Inc. (hereinafter "Terrastory") was retained by the Municipality of Huron East to prepare this Level I & II Natural Environment Report (NER) in support of a pit licence amendment pursuant to the *Aggregate Resources Act* (ARA) in the Municipality of Huron East. The extraction area is referred to as "Kelly Pit". The Subject Property is a rectangular-shaped parcel approximately 41.1 hectares (101.5 acres) in area at the northwest corner of Molesworth Line and Browntown Road. The location of the Subject Property within its broader landscape setting is shown in **Figure 1**.

The Site is designated and zoned for extractive uses. Above water extraction has proceeded pursuant to a Class A pit licence (#4781) issued in 1991, although the southern portion of the Site has only been partially stripped of vegetation. The current licence includes a 11.67 ha licensed area and 8.46 ha extraction area.

The owner (with support from the Municipality) is pursuing a licence amendment to permit below water table extraction. The licence amendment will maintain the existing licensed area but reduces the extraction area to provide for better protection of adjacent significant natural features. Extraction is proposed to proceed in five phases (1-5) in a predominantly east to west sequence.

The following terminology is employed throughout this NER to describe certain noteworthy areas and features which are shown spatially on **Figure 1**.

- **Subject Property** – parcel/property in which the ARA licence is situated.
- **Site** – proposed area to be licensed.
- **Adjacent Lands** – areas within 120 metres of the Site.
- **Study Area** – Site and Adjacent Lands collectively.
- **Northern Forest and Swamp Complex** – natural area along the northern boundary of the Site containing deciduous forest/woodland and deciduous swamp associated with the Provincially Significant Molesworth/Jamestown Wetland Complex.
- **Southern Wetland** – natural area along Browntown Road containing wetland communities (marsh and swamp) associated with the Provincially Significant Molesworth/Jamestown Wetland Complex.
- **Conifer Forest and Plantation** – natural area southeast of the Southern Wetlands containing cedar-dominated conifer forest and pine plantation, situated along an esker and its associated slopes.

1.2 Study Purpose

This Level I & II NER has been prepared to address the requirements of the ARA and its associated regulation (O. Reg. 244/97) and policy standards. ARA licence applications must be made in accordance with the Provincial Standards (i.e., Aggregate Resources of Ontario: Provincial Standards, Version 1.0) per section 7 of O. Reg. 244/97. The Provincial Standards for Category 1, Class A pit licences require the submission of a supporting NER which may be either a Level I or II assessment depending upon the natural features present on or within 120 of the Site. "Site" is

defined per section 1 of the ARA as "*the land or land under water to which a licence or permit or an application therefor relates*".

Per MNRF's Natural Environment Report Standards policy document (No. A.R. 2.01.07; OMNR 2006), the purpose of a Level I NER is to describe the existing natural environmental conditions on and within 120 m of the Site, and to determine whether any of the following natural features are present:

- Significant Wetlands;
- Habitat of Endangered and Threatened Species;
- Significant Areas of Natural and Scientific Interest (ANSIs);
- Significant Woodlands (south and east of the Canadian Shield);
- Significant Valleylands (south and east of the Canadian Shield);
- Significant Wildlife Habitat (SWH); and,
- Fish Habitat.

When any of the above natural features are identified through a Level I NER, a Level II NER is required to assess the potential for negative impacts on the identified significant natural feature(s). If potential impacts are identified, the Level II NER must provide recommendations for appropriate preventative, mitigative, and remedial measures. As certain significant natural features were known within the Site at project commencement, this NER satisfies the requirements for both a Level I and II assessment.

In addition to satisfying ARA requirements, this report also considers and assesses the consistency of the licence amendment application with other applicable natural heritage policies including the provincial *Endangered Species Act* and federal *Fisheries Act*.

2 APPROACH AND METHODS

This study is composed of five (5) discrete components which are bulleted below and further described in the following sections.

- **Acquire background biophysical information and mapping** available for the Study Area and local landscape (see **Section 2.1**).
- **Conduct site assessments and ecological surveys** to field-verify the accuracy of the acquired background biophysical information and collect additional biophysical information as necessary (see **Section 2.2**).
- **Assess the significance** of the biophysical information collected and natural features identified within the context of applicable natural heritage and environmental policies (see **Section 2.3**).
- **Predict the effects** of the application on the identified significant natural features and natural environment, particularly the net effects once mitigation measures and technical recommendations are implemented (see **Section 2.4**).
- **Determine whether the proposed application addresses applicable natural heritage and environmental policies** at municipal, provincial, and federal levels (see **Section 2.5**).

All items associated with the preparation of this Level I & II NER – including background information gathering, site assessments and surveys, graphics, and reporting – were undertaken by Terrastory's Senior Ecologist/President (T. Knight). A curriculum vitae is provided in **Appendix 1**.

2.1 Background Biophysical Information Assessment

This study is supported by background biophysical information and mapping acquired and reviewed from a variety of sources which are listed below in **Table 1**.

Table 1. Background Biophysical Information Acquired and Reviewed.

Type of Information Acquired	Description
Ortho-rectified Aerial Photographs	• 1954, 2009, 2015-2016, 2019.
Natural Feature Mapping	• Municipality of Huron East Official Plan (August 2018 consolidation) Schedules and Maps. • County of Huron Official Plan (September 2015 consolidation) Schedules and Maps. • Land Information Ontario (LIO) accessed via MNRF's "Make a Map" web-based platform (accessed 16 November 2020). • Maitland Valley Conservation Authority (MVCA) regulation mapping (accessed 16 November 2020).
Physiographic Resource Mapping and Datasets	• Ontario Base Mapping produced by MNR (1:10,000) with 5 m contours. • Ontario Well Records (publicly-available). • Soil Survey of Huron County (Hoffman et al. 1952). • Agricultural Information Atlas (accessed 16 November 2020). • Paleozoic Geology of Southern Ontario (Armstrong and Dodge 2007). • Surficial Geology of Southern Ontario (Ontario Geological Survey 2010). • Physiography of Southern Ontario (Chapman and Putnam 1984).
Ecological Resource Mapping and Datasets	• Natural Heritage Information Centre (NHIC) database accessed via MNRF's "Make a Map" web-based platform (squares: 17MJ9144, 17MJ9244, 17MJ9143, 17MJ9243; accessed 16 November 2020). • iNaturalist "(NHIC) Rare species of Ontario" project (accessed 16 November 2020). • iNaturalist "Herps of Ontario" project (accessed 16 November 2020). • Ontario Breeding Bird Atlas (OBBA) database and the Atlas of the Breeding Birds of Ontario, 2001–2005 (Cadman et al. 2007) (square: 17MJ94). • Ontario Butterfly Atlas database (square: 17MJ94; accessed 16 November 2020). • Aquatic Species at Risk Maps by Fisheries and Oceans Canada (accessed 16 November 2020). • Atlas of the Mammals of Ontario (Dobbyn 2005).
Natural Heritage Objectives and Strategies	• Huron Natural Heritage Plan Technical Document (Huron County 2015). • Great Lakes Conservation Blueprint for Terrestrial Biodiversity, Volume 2 (Henson and Brodribb 2005). • Great Lakes Conservation Blueprint for Aquatic Biodiversity, Volume 2 (Phair et al. 2005)

2.2 Site Assessments and Surveys

The acquired background information per **Table 1** helped direct several site assessments and ecological surveys carried out by Terrastory staff. **Table 2** below indicates the primary assessments/surveys performed during each site visit, weather conditions, and time on-site.

Table 2. Site Assessments and Ecological Surveys performed within the Subject Property.

Date	Assessments/Surveys Performed	Terrastory Staff	Weather Conditions	Time On-site
13 June 2019	Site reconnaissance.	T. Knight	Air temperature 16°C, cloudy but fair.	14:30-16:30
15 September 2019	Fall vascular plant survey, incidental observations.	T. Knight	Fair, warm.	10:00-13:45
4 April 2020	Snake emergence survey, stick nest survey, preliminary natural feature mapping, Anuran calling survey #1, incidental observations.	T. Knight	Air temperature 12-13°C; Beaufort Wind Scale 0-1; Cloud Cover 50-60% (snake survey) and 90-100% (anuran survey); no precipitation.	13:30-20:30
27 April 2020	Snake emergence survey, spring vascular plant survey, incidental observations.	T. Knight	Sunny, warm	12:30-15:30
31 May 2020	Anuran calling survey #2, incidental observations.	T. Knight	Air temperature 11°C; Beaufort Wind Scale 0; Cloud Cover 70-80%; no precipitation.	21:30-22:00
1 June 2020	Breeding bird survey #1, Ecological Land Classification vegetation mapping, natural feature mapping, incidental observations.	T. Knight	Air temperature 9-15°C; Beaufort Wind Scale 0-1; Cloud Cover 0%; no precipitation.	6:45-11:30
21 June 2020	Breeding bird survey #2, Ecological Land Classification vegetation mapping, natural feature mapping, incidental observations.	T. Knight	Air temperature 9-15°C; Beaufort Wind Scale 0-1; Cloud Cover 0%; no precipitation.	7:30-13:00
30 November 2020	Site review with project Hydrogeologist	T. Knight	Cool, overcast.	9:30-10:30

The site assessments and surveys centred on characterizing the land use (e.g., historical development patterns, existing built features, land maintenance, etc.), physiographic (e.g., topography, drainage, surface water features, etc.), and ecological (e.g., vegetation, wildlife, habitats, etc.) conditions and features of the Site and Adjacent Lands. All land-use, physiographic, and ecological information described for Adjacent Lands (outside the Subject Property) was collected from either current aerial photographs or observations from inside the Subject Property and/or publicly-accessible areas (e.g., rights-of-way, etc.). The locations and boundaries of significant natural features and/or habitats were recorded on-site with a high-accuracy GPS (Mesa II) supported by representative photographs.

In addition to collecting general biophysical information, the following targeted assessments (i.e., feature- or species-specific surveys) were undertaken:

- **Vegetation Mapping according to Ecological Land Classification (ELC)**: Vegetation communities on the Subject Property were characterized and mapped according to Ecological Land Classification (Lee et al. 1998) and the 2008 update to the Vegetation Type List (Lee 2008). Vegetation communities were initially identified based on current aerial photographs and then verified and refined (as necessary) on-site. ELC mapping was scaled to the finest level of resolution deemed appropriate (i.e., either Ecosite or Vegetation Type). Vegetation communities mapped on Adjacent Lands were delineated predominantly via aerial photograph interpretation.
- **Wetland Boundaries:** Where wetlands were identified via ELC, their boundaries were delineated consistent with the "50% wetland vegetation rule" and presence of hydric soils per the procedures of the Ontario Wetland Evaluation System (OWES) (OMNRF 2014). All wetlands mapped on Adjacent Lands (outside the Subject Property) were delineated via aerial photograph interpretation.
- **Vascular Plant Survey:** Vascular plants were recorded based on a comprehensive area search ("wandering transects") within naturally-occurring (i.e., non-planted) or naturalizing areas of vegetation. Particular effort was paid to areas with the greatest potential to support significant vascular plants (i.e., designated Species at Risk, provincially rare, etc.) and areas with the greatest potential for impact based on the proposed development plan. Nomenclature and common names for the recorded vascular plant species are generally consistent with the Southern Ontario Vascular Plant Species List (Bradley 2013) except where a name change has more recently been adopted by NHIC.
- **Anuran Calling Surveys according to the Marsh Monitoring Protocol:** Two (2) rounds of Anuran calling surveys (capturing early- and mid-season breeders only) were conducted in accordance with the Marsh Monitoring Protocol (Bird Studies Canada et al. 2008). Surveys occurred within the appropriate season (April to June), time of day (between 30 minutes after sunset and 12:00am), and weather conditions (minimal to no rain, wind speed ≤3 on the Beaufort Wind Scale).
- **Breeding Bird Surveys according to the Ontario Breeding Bird Atlas Protocol:** Two (2) rounds of breeding bird surveys were conducted in accordance with the Ontario Breeding Bird Atlas (OBBA) protocol (Bird Studies Canada et al. 2001). Surveys occurred within the appropriate season (May 24–July 10), time of day (between dawn and approximately 5 hours after dawn), and weather conditions (no rain, wind speed ≤3 on the Beaufort Wind Scale). While the OBBA protocol recommends that stations be situated at least 300 m apart (to avoid double counting), the stations established herein were often closer together to ensure more comprehensive survey coverage. Surveys occurred for a minimum duration of 10 minutes at each station.
- **Snake Emergence and Active Hand Surveys:** Two surveys were conducted to document potential snake emergence from hibernacula. Surveys were undertaken under appropriate weather conditions (e.g., air temperatures between >10°C, sunny, limited wind, no rain), particularly following additional days of unseasonably warm, sunny weather. Where present, cover objects (e.g., rocks, debris, etc.) were overturned in an attempt to detect individuals beneath.

2.3 Significance Assessment

2.3.1 Definitions and Criteria

"Significant natural features" as described herein represent natural features and habitats that have recognized status (and therefore policy significance) within the planning jurisdiction in which an application is proposed. Significant natural features are defined herein to include those outlined in

the Natural Environment Report Standards policy document (No. A.R. 2.01.07; OMNR 2006), namely:

- Significant Wetlands;
- Habitat of Endangered and Threatened Species;
- Significant Areas of Natural and Scientific Interest (ANSIs);
- Significant Woodlands (south and east of the Canadian Shield);
- Significant Valleylands (south and east of the Canadian Shield);
- Significant Wildlife Habitat (SWH); and
- Fish Habitat

Criteria used to determine the presence or absence of the above significant natural features within the Study Area were considered from a variety of sources including the Natural Heritage Reference Manual (MNR 2010) and (for Significant Wildlife Habitat) the Ecoregion 6E Criteria Schedule (MNRF 2015).

Like significant natural features, "significant species" represent individuals of wild species which have recognized status (and therefore policy significance) within the planning jurisdiction in which an application is proposed. Significant species are defined herein to include:

- Species designated Endangered, Threatened, or Special Concern under O. Reg. 230/08 pursuant to the provincial *Endangered Species Act, 2007*.
- Species designated Provincially Rare (i.e., S1, S2, or S3) by NHIC.

2.3.2 Determination

After collecting the background biophysical information and conducting the site assessments the data was interpreted to determine whether any significant natural features and/or significant species occur within the Study Area. If a natural feature or species met the significance criteria, it is considered "confirmed". If a natural feature or species may be present within the Study Area given the prevailing biophysical or habitat conditions but was not confirmed based on either background or site-specific biophysical data, it is considered potential or "candidate". Candidate significant natural features and species are treated as confirmed where no additional information is available.

2.4 Effects Assessment and Mitigation

The potential ecological effects of an application can be understood spatially as zones that radiate outward from the direct project footprint (e.g., building envelope, etc.) and associated areas of site alteration (e.g., grading, etc.). While the greatest potential for effects typically occurs within areas directly subject to development or disturbance, surrounding areas may also be affected indirectly. Such indirect effects can include light or noise pollution that affects wildlife communities on Adjacent Lands, or degradation of water quality within a downstream receptor resulting from sediment runoff during extraction.

The following five-pronged approach is employed herein to assess the effects of an application on significant natural features and species and (where warranted) the natural environment in general:

1. **Scope** the effects assessment to environmental components that warrant consideration. The effects assessment herein centres principally on significant natural features and species (i.e., those that have policy significance within the planning jurisdiction, as defined in **Section 2.3**) but may also consider general environmental effects where warranted.
2. **Identify the predicted direct and indirect effects** of the application on each significant natural feature or species during all project stages (i.e., pre- to -post-development) in the absence of mitigation. Direct effects are those where there is a cause-effect relationship between a proposed activity and an effect on a natural feature or species (e.g., tree clearance within a building footprint, etc.). Indirect effects result when an activity is linked to a direct effect through a chain of foreseeable interactions or steps.
3. **Evaluate the significance** of the predicted effects for each environmental component based on their attributes (i.e., spatial extent, magnitude, timing, frequency, and duration) and likelihood (i.e., high, medium, low).
4. Where the potential for negative effects are anticipated, **recommend ecologically-meaningful mitigation measures** to avoid such impacts first (where possible), and where impacts cannot be avoided to minimize, compensate, and/or enhance as appropriate.
5. **Identify the predicted residual or net effect**s of the application assuming implementation of all recommended mitigation measures.

Per step 4, mitigation measures are offered where the potential for negative effects are anticipated to a degree that cannot be supported given the prevailing policy context. Whenever possible, Terrastory works iteratively with the project team as a means to identify extraction options that avoid negative effects first; options that would minimize or mitigate such negative effects are less preferred and considered secondarily. In general, avoidance measures that have already been incorporated into the application or project design are not duplicated as technical recommendations herein. The Site Plans (phasing, operations, and rehabilitation) are described in **Section 5** while the effects assessment and recommended mitigation measures are provided in **Section 6**.

2.5 Natural Heritage Policy Context

The overarching natural heritage policy framework directing aggregate extraction activities within the Site is outlined below in **Table 3**. A determination of whether the pit licence amendment considered herein addresses such policies is provided in **Section 7**. It is noted that the necessary municipal designations and zoning permitting aggregate extraction are already in place within the Site which obviates the need for any accompanying applications under the *Planning Act*. Given this, the natural heritage provisions of the Municipality's OP, County OP, and Provincially Policy Statement are not assessed in detail herein.

Table 3. Applicable Natural Heritage Policies.

Level of Government	Natural Heritage or Environmental Policy Requirements
Provincial	*Aggregate Resources Act* (ARA), R.S.O. 1990, c. A.8, including • Ontario Regulation 244/97 – General • Provincial Standards of Ontario – Category 1, Class A Pit Below Water • Natural Environment Report Standards (A.R. 2.01.07) *Endangered Species Act* (ESA), S.O. 2007, c. 6, including:

Level of Government	Natural Heritage or Environmental Policy Requirements
	• Ontario Regulation 230/08 – Species at Risk in Ontario List. • Ontario Regulation 242/08 – General. *Fish and Wildlife Conservation Act,* S.O. 1997, c. 41.
Federal	*Fisheries Act*, R.S.C. 1985, c. F-14, including: • Fish and Fish Habitat Protection Policy Statement (DFO 2019). *Migratory Birds Convention Act*, S.C. 1994, c. 22, including: • Migratory Birds Regulations, C.R.C., c. 1035.

3 EXISTING BIOPHYSICAL CONDITIONS

The following is a description of the biophysical features and conditions of the Site, which are shown spatially on **Figure 2**. Representative photographs are provided in **Appendix 2**.

3.1 Land-use and Landscape Setting

The Site is primarily maintained for aggregate extraction. The landscape surrounding the Site is rural with a mixture of land-uses and land cover classes including agricultural fields (mostly cash crops), woodlots/swamps, and formerly extracted areas. The communities of Ethel and Molesworth occur to the southwest and northeast, respectively.

3.2 Physical Setting

3.2.1 Bedrock Geology

The bedrock underlying the Site consists of Middle Devonian-aged (i.e., 382 to 393 million year old) light to grey-brown limestones (and minor dolostones) of the Detroit River Group (Armstrong and Dodge 2007). In southern Ontario, the Detroit River Group subcrops (i.e., forms the uppermost stratigraphic unit below ground) from approximately Kincardine on the shores of Lake Huron to approximately the community of Simcoe in Norfolk County. Based on a review of publicly available well records, the bedrock may be approximately 30-35 m below the ground surface in the local landscape.

3.2.2 Surficial Geology and Groundwater Resources

The Site is situated within the Dundalk Till Plain physiographic region (Chapman and Putnam 1984). The Dundalk Till Plain has a predominantly fluted surface consisting of shallow troughs and ridges that orient southeast consistent with the primary direction of glacial movement. The Site also occurs within Ecodistrict 6E-5 (Mount Forest), which covers most of the Dundalk Till Plain and portions of the Counties of Grey, Bruce, Huron, and Perth.

The Site contains ice-contact stratified drift deposits dominated by sand and gravel (Ontario Geological Survey 2010). Such deposits are of collapsed origin and form when glacial materials accumulate on top of or within glacial ice due to flowing meltwater. When the ice melts the drift slumps and becomes deposited in a mass that eliminates stratification. The Southern Wetland along Browntown Road is mapped as containing organic/peat/muck materials associated with saturated conditions. The agricultural fields on Adjacent Lands west of the Site contain Elma Till deposited

directly by glacial action. The pine plantation at the extreme southern portion of the Site straddles an esker (see **Figure 2**).

Based on the results of the Hydrogeologic Assessment (Groundwater Science Corp. 2020), the water table within the Site is situated within the sand/gravel deposits with an overall flow direction from southeast to northwest. Groundwater levels within the on-site wetlands (i.e., Southern Wetland and wetland portions of the Northern Wetland and Forest Complex) are situated within the surficial peat and underlying silt/clay deposits. Sand/gravel may underlie the peat in certain portions of the wetlands and the exact transition between the sand/gravel and till deposits within the wetland areas is not known with certainty.

3.2.3 Topography, Drainage, and Surface Water Features

The Site is topographically situated between approximately 349-359 metres above sea level (masl), with overall relief of 10 m. The topographic apex is associated with the esker crest while the existing pit floor serves as a uniform topographic low. Watercourses are absent from the Site. Stormwater runoff likely tends to sheet flow or is absorbed into the surficial soils. Minor rills and gullies have formed along the existing pit walls which would channel surface runoff during storm events.

A groundwater upwelling/discharge area (spring) is present in the Southern Wetland (see **Figure 2**). An upward hydraulic gradient was documented via evidence of "bubbling" during each site visit in 2020 (April-November). The upwelling conveys groundwater through a short constructed ditch which outlets into the meadow marsh to the north. The discharge area also appears to have been constructed (i.e., dug-out) given its uniformly circular configuration and outlet into a ditch.

Additional ditches were documented which appear to be draining one of the wetlands in the Northern Swamp and Forest Complex (see **Figure 2**). This feature serves to convey standing water in the swamp westward at high water levels and appears to be constructed. A second ditch was also documented but this feature appears to channel runoff into the swamp.

The overall direction of surface runoff within the Site is indicated on **Figure 2** based on existing topographic information. Surface water is shed in all directions from the esker crest.

3.3 **Ecological Setting**

3.3.1 Vegetation Communities

Vegetation communities overlapping with the Study Area are described below and mapped in **Figure 2**.

3.3.1.1 Northern Swamp and Forest Complex

Vegetation communities within the Northern Swamp and Forest Complex are topographically variable, with two (2) deciduous swamps occupying the bottomlands. The northwestern swamp (SWDM2-2) is dominated by Green Ash (*Fraxinus pennsylvanica*) both in the canopy and regeneration layer. Glossy Buckthorn (*Frangula alnus*) is the dominant shrub species, while Wild Grape (*Vitis riparia*) scrambles through the canopy. The hydroperiod of this community (i.e., depth and duration of standing water) did not permit Anuran breeding in 2020. The southeastern swamp (SWDM3-3) is more spatially extensive and dominated by Freeman's Maple (*Acer x freemanii*) with occasional Green Ash. Overall, this community contains a sparse understory (woody vegetation established would generally be restricted by seasonal standing water), though dense thickets of Silky Dogwood (*Cornus*

amomum), Winterberry (*Ilex verticillata*), and Glossy Buckthorn occur in places. Standing water is relatively deep in early spring (>40 cm) but mostly recedes completely by early summer (2020) to mid summer (2019) leaving mudflats and shallow pools. Herbaceous vegetation such as Sensitive Fern (*Onoclea sensibilis*), Royal Fern (*Osmunda regalis*), Marsh Fern (*Thelypteris palustris*), Fringed Sedge (*Carex crinita*), and Tuckerman's Sedge (*Carex tuckermanii*) emerge by late summer. Purple loosestrife (*Lythrum salicaria*) has established in places. Both swamps form part of the Provincially Significant Molesworth/Jamestown Wetland Complex (hereinafter "PSW").

Surrounding the swamps are various upland forests. The most spatially extensive is a lowland deciduous forest (FODM7) dominated by Green Ash, American Elm (*Ulmus americana*), and Trembling Aspen (*Populus tremuloides*). The shrub layer is dense and diverse, containing Alternate-leaved Dogwood (*Cornus alternifolia*), Glossy Buckthorn, Choke Cherry (*Prunus virginiana*), American Black Currant (*Ribes americanum*), Prickly Gooseberry (*Ribes cynosbati*), and Dotted Hawthorn (*Crataegus punctata*). Herbaceous associates include White Avens (*Geum canadense*), Enchanters Nightshade (*Circaea canadense*), and Virginia Creeper (*Parthenocissus inserta*). A coniferous forest (FOCM4-1) dominated by Eastern White Cedar, and a mixed forest (FOMM4-2) with Eastern White Cedar, Trembling Aspen, and Balsam Poplar (*Populus balsamifera*), occur southeast of the Freeman's Maple swamp. Contiguous with the woodland edge is a mixed meadow containing scattered regenerating Eastern White Cedar and Balsam Poplar amongst Poverty Oat Grass (*Danthonia spicata*), Canada Blue Grass (*Poa compressa*), and a variety of pasture grasses. The meadow substrate is noticeably gravelly.

3.3.1.2 Southern Wetland

Two (2) wetland communities along Browntown Road comprise the Southern Wetland which also forms part of the PSW. The most spatially extensive community is a poplar swamp (SWDM4-5) dominated by Trembling Aspen with varying amounts of Balsam Poplar, American Elm, Green Ash, and Black Ash (*Fraxinus nigra*). Glossy Buckthorn, Nannyberry (*Viburnum lentago*), Grey Dogwood (*Cornus racemosa*), European Buckthorn (*Rhamnus cathartica*), and regenerating Green Ash form the understory. Common Horsetail (*Equisetum arvense*), White Avens, Golden Ragwort (*Packera aurea*), and Swamp Dewberry (*Rubus pubescens*) form the ground layer. This community contains seepage associated with a dug-out discharge area (see **Section 3.2.3**).

A small meadow marsh (MAMM1) dominated by Broad-leaved Cattail (*Typha latifolia*), Narrow-leaved Cattail (*Typha angustifolia*), and Reed-canary Grass (*Phalaris arundinacea*) occurs along the swamp border and is fed by the groundwater discharge. Smooth Swamp Aster (*Symphyotrichum firmum*), Spotted Joe-pye Weed (*Eutrochium maculatum*), and Lake Sedge (*Carex lacustris*) are occasional. Standing water was documented in this community in April 2020 (generally <20 cm depth) but had receded entirely by the 21 June 2020 site visit.

3.3.1.3 Conifer Forest and Plantation

Upgradient of the Southern Wetland is a sloped area associated with an esker. Naturalized conifer plantation (FOCM6-1) dominated by Eastern White Pine (*Pinus strobus*) occupies the crest and upper slopes. These plantations may have been formerly cultivated and appear to have been planted sometime after 1954 based on a review of historical aerial photographs; a few scattered hawthorn persist in the understory. Along the mid-slopes is a conifer forest densely dominated by Eastern White Cedar (*Thuja occidentalis*). Both the pine plantation and cedar forest cast dense shade which significantly restricts establishment by understory vegetation. The lowest slopes are occupied by a mixed forest of Eastern White Cedar, Balsam Poplar, and Trembling Aspen. Some moister pockets

at the slope toe contain facultative species such as Common Horsetail and dense bryophyte growth including Delicate Fern Moss (*Thuidium delicatulum*) and serve to funnel overland runoff from the adjacent slopes towards the downgradient wetland.

A regenerating cedar thicket (THCM1-2) occurs along Molesworth Line, also containing scattered White Poplar (*Populus alba*) and Balsam Poplar in the understory. The soils are quite gravelly and bare and contain lichen species such as Earthscale (*Placidium squamulosum*) which is associated with calcareous soil patches. Meadow Hawkweed (*Pilosella caespitosa*), Poverty Oat Grass (*Danthonia spicata*), and Bladder Campion (*Silene vulgaris*) dominate the herbaceous layer.

3.3.1.4 Adjacent Lands

A mixed swamp (SWM) associated with the PSW occurs on the south side of Browntown Road. This feature is adjacent to a coniferous forest and deciduous woodland. The precise wetland boundary is based on aerial photograph interpretation and is not known with certainty. Active agricultural fields and lands previously extracted for aggregate material also occur on Adjacent Lands.

3.3.2 Vascular Plants

A total of 159 vascular plant species were recorded within the Study Area (see **Appendix 3**). No provincially rare or species at risk vascular plants were documented.

3.3.3 Calling Anurans

Anuran calling surveys were undertaken at three (3) stations on 4 April and 31 May2020. While the Marsh Monitoring Protocol requires that localities between the 43rd and 47th parallels be surveyed between the 16th and 31st of each month, the first survey was undertaken early as a result of unseasonably warm weather during the first week of April 2020. The third survey (16-30 June) was cancelled given the absence of potentially significant breeding habitat for late-season breeders. Station AN-1 surveyed the Green Ash deciduous swamp (SWDM2-2) while AN-2 surveyed the Freeman's Maple deciduous swamp (SWDM3-3), both of which are situated in the Northern Forest and Swamp Complex. Station AN-3 surveyed the Southern Wetland. The locations of each survey station are shown on **Figure 2** while the full survey results are provided in **Appendix 4**. A general summary of the Anuran communities present within the Study Area is provided below.

A total of two (2) Anuran species were documented during the calling surveys in 2020. Loud choruses (call code 3) of Wood Frog (*Lithobates sylvaticus*) were documented in the Freeman's Maple swamp at AN-2. A single vocalizing Western Chorus Frog (*Pseudacris triseriata*) was also documented at this station. One (1) individual Western Chorus Frog (possibly same) was also recorded vocalizing incidentally in the same general area on 27 April 2020. Given that the Freeman's Maple swamp lacked standing water by 21 June 2020, it is unknown if many tadpoles would have had sufficient time to feed, develop into froglets, and disperse during the 2020 breeding season.

A small number of Green Frogs (*Lithobates clamitans*) were documented incidentally in the meadow marsh (MAMM1) in April 2020; however, this feature was dry by early summer and would not have supported breeding by this species (or other late-season breeding Anurans) in 2020.

3.3.4 Breeding Birds

Breeding bird surveys were undertaken at seven (7) stations on 1 and 21 June 2020. A total of 42 bird species were recorded during the breeding bird surveys. Additional birds species believed to be breeding (American Woodcock) or on migration (e.g., Golden-crowned Kinglet, etc.) were recorded incidentally during the course of other field activities. The assemblage and abundance of birds recorded generally reflects the prevailing structure and composition of on-site vegetation communities and variable habitats of the Study Area (e.g., forest, woodland, treed swamp, conifer plantation, etc.). The locations of each survey station are shown on **Figure 2** while the full survey results indicating each species' breeding status by survey station can be found in **Appendix 5**. The locations of significant bird species recorded are shown on **Figure 3**. A general summary of the breeding bird communities present within the Study Area is provided below.

Stations BB-1, BB-2, and BB-3 were situated to capture breeding birds in the Northern Forest and Swamp Complex. Bird species considered confirmed or probable breeders at these stations include (amongst others) American Redstart (*Setophaga ruticilla*), American Robin (*Turdus migratorius*), Baltimore Oriole (*Icterus galbula*), Brown-headed Cowbird (*Molothrus ater*), Downy Woodpecker (*Picoides pubescens*), Eastern Towhee (*Pipilo erythrophthalmus*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*), and Song Sparrow (*Melospiza melodia*).

Stations BB-4, BB-5, BB-6, and BB-7 were situated to capture breeding birds in the Conifer Forest and Plantation and the eastern portion of the Southern Wetland. Bird species considered confirmed or probable breeders at these stations include (amongst others) American Goldfinch (*Spinus tristis*), American Redstart, Cedar Waxwing (*Bombycilla cedrorum*), Chipping Sparrow (*Spizella passerina*), House Wren (*Troglodytes aedon*), Indigo Bunting (*Passerina cyanea*), and Song Sparrow.

Three (3) significant bird species were recorded during the targeted breeding bird surveys: Bank Swallow (*Riparia riparia*), Eastern Wood-pewee (*Contopus virens*), and Wood Thrush (*Hylocichla mustelina*). All documented locations of these species within the Study Area are shown on **Figure 3** with their habitat requirements described in **Section 4.3** (Eastern Wood-pewee and Wood Thrush) and **Section 4.4** (Bank Swallow).

3.3.5 Hibernating Snakes

Snake emergence and active hand surveys were undertaken on 4 and 27 April 2020. A total of seven (7) Eastern Gartersnakes (*Thamnophis sirtalis sirtalis*) were documented on 4 April 2020 along a small berm/stockpile at the edge of the existing extraction area along the dripline of Northern Forest and Swamp Complex (see **Figure 3** and Photographs 14 and 15 in **Appendix 2**). The presence of congregating snakes, at this time of year (early April), on a southwest facing slope with significant sun exposure, is suggestive of snake hibernation within this feature in 2020. Four (4) individuals were also documented at various locations along the berm/stockpile on the second snake emergence survey on 27 April 2020. One (1) additional Eastern Gartersnake was documented near Browntown Road on 27 April 2020.

No snake species other than Eastern Garter Snake were observed during targeted surveys or incidentally within the Study Area in 2019 and 2020.

4 SIGNIFICANCE ASSESSMENT

Based on the biophysical information collected during background information gathering (per **Table 1**) and the results of the site assessments and surveys (per **Sections 2.2** and **3**), **Table 4** below provides a determination of the presence (or potential presence) of each significant natural feature considered herein. Shaded rows denote features which were confirmed or may be present within the Subject Property or Adjacent Lands and are considered further as part of the effects assessment in **Section 5**. Significant natural feature mapping is provided in **Figure 3**.

Table 4. Summary of the Assessment of Significant Natural Features within the Site and Adjacent Lands.

Significant Natural Feature	Status within the Site	Status on Adjacent Lands (i.e., < 120 m from the Site)
Significant Natural Features per ARA Provincial Standards		
Significant Wetlands	**Present**. See **Section 4.1**.	**Present**. See **Section 4.1**.
Significant Woodlands	**Present**. See **Section 4.2**.	**Present**. See **Section 4.2**.
Significant Valleylands	**Absent**.	**Absent**.
Significant Wildlife Habitat	**Confirmed/Candidate**. See **Section 4.3.**	**Confirmed/Candidate**. See **Section 4.3**.
Significant Areas of Natural and Scientific Interest	**Absent**.	**Absent**.
Habitat of Endangered and Threatened Species (per ESA)	**Present**. See **Section 4.4.**	**Present**. See **Section 4.4**.
Fish Habitat (per *Fisheries Act*)	**Absent**. See **Section 4.5**.	**Absent**. See **Section 4.5**.

4.1 Provincially Significant Wetlands

Units associated with the Provincially Significant Molesworth/Jamestown Wetland Complex occur within the northern and southern portions of the Study Area. Terrastory compared the existing boundaries of these wetlands (per provincial mapping) with on-site conditions through a wetland delineation exercise (in accordance with OWES protocols). Adjustments to the wetland boundary mapping is appropriate in certain areas; in particular, the extent of wetland area in the Northern Forest and Swamp Complex is considerably less than currently mapped. The existing PSW boundary, and Terrastory's opinion as to the limit of wetland conditions, are shown on **Figure 3**.

An assessment of potential effects to PSW associated with the proposed pit operations plan is provided in **Section 6.1**.

4.2 Significant Woodlands

All forests/woodlands within the Study Area contain a Significant Woodland overlay designation per Background Map 2 of the Municipality's OP. The Conifer Forest and Plantation in the southern portion of the Study Area is designated for Extractive Resources per Schedule B of the Municipality's OP and contained within a permitted extraction area pursuant to the ARA licence; this feature has not yet been stripped of vegetation. Significant Woodland mapping is shown on **Figure 3**.

An assessment of potential effects to the Significant Woodlands associated with the proposed pit operations plan is provided in **Section 6.2**.

4.3 Significant Wildlife Habitat

An assessment of the likelihood that any candidate or confirmed Significant Wildlife Habitat (SWH) types occur within the Site or Adjacent Lands is provided in **Appendix 6**. Based on the results of this assessment, five (5) SWH types are considered further through this study:

- Seasonal Concentration Areas of Animals
    1. Bat Maternity Colonies
    2. Reptile Hibernaculum
- Rare Vegetation Communities or Specialized Habitats for Wildlife
    3. Seeps and Springs
- Habitat of Species of Conservation Concern
    4. Terrestrial Crayfish
    5. Special Concern and Rare Wildlife Species

Also based on this assessment, a total of five (5) Special Concern or provincially rare species are considered to have a possible likelihood of occurrence within the Site or Adjacent Lands (or were confirmed) given their habitat associations and current distribution in southern Ontario:

1) Western Chorus Frog (*Pseudacris triseriata*)
2) Eastern Wood-pewee (*Contopus virens*)
3) Wood Thrush (*Hylocichla mustelina*)
4) Monarch (*Danaus plexippus*)
5) Yellow-banded Bumblebee (*Bombus terricola*)

A general description of each SWH type and Special Concern/provincially rare species and their habitat within the Site is offered below. An assessment of potential effects to the candidate/confirmed SWH features and Special Concern/provincially rare species associated with the proposed pit operations plan is provided in **Section 6.3**.

4.3.1 Bat Maternity Colonies

Big Brown Bat (*Eptesicus fuscus*) and Silver-haired Bat (*Lasionycteris noctivagans*) form maternity colonies that roost with pups in various features, particularly cracks, cavities, or loose bark associated with large-diameter trees (≥25 cm diameter at breast height), snags, and buildings. Snags/cavity trees in earlier stages of decay (i.e., decay classes 1-3) may be preferred.

The Conifer Forest and Plantation does not contain a sufficient density of snags/cavity trees (>10/ha) to be expected to support significant maternity colonies of Big Brown Bat and Silver-haired Bat. Greater snag/cavity tree density is found in the Northern Forest and Swamp Complex where significant bat maternity colonies are more likely to roost.

4.3.2 Reptile Hibernaculum

Snakes in Ontario hibernate in areas which provide access below the frost line or that do not freeze during winter. A wide array of features may function as snake hibernacula, including natural (e.g., small mammal burrows, crevices in bedrock, etc.) and human-built (e.g., rock piles, old stone

foundations, etc.) features. Survey methodologies for confirming snake use of a potential hibernacula typically involve spring or (less preferred) fall surveys to identify congregations of snakes near their point of exit or emergence from a hibernaculum; however, such surveys may still produce a false negative (i.e., fail to successfully identify hibernacula) given the camouflaged, cryptic nature of snakes and variability in emergence/exit dates.

A significant hibernaculum for Eastern Gartersnake was documented along a berm/stockpile at the existing extraction limit (see **Section 3.3.5**). The location of this feature is shown on **Figure 3**.

4.3.3 Seeps and Springs

Seeps and springs represent concentrated surface expressions of groundwater. Seeps (or seepage) may occur where pressure forces groundwater upward (i.e., upward hydraulic gradient), or where a confining layer (such as bedrock) meets thin, permeable soil which directs shallow groundwater towards the surface. Seeps may be permanent or seasonal. Springs represent flowing seepage which tends to be associated with sloping topography. Seeps and springs may provide important habitat for local biota by acting as winter watering holes for White-tailed Deer (*Odocoileus virginianus*) and Ruffed Grouse (*Bonasa umbellus*), providing amphibian breeding habitat, or supporting rare or conservative flora.

As described in **Section 3.2.3**, a discharge area was documented in the Southern Wetland (see **Figure 2**) via evidence of "bubbling", which is suggestive of an upward hydraulic gradient. This upwelling conveys water through a short, poorly defined ditch which outlets into the meadow marsh to the north. No other areas of discrete discharge were documented within the Site.

4.3.4 Terrestrial Crayfish

Historically, terrestrial (or "burrowing") crayfish in Ontario have been referred to two species: Digger Crayfish (*Creaserinus fodiens*) and Devil Crayfish (*Lacunicambarus diogenes*). These species are considered primary burrowers and spend most of their lives underground. A third species – Calico Crayfish (*Faxonius immunis*) – is a secondary burrower which may only dig burrows to escape drying waterbodies. A fourth species – Paintedhand Mudbag (*Lacunicambarus polychromatus*) – was recently documented at three sites in the Windsor area (Jones and Glon 2019).

Terrestrial crayfish excavate burrows in areas of moist/wet soil with a high water table such as marshes, wet meadows, and even manicured lawn. The burrows are flooded by groundwater and open to the ground surface by a "chimney" consisting of rounded soil pellets. Burrows produced from clay often exhibit the definitive chimney structure while those excavated from organic substrate (i.e., peat) may appear as a circular collapsed mound.

Two (2) terrestrial crayfish chimneys were documented adjacent to the discharge area in the Southern Wetland (see **Figure 3**). The terrestrial crayfish species responsible for excavating the chimney is unknown as no individuals were observed.

4.3.5 Western Chorus Frog

The Great Lakes/St. Lawrence – Canadian Shield population of Western Chorus Frog is designated Threatened on Schedule 1 of the *Species at Risk Act* and considered provincially rare (S3) in Ontario. This species is an early-season breeder and one of the first Anurans to begin calling on warm nights (or diurnally) in late March or April. Some authorities consider this population of Western Chorus

Frog to represent a relict population of Boreal Chorus Frog (*Pseudacris maculata*) based on genetic and other analyses.

One (1) individual was documented vocalizing during the first Anuran calling survey on 4 April 2020. An individual (possibly same) was also recorded incidentally on 27 April 2020 in the same general location.

4.3.6 Eastern Wood-pewee

Eastern Wood-pewee is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the *Endangered Species Act* (ESA) and is federally designated Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This species is most commonly associated with relatively open, deciduous and mixed forests of various sizes, as well as forest edges and other areas with relatively continuous canopy cover (e.g., parks, cemeteries, etc.). This species' preference for open forests and forest edges may be attributed to its aerial foraging behaviour (COSEWIC 2012). Territory sizes were shown to average approximately 1.75 ha (representing a circle with a radius of 75 m) in a study in southern Ontario (as cited in COSEWIC 2012).

Eastern Wood-pewee was documented as a possible breeder at BB-2 in the Northern Forest and Swamp Complex and a probable breeder at BB-4 in the Southern Wetland. All documented locations of vocalizing males of this species are shown on **Figure 3**.

4.3.7 Wood Thrush

Wood Thrush is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Special Concern by COSEWIC. Wood Thrush is predominantly found in deciduous and mixed forests with a well-developed understorey of regenerating trees and shrubs. This species is more often found in larger forest blocks but may successfully breed within smaller forest fragments (Cadman et al. 2007). In a study in Pennsylvania, Wood Thrush territory sizes were shown to be 2.5 ha on average with a range of 1.5-4 ha (Evans et al. 2008).

Wood Thrush was documented as a probable breeder at BB-1 (north of the Study Area), as a possible breeder at BB-3 in the Northern Forest and Swamp Complex, and as a possible breeder at BB-5 southwest of Browntown Road. All documented locations of vocalizing males are shown on **Figure 3**, with the exception of the individual at BB-1 which vocalized north of the Study Area.

4.3.8 Monarch

Monarch is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Endangered by COSEWIC. Monarch is well-known to be host-specific and oviposits exclusively on species of milkweed (*Asclepias* spp.). This species is a generalist forager and may nectar in any area with wildflowers.

Monarch was observed within the Site and is expected to be relatively common in the wider landscape. While no confirmed breeding via observations of ovipositing individuals, eggs, or caterpillars was documented, the presence of Common Milkweed (*Asclepias syriaca*) indicates that Monarch may breed within the Site.

4.3.9 Yellow-banded Bumble Bee

Yellow-banded Bumble Bee is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Special Concern by COSEWIC. This species occupies a range of open areas that contain nectaring sites and nests underground in abandoned rodent burrows or decomposing logs, typically in woodlands.

Current records in southern Ontario suggest that this species is associated with more densely forested landscapes northeast of the Study Area. Notwithstanding this, given that the Study Area provides potentially suitable nectaring, nesting, and overwintering habitat for this species, and bumble bee surveys were not undertaken as part of this study, the Site is assumed to contain suitable habitat for Yellow-banded Bumble Bee.

4.4 Habitat of Endangered and Threatened Species

An assessment of the likelihood that any Endangered and Threatened species or their habitats occur within the Study Area is provided in **Appendix 7**. A total of four (4) Endangered or Threatened species are considered to have a possible likelihood of occurrence on the Subject Property (or were confirmed) given their habitat associations and current distribution in southern Ontario:

1) Little Brown Myotis (*Myotis lucifugus*)
2) Northern Myotis (*Myotis septentrionalis*)
3) Tri-colored Bat (*Perimyotis subflavus*)
4) Bank Swallow (*Riparia riparia*)

A general description of each Endangered/Threatened species and their habitat is offered below. An assessment of potential effects to these Endangered/Threatened species associated with the proposed pit operations plan is provided in **Section 6.4**.

4.4.1 Endangered Bats

Per the assessment in **Appendix 7**, Little Brown Myotis, Northern Myotis, and Tri-colored Bat have the potential to roost and forage within the Study Area. Each of these bat species is designated Endangered in Ontario per O. Reg. 230/08 pursuant to the ESA and are federally designated Endangered by COSEWIC. Little Brown Myotis and Northern Myotis form maternity colonies that roost in large-diameter trees with cracks, crevices, and/or exfoliating bark; Little Brown Myotis will also frequently roost in buildings (e.g., attics, barns, etc.). Roosting sites for Tri-colored Bat maternity colonies are less understood but have been documented in dead or dying leaf clusters of oaks (*Quercus* spp.) and maples (*Acer* spp.), along with live foliage and buildings (Humphrey and Fotherby 2019). Individuals (i.e., non-reproductive females and males) of all three bat species may roost in smaller diameter trees and other spaces (e.g., beneath house siding, etc.) which are not occupied by maternity colonies. Overwintering habitat includes caves and mines that maintain temperatures above 0°C. White Nose Syndrome (a fungal disease caused by an introduced pathogen) has devastated populations of each species across their ranges. The fungus causes hibernating individuals to become dehydrated, leading to excessive arousal, depleted fat reserves, and ultimately emaciation and/or death.

Treed communities within the Northern Forest and Swamp Complex, Southern Wetland, and Conifer Forest and Plantation contain potential roosting sites for maternity colonies of Little Brown Myotis and Northern Myotis. Greater snag/cavity tree density is found in the Northern Forest and

Swamp Complex where maternity colonies associated with these species are more likely to roost. Tri-colored Bat is not expected to roost in the Conifer Forest and Plantation (given the absence of maple or oak) and is more likely to roost in the Freeman's Maple deciduous swamp (SWDM3-3).

4.4.2 Bank Swallow

Bank Swallow is designated Threatened in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Threatened by COSEWIC. This species is a colonial breeder which nests in exposed, sandy substrates on vertical or steep surfaces, including cliff/bluff faces, river-banks, and construction stockpiles. Foraging habitat includes a variety of open areas including agricultural lands, meadows, prairies, woodland clearings, marshes, and waterbodies.

Nest excavations associated with this species were documented in several locations within the existing pit (e.g., pit faces, stockpiles) in 2019. Individuals were documented foraging at four (4) stations (BB-2, BB-3, BB-6, BB-7) during breeding bird surveys in 2020; however, none of the nest excavations documented in 2019 appeared to be occupied in 2020. Bank Swallow did not breed within the Site in 2020.

4.5 **Fish Habitat**

There are no surface water features that provide direct fish habitat within the Site or Adjacent Lands. The nearest surface water feature that is assumed to directly support fish is the Storey Drain, which flows in a predominantly northwest direction on the east side of Molesworth Line no closer than 140 m northeast of the Site. The Story Drain is a Class C Municipal Drain and as such is expected to contain permanent, warmwater fish habitat.

As the Storey Drain is situated outside the Study Area, impacts to fish habitat are considered negligible and not considered further herein.

5 PHASING, OPERATIONS, AND REHABILITATION PLANS

The owner is applying for an amendment to an existing Category 1, Class A licence to facilitate below-water pit extraction within the Site. The ARA plans are provided in **Appendix 8**. The total area to be licensed, extracted, and rehabilitated is as follows:

- Total area to be licensed: 11.67 ha
- Total area to be extracted: 7.5 ha
- Total area to be rehabilitated: 7.6 ha, including:
    - Wetland: 0.8 ha
    - Pond: 4.1 ha
    - Meadow: 1.8 ha
    - Reforestation: 0.9 ha

The licence amendment proposes to reduce the approved extraction area by 0.96 hectares to incorporate greater setbacks into the operations plan to protect the adjacent PSW and Significant Woodlands. Wetlands adjacent to the Site had not been evaluated as provincially significant when the original 1991 ARA licence was secured.

Upon completion of extraction, areas below approximately ±348.5 masl will become permanently flooded encompassing about 4 ha in area. There will be an additional 0.8 ha of wetland habitat along

the western pond margin created through contouring (shallow nearshore slopes), shoreline plantings, and inclusion of woody debris and other structural elements. Native upland plantings are also proposed through the Rehabilitation Plan, including plantings in previously extracted areas and reforestation beyond the extraction limit adjacent to the Northern Forest and Swamp Complex.

6 EFFECTS ASSESSMENT AND MITIGATION

The purpose of this NER is to present a biophysical characterization of the Study Area as a means to identify the potential for adverse effects on the natural environment and natural heritage features stemming from the proposed pit extraction activities. Several significant natural features and species were documented (or may occur) within the Site pursuant to the assessments in **Section 4**. The following effects assessment provides an evaluation of the potential for the proposed pit application to result in negative effects to such environmental components and offers technical recommendations to mitigate such effects where warranted. Certain technical recommendations offered herein apply to several natural features and/or species simultaneously; as such, all technical recommendations should be read and considered in their entirety. The baseline or existing conditions against which the application is assessed are treated as the state of the Site at the time of the site assessments. The effects assessment herein is based on the Site Plans provided in **Appendix 8**.

All pits and quarries in Ontario are subject to a set of standards and conditions which are specific to the type of licence being applied for. The effects assessment herein assumes that all pit operations within the Site will be undertaken consistent with the Prescribed Conditions for Category 1, Class A licences and the Operational Standards which pertain to all licence categories. Such conditions and standards that have bearing on protection of the natural environment are not duplicated as technical recommendations herein as they already represent licence requirements. Relevant Prescribed Standards and Operational Standards include the following:

- Dust will be mitigated, and the use of dust suppressants will be applied to internal haul roads and processing areas as required (Prescribed Standard 3.1 and 3.2).
- A Spills Contingency Program will be developed prior to site preparation (Prescribed Standard 3.5).
- Fuel storage tanks will be installed and maintained according to the *Gasoline Handling Act* (Prescribed Standard 3.6).
- An Environmental Compliance Approval will be secured for water discharged off-site (Prescribed Standard 3.7).
- A Permit to Take Water will be secured if required (Prescribed Standard 3.9).
- Topsoil will be stripped sequentially prior to aggregate extraction (Operational Standard 5.4).
- Topsoil and overburden stripped during the operation will be stored separately with vegetated stable slopes (Operational Standard 5.6).
- Adequate vegetation will be established and maintained to control erosion of any berm or stockpile (Operational Standard 5.7).
- Scrap cannot be located within 30 m of any body of water and 30 metres from the boundary of the Site (Operational Standard 5.9).
- Excavation is to be set back 15 metres from the boundaries of the Site and 30 metres from any body of water that is not the result of excavation below the water table (Operational Standard 5.10).

- All excavation faces are to be stabilized to prevent erosion (Operational Standard 5.12).
- All stripped topsoil or overburden will be used in the rehabilitation of the Site (Operational Standard 5.17).
- Adequate vegetation is established and maintained to control erosion of any topsoil or overburden replaced for rehabilitation purposes (Operational Standard 5.18).
- Rehabilitation will ensure adequate drainage and vegetation is provided and any compaction is alleviated (Operational Standard 5.21).

Technical recommendations above and beyond the aforementioned conditions and standards are offered herein to avoid and/or minimize impacts to the significant natural features identified. Certain technical recommendations apply to several natural features and/or species simultaneously; as such, all technical recommendations should read and considered in their entirety. All technical recommendations offered herein are incorporated into the ARA Site Plans provided in **Appendix 8** while the recommended feature and habitat setbacks from the Northern Forest and Swamp Complex and Southern Wetland (including PSW therein) are also shown in **Figure 3**.

6.1 Provincially Significant Wetlands

Where development and/or site alteration activities are proposed adjacent to wetlands, adverse effects may occur via the following pathways:

- Alterations to surface water and/or groundwater contributions to the wetland from construction (e.g., dewatering, etc.), grading that modifies the existing topography or drainage, and/or increased coverage of impervious surfaces (e.g., roads, roofs, etc.);
- Increased sediment loadings and/or nutrient enrichment within the wetland via runoff exiting from development areas during and post construction. This may alter wetland water quality and vegetation communities via increased turbidity, eutrophication, contamination by toxic substances, changes in pH, etc.
- Noise and/or light pollution that may adversely affect the ability of wetland wildlife to successfully carry out their life processes (e.g., breeding, feeding, etc.); and
- Increased human activity (i.e., encroachment) within the wetland which may result in soil compaction, dumping, etc.

Terrastory has worked closely and iteratively with the project team to define an ecologically appropriate extraction limit during preparation of the Site Plans. The extraction limit in the vicinity of the Northern Forest and Swamp Complex (and PSW therein) incorporates the greater of the following three (3) setbacks:

- 30 m from the PSW boundaries as delineated by Terrastory staff in 2020 in accordance with OWES protocols, and
- 15 m from the Significant Woodland dripline, and
- 30 m from the significant hibernaculum for Eastern Gartersnake.

The PSW in the Southern Wetland is also afforded a 30 m extraction setback.

A detailed assessment of potential impacts to the shallow groundwater aquifer stemming from below-water pit extraction within the Site was undertaken through the Hydrological Assessment (Groundwater Science Corp. 2020). The following potential impacts were identified:

- The removal of sand/gravel during below-water pit extraction may have short-duration localized effects on the groundwater elevation along the pond perimeter.
- Changes in the water budget of the Site may result from either 1) increases in evaporation from the pit pond (deficit) and/or 2) increased surface runoff into the pond (surplus).
- Permanent changes may result from an overall flattening of the groundwater elevation in the pit pond which will stabilize at the central range of groundwater elevations (±348.5 masl) present under existing conditions.
- Increases in groundwater temperature would be anticipated once the groundwater surface is exposed in the pit pond.

The results of the Hydrogeological Assessment suggest that the potential for significant adverse effects to the PSW via below water table pit extraction are negligible. Any changes to the runoff contribution to Southern Wetlands and Northern Forest and Wetland Complex as modeled by the site-specific water balance are considered minor. Water table conditions within the Southern Wetland will be maintained by a 30 m extraction setback and a Site Plan note ensuring no extraction of till or organic deposits (as this represents the substrata in which the water table has developed in the Southern Wetland). Local groundwater recharge will be maintained (increased slightly) as more runoff will be contained in the pit pond and made available to infiltrate. While an increase in the water table elevation at the downgradient (i.e., northern) edge of the pond is expected, the results of the Hydrogeological Assessment indicate that no significant potential impacts to the local environment features (i.e., Southern Wetland and Northern Forest and Wetland Complex) are anticipated.

Through discussions with the project team, Terrastory identified a location for enhancement plantings outside the extraction limit along the Northern Forest and Swamp Complex boundary. Native tree plantings in this area will provide improved buffering capacity for the adjacent PSW and will expand the spatial extent of the Significant Woodland. This "reforestation area" is shown on the Rehabilitation Plan provided in **Appendix 8**.

To protect the PSW from pit-related impacts, the following measures are recommended and have been incorporated into the ARA Site Plans:

- **All extraction activities and aggregate stockpiles will be set back a minimum of 30 m from the Provincially Significant Wetland. The 30 m setback will be well-marked under the direction of a qualified Ecologist prior to the commencement of adjacent pit operations.**
- **The 30 m Provincially Significant Wetland setback area will remain as natural, self-sustaining vegetation.**

6.2 Significant Woodlands

Where development and/or site alteration activities are proposed within or adjacent to forests or woodlands, adverse effects may occur via the following pathways:

- Direct vegetation removal (e.g., trees, shrubs, herbaceous vegetation, etc.), resulting in loss of woodland area and functions (e.g., wildlife habitat, carbon sequestration, runoff attenuation, etc.).
- Mechanical injury to the trunk, roots, branches, and/or foliage of retained woody vegetation.
- Soil compaction from the use of heavy machinery.
- Smothering or exposure of roots due to changes in grade.
- Noise and/or light pollution that may adversely affect the ability of woodland wildlife to successfully carry out their life processes (e.g., breeding, feeding, etc.).
- Increased human activity (i.e., encroachment) within or adjacent to the woodland which may result in soil compaction, dumping, etc.

As noted in **Section 4.2**, all forests/woodlands within the Study Area contain a Significant Woodland overlay designation per Background Map 2 of the Municipality's OP. This includes the Conifer Forest and Plantation, which is largely situated within the extraction limit of the current ARA licence.

Extraction is proposed to be set back a minimum of 15 m from the dripline of the Significant Woodland overlapping the Northern Forest and Swamp Complex. The extraction limit is set back further where the 30 m PSW or hibernaculum setbacks apply.

Approximately 1.5 ha of Significant Woodland in the Conifer Forest and Plantation will be stripped to support future extraction activities. This woodland has been deemed significant on the basis of Background Map 2 of the Municipality's OP. Notwithstanding this, neither the cedar conifer forest nor pine plantation overlap with confirmed SWH or contain interior forest habitat. Removal of 1.5 ha of this Significant Woodland is considered acceptable given applicable ARA policies for the following reasons:

- The current Class A above water table pit licence allows for aggregate extraction in this area.
- The proposed licence amendment incorporates an extraction limit that will expand the amount of Significant Woodland to be protected in the Conifer Forest and Plantation.
- The Rehabilitation Plan requires upland tree plantings for this area above the permanent pond elevation.

To protect the Significant Woodlands from pit-related impacts, the following measures are recommended and have been incorporated into the ARA Site Plans:

- **All extraction activities and aggregate stockpiles will be set back a minimum of 15 m from the Significant Woodland adjacent to extraction areas 1 and 2. The 15 m setback will be well-marked under the direction of a qualified Ecologist prior to the commencement of adjacent pit operations.**
- **The 15 m Significant Woodland setback adjacent to extraction areas 1 and 2 will remain as natural, self-sustaining vegetation.**
- **All necessary removal of vegetation within the extraction limit will be completed outside the primary bird nesting and bat activity periods (i.e., to be completed between October 1 and March 31).**

- **Upland tree plantings and reforestation will occur consistent with the Rehabilitation Plan.**

6.3 Significant Wildlife Habitat

Per the assessment in **Section 4.3**, a total of five (5) SWH features were considered further through this study:

- Seasonal Concentration Areas of Animals
    1. Bat Maternity Colonies
    2. Reptile Hibernaculum
- Rare Vegetation Communities or Specialized Habitats for Wildlife
    3. Seeps and Springs
- Habitat of Species of Conservation Concern
    4. Terrestrial Crayfish
    5. Special Concern and Rare Wildlife Species

Also based on this assessment, a total of five (5) Special Concern or provincially rare species are considered to have a possible likelihood of occurrence on the Subject Property (or were confirmed) given their habitat associations and current distribution in southern Ontario:

1) Western Chorus Frog (*Pseudacris triseriata*)
2) Eastern Wood-pewee (*Contopus virens*)
3) Wood Thrush (*Hylocichla mustelina*)
4) Monarch (*Danaus plexippus*)
5) Yellow-banded Bumblebee (*Bombus terricola*)

All SWH types and Special Concern/provincially rare species overlapping with the Northern Forest and Swamp Complex will be adequately protected by the recommended extraction limit setback. This includes the confirmed significant hibernaculum for Eastern Gartersnakes, confirmed breeding habitat for Eastern Wood-pewee and Wood Thrush, confirmed breeding habitat for Western Chorus Frog, and candidate habitat for bat maternity colonies. All SWH types associated with the Southern Wetland will also be protected by the recommended extraction limited setback, which includes several of the above SWH types along with terrestrial crayfish habitat and a discharge area.

No specific recommendations are offered herein to minimize impacts to potential foraging and breeding habitat for Monarch or Yellow-banded Bumblebee. Both species are habitat generalists and abundant nectaring habitat exists within the wider landscape surrounding the Site. Oviposition sites for Monarch (e.g., Common Milkweed), overwintering habitat for Yellow-banded Bumblebee, and general nectaring habitat for both species is present within the wider local landscape.

The Conifer Forest and Plantation (1.5 ha of which will be removed) and adjacent cedar regeneration thicket do not overlap with any confirmed or candidate SWH types.

6.4 Habitat of Endangered and Threatened Species

Per the assessment in **Appendix 7**, a total of four (4) Endangered or Threatened species are considered to have a possible likelihood of occurrence on the Subject Property (or were confirmed) given their habitat associations and current distribution in southern Ontario:

1) Little Brown Myotis (*Myotis lucifugus*)
2) Northern Myotis (*Myotis septentrionalis*)
3) Tri-colored Bat (*Perimyotis subflavus*)
4) Bank Swallow (*Riparia riparia*)

A timing restriction on tree (and other vegetation removal) was recommended per **Section 6.2**. Adherence to this timing restriction will eliminate potential impacts to roosting Endangered bats (either individuals or maternity colonies) during stripping and vegetation removal. The Northern Forest and Swamp Complex, which has a greater potential to support maternity colonies of the three Endangered bats, will be protected by a (minimum) 15 m dripline setback. Additional "reforestation" efforts adjacent to this feature (per the Rehabilitation Plan in **Appendix 8**), and the fact that the set back will remain in natural, self-sustaining vegetation, will allow for expansion of roosting habitat for bats in this area over time.

Bank Swallow nest excavations in temporary stockpiles of aggregate material and vertical pit faces were documented in 2019; however, this species was not documented to be breeding within the Site in 2020. Bank Swallow frequently nests in vertical or near-vertical (i.e., above 75°) aggregate stockpiles and pit faces containing sandy overburden. Occupation by Bank Swallow of future aggregate stockpiles or pit faces under active extraction during the nesting season (i.e., approximately April to late August for this species) would result in the need for temporary cessation of nearby pit operations until the birds have completed nesting. To avoid impacts to this threatened species, the following measure is recommended:

- **All aggregate operations within the Site will be undertaken consistent with the document titled "Best Management Practices for the Protection, Creation and Maintenance of Bank Swallow Habitat in Ontario" (OMNRF 2017).**

One of the pit faces in which Bank Swallow nest excavations were documented in 2019 is situated within the extraction setback (see **Figure 3**). This feature would remain and provide suitable nesting habitat for this species in future years.

6.5 Natural Environment Technical Recommendations

Terrastory has advised the project team regarding suitable native tree species for inclusion in rehabilitation/reforestation and other items related to the Rehabilitation Plan. These recommendations have been incorporated directly into the proposed Site Plans.

7 APPLICABLE NATURAL HERITAGE AND ENVIRONMENTAL POLICIES

The following sections summarize the environmental and natural heritage policies that apply to the proposed pit operations plan and describe how the recommendations provided in this study will address these policies (where applicable). It is noted that the necessary municipal designations and zoning permitting aggregate extraction are already in place within the Site which obviates the need for any accompanying applications under the *Planning Act*. Given this, the natural heritage provisions of the Municipality's OP, County OP, and Provincially Policy Statement are not assessed in detail herein.

7.1 Aggregate Resources Act, R.S. O. 1990, c. A.8

The information and recommendations provided in this report satisfy the requirements for Natural Environment Level 1 and Level 2 Assessments pursuant to a Category 1, Class A licence:

> 2.2.1 Natural Environment Level 1: determine whether any of the following features exist on and within 120 metres of the site: significant wetland, significant portions of the habitat of endangered or threatened species, fish habitat, significant woodlands (south and east of the Canadian Shield), significant valley lands (south and east of the Canadian Shield), significant wildlife habitat and significant areas of natural and scientific interest; and
>
> 2.2.2 Natural Environment Level 2: impact assessment where the Level 1 identified any features on and within 120 metres of the site in order to determine any negative impacts on the natural features or ecological functions for which the area is identified, and any proposed preventative, mitigative or remedial measures.

The following significant natural features per ARA policies were identified within the Study Area:

- Provincially Significant Wetland (Jamestown/Molesworth Wetland complex).
- Significant Woodland (Northern Forest and Swamp Complex, Southern Wetland, and Conifer Forest and Plantation).
- Candidate or Confirmed Significant Wildlife Habitat, including:
  - Bat Maternity Colonies (candidate);
  - Reptile Hibernaculum (confirmed);
  - Seep/spring (confirmed);
  - Terrestrial Crayfish (confirmed);
  - Western Chorus Frog (confirmed)
  - Eastern Wood-pewee (confirmed);
  - Wood Thrush (confirmed)
  - Monarch (candidate);
  - Yellow-banded Bumble Bee (candidate).
- Candidate Habitat of Endangered and Threatened Species, including:
  - Little Brown Myotis, Northern Myotis, and Tri-colored Bat
  - Bank Swallow

The extraction limit incorporated into the Site Plan reflects the greater of a 30 m setback from all PSW units, 15 m setback from the dripline of the Northern Forest and Swamp Complex, and 30 m setback from the significant hibernaculum for Eastern Gartersnake. These setbacks, in combination with a determination of no negative impacts to the PSWs made herein and through the Hydrogeological Assessment (Groundwater Science Corp.), allow for adequate protection of all significant natural features overlapping with the Northern Forest and Swamp Complex and Southern Wetland consistent with ARA Provincial Standards.

Approximately 1.5 ha of the municipally designated Significant Woodland overlapping with the Conifer Forest and Plantation will be removed. As noted in **Section 6.2**, removal of a portion of this Significant Woodland is considered acceptable pursuant to applicable ARA policies for the following reasons:

- The current Class A above water table pit licence allows for aggregate extraction in this area.
- The proposed licence amendment incorporates an extraction limit that will expand the amount of Significant Woodland to be protected in the Conifer Forest and Plantation.
- The Rehabilitation Plan requires upland tree plantings for this area above the permanent pond elevation.

Technical recommendations are offered in **Section 6** to minimize the potential for impact to the identified significant natural features above the regulatory requirements of the ARA. All such technical recommendations are included on the ARA Site Plans in **Appendix 8**.

7.2 Provincial Endangered Species Act, S.O. 2007, c. 6

The *Endangered Species Act* (ESA) is administered by MECP and protects designated Endangered and Threatened species in Ontario from being killed, harmed, or harassed (s. 9) or having their habitat damaged or destroyed (s. 10). The protection afforded to Endangered and Threatened species "habitat" is either prescribed by O. Reg. 242/08, or (for those species that lack regulated habitat) is defined as *an area on which the species depends, directly or indirectly, to carry on its life processes, including life processes such as reproduction, rearing, hibernation, migration or feeding.* Activities that constitute habitat damage and/or destruction can only proceed subject to requirements of s. 17 or (in limited circumstances) an activity registration under O. Reg. 242/08.

A detailed assessment of potential Endangered and Threatened habitat within the Study Area is provided in **Appendix 7**. Provided that relevant technical recommendations outlined in **Section 6.4** (to address potential tree removal impacts to roosting bats and consideration for nesting Bank Swallow) are implemented in full, it has been determined that the proposed development plan is consistent with the species and habitat protection provisions of the ESA. Confirmation from MECP that the licence amendment application appropriately addresses the ESA is advised.

7.3 Federal *Fisheries Act*, R.S.C. 1985, c. F-14

The amended federal *Fisheries Act* (Bill C-68) received Royal Assent in June 2019 while the updated fish and fish habitat protection provisions came into force in August 2019. Subsection 34.4(1) of the amended *Fisheries Act* prohibits all work, undertaking, or activity from causing the death of fish (other than fishing). Subsection 35(1) requires that project activities not result in the "*harmful alteration, disruption or destruction of fish habitat*" (HADD) unless undertaken in accordance with the requirements of a statutory exemption per subsection 35(2). Based on the Fish and Fish Habitat Protection Policy Statement (August 2019), HADD is interpreted by DFO to include "*any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish*".

No in-water works or fill placement below the high-water mark of a surface water feature containing fish habitat is proposed through this application. Consistent with the assessment carried out in **Section 4.5**, it has been determined that the proposed pit operations plan is consistent with the fish and fish habitat protection provisions outlined in the *Fisheries Act*.

7.4 Federal *Migratory Birds Convention Act*, S.C. 1994, c. 22

Section 6 of the Migratory Birds Regulations under the *Migratory Birds Convention Act, 1994* (MBCA) prohibits the disturbance or destruction of nests, eggs, or nest shelters of a migratory bird. The provincial *Fish and Wildlife Conservation Act, 1997* extends the protection of bird nests and eggs to

certain species not listed under the Migratory Birds Regulations (e.g., Corvids, Strigids, Accipitrids, etc.).

Provided that the recommendations outlined in **Section 6.5** are implemented in full (i.e., prohibition on vegetation removal during the bird breeding season), no impacts to breeding birds or bird nests protected by the MBCA or FWCA are anticipated.

8 CONCLUSIONS

In accordance with the application standards for Category 1, Class A pit licences pursuant to the *Aggregate Resources Act*, the preceding Level I & II Natural Environment Report provides a detailed characterization of the natural environment occurring within and adjacent to Kelly Pit. This NER has been prepared in support of an amendment to an existing pit licence (#4781) to facilitate below-water extraction. Included herein is a comprehensive approach to identifying the presence or absence of several significant natural features afforded varying degrees of protection by applicable environmental policies, particularly the ARA Provincial Standards and *Endangered Species Act*. Potential negative impacts to the identified significant natural features are described with mitigation measures and technical recommendations offered to avoid or minimize such impacts and/or offer enhancements as appropriate.

Based on the findings presented in this report, the following natural features with ecological and/or policy significance have been identified within the Study Area:

- **Provincially Significant Wetland (Jamestown/Molesworth Wetland Complex)** and overlapping **Significant Woodland** along the northern and southwestern boundaries of the Site.
- Confirmed **Significant Wildlife Habitat** including a hibernaculum for Eastern Gartersnake, Terrestrial Crayfish habitat, breeding habitat for Eastern Wood-pewee and Wood Thrush, and a discharge area (spring).
- Feeding habitat and potential roosting habitat for **Endangered Myotis Bats**, and suitable breeding habitat for the **Threatened Bank Swallow**.

The extraction limit incorporates a minimum 30 m PSW setback, 15 m dripline setback from the Northern Forest and Swamp Complex, and 30 m setback from the Eastern Gartersnake hibernaculum. The proposed removal of portions of a municipally designated Significant Woodland (Conifer Forest and Plantation) will be addressed through technical recommendations incorporated into the Site Plan (e.g., timing restriction on vegetation removal) and the requirements of the Rehabilitation Plan.

Overall, it has been determined that no negative impacts to the above-noted significant natural features will occur provided that all technical recommendations are implemented in full. The ARA Site Plan that directs and constrains pit operations (**Appendix 8**) incorporates all technical recommendations made herein.

9 REFERENCES

Armstrong, D. K., and J. E. P. Dodge. 2007. "Paleozoic Geology of Southern Ontario."

Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, and Ontario Ministry of Natural Resources Ontario Nature. 2001. "Ontario Breeding Bird Atlas: Guide for Participants."

Bird Studies Canada, United States Environmental Protection Agency, and Environment Canada. 2008. "Marsh Monitoring Program Participant's Handbook for Surveying Amphibians."

Bradley, D. J. 2013. "Southern Ontario Vascular Plant Species List."

Cadman, M. D., D. A. Sutherland, G. G. Beck, D. Lepage, and A. R. Couturier. 2007. *Atlas of the Breeding Birds of Ontario, 2001–2005*.

Chapman, L.J., and D.F. Putnam. 1984. "Physiography of Southern Ontario."

COSEWIC. 2012. "COSEWIC Assessment and Status Report on the Eastern Wood-Pewee (Contopus Virens) in Canada."

DFO. 2019. "Fish and Fish Habitat Protection Policy Statement."

Dobbyn, J. S. 2005. *Atlas of the Mammals of Ontario*.

Evans, M. L., B. J. M. Stutchbury, and B. E. Woolfenden. 2008. "Off-Territory Forays and Genetic Mating System of the Wood Thrush (Hylocichla Mustelina)." *The Auk* 125 (1): 67–75.

Henson, B. L., and K. E. Brodribb. 2005. "Great Lakes Conservation Blueprint for Terrestrial Biodiversity." Vol. 2.

Hoffman, D. W., N. R. Richards, and F.F Morwick. 1952. "Soil Survey of Huron County," 100. http://sis.agr.gc.ca/cansis/publications/surveys/on/on13/index.html.

Humphrey, C., and H. Fotherby. 2019. "Little Brown Myotis, Northern Myotis and Tri-Colored Bat Recovery Strategy."

Huron County. 2015. "Huron Natural Heritage Plan Technical Document," no. June: 115.

Jones, Colin, and Mael Glon. 2019. "First Record of the Paintedhand Mudbug (Lacunicambarus Polychromatus) in Ontario and Canada and the Significance of INaturalist in Making New Discoveries." *Canadian Field Naturalist* 133 (2): 160–66. https://doi.org/10.22621/cfn.v133i2.2223.

Lee, H. T. 2008. "Southern Ontario Ecological Land Classification: Vegetation Type List."

Lee, H. T., W. D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. "Ecological Land Classification for Southern Ontario: First Approximation and Its Application."

MNR. 2010. "Natural Heritage Reference Manual."

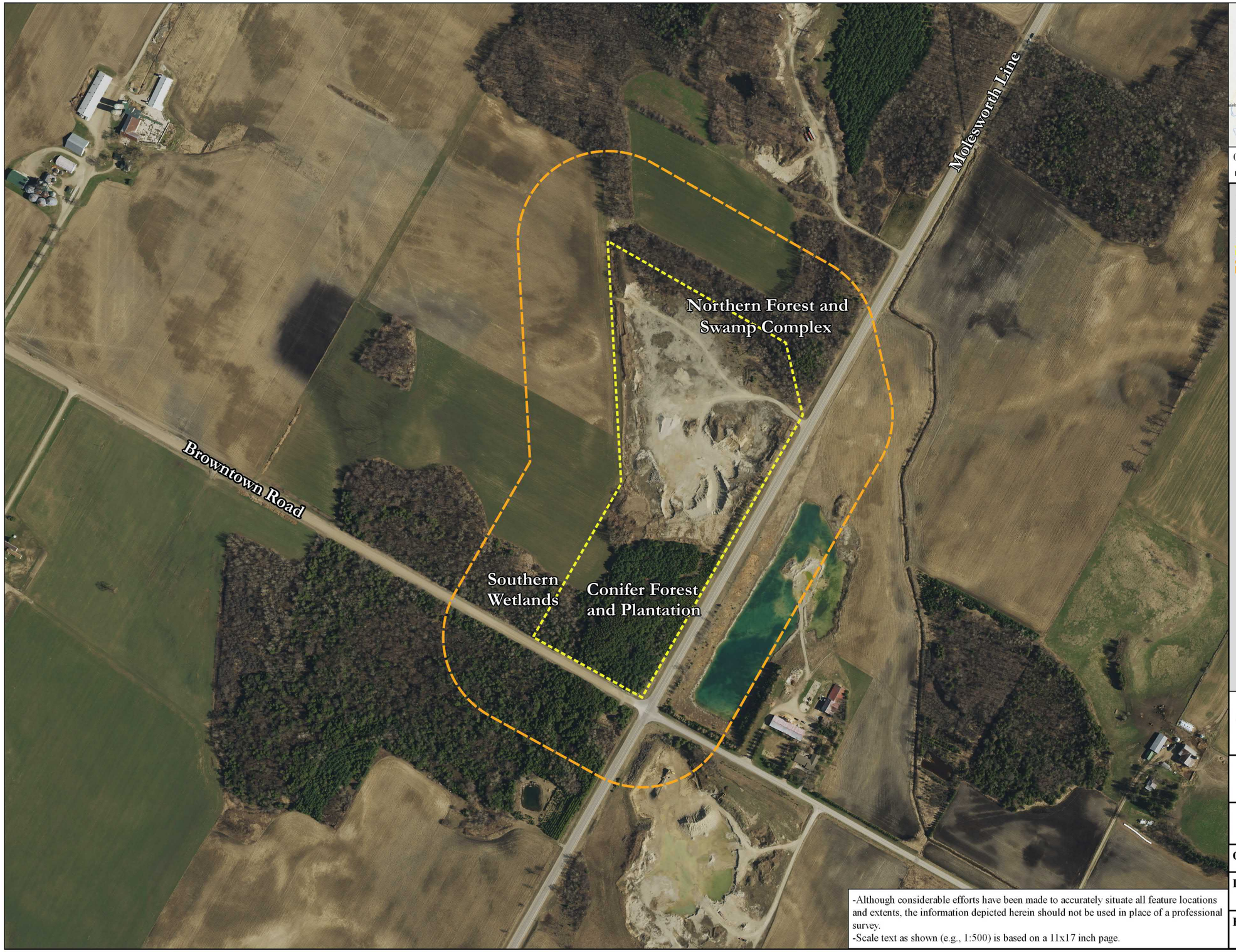
MNRF. 2015. "Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E."

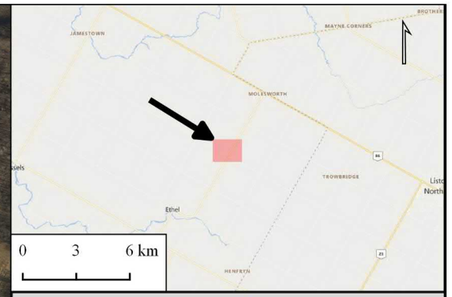
OMNRF. 2014. *Ontario Wetland Evaluation System: Southern Manual*.

———. 2017. "Best Management Practices for the Protection, Creation and Maintenance of Bank Swallow Habitat in Ontario."

Ontario Geological Survey. 2010. "Surficial Geology of Southern Ontario."

Phair, C., B.L. Henson, and K.E. Brodribb. 2005. "Great Lakes Conservation Blueprint for Aquatic Biodiversity." Vol. 2.





Legend

Study Area

- Site
- Adjacent Lands (Site + 120 m)

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
-Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.

TERRASTORY
environmental consulting inc.

1:5,000	0 50 100 150 200 m		
N	Project No.: 1954	By: TK	Date: 2020-11-16

Orthophotograph Date: 2015 (SWOOP).

Location: Kelly Pit, Municipality of Huron East.

Figure 1. Location of the Study Area.

Legend

Study Area
- Site
- Adjacent Lands (Site + 120 m)

Survey Stations
- Anuran Calling Stations
- Breeding Bird Survey Stations

Biophysical Conditions - Terrastory
- Vegetation Communities
- Runoff Direction
- Discharge/Spring
- Ditch
- Provincially Significant Molesworth/Jamestown Wetland Complex (Terrastory Update)
- Crest of Esker Slope

Vegetation Community Codes:

UPLAND
FOD: Deciduous Forest
FODM7: Lowland Deciduous Forest
FOMM4-2: Dry - Fresh White Cedar - Poplar Mixed Forest
FOMM4-3: Dry - Fresh White Cedar - Hardwood Mixed Forest
FOC: Coniferous Forest
FOCM4-1: Fresh - Moist White Cedar Coniferous Forest
FOCM6-1: Dry - Fresh White Pine Naturalized Coniferous Plantation
WOD: Deciduous Woodland
WODM5-1: Fresh - Moist Poplar Deciduous Woodland
THCM1-2: Dry - Fresh Coniferous Regeneration Thicket
TAGM5: Fencerow
MEMM3: Dry - Fresh Mixed Meadow

WETLAND
SWDM2-2: Green Ash Mineral Deciduous Swamp
SWDM3-3: Swamp Maple Mineral Deciduous Swamp
SWDM4-5: Poplar Mineral Deciduous Swamp
SWM: Mixed Swamp
MAMM1: Graminoid Mineral Meadow Marsh

TERRASTORY
environmental consulting inc.

1:3,500

0 50 100 150 m

N

Project No.: 1954

By: TK

Date: 2020-12-20

Orthophotograph Date: 2015 (SWOOP).

Location: Kelly Pit, Municipality of Huron East.

Figure 2. Biophysical Features and Conditions.

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
-Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.

Legend

Study Area
- Site
- Adjacent Lands (Site + 120 m)

Significant Natural Features - Agency Identified
- Provincially Significant Molesworth/Jamestown Wetland Complex
- Significant Woodland (Municipality of Huron East Official Plan)

Significant Natural Features - Terrastory

Confirmed Significant Wildlife Habitat
- Significant Hibernaculum for Eastern Gartersnake
- Terrestrial Crayfish
- Location of Vocalizing Wood Thrush (approx.)
- Location of Vocalizing Eastern Wood-pewee (approx.)
- Location of Vocalizing Chorus Frog (approx.)
- Discharge/Spring

Endangered/Threatened Species
- Nest Excavations associated with Bank Swallow

Significant Natural Feature Boundaries
- Dripline (Northern Forest and Swamp Complex)
- Wetland Boundary (OWES)
- Provincially Significant Molesworth/Jamestown Wetland Complex (Terrastory Update)

Mitigation Measures Recommended
- Greatest Natural Feature Setback (30 m from Wetlands, 15 m from Northern Significant Woodland Dripline, or 30 m from Significant Hibernaculum)
- Areas to be Replanted through Progressive Rehabilitation

TERRASTORY
environmental consulting inc.

1:3,500	0 50 100 150 m		
N	Project No.: 1954	By: TK	Date: 2020-12-20

Orthophotograph Date: 2015 (SWOOP).

Location: Kelly Pit, Municipality of Huron East.

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
-Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.

Figure 3. Significant Natural Features and Technical Recommendations.

Appendix 1. Curriculum Vitae

TERRASTORY
environmental consulting inc.

Tristan L. Knight, M.E.S., M.Sc.
Senior Ecologist / President

CAREER AND ACADEMIC HISTORY

2018 – Present	**Senior Ecologist / President, Terrastory Environmental Consulting Inc.**
2014 – 2018	Ecologist / Botanist, RiverStone Environmental Solutions Inc.
2013 – 2014	Watershed Restoration Technician, Credit Valley Conservation Authority
2012 – 2013	Terrestrial Ecologist, Aquafor Beech Ltd.
2011 – 2012	Wetland Biologist / Asst. SAR Biologist, Ontario Ministry of Natural Resources
2009 – 2011	Master of Science, SUNY College of Environmental Science and Forestry, Syracuse, NY
2007 – 2009	Master of Environmental Studies, York University, Toronto, ON
2003 – 2007	Hons. Bachelor of Arts, University of Western Ontario, London, ON

PROFESSIONAL EXPERIENCE

Tristan has ten years of experience as an environmental professional acting in diverse private- and public-sector roles. He has assisted a wide array of clients across the development industry (e.g., residential, aggregates, municipal infrastructure, green energy, etc.) and has extensive project management experience with projects big and small. Tristan is an accomplished field ecologist and certified Arborist with professional training in a vast array of provincial data collection protocols including but not limited to Ecological Land Classification, Ontario Wetland Evaluation System, Ontario Stream Assessment Protocol, Ontario Benthos Biomonitoring Network, and Vegetation Sampling Protocol. He is regularly involved in providing opinions and conformity assessments associated with federal, provincial, and municipal environmental policies, conducting environmental impact assessments, and identifying creative solutions to development challenges. Tristan is single-mindedly focused on generating high quality, time-sensitive, cost-competitive environmental reporting and advice.

The following is a partial list of Tristan's consulting project experience since 2012.

Environmental Impact Studies / Natural Heritage Assessments

- Natural Environment Level 1 & 2 Technical Report in the **Municipality of Huron East**; *for private client*; **Key Tasks:** extensive terrestrial/wetland/aquatic surveys, species at risk surveys (birds, turtles, bats, etc.), significant wildlife habitat assessments, graphics, reporting in support of a quarry application for a licence expansion and new licence.
- Environmental Impact Statement in the **Township of Southgate**; *Flato Developments Inc.*; **Key Tasks:** extensive terrestrial/wetland/aquatic surveys, species at risk surveys, significant wildlife habitat assessments, *Endangered Species Act* approvals, *Fisheries* Act authorization, graphics, reporting in support of a ~500-unit plan of subdivision.
- Natural Environment Report in the **Town of Caledon/City of Brampton**; *for the Regional Municipality of Peel*; **Key Tasks:** ELC, breeding bird surveys, tree inventory and health assessment, fish and aquatic habitat surveys, anuran calling surveys, botanical inventory, identification and assessment of significant natural heritage features, mitigation opportunities, permitting under the *Endangered Species Act* (Redside Dace), permitting under the *Conservation Authorities Act*, graphics, and reporting in support of 14 km of improvements to Mayfield Road.

- Natural Environment Addendum in the **City of Kawartha Lakes**; *for Giofam Investments Inc.*; **Key Tasks:** breeding bird surveys, significant wildlife habitat assessment, graphics, reporting in support of a quarry application.
- Environmental Impact Study in the **Town of Huntsville**; *for private client*; **Key Tasks**: ELC, breeding bird surveys, graphics, and reporting in support of a multiple lot severance.
- Natural Heritage Impact Statement in the **City of Toronto**; *for the City of Toronto*; **Key Tasks**: ELC, aquatic habitat assessment, tree inventory and health assessment, identification of mitigation opportunities, graphics, *Conservation Authorities Act* approval, and reporting in support of bridge works on Bloor Street over Etobicoke Creek.
- Environmental Impact Statement in the **Town of Georgina**; *for private client*; **Key Tasks**: ELC, identification and assessment of significant natural heritage features, mitigation opportunities, graphics, reporting in support of a lot severance.
- Environmental Impact Statement in the **Town of Aurora**; *for private client*; **Key Tasks**: ELC, identification and assessment of significant natural heritage features, mitigation opportunities, graphics, reporting in support of a rezoning application.
- Site Evaluation Report in the **Township of Muskoka Lakes**; *for private client*; **Key Tasks**: ELC, wetland boundary delineation, identification and assessment of significant natural heritage features, mitigation opportunities, graphics reporting in support of a lot severance.
- Natural Heritage Evaluation in the **Township of Hamilton**; *for private client*; **Key Tasks**: ELC, identification and assessment of significant natural heritage features, Butternut Health Assessment, mitigation opportunities, graphics, reporting in support of a site plan application.
- Environmental Impact Statement and Site Evaluation Report in the **Town of Gravenhurst**; *for private client;* **Key Tasks**: ELC, identification and assessment of significant natural heritage features, mitigation opportunities, graphics, reporting in support of a multiple lot severance.
- Natural Heritage Evaluation in the **Township of King**; *for private client*; **Key Tasks:** ELC, identification and assessment of significant natural heritage features, significant woodland assessment, mitigation opportunities, graphics, reporting in support of a site plan application.
- Site Evaluation Report in the **Municipality of Dysart et al.**; *for private client*; **Key Tasks:** ELC, identification and assessment of significant natural heritage features, fish and aquatic habitat assessment, mitigation opportunities, graphics, reporting in support of a single lot severance.

Municipal Class Environmental Assessments

- Municipal Class Assessment (Schedule B) in the **Town of Caledon**; *for IBI Group*. **Key Tasks:** fish habitat assessments, vegetation surveys, tree inventory, breeding bird surveys, graphics, alternatives assessment for a bridge replacement project.
- Municipal Class Environmental Assessment (Schedule C) in the **Town of Milton**; *for Delcan Corporation*. **Key Tasks:** calling anuran surveys, significant woodland assessment, graphics, reporting in support of the expansion of Britannia Road.

Environmental Servicing/Implementation Reports

- Environmental Implementation Report in the **Township of Southgate**; *for Flato Developments Inc.* **Key Tasks:** comprehensive construction mitigation plan integrating a variety of disciplines and construction activities (i.e., grading, installation of watercourse crossing structures, landscaping for stormwater retention ponds, etc.).

- Master Environmental Servicing Plan in the **City of Brampton**; *for Candevcon Ltd.* **Key Tasks:** ELC, summer and fall botanical inventories, significant wildlife habitat assessment, hedgerow assessment, natural heritage system recommendations, mitigation opportunities, graphics, reporting in support of a Master Environmental Servicing Plan.

Species at Risk Surveys and Habitat Assessments

- Surveys for Pale-bellied Frost Lichen in the County of Hastings; *for private client*; **Key Tasks**: two (2) days of inventories for Pale-bellied Frost Lichen, reporting.
- Species at Risk Habitat Assessment in the **Township of Guelph/Eramosa**; *for River Valley Developments Inc.*; **Key Tasks**: assessment and collection of background information, identification and assessment of species at risk habitat in support of a new quarry licence application.
- SAR Habitat Assessment in the **City of Brampton**; *for Planmac Inc.*; **Key Tasks:** Redside Dace, Eastern Meadowlark and Bobolink habitat assessment in support of bridge works.
- Butternut Health Assessment in the **Town of Caledon**; *for the Town of Caledon*; **Key Tasks**: Butternut Health Assessment in support of culvert works.
- Butternut Health Assessment in the **City of Toronto;** *for the City of Toronto*; **Key Tasks:** Butternut Health assessment in support of watercourse works.
- Butternut Health Assessment in the **Town of Orangeville;** *for the City of Toronto*; **Key Tasks:** Butternut Health Assessment in support of watercourse works.

Fisheries and Fish Habitat Assessments

- Fish Habitat Impact Assessment in the **Township of Muskoka Lakes**; *for private client;* **Key Tasks**: fish and aquatic habitat assessment, graphics, reporting in support of a quarry application.
- Fish Sampling and Habitat Assessments **across eastern Ontario**; *for Trans Canada Pipelines*; **Key Tasks:** fish sampling, fish habitat assessments in support of a pipeline expansion.
- Fish Rescue in the **Township of Muskoka Lakes**; *for private client*; **Key Tasks:** fish rescue in support of bridge works.
- Water Quality Monitoring in the **Village of Burks Falls**; *for private client*; **Key Tasks:** water quality sampling in support of post-construction monitoring efforts on a wind farm.

Tree Inventories and Arborist Reports

- Tree Inventory and Recommendations in the **Town of Richmond Hill**; *for The Municipal Infrastructure Group*; **Key Tasks**: tree inventory and health assessment, tree retainment recommendations in support of stormwater pond maintenance activities.
- Tree Inventory and Preservation Plan in the **Town of Georgina**; *for Oxford Developments*; **Key Tasks**: tree inventory and health assessment, tree retainment recommendations in support of a sidewalk extension.
- Arborist Report in the **Town of Aurora**; *for private client*; **Key Tasks**: tree inventory and health assessment, tree retainment recommendations, significant species presence/absence survey, mitigation options, reporting in support of watercourse and culvert works.
- Tree Inventory and Health Assessment in the **Town of New Tecumseth**; *for Granite Condos*: **Key Tasks:** tree inventory and health assessment, tree retainment recommendations, mitigation options, graphics, reporting in support of a site plan application for a retirement home.

- Tree Inventory and Health Assessment in the **City of Burlington;** *for private client*; **Key Tasks:** tree inventory and health assessment, tree retainment recommendations, mitigation options, graphics, reporting in support of watercourse works.
- Tree Inventory and Health Assessment in the **City of Mississauga;** *for private client*; **Key Tasks:** tree inventory and health assessment, tree retainment recommendations, mitigation options, graphics, reporting in support of watercourse works.
- Tree Inventory and Health Assessment in the **City of Toronto;** *for private client*; **Key Tasks:** tree inventory and health assessment, tree retainment recommendations, mitigation options, graphics, reporting in support of watercourse works.

Environmental Constraints Analyses

- Environmental Constraints Analysis in the **Town of Fort Erie**; *for private client*; **Key Tasks:** natural feature constraints analysis, assessment of significant natural heritage features, guidance as part of due diligence.
- Environmental Protection Zone Assessment in the **Town of Gravenhurst**; *for private client*; **Key Tasks:** ELC, identification and assessment of significant natural heritage features, graphics, reporting in support of a site plan application.
- Environmental Constraints Analysis in the **Town of Gravenhurst**; *for private client*; **Key Tasks**: identification and assessment of species at risk habitat and significant natural heritage features, graphics, reporting in support of a multiple lot severance.
- Environmental Constraints Analysis in the **Town of Huntsville**; *for private client*; **Key Tasks**: wetland boundary delineation, graphics, reporting in support of a site plan application for a resort development.
- Construction Mitigation Plan in the **Town of Caledon**; *for private client*; **Key Tasks:** significant wildlife habitat assessment, mitigation opportunities, graphics, reporting in support of a site plan application.

Peer Review

- Peer Review and Opinion Letter in the **City of Kawartha Lakes**; *for private client*; **Key Tasks**: critical assessment of several reports pertaining to flooding/environmental damages, wetland conditions and functional assessment.

Policy Research

- Multi-Jurisdictional Review of Endangered Species Act Concepts report; *for the Ontario Ministry of Natural Resources*; **Key Tasks:** intensive literature review, interviews, policy guidance, reporting.

Restoration Plans

- Restoration Options Plan in the **Village of Burks Falls**; *for private client*; **Key Tasks:** identification of restoration opportunities to minimize soil erosion in support of post-construction monitoring efforts on a wind farm.
- Shoreline Stabilization and Restoration Plan in the **Town of Gravenhurst**; *for private client;* **Key Tasks:** existing conditions assessment, vegetation plan, shoreline stabilization plan in support of shoreline stabilization efforts.
- Watercourse and Riparian Zone Restoration Plan in the **Town of Innisfil**; *for private client*; **Key Tasks**: identification of restoration opportunities to restore watercourse and riparian zone functions, graphics, reporting in support of efforts to restore a degraded watercourse.

Bird Nesting Surveys

- Bird Nesting Survey in the **Town of East Gwillimbury**; *for AECOM*; **Key Tasks:** area-search for nesting birds in support of a development application.
- Bird Nesting Survey in the **Town of Smooth Rock Falls**; *for private client*; **Key Tasks:** area-search for nesting birds in support of the construction of a new hydroelectric plant.

RELEVANT CERTIFICATIONS AND TRAINING COURSES

2018 MTO RAQS Terrestrial and Fisheries Assessment Specialist (pending)
2016 Tree Risk Assessment Qualification (TRAQ)
2016 Managed Forest Plan Approver (#421)
2015 Vegetation Sampling Protocol
2014 Ontario Stream Assessment Protocol
2014 Fish Identification "Level 2"
2014 Electrofishing "Class 2"
2014 Butternut Health Assessor (#268)
2013 ISA Certified Arborist #ON-1663A
2012 Ontario Benthos Biomonitoring Network
2012 Ontario Wetland Evaluation System Instructor
2011 Family-level Benthic Invertebrate ID Workshop
2011 Ontario Wetland Evaluation System
2011 Ecological Land Classification

PUBLICATIONS

Knight, T. (2010). *Enhancing the flow of ecological goods and services to society: Key principles for the design of marginal and ecologically significant agricultural land retirement programs in Canada*. Canadian Institute for Environmental Law and Policy.

De Costa, R., & Knight, T. (2011). Asymmetric encounters in Native Canada. *American Review of Canadian Studies*, 41:3, 212-227.

Appendix 2. Representative Photographs

Photo 1. Existing pit entrance looking northwest near Molesworth Line (13 June 2019).

Photo 2. Existing pit (13 June 2019).

Photo 3. Existing pit (13 June 2019).

Photo 4. Green Ash deciduous swamp (SWDM2-2) in the Northern Forest and Swamp Complex, showing lack of standing water in late spring 2019 (13 June 2019).

Photo 5. Freeman's Maple deciduous swamp (SWDM3-3) in the Northern Forest and Swamp Complex, early spring (4 April 2020).

Photo 6. Freeman's Maple deciduous swamp (SWDM3-3) in the Northern Forest and Swamp Complex, late spring (13 June 2019).

Photo 7. Freeman's Maple deciduous swamp (SWDM3-3) in the Northern Forest and Swamp Complex, late summer (15 September 2020).

Photo 8. Eastern White Pine conifer plantation (FOCM6-1) as seen from the existing pit (13 June 2019).

Photo 9. Coniferous forest (FOCM2-2) dominated by Eastern White Cedar (1 June 2020).

Photo 10. Regeneration thicket (THCM1-2) dominated by Eastern White Cedar (1 June 2020).

Photo 11. Earthscale Lichen in the regeneration thicket (THCM1-2) (1 June 2020)

Photo 12. Meadow marsh (MAMM1) in the Southern Wetland, early spring (4 April 2020).

Photo 13. Meadow marsh (MAMM1) in the Southern Wetland, late spring (1 June 2020)

Photo 14. Significant hibernaculum for Eastern Gartersnake circled in red (4 April 2020).

Photo 15. Four (4) Eastern Gartersnakes having recently emerged from a hibernaculum (4 April 2020).

Photo 16. Pit face where Bank Swallow nesting excavations were documented in 2019, which has been incorporated into the natural feature setback (13 June 2019).

Appendix 3. Vascular Plant List

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Coefficient of Conservatism	Coefficient of Wetness
Acer x freemanii	Freeman's Maple	Aceraceae	SNA	n/a	-5
Acer negundo	Manitoba Maple	Aceraceae	S5	0	0
Aegopodium podagraria	Goutweed	Apiaceae	SNA	n/a	0
Agrimonia gryposepala	Hooked Agrimony	Rosaceae	S5	2	3
Alliaria petiolata	Garlic Mustard	Brassicaceae	SNA	n/a	0
Ambrosia artemisiifolia	Common Ragweed	Asteraceae	S5	0	3
Amelanchier arborea	Downy Serviceberry	Rosaceae	S5	5	3
Anemone canadensis	Greek Anemone	Ranunculaceae	SNA	n/a	0
Arenaria serpyllifolia	Thyme-leaved Sandwort	Caryophyllaceae	SNA	n/a	0
Asclepias syriaca	Common Milkweed	Asclepiadaceae	S5	0	5
Athyrium filix-femina var. angustum	Northeastern Lady Fern	Dryopteridaceae	S5	4	0
Betula alleghaniensis	Yellow Birch	Betulaceae	S5	6	0
Betula pendula	Weeping Birch	Betulaceae	SNA	n/a	0
Boehmeria cylindrica	False Nettle	Urticaceae	S5	4	-5
Bromus inermis	Smooth Brome	Poaceae	SNA	n/a	5
Carex bebbii	Bebb's Sedge	Cyperaceae	S5	3	-5
Carex blanda	Woodland Sedge	Cyperaceae	S5	3	0
Carex crinita	Fringed Sedge	Cyperaceae	S5	6	-5
Carex gracillima	Graceful Sedge	Cyperaceae	S5	4	3
Carex granularis	Limestone Meadow Sedge	Cyperaceae	S5	3	-3
Carex pseudocyperus	Cyperus-like Sedge	Cyperaceae	S5	6	-5
Carex stipata	Awl-fruited Sedge	Cyperaceae	S5	3	-5
Carex tuckermannii	Tuckerman's Sedge	Cyperaceae	S5	7	-5
Centaurea maculosa subsp.micranthos	Globe Knapweed	Asteraceae	SNA	n/a	5
Centaurea nigrescens	Short-fringed Knapweed	Asteraceae	SNA	n/a	5
Cerastium fontanum	Common Mouse-ear Chickweed	Caryophyllaceae	SNA	n/a	3
Chaenorhinum minus	Dwarf Snapdragon	Scrophulariaceae	SNA	n/a	5
Cichorium intybus	Chicory	Asteraceae	SNA	n/a	5
Circaea canadensis subsp. canadensis	Canada Enchanter's Nightshade	Onagraceae	S5	2	3
Cirsium arvense	Canada Thistle	Asteraceae	SNA	n/a	3
Cirsium vulgare	Bull Thistle	Asteraceae	SNA	n/a	3
Clematis virginiana	Virginia Virgin's-bower	Ranunculaceae	S5	3	0
Clinopodium vulgare	Field Basil	Lamiaceae	S5	4	5
Cornus alternifolia	Alternate-leaved Dogwood	Cornaceae	S5	6	3
Cornus obliqua	Pale Dogwood	Cornaceae	S5	2	-3
Cornus racemosa	Gray Dogwood	Cornaceae	S5	2	0
Cornus stolonifera	Red-osier Dogwood	Cornaceae	S5	2	-3
Crataegus coccinea var. pringleyi	Pringle's Hawthorn	Rosaceae	S5	4	5
Crataegus punctata	Dotted Hawthorn	Rosaceae	S5	4	5
Cystopteris bulbifera	Bulblet Fern	Dryopteridaceae	S5	5	-3

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Coefficient of Conservatism	Coefficient of Wetness
Danthonia spicata	Poverty Oatgrass	Poaceae	S5	5	5
Dichanthelium implicatum	Slender-stemmed Panicgrass	Poaceae	S5	3	0
Dryopteris carthusiana	Spinulose Wood Fern	Dryopteridaceae	S5	5	-3
Dryopteris cristata	Crested Wood Fern	Dryopteridaceae	S5	7	-5
Echinocystis lobata	Wild Mock-cucumber	Cucurbitaceae	S5	3	-3
Epipactis helleborine	Eastern Helleborine	Orchidaceae	SNA	n/a	3
Equisetum arvense	Field Horsetail	Equisetaceae	S5	0	0
Erigeron canadensis	Canada Horseweed	Asteraceae	S5	0	3
Erigeron philadelphicus var. philadelphicus	Philadelphia Fleabane	Asteraceae	S5	1	-3
Erigeron strigosus	Rough Fleabane	Asteraceae	S5	4	3
Eupatorium perfoliatum	Common Boneset	Asteraceae	S5	2	-3
Euphorbia esula	Cushion Spurge	Euphorbiaceae	SNA	n/a	5
Euthamia graminifolia	Grass-leaved Goldenrod	Asteraceae	S5	2	0
Eutrochium maculatum var. maculatum	Spotted Joe Pye Weed	Asteraceae	S5	3	-5
Frangula alnus	Glossy Buckthorn	Rhamnaceae	SNA	n/a	0
Fraxinus americana	White Ash	Oleaceae	S4	4	3
Fraxinus nigra	Black Ash	Oleaceae	S4	7	-3
Fraxinus pennsylvanica	Green Ash	Oleaceae	S4	3	-3
Galium mollugo	Smooth Bedstraw	Rubiaceae	SNA	n/a	5
Galium palustre	Marsh Bedstraw	Rubiaceae	S5	5	-5
Geranium robertianum	Herb-Robert	Geraniaceae	S5	2	3
Geum aleppicum	Yellow Avens	Rosaceae	S5	2	0
Geum canadense	White Avens	Rosaceae	S5	3	0
Helianthus strumosus	Pale-leaved Sunflower	Asteraceae	S5	7	5
Hemerocallis fulva	Orange Daylily	Liliaceae	SNA	n/a	5
Hesperis matronalis	Dame's Rocket	Brassicaceae	SNA	n/a	3
Hypericum perforatum	Common St. John's-wort	Clusiaceae	SNA	n/a	5
ilex verticillata	Black Holly	Aquifoliaceae	S5	5	-3
Juglans nigra	Black Walnut	Juglandaceae	S4?	5	3
Laportea canadensis	Wood Nettle	Urticaceae	S5	6	-3
Larix laricina	Tamarack	Pinaceae	S5	7	-3
Lepidium campestre	Field Peppergrass	Brassicaceae	SNA	n/a	5
Leucanthemum vulgare	Oxeye Daisy	Asteraceae	SNA	n/a	5
Lithospermum officinale	European Gromwell	Boraginaceae	SNA	n/a	5
Lolium arundinaceum	Tall Fescue	Poaceae	SNA	n/a	3
Lolium pratense	Meadow Fescue	Poaceae	SNA	n/a	3
Lotus corniculatus	Garden Bird's-foot Trefoil	Fabaceae	SNA	n/a	3
Lycopus americanus	American Water-horehound	Lamiaceae	S5	4	-5
Lycopus uniflorus	Northern Water-horehound	Lamiaceae	S5	5	-5
Lysimachia thyrsiflora	Water Loosestrife	Primulaceae	S5	7	-5

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Coefficient of Conservatism	Coefficient of Wetness
Malus pumila	Common Apple	Rosaceae	SNA	n/a	5
Medicago lupulina	Black Medic	Fabaceae	SNA	n/a	3
Melilotus albus	White Sweet-clover	Fabaceae	SNA	n/a	3
Melilotus officinalis	Yellow Sweet-clover	Fabaceae	SNA	n/a	3
Osmunda regalis	Royal Fern	Osmundaceae	S5	7	-5
Oxalis dilenni	Creeping Wood-sorrel	Oxalidaceae	SNA	n/a	3
Oxybasis glauca subsp. glauca	Saline Goosefoot	Chenopodiaceae	S4?	0	-3
Parthenocissus vitacea	Thicket Creeper	Vitaceae	S5	4	3
Phalaris arundinacea	Reed Canary Grass	Poaceae	S5	0	-3
Phleum pratense	Common Timothy	Poaceae	SNA	n/a	3
Physocarpus opulifolius	Eastern Ninebark	Rosaceae	S5	5	-3
Picea glauca	White Spruce	Pinaceae	S5	6	3
Pilosella caespitosa	Meadow Hawkweed	Asteraceae	SNA	n/a	5
Pinus strobus	Eastern White Pine	Pinaceae	S5	4	3
Plantago lanceolata	English Plantain	Plantaginaceae	SNA	n/a	3
Poa compressa	Canada Bluegrass	Poaceae	SNA	n/a	3
Poa palustris	Fowl Bluegrass	Poaceae	S5	5	-3
Poa pratensis subsp. pratensis	Kentucky Bluegrass	Poaceae	SNA	n/a	3
Populus alba	White Poplar	Salicaceae	SNA	n/a	5
Populus nigra	Black Poplar	Salicaceae	SNA	n/a	5
Populus tremuloides	Trembling Aspen	Salicaceae	S5	2	0
Prunus serotina	Black Cherry	Rosaceae	S5	3	3
Prunus virginiana	Choke Cherry	Rosaceae	S5	2	3
Ranunculus acris	Tall Buttercup	Ranunculaceae	SNA	n/a	0
Endotropis alnifolia	Alder-leaved Buckthorn	Rhamnaceae	S5	7	-5
Rhamnus cathartica	Common Buckthorn	Rhamnaceae	SNA	n/a	0
Ribes americanum	Wild Black Currant	Grossulariaceae	S5	4	-3
Ribes cynosbati	Prickly Gooseberry	Grossulariaceae	S5	4	3
Ribes triste	Swamp Red Currant	Grossulariaceae	S5	6	-5
Rubus idaeus subsp. strigosus	Wild Red Raspberry	Rosaceae	S5	2	3
Rubus occidentalis	Black Raspberry	Rosaceae	S5	2	5
Rubus pubescens	Dewberry	Rosaceae	S5	4	-3
Rudbeckia hirta	Black-eyed Susan	Asteraceae	S5	0	3
Salix amygdaloides	Peach-leaved Willow	Salicaceae	S5	6	-3
Salix bebbiana	Bebb's Willow	Salicaceae	S5	4	-3
Salix discolor	Pussy Willow	Salicaceae	S5	3	-3
Salix eriocephala	Heart-leaved Willow	Salicaceae	S5	4	-3
Salix exigua	Crack Willow	Salicaceae	SNA	n/a	0
Salix petiolaris	Meadow Willow	Salicaceae	S5	3	-3
Scirpus atrovirens	Dark-green Bulrush	Cyperaceae	S5	3	-5

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Coefficient of Conservatism	Coefficient of Wetness
Silene vulgaris	Bladder Campion	Caryophyllaceae	SNA	n/a	5
Sinapis arvensis	Corn Mustard	Brassicaceae	SNA	n/a	5
Sium suave	Hemlock Water-parsnip	Apiaceae	S5	4	-5
Solidago altissima	Tall Goldenrod	Asteraceae	S5	1	3
Solidago juncea	Early Goldenrod	Asteraceae	S5	3	5
Solidago nemoralis subsp. nemoralis	Gray-stemmed Goldenrod	Asteraceae	S5	2	5
Solidago rugosa subsp. rugosa	Northern Rough-stemmed Goldenrod	Asteraceae	S5	4	0
Spiraea alba	White Meadowsweet	Rosaceae	S5	3	-3
Sporobolus vaginiflorus	Sheathed Dropseed	Poaceae	S5	1	5
Symphiotrycum ericoides var. ericoides	Southern Succisella	Dipsacaceae	SNA	n/a	5
Symphyotrichum firmum	Glossy-leaved Aster	Asteraceae	S4?	4	-3
Symphyotrichum lanceolatum	Panicled Aster	Asteraceae	S5	3	-3
Symphyotrichum lateriflorum var. lateriflorum	Calico Aster	Asteraceae	S5	3	0
Symphyotrichum novae-angliae	New England Aster	Asteraceae	S5	2	-3
Symphyotrichum ontarionis	Ontario Aster	Asteraceae	S5	6	0
Symphyotrichum pilosum var. pilosum	Old Field Aster	Asteraceae	S5	1	3
Syringa vulgaris	Common Lilac	Oleaceae	SNA	n/a	5
Thelypteris palustris var. pubescens	Eastern Marsh Fern	Thelypteridaceae	S5	5	-3
Thuja occidentalis	Eastern White Cedar	Cupressaceae	S5	4	-3
Tilia americana	American Basswood	Tiliaceae	S5	4	3
Toxicodendron radicans var. radicans	Eastern Poison Ivy	Anacardiaceae	S5	2	0
Trifolium hybridum	Alsike Clover	Fabaceae	SNA	n/a	3
Trifolium pratense	Red Clover	Fabaceae	SNA	n/a	3
Triosteum aurantiacum	Orange-fruited Horse-gentian	Caprifoliaceae	S4S5	7	5
Tussilago farfara	Colt's-foot	Asteraceae	SNA	n/a	3
Typha angustifolia	Narrow-leaved Cattail	Typhaceae	SNA	n/a	-5
Typha latifolia	Broad-leaved Cattail	Typhaceae	S5	1	-5
Ulmus americana	American Elm	Ulmaceae	S5	3	-3
Verbascum thapsus	Common Mullein	Scrophulariaceae	SNA	n/a	5
Veronica arvensis	Corn Speedwell	Scrophulariaceae	SNA	n/a	5
Veronica officinalis	Common Speedwell	Scrophulariaceae	SNA	n/a	5
Veronica persica	Bird's-eye Speedwell	Scrophulariaceae	SNA	n/a	5
Viburnum lentago	Nannyberry	Caprifoliaceae	S5	4	0
Vicia cracca	Tufted Vetch	Fabaceae	SNA	n/a	5
Viola odorata	English Violet	Violaceae	SNA	n/a	5
Viola pubescens	Yellow Violet	Violaceae	S5	5	3
Viola sororia	Woolly Blue Violet	Violaceae	S5	4	0
Viola sororia var. affinis	Woolly Blue Violet	Violaceae	S5	4	0
Vitis riparia	Riverbank Grape	Vitaceae	S5	0	0

Appendix 4. Anuran Calling Survey Results

Station ID[1]	Feature or ELC Community Surveyed	Bearing (°)	Survey #1 – 4 April 2020[2]	Survey #2 – 31 May 2020[2]	Comments[2]
AN-1	Green Ash deciduous swamp (SWDM2-2)	23	No calling anurans	No calling anurans	**Survey #1:** No calling Anurans at this station (Wood Frogs audible from AN-2). Wood Ducks flushed from vernal pool. American Woodcocks undertaking aerial displays. **Survey #2:** Standing water absent in Green Ash deciduous swamp.
AN-2	Freeman's Maple deciduous swamp (SWDM3-3)	45	Wood Frog (3) Chorus Frog (1-1)	No calling anurans	**Survey #1:** Wood Frog chorus emanating from approximately 70 metres northwest. Chorus Frog calls emanating due east. **Survey #2:** Standing water present in Freeman's Maple deciduous swamp but limited in depth.
AN-3	Southern Wetland	34	No calling anurans	No calling anurans	**Survey #1:** No calling anurans at this station, and no calls emanating from swamps on the southwest side of Browntown Road. **Survey #2:** n/a.

[1] Locations of Anuran Calling Stations are shown in **Figure 2**.

[2] **Call Code 1** = Individuals can be counted; calls not simultaneous; **Call Code 2** = Calls distinguishable; some simultaneous calling; **Call Code 3** = Full chorus; calls continuous and overlapping. Second number after the call code indicates the estimated number of individuals calling; no estimate of individuals is provided for Call Code 3.

Appendix 5. Breeding Bird Survey Results

Common Name	Scientific Name	Breeding Bird Stations[1] and Breeding Status[2]						
		BI-1	BI-2	BI-3	BI-4	BI-5	BI-6	BI-7
Alder Flycatcher	*Empidonax alnorum*				Po			
American Crow	*Corvus brachyrhynchos*	O		O				
American Goldfinch	*Spinus tristis*	Po			Pr	Pr	Po	Po
American Redstart	*Setophaga ruticilla*	Pr	Pr	Po			Po	Pr
American Robin	*Turdus migratorius*		Pr			Po	Po	
Baltimore Oriole	*Icterus galbula*		Pr	Po		Po	Po	Po
Bank Swallow	***Riparia riparia***		**O**	**O**			**O**	**O**
Black-and-white Warbler	*Mniotilta varia*				Po	Po	Po	
Black-capped Chickadee	*Poecile atricapillus*		Po			Po		
Blue Jay	*Cyanocitta cristata*	Po	Po		Po	Po	Po	
Brown-headed Cowbird	*Molothrus ater*	Pr		Po	Po			Po
Canada Goose	*Branta canadensis*					Po		O
Cedar Waxwing	*Bombycilla cedrorum*	Po	Po		Po		Po	Pr
Chipping Sparrow	*Spizella passerina*	Po					Po	Pr
Common Grackle	*Quiscalus quiscula*		Po					
Common Yellowthroat	*Geothlypis trichas*				Po	Po		
Downy Woodpecker	*Dryobates pubescens*		Pr		Po			
Eastern Towhee	*Pipilo erythrophthalmus*		Pr	Po	Po	Po		
Eastern Wood-pewee	***Contopus virens***		**Po**		**Pr**			
Field Sparrow	*Spizella pusilla*	Pr	Pr					
Gray Catbird	*Dumetella carolinensis*			Pr	Pr	Po		Po
Great Blue Heron	*Ardea herodias*				O			O
Great Crested Flycatcher	*Myrarchus crinitus*	Po	Po	Po				
Horned Lark	*Eremophila alpestris*	Po		O				
House Wren	*Troglodytes aedon*	Po			Pr			Po
Indigo Bunting	*Passerina cyanea*	Po	Po	Po	Pr			
Killdeer	*Charadrius vociferus*						O	
Mourning Dove	*Zenaida macroura*	Po					Po	
Mourning Warbler	*Geothlypis philadelphia*	Po			Po			
Northern Cardinal	*Cardinalis cardinalis*	Po			Po			
Northern Waterthrush	*Parkesia noveboracensis*				Po			
Red-breasted Nuthatch	*Sitta canadensis*					Po		
Red-eyed Vireo	*Vireo olivaceus*	Po	Po			Po[3]		
Red-winged Blackbird	*Agelaius phoeniceus*	Po		Pr			Po	Pr
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Pr	Po		Po	Pr		
Song Sparrow	*Melospiza melodia*	Pr	Po	Pr		Po	Po	Pr

Common Name	Scientific Name	Breeding Bird Stations[1] and Breeding Status[2]						
		BI-1	BI-2	BI-3	BI-4	BI-5	BI-6	BI-7
Turkey Vulture	*Cathartes aura*					Po		
Wild Turkey	*Meleagris gallopavo*	Co						
Winter Wren	*Troglodytes hiemalis*					Po[3]		
Wood Thrush	***Hylocichla mustelina***	**Pr[3]**		**Po**		**Po**		
Yellow-bellied Sapsucker	*Sphyrapicus varius*					Po		
Yellow-billed Cuckoo	*Coccyzus americanus*			Pr	Po	Po		

[1] Locations of breeding bird survey stations are indicated on **Figure 2**.

[2] **Co** = Confirmed Breeder; **Pr** = Probable Breeder; **Po** = Possible Breeder; **O** = Observed (no evidence of breeding). Breeding status determined based on the results of the formal breeding bird surveys. Additional bird species recorded within the Study Area outside of the formal breeding bird surveys are noted in the report.

[3] Documented on Adjacent Lands (or outside the Study Area) only.

Appendix 6. Significant Wildlife Habitat Assessment

Table 1. Results of the Significant Wildlife Habitat Assessment.

Ecoregion 6E	Do any Features, Habitats, or Areas within the Site or Adjacent Lands meet relevant criteria (Ecoregion 6E Criteria Schedule) as Candidate SWH?	Do any Features, Habitats, or Areas within the Site or Adjacent Lands meet relevant criteria (Ecoregion 6E Criteria Schedule) as Confirmed SWH?	Likelihood that Negative Effects to SWH (i.e., "degradation that threatens the health and integrity" as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Seasonal Concentration Areas of Animals			
Waterfowl Stopover and Staging Areas (Terrestrial)	**No.** Meadows, fields, and/or thickets that annually flood during spring and could support significant congregations of migrating waterfowl are absent.	--	--
Waterfowl Stopover and Staging Areas (Aquatic)	**No.** Large surface water features (e.g., ponds, lakes, bays, coastal inlets, large watercourses, etc.) and/or wetlands that annually flood during spring and could support significant congregations of migrating waterfowl are absent.	--	--
Shorebird Migratory Stopover Areas	**No.** Unvegetated open areas adjacent to surface water features (e.g., shorelines, beaches, mudflats, etc.) which could support significant congregations of migrating shorebirds are absent	--	--
Raptor Wintering Areas	**No.** While forest and (to a lesser extent) meadow habitats are present, which may occasionally support wintering raptors, such habitats are too small to support significant congregations of wintering raptors.	--	--
Bat Hibernacula	**No.** Features that could support hibernating bats (e.g., caves, mine shafts, karsts, etc.) are absent.	--	--
Bat Maternity Colonies	**Yes.** Mature deciduous and mixed forests with a high-density (i.e., >10/ha) of large-diameter (i.e., ≥25 cm DBH) trees containing cracks/cavities may be present.	**Unknown.** Acoustic monitoring devices not deployed as part of this study.	**Negligible.** Development and site alteration activities are restricted from the boundary (i.e., dripline) of the Northern Woodland and Swamp Complex. Any necessary removal of trees within the Coniferous Forest and Plantation will be subject to a timing restriction. See report for greater details.
Turtle Wintering Areas	**No.** Surface water features and/or wetlands with soft, muddy substrate which do not freeze to the bottom during winter are absent.	--	--
Reptile Hibernaculum	**Yes.** Features (e.g., small mammal burrows, rock crevices, etc.) and/or habitats (e.g., certain wetlands with a fluctuating water table, etc.) that could provide snakes with access below the frost line are present.	**Yes.** Spring emergence surveys confirmed the presence of a significant hibernaculum for Eastern Gartersnake associated with a berm/stockpile (see **Figure 3**).	**Negligible.** The significant hibernaculum is situated within an area of disturbance adjacent to the existing extraction limit. This feature will be protected by a 30 m setback from extraction through the licence amendment.
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff)	**No.** Features that could support nesting by Cliff Swallow and Northern Rough-winged swallow (e.g., eroding banks, sandy hills, borrow pits, steep slopes, cliff faces, etc.) are absent. This SWH type does not include licenced aggregate operations.	--	--
Colonially - Nesting Bird Breeding Habitat Breeding Habitat (Tree/Shrubs)	**Yes.** Swamp communities are present.	**No.** Stick nests associated with colonially nesting bird species are absent.	--
Colonially - Nesting Bird Breeding Habitat (Ground)	**No.** Rocky islands or peninsulas along lakes or large rivers are absent.	--	--
Migratory Butterfly Stopover Areas	**No.** A mixture of fields and forests within 5 km from the shoreline of Lake Ontario are absent.	--	--

Ecoregion 6E	Do any Features, Habitats, or Areas within the Site or Adjacent Lands meet relevant criteria (Ecoregion 6E Criteria Schedule) as Candidate SWH?	Do any Features, Habitats, or Areas within the Site or Adjacent Lands meet relevant criteria (Ecoregion 6E Criteria Schedule) as Confirmed SWH?	Likelihood that Negative Effects to SWH (i.e., "degradation that threatens the health and integrity" as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Landbird Migratory Stopover Areas	**No.** While migrating landbirds may temporarily stopover within the Site to feed and rest, it is unlikely that the Site supports significant congregations of migrating landbirds as it is greater than 5 km from the shoreline of Lake Ontario.	--	--
Deer Yarding Areas	**No.** While deer use of portions of the Site (particularly the conifer forest/plantation) within winter can be expected, MNRF has not identified any deer yarding areas within 1.5 km of the Site.	--	--
Deer Winter Congregation Areas	**No.** See above.	--	--
Rare Vegetation Communities or Specialized Habitats for Wildlife			
Cliffs and Talus Slopes	**No.** Cliffs and talus slope communities are absent.	--	--
Sand Barren	**No.** Sand barren communities are absent.	--	--
Alvar	**No.** Flora characteristic of alvars are absent.	--	--
Old Growth Forest	**No.** Forests/woodlands within the Study Area are generally early/mid successional and lack sufficient old-growth characteristics.	--	--
Savannah	**No.** Flora characteristic of savannahs are absent.	--	--
Tallgrass Prairie	**No.** Flora characteristic of tallgrass prairies are absent.	--	--
Other Rare Vegetation Community	**No.** Provincially rare vegetation communities are absent.	--	--
Waterfowl Nesting Area	**Yes.** Wetland communities which may support nesting waterfowl are present.	**No.** Nesting waterfowl are absent from the Study Area. On-site swamps lack sufficient standing water under average conditions to support waterfowl rearing.	--
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	**No.** Forest communities adjacent to large surface water features are absent.	--	--
Woodland Raptor Nesting Habitat	**Yes.** On-site forest communities may support nesting raptors.	**No.** While no stick nests were documented on-site, tree cavities that may support Barred Owl are present. Notwithstanding this, the Study Area does not contain interior forest habitat and is therefore unlikely to support nesting Barred Owls.	--
Turtle Nesting Areas	**Yes.** Exposed mineral soils adjacent to surface water features (e.g., lakes, ponds, etc.) and/or wetlands that may support turtles are present.	**No.** Turtles are absent from the Site.	--
Seeps and Springs	**Yes.** Areas where groundwater emerges at the surface and may support specialized habitat for plants and wildlife may be present.	**Yes.** A discharge area was documented within the Southern Wetland.	**Negligible**. The Southern Wetland will be protected by a 30 m setback from extraction. The Hydrogeological Assessment establishes that no impacts to groundwater resources adjacent to the Site are anticipated.

Ecoregion 6E	Do any Features, Habitats, or Areas within the Site or Adjacent Lands meet relevant criteria (Ecoregion 6E Criteria Schedule) as Candidate SWH?	Do any Features, Habitats, or Areas within the Site or Adjacent Lands meet relevant criteria (Ecoregion 6E Criteria Schedule) as Confirmed SWH?	Likelihood that Negative Effects to SWH (i.e., "degradation that threatens the health and integrity" as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Amphibian Breeding Habitat (Woodland)	**Yes.** Forests with wetlands, ponds, and/or pools that may support significant congregations of breeding amphibians are present.	**No.** The results of the Anuran calling surveys confirm the absence of significant breeding habitat for Anurans. Breeding habitat for mole salamanders is unlikely to be present given the observed wetland hydroperiods in 2020.	--
Amphibian Breeding Habitat (Wetlands)	**Yes.** Wetlands and surface water features (e.g., ponds, lakes, etc.) that may support significant congregations of breeding amphibians are present.	**No.** The results of the Anuran calling surveys confirm the absence of significant breeding habitat for Anurans.	--
Woodland Area-Sensitive Bird Breeding Habitat	**No.** Interior forest interior conditions (i.e., >200 m from edge) are absent.	--	--
Habitat for Species of Conservation Concern			
Marsh Bird Breeding Habitat	**No.** Wetland habitats of sufficient size with shallow water and emergent aquatic vegetation are absent.	--	--
Open Country Bird Breeding Habitat	**No.** Meadow habitats of sufficient size are absent.	--	--
Shrub/Early Successional Bird Breeding Habitat	**Yes.** Shrub/early-successional habitats of sufficient size may be present.	**No.** Results of the breeding bird surveys in 2020 confirm the absence of this SWH type.	--
Terrestrial Crayfish	**Yes.** Marsh and swamp communities and/or wet fields are present	**Yes.** Two (2) terrestrial crayfish chimneys were documented in the Southern Wetland adjacent to the seep/spring.	**Negligible.** The Southern Wetland will be protected by a 30 m setback from extraction. The Hydrogeological Assessment establishes that no impacts to groundwater resources adjacent to the Site are anticipated. The two (2) documented terrestrial crayfish chimneys are ~60 m from the extraction limit.
Special Concern and Rare Wildlife Species	**Yes.** See **Table 2** below.	**Yes.** See **Table 2** below.	**Possible.** See **Table 2** below.
Animal Movement Corridors			
Amphibian Movement Corridors	**No.** Significant amphibian breeding habitat is absent. Site is not expected to act as a significant movement corridor between breeding and summer habitat for amphibians.	--	--
Deer Movement Corridors	**No.** As MNRF has not identified any Deer Yarding Areas, significant Deer Movement Corridors are by extension also absent.	--	--

Table 2. Results of the Special Concern and Provincially Rare Species Assessment.

Species	Status per O. Reg. 242/08 under the ESA and/or NHIC	Rationale for Consideration in this Study	General Description of Habitats and Features which the Species is Known to Occupy or Use within the Ecoregion in which this Study is Located	Likelihood that the Species Occupies the Area within or adjacent to proposed Development or Site Alteration[1]	Likelihood that Negative Effects to the Species or its Habitat (i.e., "degradation that threatens the health and integrity" as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Amphibians					
Western Chorus Frog (*Pseudacris triseriata*)	S3	Distribution and on-site habitats.	• Generally breeds in fishless woodland ponds, bottomland swamps, damp meadows, marshes, and temporary ponds in both closed canopy and open areas • Overwinters underground in terrestrial areas or under surface cover, such as fallen logs.	**Confirmed**. One (1) individual was documented vocalizing during the Anuran calling survey on 4 April 2020 (and incidentally during the day on 27 April 2020).	**Negligible**. Location where this species was documented will be protected by a 30 m setback. The Hydrogeological Assessment establishes that no impacts to groundwater resources adjacent to the Site are anticipated.
Birds					
Eastern Wood-pewee (*Contopus virens*)	SC	OBBA	• Breeds and forages in relatively open, deciduous and mixed forests of various sizes (including urban forest fragments) and along forest edges.	**Confirmed**. Species was documented as a possible/probable breeder at two (2) locations within the Study Area.	**Negligible**. All habitats in which this species was documented are situated outside the extraction limit with an ecologically appropriate buffer.
Wood Thrush (*Hylocichla mustelina*)	SC	OBBA	• Breeds and forages in second-growth and mature deciduous and mixed forests with a well-developed understory.	**Confirmed**. Species was documented as a possible/probable breeder at three (3) locations within/outside the Study Area.	**Negligible**. All habitats in which this species was documented are situated outside the extraction limit with an ecologically appropriate buffer.
Insects					
Monarch (*Danaus plexippus*)	SC	Distribution and on-site habitats.	• Oviposits on Milkweeds (*Asclepias* spp.). • Generalist foraging that nectars in most areas with wildflowers.	**Possible.** Ovipositing sites (i.e., species in the genus *Asclepias*) are present, and species may forage within the Site.	**Negligible.** The landscape surrounding the Study Area provides abundant nectaring and ovipositing sites for this species.
Yellow Banded Bumble Bee (*Bombus terricola*)	SC	Distribution and on-site habitats.	• Occupies a range of open areas with nectaring sites. • Nests underground in abandoned rodent burrows or decomposing logs.	**Possible.** Species is a habitat generalist and occupies a wide range of areas.	**Negligible.** Proposed development and disturbance will not adversely affect nectaring opportunities for this species in the local landscape.
Reptiles					
Eastern Ribbonsnake (*Thamnophis saurita*)	SC	Distribution and on-site habitats.	• Occupies edges of shallow ponds, streams, marshes, swamps, or bogs bordered by dense vegetation.	**Unlikely**. Species not documented during surveys in 2019/2020.	--

[1] Likelihood categories should be interpreted as follows:

Negligible: so limited that the assessed species can be assumed absent.

Unlikely: while theoretically conceivable, species presence very improbable or temporary based on available information (e.g., habitat conditions, range, abundance in local landscape, etc.).

Possible: species presence plausible based on available information; no convincing evidence suggesting species could not occur on-site.

Probable: while not confirmed, available information suggests species has a high likelihood of being present.

Confirmed: species observed and/or evidence of occupation (e.g., tracks, etc.) documented.

Appendix 7. Endangered and Threatened Species Assessment

Species	Status per O. Reg. 230/08 of the ESA	Rationale for Consideration in this Study	General Description of Habitats and Features which the Species is Known to Occupy within the Ecoregion in which this Study is Located	Likelihood that the Species Occupies the Area within or adjacent to proposed Development or Site Alteration[1]	Likelihood that Negative Effects to the Species or its Habitat (i.e., "Damage" or "Destruction" as defined in the ESA) will occur based on the Proposed Development Plan and any related Site Alteration Activities
Birds					
Bank Swallow (*Riparia riparia*)	THR	OBBA	• Nests in natural or anthropogenically derived exposed, sandy substrates on vertical or steep surfaces. • Forages in a variety of open areas including agricultural lands, meadows, prairies, woodland clearings, marshes, and above waterbodies.	**Confirmed.** Nest excavations associated with this species were documented in several locations associated with extraction activities (e.g., pit faces, stockpiles) in 2019, and individuals were documented during breeding bird surveys in 2020.	**Negligible.** Species was not documented to be breeding within the Site in 2020. Pit extraction activities will be undertaken consistent with the "Best Management Practices for the Protection, Creation and Maintenance of Bank Swallow Habitat in Ontario". See report for greater details.
Barn Swallow (*Hirundo rustica*)	THR	OBBA	• Nests in barns, bridge/culvert undersides, awnings/overhangs on sides of buildings, and (historically) tree cavities. • Forages in a variety of open areas including agricultural lands, meadows, prairies, woodland clearings, marshes, and above waterbodies.	**Negligible.** Species was not documented during breeding bird surveys. While this species may forage over open areas on the Site for brief periods during migration or forays from adjacent breeding sites, suitable breeding sites are absent from the Site.	--
Bobolink (*Dolichonyx oryzivorus*)	THR	OBBA	• Breeds and forages in hayfields, pastures, meadows, grasslands, and prairies which are often (but not always) greater 4 ha. • May be found in more marginal habitats (e.g., shrubby fields, smaller fields, etc.) during migration or following disturbance to breeding habitats (e.g., hay cutting).	**Negligible.** Species was not documented during breeding bird surveys. Suitable breeding habitat is absent.	--
Eastern Meadowlark (*Sturnella magna*)	THR	OBBA	• Breeds and forages in hayfields, savannahs, pastures, meadows, grasslands, prairies, and shrubby fields.	**Negligible.** Species was not documented during breeding bird surveys. Suitable breeding habitat is absent.	
Mammals					
Eastern Small-footed Myotis (*Myotis leibii*)	END		• Maternal roosting sites include exposed rock outcrops, crevices, and cliffs. • Overwinters in caves and mines that maintain temperatures above 0°C.	**Unlikely.** While species may forage above open habitats within the Site, potential maternal roosting habitat (e.g., rock outcrops, cliffs, etc.) is absent.	--
Little Brown Myotis (*Myotis lucifugus*)	END		• Maternity roosts sites most often include buildings and large diameter trees with cracks, crevices, and/or exfoliating bark. • Overwinters in caves and mines that maintain temperatures above 0°C.	**Possible.** Individuals or maternity colonies may roost in snags or other trees containing cracks, cavities, or loose bark in any of the treed vegetation communities within the Site.	**Negligible.** Northern Forest and Swamp Complex (which has the greatest potential to support roosting by maternity colonies of this species) will be protected by an ecologically appropriate setback. A timing window restriction will be applied to tree removal activities to avoid impacting roosting bats (individuals or maternity colonies). See report for greater details.
Northern Myotis (*Myotis septentrionalis*)	END		• Maternity roosts most often include large diameter trees with cracks, crevices, and/or exfoliating bark (buildings rarely used). • Overwinters in caves and mines that maintain temperatures above 0°C.	**Possible.** Individuals or maternity colonies may roost in snags or other trees containing cracks, cavities, or loose bark in any of the treed vegetation communities within the Site.	**Negligible.** Northern Forest and Swamp Complex (which has the greatest potential to support roosting by maternity colonies of this species) will be protected by an ecologically appropriate setback. A timing window restriction will be applied to tree removal activities to avoid impacting roosting bats (individuals or maternity colonies). See report for greater details.
Tri-colored Bat (*Perimyotis subflavus*)	END		• Maternal roosting sites include Maple (*Acer* spp.) and Oak (*Quercus* spp.) with dead/dying leaf clusters.	**Possible.** Individuals may roost in maple trees within the Site, which occur at a high density in the Freeman's	**Negligible.** Freeman's Maple deciduous swamp (which has the greatest potential to support roosting by

Species	Status per O. Reg. 230/08 of the ESA	Rationale for Consideration in this Study	General Description of Habitats and Features which the Species is Known to Occupy within the Ecoregion in which this Study is Located	Likelihood that the Species Occupies the Area within or adjacent to proposed Development or Site Alteration[1]	Likelihood that Negative Effects to the Species or its Habitat (i.e., "Damage" or "Destruction" as defined in the ESA) will occur based on the Proposed Development Plan and any related Site Alteration Activities
			• Overwinters in caves and mines that maintain temperatures above 0°C.	Maple deciduous swamp (SWDM3-3) in the Northern Forest and Swamp Complex.	maternity colonies of this species) will be protected by an ecologically appropriate setback. A timing window restriction will be applied to tree removal activities to avoid impacting roosting bats (individuals or maternity colonies). See report for greater details.
Plants					
American Ginseng (*Panax quinquefolius*)	END		• Occupies rich, relatively undisturbed deciduous forests.	**Negligible.** Species not documented during vascular plant surveys..	--
Butternut (*Juglans cinerea*)	END		• Occupies a variety of treed habitats including mature forests, early-successional forests, and hedgerows.	**Negligible.** Species not documented during vascular plant surveys.	--

[1] Likelihood categories are to be interpreted as follows:

Negligible: so limited that the assessed species can be assumed absent.

Unlikely: while theoretically conceivable, species presence very improbable or temporary based on available information (e.g., habitat conditions, range, abundance in local landscape, etc.).

Possible: species presence plausible based on available information; no convincing evidence suggesting species could not occur on-site.

Probable: while not confirmed, available information suggests species has a high likelihood of being present.

Confirmed: species observed and/or evidence of occupation (e.g., tracks, etc.) documented.

Appendix 8. Site, Operations, Phasing and Final Rehabilitation Plans

HM AMENDMENT BOX

1	ADDED WETLANDS AND LIMIT OF EXTRACTION, UPDATED SECTION TO REFLECT BELOW WATER EXTRACTION	DEC 2020	S.B.
No.	Revision	Date	Initial

Revisions made by Harrington McAvan Ltd. dating from MARCH 2018 only.

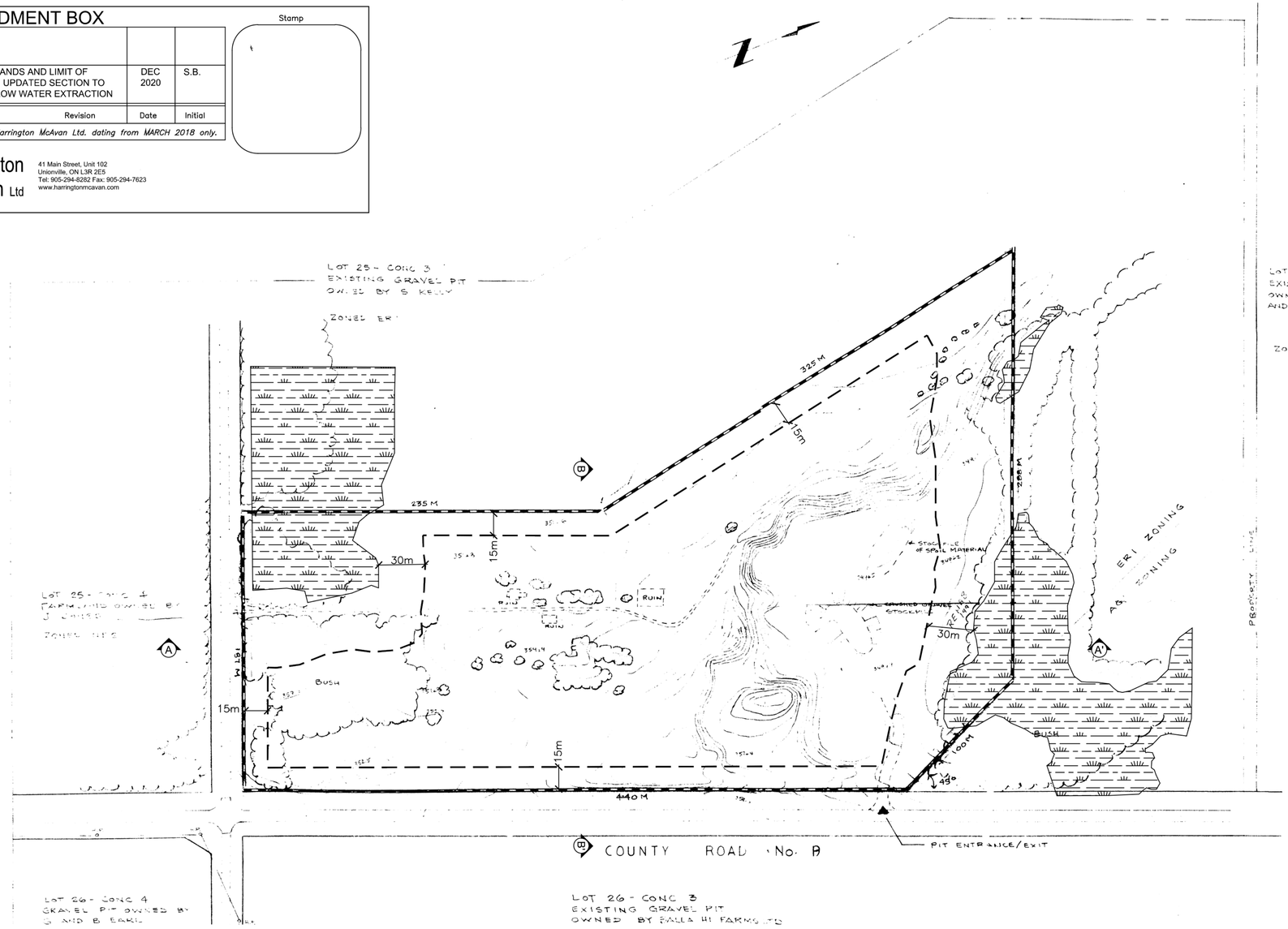
Stamp

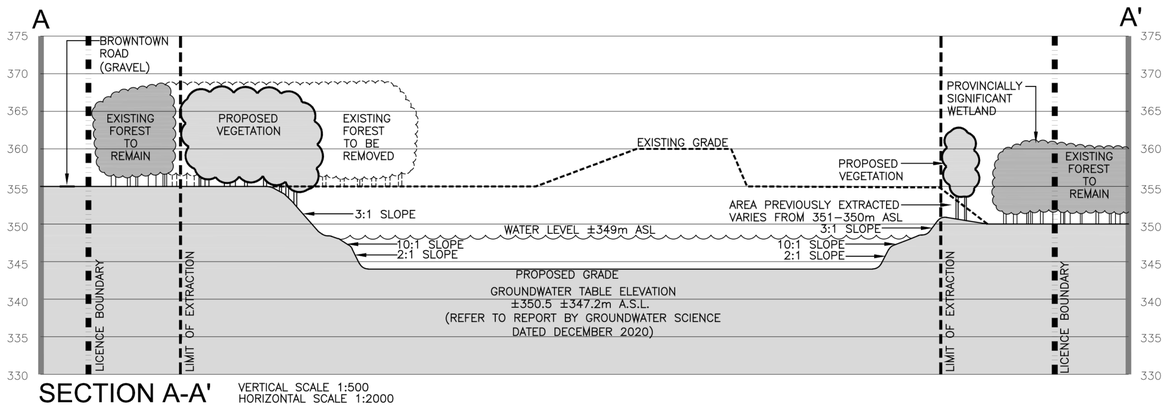
Harrington McAvan Ltd
41 Main Street, Unit 102
Unionville, ON L3R 2E5
Tel: 905-294-8282 Fax: 905-294-7623
www.harringtonmcavan.com

N°	Revision	Date
1	WELL INFORMATION ADDED	JULY 15/21
2	CROSS SECTION A-A' ADDED	JULY 15/21

NOTES

1. LICENCE AREA 11.67 HECTARES
   EXTRACTION AREA 7.50 HECTARES
   DISTURBED AREA 2.25 HECTARES
2. PIT OWNER: SHIRLEY KELLY
   PIT APPLICANT: CORPORATION OF THE TOWNSHIP OF GREY, RR 3 BRUSSELS ONT
3. LOCATION: PART OF LOT 25, CONCESSION 3 TOWNSHIP OF GREY, COUNTY OF HURON
4. STATEMENT OF PURPOSE: THIS PLAN IS PREPARED FOR SUBMISSION TO THE MINISTRY OF NATURAL RESOURCES IN CONJUNCTION WITH AN APPLICATION FOR A CLASS "A" LICENCE UNDER THE AGGREGATE RESOURCES ACT AND REGULATIONS.
5. ESTIMATED WATER TABLE ELEV 347.0
6. EXISTING WELLS:
   (a) DRILLED WELL ON LOT 26, CONC 3, TOWNSHIP OF GREY - STATIC WATER ELEV ± 347.0
7. ELEVATIONS OF DISTURBED AREA OBTAINED BY FIELD SURVEY JUNE 15, 1991, OTHER CONTOURS INTERPOLATED FROM AERIAL SURVEY CARRIED OUT BY KEATING EARTH SERVICES LTD FROM 1:6 PHOTOGRAPHY





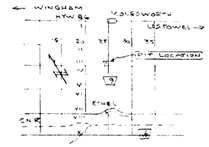
SECTION A-A' VERTICAL SCALE 1:500 HORIZONTAL SCALE 1:2000

WELL No.1 DATA
OWNER: FALLA HI FARMS LTD
TYPE: DRILLED
WELL DEPTH: 90.2 m
STATIC LEVEL: 114 m

LEGEND

- PIT ENTRANCE/EXIT
- BOUNDARY - AREA TO BE LICENCED
- FENCE LINE
- HYDRO LINE
- BUSH
- 350 EXISTING CONTOUR
- 354.7 SPOT ELEVATION
- PAVED ROAD
- 150 METERS FROM LICENCED AREA
- WETLAND BOUNDARY TERRASTORY ECOLOGICAL CONSULTING, OCTOBER 2020
- LIMIT OF EXTRACTION
- A' LOCATION OF CROSS SECTION

GEODETIC BENCHMARK - CUT CROSS IN NORTHEAST CORNER OF CONCRETE CULVERT - APPROX 350M NORTH OF CONC 3-4 INTERSECTION ON CR 8 ELEV 349.00



KEY PLAN

ORIGINAL PLAN STAMPED/SIGNED BY G.R. YUNDT

DARCOR ENTERPRISES
Consulting Engineers R. R. 3 Brussels, Ontario

MUNICIPALITY OF HURON EAST

KELLY PIT LICENCE # 4781

EXISTING FEATURES

Description		
Scale 1:1500	Drawn by G R Y	Project N° 91006
Date June 21/91	Approved by G R Yundt	Drawing N° 1 OF 3

FILE NAME: 16-34\COMP\1634-1.PSD
PLOT DATE: NOVEMBER 17, 2020

HM AMENDMENT BOX

No.	Revision	Date	Initial
2	UPDATED TO SHOW NEW MONITORING WELLS, PIEZOMETERS, CURRENT CONDITIONS, BELOW WATER EXTRACTION AND TECHNICAL RECOMMENDATIONS.	DEC 2020	S.B.
1	CHANGED SOUTH AND EAST SETBACKS TO 15m (SEE SITE PLAN OVERRIDE #1).	MARCH 2018	S.B.

Revisions made by Harrington McAvan Ltd. dating from MARCH 2018 only.

Stamp

Harrington McAvan Ltd
41 Main Street, Unit 102
Unionville, Ontario L3R 2E5
Tel: 905-294-8282 Fax: 905-294-7623
www.harringtonmcavan.com

SITE PLAN OVERRIDE (VARIANCE)

THE FOLLOWING CONDITIONS ILLUSTRATED ON THESE PLANS VARY FROM THE OF THE PROVINCIAL STANDARDS MADE UNDER THE AGGREGATE RESOURCES ACT

ITEM	SECTION
1. SOUTH AND EAST SETBACKS CHANGED TO 15m AS PER HURON COUNTY EMAIL TO MNRF AND MUNICIPALITY OF HURON EAST APPROVAL.	5.10.1
2. THERE WILL BE NO FENCING ON THE NORTH AND SOUTH BOUNDARY - DENSE VEGETATION AND ON THE WEST BOUNDARY PER AGREEMENT WITH ADJACENT LANDOWNER.	5.1

PLANS PREVIOUSLY STAMPED AND SIGNED BY G.R.YUNDT

PHASE 1

1. CONTINUE ABOVE WATER EXTRACTION IN A WEST TO EAST DIRECTION AS SHOWN.
2. TREES TO BE REMOVED WITHIN AREA 5 WILL BE UTILIZED FOR FIREWOOD OR THEIR BEST USE. STUMPS, LOGS AND OVERSIZE ROCK MAY REMAIN ON SITE FOR FURTHER PROGRESSIVE AND FINAL UNDER WATER EXTRACTION.
3. STRIP TOPSOIL AND OVERBURDEN SEPARATELY FROM AREA 5 AND STORE IN STOCKPILES ON THE PIT FLOOR OR IN STORAGE BERMS ALONG LICENCE BOUNDARY.
4. COMPLETE ABOVE WATER EXTRACTION.

PHASE 2

1. BEGIN BELOW WATER EXTRACTION IN DIRECTION AS SHOWN. AGGREGATE EXTRACTED FROM BELOW WATER WILL BE PLACED IN WINDROWS ON THE PIT FLOOR, TO DRAIN BEFORE BEING TRANSPORTED FOR PROCESSING OR OFF-SITE.
2. BEGIN REHABILITATION OF WEST SHORELINE USING MATERIAL STORED IN BERMS AND STOCKPILES, AS RESERVE IS DEPLETED.
3. COMPLETE BELOW WATER EXTRACTION AND COMPLETE REHABILITATION OF SHORELINE AND HAUL ROAD AREAS USING MATERIAL STORED IN BERMS. SITE SHALL BE REHABILITATED TO OPEN WATER POND, WETLAND, AND NATURAL AREAS.
4. REMOVE ALL SCRAP AND EQUIPMENT FROM SITE.

TECHNICAL RECOMMENDATIONS CONTINUED

HYDROGEOLICAL REPORT BY GROUNDWATER SCIENCE CORP. DATED DECEMBER, 2020

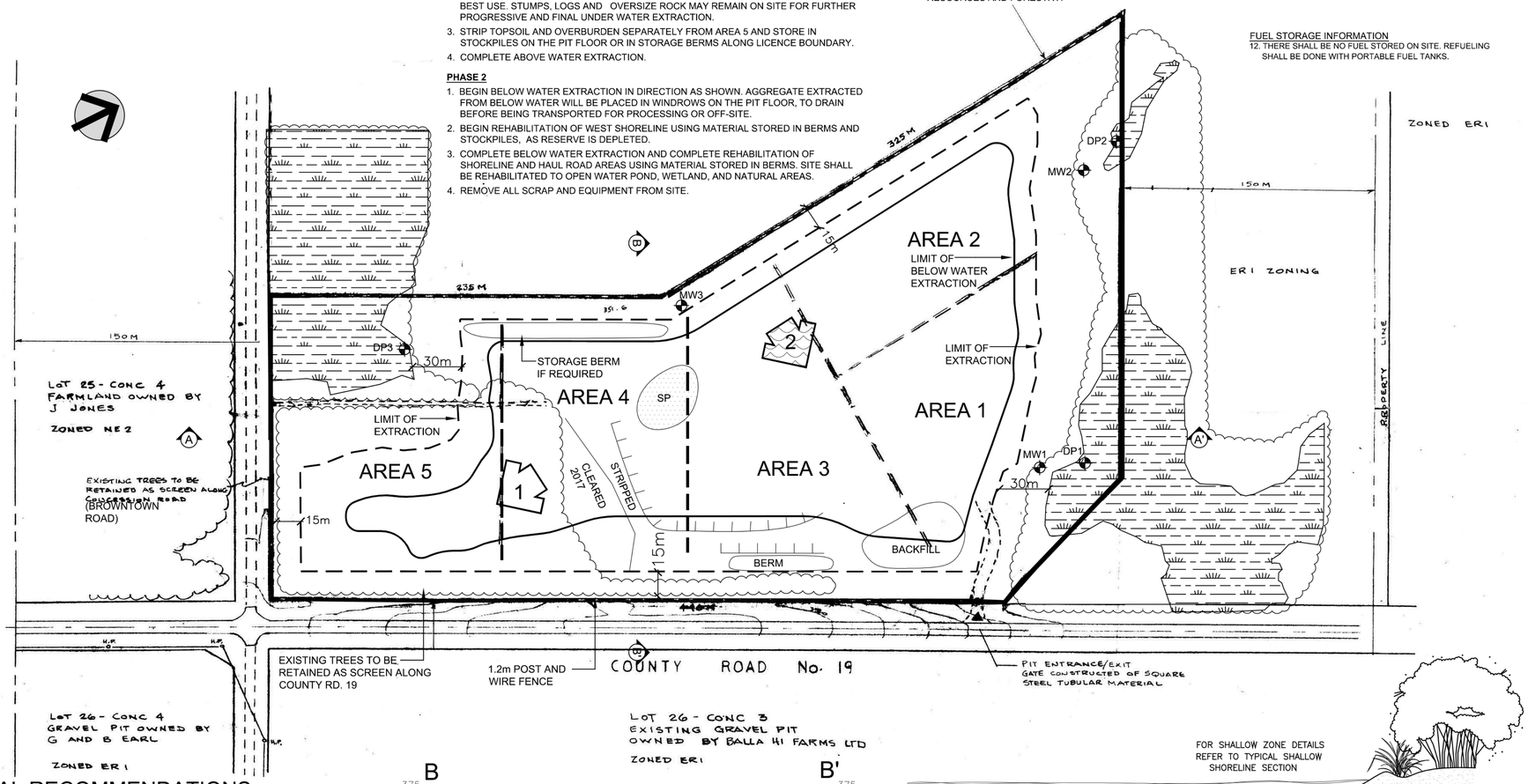
1. EXTRACTION SHALL REMOVE SAND AND GRAVEL RESOURCES AT THE SITE, AND SHALL NOT EXTEND INTO THE SILT/CLAY TILL DEPOSITS OR ORGANIC SOIL DEPOSITS NEAR THE SOUTHWESTERN WETLAND.
2. WHERE THE MINISTRY OF NATURAL RESOURCES AND FORESTRY WITH THE ASSISTANCE OF THE MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS, ACCORDING TO EXISTING WATER WELL INTERFERENCE COMPLAINT PROTOCOLS, HAS DETERMINED THAT THE OPERATION OF THE PIT HAS CAUSED ANY WELL WATER TO BE ADVERSELY AFFECTED, THE LICENSEE SHALL, AT THE LICENSEE'S EXPENSE, EITHER DEEPEN THE WELL OR REPLACE THE WELL TO ENSURE THAT HISTORIC WATER PRODUCTION QUALITY STANDARDS ARE MAINTAINED FOR THAT WELL. IF THIS PIT OPERATION HAS CAUSED A WATER SUPPLY PROBLEM, THE LICENSEE SHALL, AT THEIR EXPENSE, ENSURE A CONTINUOUS SUPPLY OF POTABLE WATER TO THE AFFECTED LANDOWNER.

GROUNDWATER MONITORING PLAN:

1. WATER LEVEL MEASUREMENTS SHALL BE OBTAINED AT THE EXISTING ON-SITE MONITORING WELL LOCATIONS (AS ACCESSIBLE) MW1, MW2, MW3, DP1, DP2 AND DP3 ON A QUARTERLY BASIS DURING THE FIRST THREE YEARS OF BELOW WATER OPERATIONS.
2. AT THE END OF THREE YEARS OF MONITORING THE DATA SHALL BE SUMMARIZED IN A REPORT PROVIDED TO THE MINISTRY OF NATURAL RESOURCES AND FORESTRY. THE MONITORING PROGRAM SHALL BE DISCONTINUED IF NO GROUNDWATER IMPACTS ARE OBSERVED AFTER 3 YEARS
3. THE MONITORING DATA SHALL BE SUMMARIZED IN AN ANNUAL REPORT PROVIDED TO THE MINISTRY OF NATURAL RESOURCES AND FORESTRY.

FUEL STORAGE INFORMATION

12. THERE SHALL BE NO FUEL STORED ON SITE. REFUELING SHALL BE DONE WITH PORTABLE FUEL TANKS.

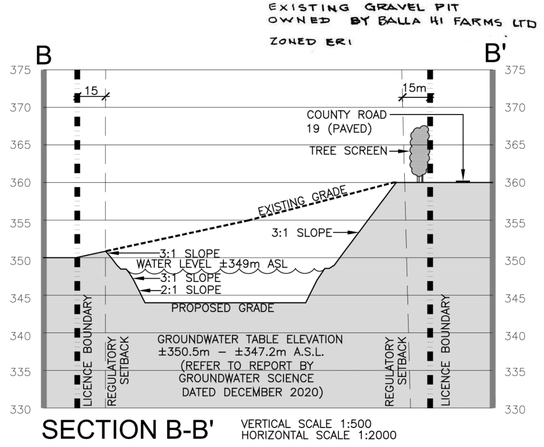


TECHNICAL RECOMMENDATIONS

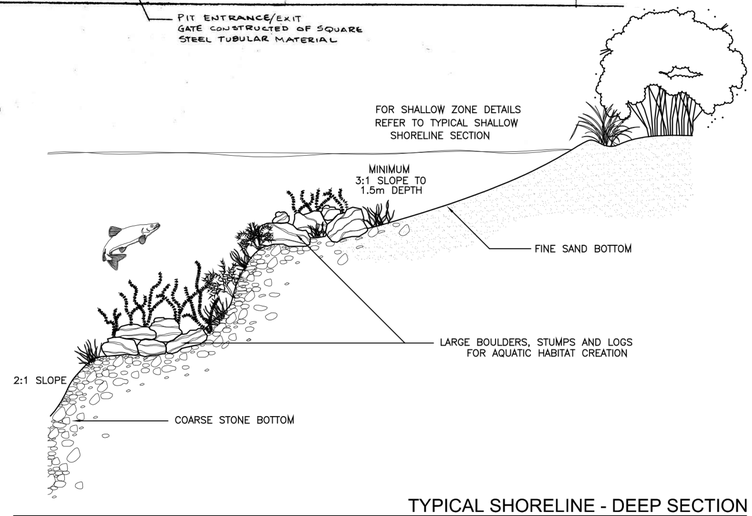
THE FOLLOWING ARE THE TECHNICAL RECOMMENDATIONS FROM ALL OF THE EXPERTS' REPORTS AS OF NOVEMBER 2020. ADDITIONAL RECOMMENDATIONS MAY BE INCLUDED AS A RESULT OF THE SITE PLAN AMENDMENT REVIEW PROCESS.

NATURAL ENVIRONMENT REPORT BY TERRASTORY ENVIRONMENTAL CONSULTING INC. DATED DECEMBER, 2020

1. ALL EXTRACTION ACTIVITIES AND AGGREGATE STOCKPILES WILL BE SET BACK A MINIMUM OF 30 M FROM THE PROVINCIALLY SIGNIFICANT WETLAND. THE 30 M SETBACK WILL BE WELL-MARKED UNDER THE DIRECTION OF A QUALIFIED ECOLOGIST PRIOR TO THE COMMENCEMENT OF ADJACENT PIT OPERATIONS.
2. THE 30 M PROVINCIALLY SIGNIFICANT WETLAND SETBACK AREA WILL REMAIN AS NATURAL, SELF-SUSTAINING VEGETATION.
3. ALL EXTRACTION ACTIVITIES AND AGGREGATE STOCKPILES WILL BE SET BACK A MINIMUM OF 15 M FROM THE SIGNIFICANT WOODLAND ADJACENT TO EXTRACTION AREAS 1 AND 2. THE 15 M SETBACK WILL BE WELL-MARKED UNDER THE DIRECTION OF A QUALIFIED ECOLOGIST PRIOR TO THE COMMENCEMENT OF ADJACENT PIT OPERATIONS.
4. THE 15 M SIGNIFICANT WOODLAND SETBACK ADJACENT TO EXTRACTION AREAS 1 AND 2 WILL REMAIN AS NATURAL, SELF-SUSTAINING VEGETATION.
5. ALL NECESSARY REMOVAL OF VEGETATION WITHIN THE EXTRACTION LIMIT WILL BE COMPLETED OUTSIDE THE PRIMARY BIRD NESTING AND BAT ACTIVITY PERIODS (I.E., TO BE COMPLETED BETWEEN OCTOBER 1 AND MARCH 31).
6. UPLAND TREE PLANTINGS AND REFORESTATION WILL OCCUR CONSISTENT WITH THE REHABILITATION PLAN.
7. ALL AGGREGATE OPERATIONS WITHIN THE SITE WILL BE UNDERTAKEN CONSISTENT WITH THE DOCUMENT TITLED "BEST MANAGEMENT PRACTICES FOR THE PROTECTION, CREATION AND MAINTENANCE OF BANK SWALLOW HABITAT IN ONTARIO" (OMNRF 2017).



SECTION B-B' VERTICAL SCALE 1:500 HORIZONTAL SCALE 1:2000



TYPICAL SHORELINE - DEEP SECTION N.T.S.

N°	Revision	Date
1	SLOPES REVISED TO 3:1	JULY 15/91

OPERATIONS NOTES

GENERAL INFORMATION

1. THIS PLAN DEPICTS A SCHEMATIC OPERATIONS AND REHABILITATION SEQUENCE FOR THIS PROPERTY BASED ON THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION. PHASES SHOWN ARE SCHEMATIC AND MAY VARY WITH MATERIAL QUALITY, SITE HYDROLOGY AND HYDROGEOLOGY OR MARKET DEMAND. PHASES DO NOT REPRESENT ANY SPECIFIC OR EQUAL TIME PERIOD.

   EXTRACTION SHALL GENERALLY FOLLOW THE SEQUENCE SHOWN. WHEN PARTIAL REHABILITATION OF A PHASE IS POSSIBLE IT SHALL BE CARRIED OUT. NOT WITHSTANDING THE EXTRACTION AND REHABILITATION PROCESS ABOVE, DEMAND FOR CERTAIN PRODUCTS OR BLENDING OF MATERIALS MAY REQUIRE SOME DEVIATION IN THE EXTRACTION AND REHABILITATION PHASING. ANY MAJOR DEVIATIONS FROM THE OPERATIONS SEQUENCE SHOWN WILL REQUIRED APPROVAL FROM MNRF.

RESOURCE INFORMATION

2. RESOURCE INFORMATION IS OBTAINED FROM TEST PITS DUG BY APPLICANT IN 2017.

EXTRACTION/PROCESSING/HAULING INFORMATION

3. TOTAL AREA TO BE EXTRACTED IS 7.5 HECTARES.
4. EXTRACTION OF SAND AND GRAVEL ABOVE WATER TABLE WILL TAKE PLACE IN TWO BENCHES, WITH A MAXIMUM HEIGHT OF ± 6 METRES. UNDERWATER EXTRACTION WILL BE BY DRAGLINE OR EXCAVATOR TO A MAXIMUM DEPTH OF ± 344m ASL OR THE DEPTH OF THE RESOURCE. THE GROUNDWATER TABLE IS ESTIMATED TO BE BETWEEN ±350.5 AND 347.2m ASL (SEE HYDROGEOLOGICAL REPORT). FRONT END LOADERS AND TRUCK OR CONVEYOR WILL TRANSPORT MATERIAL TO THE PORTABLE PLANT FOR FURTHER PROCESSING.

   PORTABLE AND STATIONARY PROCESSING, CRUSHING, WASHING AND SCREENING EQUIPMENT WILL BE USED ON SITE AND WILL BE LOCATED ON THE PIT FLOOR. OTHER EQUIPMENT TO BE USED IN THE OPERATION OF THE PIT MAY INCLUDE TRUCKS, LOADERS, DRAGLINE, EXCAVATOR, BULLDOZERS, SCRAPERS, CONVEYORS AND OTHER RELATED EQUIPMENT. TEMPORARY STOCKPILES MAY BE LOCATED NEAR THE PIT FACE. PROCESSING EQUIPMENT, STACKERS AND PRODUCT STOCKPILES WILL NOT EXCEED ± 15 METRES IN HEIGHT.

   MATERIAL FROM OTHER LICENCED PROPERTIES (EG. SAND) MAY BE IMPORTED INTO THE SITE FOR BLENDING AND CUSTOM PRODUCTS.

5. BELOW-WATER EXTRACTION WILL CEASE IMMEDIATELY IF THERE ARE ANY EARLY WARNING SIGNS OF IMPACT TO SURROUNDING GROUNDWATER USERS, WETLANDS OR STREAMS THAT IS ATTRIBUTED TO BELOW WATER OPERATIONS.
6. SURFACE DRAINAGE ON THE PIT FLOOR WILL BE DIRECTED TO LOW AREAS FOR WATER TO INFILTRATE INTO THE GRANULAR MATERIALS ON THE PIT FLOOR OR DUG POND.

AIR QUALITY INFORMATION

7. WATER OR CALCIUM CHLORIDE WILL BE APPLIED TO INTERNAL HAUL ROADS AND PROCESSING AREAS AS OFTEN AS REQUIRED TO MITIGATE DUST.

SITE MANAGEMENT INFORMATION

MAINTENANCE/ PROTECTION OF VEGETATION INFORMATION

8. EXISTING VEGETATION WITHIN THE LICENSED AREA SHALL BE MAINTAINED IN A HEALTHY VIGOROUS GROWING CONDITION UNTIL SEQUENTIAL STRIPPING BEGINS OR UNTIL THE REHABILITATION IS COMPLETE. ANY VEGETATION PLANTED AS PART OF SITE IMPROVEMENTS OR PROGRESSIVE AND FINAL REHABILITATION WILL ALSO BE MAINTAINED IN A HEALTHY, VIGOROUS GROWING CONDITION.

FENCING INFORMATION

9. BOUNDARIES OF THE AREA THAT ARE PRESENTLY FENCED ARE SHOWN ON THIS PAGE. ALL FENCING SHALL BE MAINTAINED.

TOPSOIL/SUBSOIL/OVERBURDEN STORAGE INFORMATION

10. TOPSOIL AND OVERBURDEN SHALL BE STRIPPED AND STORED SEPARATELY IN BERMS OR STOCKPILES. BERMS AND STOCKPILES OF TOPSOIL SHALL BE GRADED TO STABLE SLOPES AND SEEDED WITH A GRASS/LEGUME MIXTURE TO PREVENT EROSION AND MINIMIZE DUST.

BERM INFORMATION

11. BERMS SHALL NOT EXCEED 2:1AND SHALL BE SEEDED IMMEDIATELY UPON COMPLETION TO MINIMIZE NOISE, DUST AND EROSION.

LEGEND

- PIT ENTRANCE/EXIT
- BOUNDARY – AREA TO BE LICENCED
- FENCE LINE
- HYDRO LINE
- 350 EXISTING CONTOUR
- 354.1 SPOT ELEVATION
- PAVED ROAD
- 150 METERS FROM LICENCED AREA
- LIMIT OF EXTRACTION
- DIVISION LINE BETWEEN SEQUENCES
- 348.0 PROPOSED PIT FLOOR ELEVATIONS
- 2 EXTRACTION SEQUENCES
- PROVINCIALLY SIGNIFICANT WETLAND BOUNDARY- TERRASTORY ECOLOGICAL CONSULTING, OCTOBER 2020
- DP1 DRIVE POINT PIEZOMETERS INSTALLED BY GROUNDWATER SCIENCE CORP. AUGUST 29, 2019
- MW3 MONITORING WELL SUPERVISED BY GROUNDWATER SCIENCE CORP. AUGUST 8, 2019
- A' LOCATION OF CROSS SECTION
- DIRECTION OF EXTRACTION
- SP STOCKPILE
- EXISTING VEGETATION

DARCOR ENTERPRISES
Consulting Engineers R. R. 3 Brussels, Ontario

MUNICIPALITY OF HURON EAST

KELLY PIT LICENCE # 4781

OPERATIONAL PLAN

Description		
Scale 1:1500	Drawn by G.R.Y	Project N° 91006
Date June 21/91	Approved by G.R.Yundt	Drawing N° 2 OF 3

FILE NAME: 16-34/COMP/1634-2.PSD
PLOT DATE: DECEMBER 21, 2020

NOTES continued

VEGETATION STABILIZATION INFORMATION

7. TOPSOIL SHALL BE SEEDED WITH A MIXTURE OF GRASSES AND LEGUMES THAT MAY INCLUDE THE FOLLOWING AT A RATE OF APPROXIMATELY 125KG/HA:
   BUCKWHEAT RED CLOVER
   WHITE CLOVER TALL FESCUE ANNUAL RYE

OPEN WATER POND REHABILITATION INFORMATION

8. THE AVERAGE WATER LEVEL IN THE POST-EXTRACTION LAKE IS ESTIMATED TO BE ±349m ASL (BASE ON HYDROGEOLOGICAL REPORT).
9. THE SHAPE AND GRADING OF THE PROPOSED POND IS APPROXIMATE, BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME OF LICENSING. ACTUAL EXTRACTION WILL FOLLOW THE BELOW WATER DEPOSIT AND REHABILITATION SHALL FOLLOW THE CONCEPT ILLUSTRATED.

WETLAND REHABILITATION INFORMATION

10. AREAS SHALL BE REHABILITATED TO WETLAND HABITAT AS FOLLOWS:
    UNDERWATER SLOPES WILL BE FORMED WITH ON-SITE FILL
    - UNDERWATER SLOPES SHALL BE A MAXIMUM OF 2:1

11. RESTORATION OF THE NEARSHORE, SHALLOW WETLAND ZONE AS SHOWN ON THE TYPICAL SHALLOW SHORELINE SECTION, SHEET 3 OF 3 WILL GENERALLY BE ACCOMPLISHED AS FOLLOWS:
    - EXTRACTION AND ROUGH GRADING WILL CREATE A NEARSHORE SHORELINE AREA AT A SLOPE OF 10:1
    - FINAL SLOPING OF THE SHORELINE TO CREATE PHYSICAL DIVERSITY BY SCALLOPING THE SHORELINE AND ADDING STRUCTURES.
    - WOODY DEBRIS- BRANCHES, TREE TRUNKS, STUMPS, ETC. CLEARED IN THE EXTRACTION PROCESS WILL BE SALVAGED WHERE POSSIBLE, FOR USE IN SHORELINE RESTORATION/ UNDERWATER HABITAT ENHANCEMENT (REFER TO TYPICAL SHORELINE HABITAT DETAIL).
    - STUMPS, LOGS, BRUSH BUNDLES, ETC. SHALL BE INSTALLED ±30m O.C. ALONG THE SHORELINE IN THE SHALLOW ZONE TO CREATE PHYSICAL DIVERSITY.
    - OVERSIZE ROCKS NOT UTILIZED IN THE AGGREGATE OPERATIONS WILL ALSO BE PLACED IN THE SHALLOW ZONE TO CREATE PHYSICAL DIVERSITY.
    - THE INITIAL SHORELINE RESTORATION AREA WILL BE SPORADICALLY PLANTED WITH TREES AND SHRUBS. SPECIES MAY INCLUDE THE FOLLOWING NATIVE PLANTS:
    RED MAPLE PUSSY WILLOW SILVER MAPLE LARCH
    RED OSIER DOGWOOD WHITE CEDAR SPECKLED ALDER

12. INITIAL SHORELINE WETLAND AREAS SHALL BE PLANTED WITH CLUMPS OF EMERGENT AND SUBMERGENT NATIVE WETLAND PLANTS TO INITIATE COLONIZATION OF THE SITE AS NUTRIENT LEVELS INCREASE TO SUPPORT THEM. NATIVE WETLAND PLANTS SUCH AS:

    FLOATING PONDWEED COONTAIL SOFTSTEM BULRUSH
    RIVER BULRUSH BLUE FLAG PICKERELWEED WATER-LILY
    ARROWHEAD

    WILL BE PLANTED IN CLUSTERS OF 5 AT APPROPRIATE DEPTHS TO BEGIN THE COLONIZATION.

AGRICULTURAL REHABILITATION INFORMATION

13. AREAS SHALL BE REHABILITATED BACK TO AGRICULTURE AS FOLLOWS:
    - DEEP RIPPING OF AREA TO ELIMINATE COMPACTION (WHERE REQUIRED)
    - SPREADING OF APPROXIMATELY 200mm OF OVERBURDEN AND ROUGH GRADING
    - SPREADING OF APPROXIMATELY 200-300mm OF TOPSOIL AND FINE GRADING
    - SEED AREAS WITH SEED MIXTURE NOTED ABOVE. ALL VEGETATION PLANTED DURING THIS LICENSE WILL BE MAINTAINED IN A HEALTHY, VIGOROUS GROWING CONDITION.
    - USING ACCEPTED FARMING PRACTICES TO RESTORE AND MAINTAIN VEGETATION

REFORESTATION INFORMATION

14. ALL VEGETATION PLANTED DURING THIS LICENSE WILL BE MAINTAINED IN A HEALTHY, VIGOROUS GROWING CONDITION

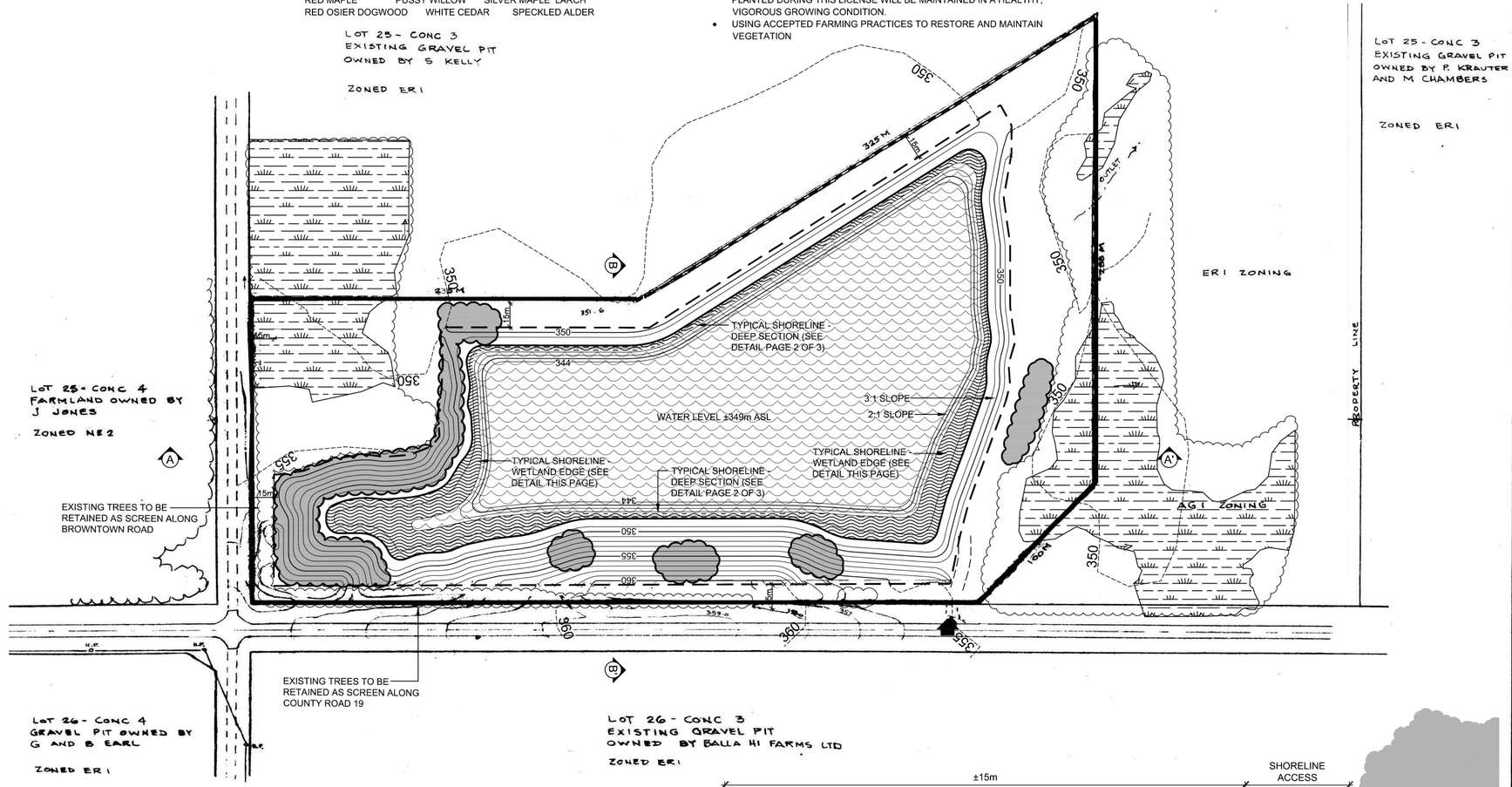
15. UPLAND AREAS SHALL BE REFORESTED, WHERE SHOWN, AS FOLLOWS:
    SPECIES MAY INCLUDE THE FOLLOWING (DEPENDENT ON AVAILABILITY)
    WHITE PINE TREMBLING ASPEN WHITE BIRCH
    WHITE CEDAR RED MAPLE BLACK CHERRY
    RED OAK BALSAM FIR LARGE-TOOTHED ASPEN

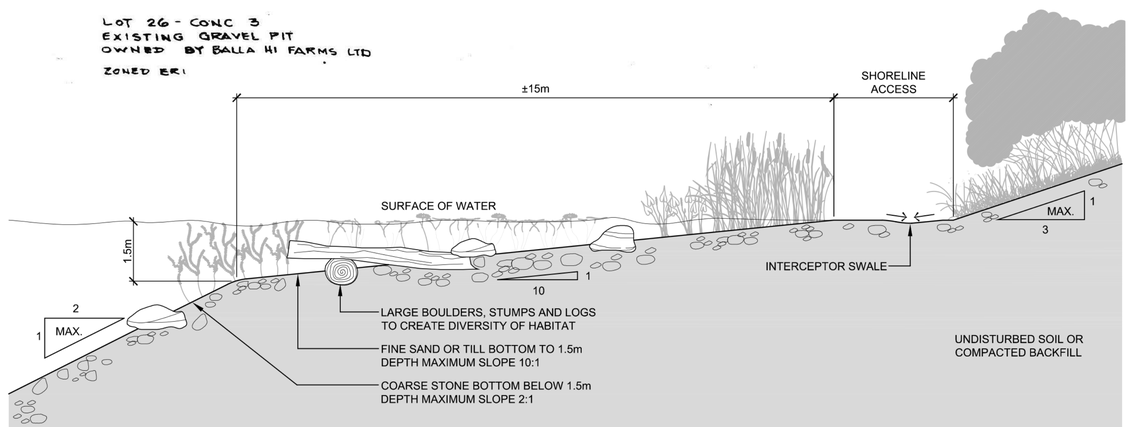
SETBACK REHABILITATION INFORMATION

16. AFTER SIDESLOPES ARE CREATED AND REQUIRED BERMS ARE REMOVED FROM SETBACKS THESE AREAS WILL BE IMMEDIATELY STABILIZED WITH A SUITABLE GROUNDCOVER AND THEN REFORESTED THE FOLLOWING SPRING.

TOPOGRAPHY INFORMATION

17. UPDATED CONTOURS OBTAINED FROM HURON COUNTY MAPPING PORTAL OCTOBER 2020.





TYPICAL SHORELINE - WETLAND EDGE

N.T.S.

HM AMENDMENT BOX

No.	Revision	Date	Initial
2	REVISED TO REFLECT BELOW WATER EXTRACTION	DECEMBER 2020	S.B.
1	CHANGED SOUTH AND EAST SETBACKS TO 15m (SEE SITE PLAN OVERRIDE PAGE 2 OF 3)	MARCH 2018	S.B.

Revisions made by Harrington McAvan Ltd. dating from MARCH 2018 only.

Stamp

Harrington McAvan Ltd
41 Main Street, Unit 102
Unionville, Ontario L3R 2E5
Tel: 905-294-8282 Fax: 905-294-7623
www.harringtonmcavan.com

No.	REVISIONS	DATE
1	SLOPES REVISED TO 3:1	JULY 15/91

REHABILITATION NOTES

GENERAL INFORMATION

1. REFER TO SHEET 2 OF 3 FOR SECTIONS, OPERATIONS AND PHASING DIAGRAMS AND NOTES AND SHEET 3 OF 3 FOR FINAL REHABILITATION AND NOTES.

2. PROPERTY SHALL BE REHABILITATED TO:
   OPEN WATER POND 4.1 HA
   WETLAND 0.8 HA
   MEADOW 1.8 HA
   REFORESTATION 0.9 HA (0.1HA OUTSIDE EXTRACTION AREA)
   FOR A TOTAL OF 7.6 HECTARES

HYDROGEOLOGICAL INFORMATION

3. IT IS ANTICIPATED THAT THE GROUNDWATER ELEVATION ACROSS THE SITE WILL REMAIN RELATIVELY UNCHANGED AT ± 350.5 TO 347.2m A.S.L. (REFER TO HYDROGEOLOGICAL REPORT).

4. ALL SURFACE DRAINAGE WILL BE DIRECTED TO THE POND REMAINING ON SITE.

SIDESLOPE/MEADOW REHABILITATION INFORMATION

GRADING INFORMATION

5. REHABILITATED SLOPES WITHIN THE LICENSED AREA WILL BE CONSTRUCTED AS SHOWN ON THE CROSS SECTIONS. REHABILITATION OF ABOVE WATER SLOPES SHALL BE BY BACKFILLING (MINIMUM 3:1) AND/OR CUT AND FILL METHOD USING AVAILABLE ON-SITE OVERBURDEN AND TOPSOIL FROM WITHIN THE LICENSED AREA.

   AVAILABLE OVERBURDEN REPLACED WILL BE APPROXIMATELY 200mm THICK.

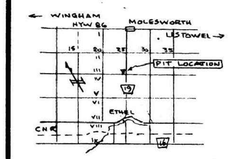
TOPSOILING INFORMATION

6. ALL AVAILABLE TOPSOIL ON THE SITE WILL REMAIN TO BE USED FOR REHABILITATION OF THIS SITE. AVAILABLE TOPSOIL REPLACED WILL BE APPROXIMATELY 200-300mm THICK.

LEGEND

- BOUNDARY - AREA TO BE LICENCED
- FENCE LINE
- HP HYDRO LINE
- 350 EXISTING CONTOUR
- 354+1 SPOT ELEVATION
- PAVED ROAD
- ENTRANCE/EXIT
- EXISTING VEGETATION
- A LOCATION OF CROSS SECTION
- REGULATORY SETBACK AND LIMIT OF EXTRACTION LINE
- WETLAND BOUNDARY TERRASTROY ECOLOGICAL CONSULTING, OCTOBER 2020
- PROPOSED POND
- PROPOSED WETLAND
- 350 PROPOSED 5m CONTOUR
- 349 PROPOSED 1m CONTOUR
- PROPOSED VEGETATION

GEODETIC BENCHMARK - CUT CROSS IN NORTHEAST CORNER OF CONCRETE CULVERT - APPROX 855M NORTH OF CONC 3-4 INTERSECTION ON CTY RD 19 - ELEV 349.225



KEY PLAN
Scale 1:250,000

ORIGINAL PLAN STAMPED/SIGNED BY G.R. YUNDT

DARCOR ENTERPRISES
Consulting Engineers R. R. 3 Brussels, Ontario

MUNICIPALITY OF HURON EAST

KELLY PIT LICENCE # 4781

PROGRESSIVE REHABILITATION AND FINAL REHABILITATION PLAN
Description

Scale	Drawn by	Project N°
1 : 1500	G.R.Y	91006
Date	Approved by	Drawing N°
June 21/91	G.R.Yundt	3 OF 3

PLOT DATE: DECEMBER 21, 2020
FILE NAME: 16-34/COMP/1634-3.DWG