

**Duntroon License Expansion -  
Level 2 Natural Environment  
Technical Report**

File #: 162602732  
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**Stantec**



## Executive Summary

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Stantec was retained by Georgian Aggregates and Construction Inc. to complete this Level II Natural Environment study for the proposed expansion of the existing Duntroon Quarry, in the Township of Clearview, County of Simcoe. This study was completed under the requirements of the Ontario Aggregate Resources Act (ARA) to determine potential impacts on significant natural heritage resources, and to develop mitigation and management measures for any impacted natural heritage resources. This report was prepared with reference to a complete range of studies addressing all requirements of the ARA and should be read in the context of the complete application.

### **Conclusions**

Based on a complete review of the existing natural heritage resources and policies the following conclusions were reached.

### **Features**

No significant natural heritage features as identified in the Ontario Provincial Policy Statement (PPS) occur within the proposed extraction area.

Significant natural heritage features, as defined in the PPS, occur on adjacent lands, including:

- The Rob Roy Complex Provincially Significant Wetland Complex;
- Cold water fisheries habitat with naturally reproducing native brook trout (tributaries of the Batteaux Creek and the Pretty and Beaver Rivers); and,
- Significant wildlife habitat.

Natural heritage features considered significant at the local or regional levels also occur on adjacent lands. These features include:

- Regionally significant Duntroon Life Science ANSI; and
- Unevaluated wetlands, included in the regional ANSI.

Locally important natural heritage features, in the form of woodlands and rare species occurrences, occur within the proposed extraction area.

### **Direct Impacts**

There will be no direct impact on any provincially significant natural heritage features.

Direct impacts will be restricted to 40.5 ha of forest that occur within the proposed extraction area. This forest is also the location of occurrences of two rare plant species; Hart's-tongue Fern and Butternut. The forest will be removed as part of the proposed extraction. This impact will be mitigated by replanting 52.2 ha of forest on adjacent lands, and by transplanting the rare plant species, managing local populations, and working in cooperation with the agencies charged with rare plant recovery.

**Indirect Impacts**

The proposed extraction will alter ground and surface water conditions in adjacent lands. These alterations may lead to potential indirect impacts on the significant features on adjacent lands. The impact of these alterations will be mitigated through management of ground and surface water resources so that there will be no *negative impact* as defined in the PPS, on significant natural heritage features.

**Recommendations**

These conclusions are based on the following recommendations being implemented:

- Extraction limits phasing and progressive rehabilitation as outlined in the site plans (MHBC, 2005);
- Maintenance of groundwater levels and surface flows as outlined in Geological Report and Level 2 Hydrogeological Assessment (Jagger Hims, 2005);
- Beaver River fish habitat enhancement in cooperation with relevant agencies;
- Preparation and implementation of a detailed ecologically diverse forest restoration plan in consultation with the appropriate agencies. The plan will include:
  - Woodland enhancement and creation on lands adjacent to the extraction area based on principles as outlined in this Level II Natural Environment Technical Report;
  - Wildlife habitat enhancement and creation on lands adjacent to the extraction area based on principles as outlined in this Level II Natural Environment Technical Report;
- Transplantation, management and monitoring of representative populations of Hart's-tongue fern and butternut on lands adjacent to the extraction area based on principles as outlined in this Level II Natural Environment Technical Report;
- Development and application of long term Adaptive Monitoring Plans (AMPs) for water, as outlined in Jagger Hims 2005, and for adjacent significant natural features as outlined in this report, with integration between the programs as required.

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## **1.0 Introduction**

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### **1.1 BACKGROUND**

Stantec Consulting (Stantec), formerly ESG International, was retained in May 2002 by Georgian Aggregates and Construction Inc, a division of Walker Industries Holdings Limited ("Georgian Aggregates"), to complete Level 1 and 2 Natural Environment Technical Reports as required under the Ontario Aggregate Resources Act for aggregate license applications.

This document is a Level 2 Natural Environment Technical Report for the proposed expansion of the existing Dunroon Quarry, referred to hereafter as "the proposed quarry expansion." The proposed license area for purposes of this Level 2 Natural Environment Technical Report is located on Lot 25 and part of Lot 26, Concession 12 and part of Lot 25, Concession 11, Clearview Township, in Simcoe County, immediately adjacent to Grey Highlands Township in Grey County as shown on **Figure 1**. The proposed license area encompasses an area of 127.02 ha, of which Georgian Aggregates is proposing an extraction area of 68.92 ha.

The proposed license area is located at the headwaters of four watersheds with the majority of the site occurring in the Beaver River and Batteaux Creek subcatchments. The Pretty River subcatchment occurs to the northeast of the property and the Mad River subcatchment is found to the south of the proposed license area, south of the existing quarry.

This report details the results of investigations on behalf of Georgian Aggregates with respect to the proposed license area and was prepared in conjunction with other consultants' studies and should be read with reference to the complete application.

### **1.2 APPLICABLE LEGISLATION**

#### **1.2.1 The Aggregate Resource Act and the Provincial Policy Statement**

Georgian Aggregates is preparing an application for a Category 2 Class 'A' license under the Aggregate Resources Act (ARA). Category 2 Class 'A' licenses are required for quarry operations with extraction below the established water table. The provincial standards (Ontario Ministry of Natural Resources, 1999) of the ARA require a Level 1 Natural Environment Technical Report to determine whether any of the following features stated in Section 2.1 of the Provincial Policy Statement (PPS) (Ministry of Municipal Affairs and Housing, 2005), exist on and/or within 120m of the proposed license area:

- Significant wetlands;
- Significant habitat of endangered or threatened species;
- Fish habitat;
- Significant woodlands;
- Significant valleylands;

- Significant wildlife habitat; and
- Areas of Natural and Scientific Interest (ANSI).

If any of the above features are located on and/or within 120m of the proposed license area, then a Level 2 Natural Environment Technical Report is required to:

- Determine the degree of impact on the natural features or ecological functions; and
- Propose any preventative, mitigative or remedial measures that may be necessary.

Given the existing natural heritage features found within 120m of the proposed license area, this Level 2 Natural Environment Technical Report has been prepared.

### **1.2.2 Township and County Official Plans**

In addition to satisfying the requirements of the Aggregate Resources Act, this report addresses the County of Simcoe Official Plan and the Clearview Township Official Plan and any issues that would be addressed under an Environmental Impact Statement for municipal planning processes.

### **1.2.3 The Niagara Escarpment Plan**

The proposed license area is located within the Niagara Escarpment Plan Area and falls under the jurisdiction of the Niagara Escarpment Planning and Development Act. The majority of the proposed license area falls within the "Escarpment Rural Area" designation. This designation has an objective to provide for new licensed pits or quarries producing more than 20,000 tonnes (22,000 tons) annually subject to an amendment to the Niagara Escarpment Plan from "Escarpment Rural Area" to "Mineral Resource Extraction Area" and subject to policies 1.5, 1.9, and 2.11.

### **1.2.4 The Greenbelt Plan**

By virtue of its inclusion in the Niagara Escarpment Plan Area, the proposed license area falls within the jurisdiction of the Greenbelt Plan. The Greenbelt Plan states that the policies of the Niagara Escarpment Plan established under the Niagara Escarpment Planning and Development Act are the applicable policies and, the policies of Protected Countryside do not apply. The only exception is Section 3.3, which details the Plan's policies pertaining to parkland, open space and trails.

## 2.0 Approach

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The purpose of this Level 2 Natural Environment Technical Report is to identify and characterize environmental features and functions that may be impacted by quarry expansion and to recommend measures to mitigate and manage these potential impacts. The process undertaken to achieve this result is illustrated in **Figure 2**. This report documents the results of an iterative process with impact analysis feeding back into design activities to ensure that impacts are held to acceptable limits.

The preliminary stage of an environmental evaluation is a background review which consists of a literature and map review of both the proposed license area and an assessment of the regional context in which the property is situated. In addition to the investigation of the proposed license area, the evaluation of environmental characteristics was extended to include adjacent lands to ensure that Project-related impacts were evaluated. Adjacent lands were defined as the greater of 120m from the proposed license area, or lands where direct impacts, such as might arise from changes in groundwater or surface water flows, might reasonably be expected to occur.

Understanding a regional context is an important step in establishing the relative significance of environmental features on the proposed license area based on their regional abundance and ecological connection with surrounding environmental features. The Regional Context is detailed in **Section 3** of this report.

Based on the results of the background review, a program of field surveys was designed and implemented to assess the natural features that based on the background review, were either known to occur, or had a reasonable probability of occurring on the proposed license area. Field surveys were extended beyond the proposed license area to include the potentially affected natural features identified on adjacent lands.

The information collected in the background review and the field surveys program represented the baseline conditions of natural features that would be potentially affected by the proposed quarry expansion. These natural features were then screened to determine if any fell into the categories of the seven natural heritage features to be considered under the ARA in accordance with Policy 2.1 of the PPS, as described in Section 1.2.

Any natural features identified in the screening process were evaluated to determine if there was the potential for them to be affected by the proposed quarry expansion. An iterative process was then undertaken where the project design was modified, or new mitigation measures included that would “design out,” or minimize to the extent possible, potential impacts to significant natural heritage features. Upon completion of this process, the final natural environment technical report was completed and conclusions and recommendations presented.

## **2.1 BACKGROUND REVIEW**

Background data were collected and reviewed to identify designated significant natural areas, significant species occurrences and landscape context. The data were used to supplement and guide the field surveys completed for the site. Key documents reviewed and agencies contacted included:

- Natural Heritage Information Centre (NHIC);
- Simcoe County Official Plan;
- Township of Clearview Official Plan;
- Niagara Escarpment Plan;
- Ecological Survey of the Niagara Escarpment Biosphere Reserve. Volume I. Significant Natural Areas (Riley et al., 1996);
- Personal Communication with local naturalist (Nelson Maher);
- Personal Communication with aquatic specialists from the Grey Sauble Conservation Authority (John Bittorf) and Nottawasaga Valley CA (Fred Dobbs);
- Personal Communication with a biologist from the Ontario Ministry of Natural Resources (Andy McKee);
- Cadman, M.D., et al. 1987. Atlas of the Breeding Birds of Ontario. Federation of Ontario Naturalists, Long Point Bird Observatory. 617pp.;
- Chapman, L.J. and D.F. Putnam. 1984. The Physiography of Southern Ontario, Third Edition. Ontario Geological Survey Special Volume 2, Ministry of Natural Resources. 270 pp.; and
- Jagger Hims Limited. 2005. Duntroon Quarry Proposed Expansion Geological Report and Level 2 Hydrogeological Assessment.

## **2.2 SITE RECONNAISSANCE AND DETAILED FIELD SURVEYS**

Field investigations were completed over a period of three years and included surveys of the vegetation communities, wildlife monitoring surveys (mammals, amphibians, reptiles and breeding birds), ephemeral pond investigations and an aquatic habitat assessment of the permanent and intermittent watercourses on and adjacent to the proposed license area. The field investigations conducted for the Level 1 and 2 Natural Environment Reports are listed in Table 1.

**Table 1. Site Investigation Record – Duntroon**

<b>Survey Type</b>	<b>Survey Date(s)</b>
<b>1. General Assessment</b>	
General natural environment review	June 4, 2003, June 20, 2004, July 11, 2004
<b>2. Vegetation Assessment</b>	
Initial ELC mapping and botanical survey	November 5, 2002
Spring botanical survey	June 4, 2003
Wetland assessments	July 30, 2003, June 23, 2005, September 1, 2005
Hart's-tongue fern survey and relocation assessment in the Duntroon Escarpment ANSI	November 26, 2003
Duntroon ANSI delineation	October 28, 2004
Final ELC mapping and summer botanical survey	August 28, 2003, June 23, 2005
Hart's-tongue fern and butternut survey	June 23, 2005, September 1 and 2, 2005
<b>3. Wildlife Assessment</b>	
Breeding bird survey	June 12, 2003, June 29, 2005
Winter wildlife assessment	March 4, 2005
Red shouldered hawk survey	May 6, 2005
Owl survey	March 4, 2005
Potential endangered and threatened species (Massasauga rattle snake) survey	June 23, 2005
Species of conservation concern (fauna)	June 25, 2004
General wildlife survey	June 25, 2004
Deer survey	March 4, 2005
<b>4. Aquatic Resource Assessment</b>	
Fisheries habitat assessment	August 25, 2003, November 3, 2004
Spawning/upwelling survey (Redds survey)	November 3, 2004
Downstream Fisheries Assessments	December 1, 2003, November 3, 2004, June 23, 2005, September 22, 2005
<b>5. Visual Assessment</b>	
Visual impact assessment (treed area assessment)	October 15, 2004

Surveys were conducted initially on the proposed license area including the 120m adjacent lands extending from the property boundary. Typically, dewatering of a quarry creates a zone of influence, which can extend beyond this survey area. In the case of the proposed quarry expansion, it was possible that potential indirect environmental impacts resulting from the project might include the alteration of hydrology in adjacent wetlands, the Duntroon Escarpment ANSI, and the headwaters of Batteaux Creek, Beaver River and Pretty River. To adequately characterize baseline conditions of these areas, field studies and background reviews were conducted for a number of natural heritage features beyond the proposed license area and 120m adjacent lands. These surveys compliment the regional review of the planning area. In combination with the background information gathered, these surveys characterize the regional conditions on which the assessment of indirect impacts was based.

Stantec staff also participated in a site visit on June 20th, 2004 with representatives from the Ontario Ministry of Natural Resources, Grey Sauble Conservation Authority, Nottawasaga Valley Conservation Authority (NVCA), and Town of the Blue Mountains.

## **2.3 FIELD SURVEY METHODS**

### **2.3.1 Vegetation Community Assessment**

Field investigations conducted as part of the Level 2 assessment included the ecological land classification of vegetation communities and a floristic survey of the proposed license area and immediate vicinity. Vegetation communities were delineated on aerial photographs and checked in the field; community characterizations (eco-sites and ecotypes) were then based on the first approximation of the Ecological Land Classification (ELC) system (Lee et al., 1998). Colloquial and Latin nomenclature of plant species generally followed Newmaster et al. (1998).

Vegetation community and plant species information was evaluated to determine potential significance at a number of different levels. Provincial significance of vegetation communities was based on the draft rankings assigned by the Natural Heritage Information Centre (Bakowsky, 1996). The provincial status of all plant species is based on Newmaster et al. (1998), with updates from the database of the Natural Heritage Information Centre (NHIC, 2001). Identification of potentially sensitive plant species is based on assignment of a coefficient of conservatism value (CC) to each native species in southern Ontario (Oldham et al., 1995). The value of CC, ranging from 0 (low) to 10 (high), is based on a species' tolerance of disturbance and fidelity to a specific natural habitat. Species with a CC value of 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters.

### **2.3.2 Herpetofaunal Survey (Amphibians and Reptiles)**

A search of the NHIC Herpetofaunal Atlas was conducted with particular emphasis on reptiles and amphibians identified as species at risk in Ontario. This information was reviewed in conjunction with the known habitat types on the proposed license area to determine which species may occur and have the potential to be affected by the quarry proposal.

In reviewing the NHIC Herpetofaunal Atlas, the only record of a significant species of reptile or amphibian in close proximity to the proposed license area was the eastern Massasauga (*Sistrurus catenatus*), which is a provincially and nationally threatened species. Information in the NHIC Herpetofaunal Atlas mapping is not presented at a scale to allow for a determination of whether the Massasauga was identified on the proposed license area. Although hibernation sites are largely unknown, it is believed that the Massasauga rattlesnake hibernates in wet lowland areas. The Massasauga prefers aquatic habitats, especially wetlands, bogs or swamps; however, in the summer they can be found in dry upland areas and woodlands. This species of snake hides extremely well in swamps and as a result, sightings are rare in these locations.

On June 23<sup>rd</sup>, 2005, a special survey was undertaken to look for snakes on the property, in particular for the Massasauga rattlesnake. The survey involved a walk of the property to look for preferred Massasauga habitat and the presence of the species. Amphibian and reptiles were also searched for opportunistically during other field surveys.

### **2.3.3 Breeding Birds**

Breeding bird surveys were conducted on four occasions including surveys on June 12, 2003 and June 29, 2005, a specific owl survey on March 4, 2005, and a specific red-shouldered hawk survey on May 6, 2005. Breeding bird surveys were conducted in accordance with Bird Studies Canada Protocols. During the June 12, 2004 and June 29, 2005 surveys, weather conditions were partially overcast with a light breeze with an air temperature of approximately 18°C, and clear with no breeze with an air temperature of 25°C, respectively. The entire property was walked slowly and all birds seen or heard were documented. If birds were in suitable habitat within their normal breeding season, it was assumed that they were nesting on site.

Additionally, an owl survey was conducted between 5:45 pm and 9:00 pm on March 4, 2005 and consisted of the broadcast recording of owl calls on portions of the proposed license area. Each species call was played for 5 minutes with small breaks during the species call to listen for a response. The survey was completed according to methods outlined in the Nocturnal Owl Surveys in Central Ontario: A Citizen Scientists Guide (BSC, 1995). This involves playing a call back CD of the following owl species:

- Great Horned Owl (*Bubo virginianus*),
- Eastern Screech-Owl (*Otus asio*),
- Northern Saw-whet Owl (*Aegolius acadicus*),
- Barred Owl (*Strix varia*), and
- Long-eared Owl (*Asio otus*).

A red-shouldered hawk survey was conducted on May 6, 2005. A total of 8 survey locations were established based upon review of the existing ELC map. The call surveys, conducted according to Bird Studies Canada protocols, were initiated at approximately 7:15 a.m. and concluded at approximately 9:45 a.m. Skies were clear with the temperature becoming increasingly warm as the morning progressed (5-10+ °C). A slight wind (1-2 on the Beaufort scale) was noted in the open fields, but mainly absent in the woodland interior.

### **2.3.4 Terrestrial Wildlife**

Terrestrial wildlife investigation was conducted on the property with the assessment of vegetation and aquatic features. The surveys included breeding bird surveys, wildlife surveys and special features review (i.e. wildlife trails, animal concentrations, etc.). The information gathered during these surveys was further supplemented with data regarding terrestrial wildlife and habitat, obtained from:

- The Atlas of the Breeding Birds of Ontario (1987);
- The Atlas of the Mammals of Ontario (1994);
- ANSI data files;
- Consolidated Wetland Evaluations; and
- Ontario Ministry of Natural Resources - Natural Heritage Information Centre.

Winter surveys were conducted on March 4, 2005 to survey the property for wildlife and in particular deer and wild turkey. Inventories of wildlife were compiled from sightings as well as distinctive sounds and signs.

### **2.3.5 Endangered, Threatened and Special Concern Species**

Ontario status designations are the product of complementary review and assessment processes implemented at national and provincial levels. The national assessment process takes place under the auspices of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and Ontario has been an active participant on COSEWIC since its inception in 1978. The provincial review process is implemented by the OMNR's Committee on the Status of Species at Risk in Ontario (COSSARO), which includes non-OMNR representation. The purpose of this committee is to ensure a uniform, science-based, defensible approach to provincial status evaluations conducted for Ontario species.

Endangered and threatened species that may occur on or in the vicinity of the proposed license area were noted during the review of background information. These species were identified in the Level I Natural Environment Report and through personal communication with persons having knowledge of species in the region. As changes were made to the size of the extraction area and in response to updated NHIC information, an additional background review was conducted to ensure that all significant species had been considered.

The NHIC searches, conducted as part of the background review, revealed that three species of provincial significance are listed as occurring in the general area of the proposed expansion: Hart's-tongue fern (*Asplenium scolopendrium*), Butternut (*Juglans cinerea*), and Massasauga rattlesnake (*Sistrurus catenatus*).

Botanical surveys were conducted on the proposed license area on June 4 and August 28, 2003 and June 23, 2005 and September 1 and 2, 2005, and involved searching for the Harts-tongue fern and Butternut. Hart's-tongue ferns were found on June 4, 2003 and June 23, 2005. During the June 23, 2005 survey, the proposed license area was carefully and systematically searched for Butternut. The Butternuts found during the survey were recorded using GPS readings and trees were photographed and their health was assessed for visual signs of butternut canker.

Off-site field investigations were conducted in the Duntroon Escarpment ANSI, located to the north of the proposed license area, on November 26, 2003, to determine the presence and assess the population of Hart's-tongue fern and to determine the availability of suitable habitat for relocating specimens from the proposed extraction area.

The Massasauga rattlesnake survey was undertaken as described in **Section 2.3.2**.

### **2.3.6 Aquatic Resource Assessment**

Fisheries site assessments were completed on August 25, 2003, December 1, 2003, November 4, 2004, June 23, 2005, and September 22, 2005. The August 25, 2003 assessment involved the review of surface water features located on the proposed license area and adjacent lands within the Beaver Creek Watershed and two on-site ponds located in the Batteaux Creek watershed. The December 1, 2003 assessment involved the assessment of off-site aquatic features (downstream) in the Beaver River and Pretty River systems. The November 4, 2004 investigation included a brook trout spawning survey of the adjacent tributaries of the Beaver and Pretty Rivers and Batteaux Creek.

Fisheries habitat assessments information was recorded at stations along the study areas (**Figure 5**); observations were noted on the following attributes (where applicable):

- In-stream Cover
- Bank Stability
- Bankfull Width
- Wetted Width
- Substrate
- Stream Dimensions and Morphology
- Aquatic Vegetation
- Riparian Vegetation
- Adjacent Land use
- Water temperature, air temperature, dissolved oxygen and pH

A review of available fisheries data and assessment of the potential impact on Brook trout (*Salvelinus fontinalis*) from the discharge of groundwater from the proposed Duntrou Quarry expansion into the headwaters of the Batteaux Creek and Beaver and Pretty Rivers was also undertaken.

Electrofishing was conducted on August 25, 2003 on a tributary and two ponds adjacent to the proposed license area using a Smith Root Model 12 backpack electro-fisher. Electrofishing was also undertaken on September 22, 2005 in the Beaver River tributary (southwest) on the expansion lands and adjacent land to the south. Electrofishing allows for a more accurate determination of fish species that may be affected by the proposed quarry expansion and allows for better-tailored mitigation measures to be developed.

### **2.3.7 Surface Water and Hydrogeological Evaluations**

Jagger Hims Limited conducted surface water and hydrogeological studies, the results of which are presented in the detail in Geological Report and Level 2 Hydrogeological Assessment (Jagger Hims, 2005), which has been reviewed and, where appropriate, referred to herein.

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## **3.0 Regional Context-Overview of Natural Features**

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### **3.1 REGIONAL DESCRIPTION**

The proposed license area is located within the Niagara Escarpment physiographic region (Chapman and Putnam, 1984). The Niagara Escarpment physiographic region is one of the most prominent physiographic formations in Southern Ontario. The escarpment represents the edge of the Guelph, Amabel and Lockport geologic formations and is characterized by vertical cliffs and exposed bedrock that has been stripped of overlying soil materials. The Niagara Escarpment extends from the Niagara Peninsula, around Lake Ontario, and north to Georgian Bay. The characteristics of the Escarpment are variable along its length, with some sections being completely covered by aggregate materials commonly associated with moraines. In the vicinity of the proposed license area, the physiographic formations include dolostone plains and till moraines. The Subject Land lies to the west, within one kilometre of the brow of Niagara Escarpment where the Amabel Formation is near the ground surface.

Watersheds create natural divides for the hydraulic features associated with the proposed license area. As discussed in the supporting documentation, Geological and Hydrogeological Assessment (see Figure 2.1 in Jagger Hims, 2005), surface water surrounding the proposed license area flows away from the site in four directions: north, east, south and west.

The four watersheds in close proximity to the proposed license area are: Pretty River Subcatchment (northeast), Batteaux Creek Subcatchment (east), Mad River Subcatchment (south) and Beaver River Subcatchment (west). The Batteaux Creek and Beaver River subcatchments cover the majority of the proposed license area and surrounding lands. The Mad River subcatchment is south of the existing Duntroon Quarry. The Batteaux Creek, Pretty River and Mad River watersheds generally flow east down the Niagara Escarpment. The Beaver River watershed flows west through the Beaver Valley. Eventually, all systems flow north into Nottawasaga Bay.

The region surrounding the proposed license area is extensively forested. **Figure 3** shows a portion of the woodlands that are contiguous with the woodlands on the proposed license area. As can be seen on **Figure 3**, forested areas on the proposed license area are part of a massive, more than 24,000 ha, network of connected woodlands. This network includes the Kolapore/Duncan Mega Woodland to the northwest, which is outside the proposed license area.

### **3.2 NATURAL HERITAGE FEATURES IN THE REGIONAL CONTEXT**

This section discusses the natural features in the vicinity of the proposed license area as identified by the provincial and municipal authorities. An arbitrary 4km radius was used to define the Regional Context and major features identified within this radius are illustrated on **Figure 4**.

The lands surrounding the proposed Duntroon Quarry license expansion area contain a variety of identified features. Within 4km, there are: a provincially significant wetland (PSW) complex; regional Areas of Natural and Scientific Interest (ANSI's) and a provincial ANSI. Where impacts on these features from the proposed quarry expansion have been anticipated, mitigation measures are recommended in **Section 7** of this Report to ensure there is no negative impact

to these off-site features. This section, however, provides an overview of the natural features surrounding the proposed license area.

At least four wetlands or wetland complexes occur in the Regional Context of the proposed license area. The Rob Roy Swamp is a PSW complex of seventeen swamp communities generally located west and south of the proposed license area within the Beaver River subcatchment. An isolated pocket of the swamp is located within the proposed license area in the northwest corner, but it lies outside the proposed extraction area.

Additionally, there are two wetland communities that occur northeast of the proposed license area, in the Duntroon Escarpment Forest ANSI, which are not hydraulically connected to the Rob Roy Swamp PSW. There are also two large unevaluated wetland pockets to the south of the existing quarry. All of these features are outside the proposed extraction area.

Four ANSI's are located in the region, including one provincial ANSI: the Nottawasaga Lookout and three regional ANSI's: the Pretty River Valley South, the Pretty River Valley Moraine and the Duntroon Escarpment. The Pretty River Valley South ANSI occurs on the Niagara Escarpment slopes on the south side of the Pretty River Valley. The slopes vary in steepness and are generally northwest facing. Wetlands, on this site, include a small open water beaver pond, a small Common Cattail marsh along a stream near the central portion. The Pretty River Valley Moraine represents an adjacent parcel dominated by forest cover. Similar to the other forests in the area, the dominant tree species is the Sugar Maple. Wetlands include a variety of diverse meadow marshes at pond edges on the escarpment terraces. The Pretty River flows through this natural area as a non-vegetated riverine community. The Duntroon Escarpment Forest ANSI is listed on the NHIC website as an International Biological Program Site, which has special physical features including representative escarpment face, talus and rim complex and also possesses a high diversity of fern species including some uncommon species. The area possesses intermediate aged deciduous and mixed upland forests and thickets and shows evidence of past disturbances from fire and cutting. All of these features are outside the proposed extraction area.

## **4.0 Baseline Conditions - Natural Environment Features**

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### **4.1 SITE TOPOGRAPHY**

The proposed license area is located within the Niagara Escarpment physiographic region (Chapman and Putnam, 1984). The proposed license area has a gently undulating topography with a range in elevation from approximately 515-530m above sea level. The low point in the northwestern corner of the proposed license area has resulted in a wetland area. This wetland area is part of the Rob Roy Swamp Complex and drains to the west into the Beaver River subcatchment. Other slopes drain to the northeast to the Pretty River subcatchment to the east to the Batteaux Creek subcatchments, to the south and west to the Beaver River catchment and to the south and east to the Batteaux Creek catchment (see **Figure 5**).

### **4.2 SOILS**

A soil survey of the proposed license area was completed as part of the Agricultural Impact Assessment (Stantec, September 2005) to refine the existing county-level soil capability mapping.

The soil survey identified 5 soil types within the proposed license area, they include Otonabee Loam, Otonabee Shallow Phase, Lyons Loam, Farmington Loam and Muck. The predominant soil within the proposed license area is Otonabee Loam. Otonabee Loam soils are well drained and are developed from loam to sandy loam till parent material containing a moderate amount of stone. Within the proposed license area, Otonabee soils are identified on variable topography, with slopes ranging from 2-30%.

Otonabee shallow Phase soils were identified within the proposed license area. These soils are underlain by bedrock at depths between 30 and 50cm. Otonabee shallow Phase soils were identified in the southwestern portions of the proposed license area in association with Farmington soils.

Lyons loam soils were identified within the proposed license area, are developed from sandy loam or loam till parent materials and are poorly drained. Lyons loam soils were identified in several locations within the proposed license area, on topography ranging from 0.5-5%.

Farmington loam soils were identified in several locations within the proposed license area and are developed on shallow loam till over limestone bedrock. Farmington soils are underlain by bedrock at depths less than 30 cm and exhibit variable drainage. Within the proposed license area, Farmington soils were identified in seven distinct areas located in the central, southwestern, and southeastern portions of the property.

Muck soils were identified in two locations within the proposed license area. These soils were identified in association with low-lying forested areas along the northern and northeastern boundary of the proposed license area, outside the proposed extraction area. Muck soils are organic, and develop over time under wetland conditions.

### **4.3 AGRICULTURAL LANDS**

In April 2004, Stantec Consulting prepared a detailed Agricultural Impact Assessment for the project. Detailed descriptions of the soils on the proposed license area are provided in Section 4.2 of that report. In summary, the assessment states that the soils of the region generally have limitations for agricultural production due to shallowness to bedrock, topography, and fertility and moisture limitations.

The proposed license area consists of a mix of agricultural production lands, forested lands, idle and scrub lands, homes and farm buildings. Agricultural production lands are scattered throughout the proposed license area. Non-farm residential development occurs around the proposed license area in the form of single severances.

Additional agricultural information including a detailed soil survey is available in the Duntroon License Expansion Agricultural Assessment (Stantec, 2005).

### **4.4 HYDROGEOLOGY**

The following hydrogeological information has been summarized from the Geological and Hydrogeological Assessment (Jagger Hims, 2005). Ontario Base Mapping for the area was compiled for a radius of approximately 3.5km around the proposed license area. Surface water subcatchment boundaries were interpreted from this information. The proposed license area is located in or adjacent to four subcatchment drainage basins:

- Batteaux Creek;
- Beaver River;
- Pretty River; and,
- Mad River.

The proposed license area forms part of the surface water divide between the drainage basins of Batteaux Creek to the east and the Beaver River to the west. The drainage basin for the Pretty River occurs to the north, and the Mad River to the south. Several headwater streams for these rivers occur within the general vicinity of the proposed license area. All subcatchments eventually drain into Nottawasaga Bay to the north.

The proposed license area includes local topographic high points in centre-east and centre-west areas, and groundwater movement occurs radially away from the high ground. Several springs (groundwater discharge areas) occur outside the proposed extraction area around the escarpment to the northeast, east and southeast of the proposed license area. The springs usually occur within or near to the base of the Amabel Formation and/or the Manitoulin Formation. Groundwater discharge provides stream baseflow to the perennial sections of the watercourses around the proposed license area. Streamflow and discharge at the surface springs is highest during the spring season and decreases significantly during the summer and fall in response to seasonal climatic change.

Surface flow in the wetland area to the east of the proposed license area is seasonal in nature, and generally stops in June. The surface flow, when present, infiltrates into the ground (the bedrock is near the surface) in the low point within the wetland near the eastern limits of the proposed license area.

Surface flow monitoring locations established by Jagger Hims are shown in **Figure 5**. More detailed descriptions of the surface water and groundwater regimes, including hydrographs for the surface water monitoring stations, are provided in the Geological Report and Level 2 Hydrogeological Assessment (Jagger Hims, 2005).

#### **4.5 AQUATIC RESOURCES**

Aquatic habitat surveys were completed within the proposed license area as well as downstream locations in the Batteaux Creek, Beaver River and Pretty River systems. An isolated tributary that originates in the Camarthen Wetland and terminates at a sinkhole was also surveyed. Aquatic habitat surveys were not undertaken in the Mad River system as this watershed was determined to be beyond the zone of any impact of the proposed expansion area. The following sections describe the on-site aquatic habitats, within the licensed area and the downstream aquatic habitats, in the three above-noted adjacent watersheds. The locations of aquatic features are shown on **Figure 5**.

##### **4.5.1 On-site Aquatic Habitats**

There are four aquatic habitat features that occur within the proposed license area. These include 2 ponds; the Bridson Pond and Millar Pond (named for former property owners), and two tributaries of the Beaver River, hereafter referred to as the Beaver River tributary - southwest and Beaver River tributary - northwest.

###### **4.5.1.1 On-site Ponds**

###### **Bridson Pond**

Bridson Pond is located near the eastern limits of the proposed license area (**Figure 5**). This pond was originally dug for the watering of livestock. However, it is no longer used for this purpose and its current use it is used largely as a recreational feature for activities such as swimming. A number of recreational structures were found at the pond including a small dock, a ladder and an old log shelter.

At the time of the survey (August 25, 2003), the pond was approximately 15m in diameter with a maximum depth of less than 1m. The substrate was comprised of clay, sand and gravel overlain with a layer of silt. Underwater cover was provided by submergent vegetation. Some emergent aquatic plants, such as water lily, cattails and rushes were also present along the edge of the pond.

The riparian zone is approximately 1m wide and is comprised of a variety of emergent aquatic plants and terrestrial vegetation dominated by, herbaceous species with a few small willow shrubs. A 10-20m swath of land surrounding the pond was mowed lawn. Beyond the manicured area, the surrounding vegetation community was old-field to the south, a white cedar swamp to the northwest and a sugar maple forest to the west.

Water is supplied to the pond via overland conveyance of surface runoff from the west and from a small spring in pond or in a channel upstream. During high water levels, the pond overflow discharge occurs to the northeast through an outlet culvert, which was approximately 30cm above the water level during the time of the August 25<sup>th</sup> survey. When surface water discharge occurs, it drains towards the wetland area on the Bridson property and infiltrates into the bedrock within the wetland near Jagger Hims monitoring location SW9. Water quality parameters recorded *in situ* on August 25, 2003 using a WTW multi-line field meter included:

- pH = 7.70
- Dissolved oxygen = 5.05mg/L
- Water temperature = 22.2°C
- Ambient air temperature = 28 °C

The pH and dissolved oxygen recorded from the Bridson Pond were at concentrations able to sustain aquatic life as determined in the Provincial Water Quality Objectives (PWQO).

It is probable that algae and duckweed proliferate in the pond during the summer months when flows cease and the water becomes stagnant; however, these characteristics were not observed during the survey. It is possible that the lack of algae was due to the maintenance of the pond to improve swimming conditions.

One goldfish was observed in the pond, and it was reportedly stocked in the pond. The pond is an isolated feature that does not accept flow or discharge flow to a defined watercourse.

### **Millar Pond**

This pond, like the Bridson pond, was dug to hold surface runoff for livestock use. The main source of water is from nearby springs, one of which is used for drinking water.

The Millar pond (**Figure 5**) is smaller than the Bridson pond, approximately 6m in diameter and shallow with a maximum depth estimated at 30cm during August 2003. The substrate was muck and submergent vegetation completely covered the pond where water depth was adequate. Algae and duckweed were also abundant in the pond.

The pond is located along the edge of a sugar maple forest that slopes into a white cedar swamp community to the northeast with old-field community surrounding the remainder of the pond. The previous landowner stated that in drier summers this pond completely dries up. When surface water discharge occurs, it drains toward the white cedar swamp and infiltrates into the bedrock near the same area as the Bridson Pond at SW9.

Pond water quality parameters recorded in-situ on August 25, 2003 using a WTW multi-line field meter, included:

- pH = 8.30
- Dissolved oxygen = 2.29mg/L
- Water temperature = 25.2°C

- Ambient air temperature = 28 °C

The pH recorded from the Millar Pond was within the acceptable range of concentrations able to sustain aquatic life as determined in the PWQO; however, dissolved oxygen levels were considerably below the 4mg/L objective for warm water biota.

The pond is an isolated feature that does not accept flow or discharge flow to a defined watercourse. In addition, it is subject to desiccation during the summer periods.

### **Beaver River Tributary System**

#### **Beaver River Tributary - Southwest system**

A headwater tributary to the Beaver River is located along the southwest corner of the proposed license area (**Figure 5**). Flow in the tributary has been monitored by Jagger Hims (2005) at SW2 and the site has been observed numerous times during visual surveys. In general, year-round flows were observed at this location, although the channel was, in some areas, not well-defined and overgrown with vegetation. Where a flowing channel was observed, average wet width was approximately 30cm with a maximum water depth of 5cm. Substrate was largely mineral soils with pockets of gravel and cobble near the road upstream of Simcoe Road 91. No fish were observed in this reach upstream of Simcoe Road 91 during visual surveys of the creek on August 23, 2004 and March 4, June 23, September 1, 2005. No fish were encountered during electrofishing on September 22, 2005.

During the August 25, 2003 survey, water quality parameters recorded in-situ using a WTW multi-line field meter and included:

- pH = 7.70
- dissolved oxygen = 8.49mg/L
- water temperature = 14.2 °C
- ambient air temperature = 28 °C

The pH and dissolved oxygen levels recorded in the tributary met the required targets for sustaining aquatic life as determined in the PWQO; however, the poor quality of the discontinuous channel and downstream culverts isolated the area from downstream fish habitat.

The feature crosses Simcoe Road 91 just east of the Grey Road 31, where it continues to flow through the adjacent wetland through a diffuse, braided channel. Immediately south of Simcoe Road 91, where a channel is evident, the creek was observed to be slow-moving with a width of approximately 0.75m and a depth of 2-5cm. Substrate consisted mostly of muck with some silt and woody debris. Riparian vegetation consisted of swamp conifers, hardwoods and an understory of tall herbaceous plants such as Joe-pye weed, jewelweed and various nettle species. After approximately 25m, the stream channel became diffuse and undefined as it entered the swamp that is adjacent to the current quarry. Several hundred metres later, periodic flow has been observed under Grey Road 31 west of the existing quarry property, as documented in Jagger Hims 2005. No flows were observed at this location on August 25, 2003 and September 22, 2005. Metal screens with an approximately 5cm<sup>2</sup> mesh covered both

culverts at this road crossing. West of Grey Road 31, downstream of these culverts, a better-defined tributary emerged. No fish were observed in the channel immediately downstream and upstream of the culvert on Grey Road 31 on August 23, 2003 and June 23 and September 22, 2005. Further details concerning the downstream aquatic habitats in this southwest system, are included in **Section 4.5.2**.

The fish habitat available in the portion of the watercourse upstream of Simcoe Road 91 and between Simcoe Road 91 and Grey Road 31, is negligible due largely to the diffuse and often low flows and poor channel development. The poorly developed channel downstream of Grey Road 31 and the grates placed on the culverts under Grey Road 31 also restrict fish migration.

#### Beaver River Tributary - Northwest system

A small intermittent tributary to the Beaver River is also found in the northwest corner of the proposed license area (**Figure 5**). The tributary was observed to be dry during several field surveys of the proposed license area. Jagger Hims surface water station SW3 recorded seasonal intermittent and low flows. The lack of flow in this tributary and a poorly developed channel upstream of Grey County Road 31, severely limits its significance as fish habitat.

### **4.5.2 Downstream Aquatic Habitats**

#### **Fisheries Survey of the Headwaters of Beaver and Pretty Rivers and Batteaux Creek**

Available fisheries data were reviewed, and site investigations undertaken to assess potential habitat for Brook trout (*Salvelinus fontinalis*) in the headwaters of the Batteaux Creek, and Beaver and Pretty Rivers. In addition, a small tributary within the isolated catchment surrounding Camarthen wetland was surveyed for potential fish resources.

##### **4.5.2.1 Batteaux Creek Tributary – Southeast system**

A trout spawning survey was undertaken on November 3, 2004 where the tributary of the Batteaux River enters the culvert at Concession 10 (**Figure 5**). The portion of the tributary surveyed was almost entirely contained within the Duntroon Highlands Golf Course. A small portion of the northernmost branch of the creek was on private property north of the golf course but it is above an irrigation pond for the golf course that would act as a barrier for brook trout.

The survey started at 10<sup>th</sup> Concession and headed west upstream. Water temperature at the start of the survey was 8°C. The tributary was approximately 1m wide; substrate was sand and silt in pools. Substrate in riffles and runs consisted of gravel and cobble; the lower portion of the tributary was almost entirely covered by a canopy of cedars and/or hardwoods. Numerous cyprinids were spotted throughout the lower portion of the tributary. Midway through the survey a brook trout (length approximately 8cm) was observed, but due to its size, it was likely immature. Throughout the lower portion of the tributary, numerous run/pool areas with suitable current speed and substrate for brook trout spawning were found. While potential spawning areas were found, no redds or mature brook trout were observed during the survey.

Above the midway point of the tributary survey, there were numerous barriers preventing the movement of brook trout. No fish were observed above the barriers, and it was unlikely fish were in this area. Due to the high gradients and barriers, there was little habitat suitable for fish. The tributary started as a spring from the escarpment. A southern branch of the tributary is

indicated in topographic maps and Ontario base maps but this is a temporary stream that would not have flowing water during brook trout spawning.

### **Batteaux Creek Tributary - Northeast system**

Two tributaries of the Batteaux Creek northeast system that crosses Concession Road 10 (**Figure 5**) were surveyed on September 22, 2005. The more northerly of the two tributaries was observed near Concession Road 10 as having a defined but not deeply incised channel that flowed through cattails, wet meadows and farmland. Flow was low volume, but quick due to the steep grade coming off the Niagara Escarpment. Immediately east of Concession 10, the watercourse flowed out from an elevated culvert over a patch of cobble-sized substrate into a wide deep pool (approximately 2.5m wide by 0.75m deep), which emptied into a Hickenbottom drain. The watercourse ceased to exist at this point, and a grassy swale was present where the previous path of the watercourse existed. The enclosure of the watercourse has eliminated fish habitat at this location.

The tributary further to the south was observed to be bound in a deep ravine with sides heavily vegetated in wet meadow species, cattails, and willow trees. In addition to having steep side slopes, the channel grade is also quite steep, causing the minimal flow that existed in the channel to have a high velocity. The watercourse was well shaded, and had gravel and rock substrate and channel features such as overhanging vegetation, which would contribute to fish habitat during times of the year when flows are sufficient to allow fish passage and support aquatic insects. During the September 2005 field survey, there was insufficient flow to support fish through this reach; however, fish were observed in this tributary during cursory reviews in early summer.

### **Pretty River Tributary**

A reach of the Pretty River tributary upstream of SW17 (see **Figure 5**) was surveyed on September 22, 2005. This watercourse originates in seeps coming down off the Niagara Escarpment. It crossed 26/27 Sideroad and converged with another Pretty River tributary. The tributary had a defined channel, but exhibited very little flow during the survey. During any time of the year (particularly spring and fall) when the water level is elevated, it is likely that portions of this area provide direct fish habitat as juvenile brook trout (with par markings) were observed in significant numbers within 50m of the confluence (SW17) of the two watercourses. Substrate is primarily gravel and bedrock and the riparian area is mostly upland hardwoods such as sugar maple. The steep slope along the Niagara Escarpment where this watercourse originates may cause fish passage to be limited to areas lower in elevation, but due to the proximity of the trout, it is likely that fish use part of this stream at some time during the year. The substrate and morphology characteristics of the stream parallel and north of Sideroad 26/27) were typical of brook trout streams, with most of the streambed composed of gravel underlain with clay. Morphology was diverse, with extensive undercutting of banks and approximately equal riffle, pool and run distribution.

A second tributary that crosses Sideroad 26/27 further to the east of SW16 (see **Figure 5**) was similar to the above noted watercourse in that it originated on the Niagara Escarpment and flows a short distance to converge with the larger Pretty River tributary immediately north of Sideroad 26/27. It flowed through farmland and open swamp areas for most of its length and has a channel that was defined but not deeply incised. At the time of the survey, September 22,

2005, very little water was flowing in the channel, but the flow that existed was fast due to the gradient. Substrate consisted mostly of bedrock and gravel south of the sideroad, and muck, gravel and sand south of the sideroad in the swamp areas. Due to its proximity to the Pretty River tributary north of Sideroad 26/27, it is likely that the brook trout present in the tributary had access to, and use of, this reach at times of the year when flows are greater.

### **Beaver River Tributary - Southwest system**

A spawning survey was undertaken downstream of the Osprey Quarry Property (**Figure 5**). This is an undeveloped but licensed quarry property owned by Georgian Aggregates to the west of the existing Dunroon Quarry. The area surrounding the starting point of the survey was an active pasture with cattle drinking from the tributary and crossing the tributary to access pastures to the north. No overhanging canopy of the tributary was found in the pasture area. Substrate in the tributary in this area consisted of sand with silt on the edges in the narrower areas or silt with organic materials in wider slower areas of the tributary. Small areas of gravel and cobble were interspersed in the tributary found in the pasture. Due to the presence of cattle accessing the tributary to drink and cross to the north side, silt was common on the limited areas of gravel. Current speed in the tributary was approximately 15cm/s and water temperature was 6.5°C. No fish were observed in the tributary within the pasture area. Limited spawning substrate was available for brook trout in the tributary influenced by the pasture; however, due to the active use of the tributary by cattle, and the siltation of the tributary due to the cattle, hatching success in the area would be minimal.

Upstream of the pasture, the tributary meandered through a cattail marsh with a beaver pond found midway. As with the pasture portion of the tributary, no overhead cover was found, although the banks were stable. Substrate in this region was dominated by organic material and silt, with no gravel or cobble found.

The tributary of Beaver River splits into two branches in the cattail marsh. The northern branch included pumped flow from the existing Georgian Aggregates Quarry east of Grey Road 31. The southern branch started in the vicinity of Camarthen Farms, flowed under the Grey Highlands 10<sup>th</sup> Line to a cattail marsh interspersed with cedar and hemlock. The water temperature at the split in the tributary was 6.2°C.

The survey continued up the north branch of the tributary where flow was being augmented with water pumped from the existing quarry. Upstream of the split, the tributary habitat changed from cattail marsh to a marsh interspersed with cedar and hemlock. While the overhead canopy increased, no brook trout spawning substrate was found as substrate continued to be dominated by organic material and silt. Survey continued to the outflow pipe of Georgian Aggregates at Grey County Road 31. Water temperature at the outflow pipe was 10°C.

The tributary from Camarthen Farms passed through open pasture flowing into the marsh/swamp north of Grey Highlands 10<sup>th</sup> Line, via the culvert under Grey Highlands 10<sup>th</sup> Line. No fish were observed in the tributary, and no substrate suitable for brook trout spawning was found upstream of the area where the tributary passed through the pasture. The substrate consisted of silt and or organic material with no cobble or gravel observed.

Spawning surveys were also conducted at several locations further downstream where the Beaver River tributary-southwest, crosses the Osprey 10<sup>th</sup> Line. Although brook trout redds

were not observed, substrate and suitable habitat were noted. Trout fisheries may exist at these downstream locations in reaches having suitable habitat characteristics.

**4.5.3 Camarthen Wetland Tributary**

At the most southern end of the Camarthen Wetland, a small tributary formed a well defined channel approximately 700m north and upstream of SW26 (**Figure 5**). When surveyed in June 2005, this tributary entered a sinkhole at SW26; which is believed to emerge below the escarpment brow in the Batteaux Creek system. The channel was approximately 1.5m wide, with a depth of 0.1-0.25m. Substrate was primarily gravel, cobble, with some boulders. The stream consisted of shallow runs and riffle areas with few pools. There was little evidence of undercut banks. It occurred entirely within the wetland/forest area and 100% canopy cover was found throughout its reach. An old road crossed the tributary approximately 500m upstream of the terminus (SW26) where two 300mm culverts were found. This road generally divided the wetland area to the north from the upland deciduous forest to the south. Downstream of the road, the creek entered a distinct valley with a depth of 2-3m and vegetation cover of upland deciduous forest. The stream channel was increasingly dispersed and undefined upstream of the road within the wetland area. Small fish species were observed in the stream near the two culverts.

**4.6 VEGETATION COMMUNITIES**

**4.6.1 Vegetation Communities**

The majority of the forested portion of the proposed license area was characterized as sugar maple forest, which occurred on elevated, dry to fresh topographic locations. Lower-elevation areas along the northern fringe of the lands had fresh to moist sugar maple-hardwood forest cover which, downslope, graded into either deciduous (red maple, ash, elm) or mixed (white cedar, yellow birch, ash, aspen) swamp communities. Old field meadows, thickets and pine plantations represented cultural communities. **Table 2** includes descriptions of the vegetation types identified on/adjacent to the proposed license area as well as ELC designations. The locations of these vegetation communities are shown on **Figure 6**.

<b>Table 2. ELC Vegetation Types</b>	
<b>ELC Vegetation Type</b>	<b>Description</b>
<b>DECIDUOUS FOREST (FOD)</b>	
<b>FOD5-1</b> Dry-Fresh Sugar Maple Deciduous Forest	An intensively managed, medium aged and simply structured forest, almost exclusively dominated by sugar maple with very limited occurrences of white ash and beech. The shrub layer was composed of maple saplings, choke cherry and red-berried elderberry. The herb layer was dominated by species such as yellow dog's-tooth violet, blue cohosh, pale-touch-me-not, herb Robert, downy yellow violet, wild leek, enchanter's nightshade and spinulose wood-fern and included Hart's-tongue fern.

<b>Table 2. ELC Vegetation Types</b>	
<b>ELC Vegetation Type</b>	<b>Description</b>
<b>FOD5-2</b> Dry-Fresh Sugar Maple-Beech Deciduous Forest	Located just inside of the northeastern boundary of the proposed license area, and extending outside the proposed license area to the north and east, a young, regenerating stand of sugar maple on very shallow soil over bedrock. Other woody species included beech, white ash and chokecherry. Relatively few plants grew on the forest floor, the most abundant being yellow dog's-tooth violet and white trillium.
<b>FOD5-4</b> Dry-Fresh Sugar Maple-Ironwood Deciduous Forest	A small, somewhat disturbed stand located along Simcoe Road 91, composed of sugar maple, ironwood, beech, black cherry, elm and ash. The shrub layer included ironwood, beech, white ash, alternate-leaved dogwood and prickly gooseberry. The herb layer was dominantly yellow dog's-tooth violet, blue cohosh, white trillium, wild leek, sharp-lobed hepatica and false Solomon's-seal.
<b>FOD6-5</b> Fresh-Moist Sugar Maple-Hardwood Deciduous Forest	Located in low, moist, bottomland positions, this type was dominated by sugar maple, with admixtures of yellow birch, white and green ash, beech and white elm. The shrub stratum was composed of ash, elm, choke cherry and red raspberry. The herb layer was rich, with such species as ostrich fern, sensitive fern, Hart's-tongue fern, wood nettle, bulbet bladder fern, enchanter's nightshade, calico aster, fowl meadow grass. The patch of this community type located in the northeast corner of the lands was open in places and disturbed by cattle grazing.
<b>FOD 7-2</b> Fresh-Moist Ash Deciduous Forest	A small woodlot composed of young green ash, trembling aspen and balsam poplar. The shrub layer included saplings of aspen, ash and elm, together with alternate-leaved dogwood and red-osier dogwood. The herb layer was dominated mostly by introduced species - weeds of European origin.
<b>CULTURAL (CU)</b>	
<b>Cultural Plantation (CUP)</b>	
<b>CUP3-3</b> Scotch Pine Coniferous Plantation	Moderately aged stand, located on a northerly slope, on shallow loamy soil over bedrock. Scotch pine was the main species in the dense tree canopy, with minor presence of trembling aspen and young sugar maple. Sugar maple saplings, chokecherry, hazel, and balsam fir grew in the shrub layer. The herb stratum had species such as yellow dog's-tooth violet, dandelion and Christmas fern.
<b>Cultural Meadow (CUM)</b>	
<b>CUM1-1</b> Dry-Moist Old Field Meadow	Forb and graminoid dominated, floristically diverse meadows developing on formerly agricultural land or in disturbed areas. These communities represent early-development stages of secondary vegetation succession. The dominant plants were Canada goldenrod, awnless brome, orchard grass, red top, timothy, calico aster, dandelion and many other species, mostly weeds of European origin.
<b>Cultural Thicket (CUT)</b>	
<b>CUT1</b> Mineral Cultural Thicket	Young communities regenerating towards sugar maple forest. The tall shrub layer was dominated by sugar maple, hawthorn, black cherry, eastern white cedar and apple, while the lower shrub layer included red-osier dogwood and chokecherry. Yellow dog's-tooth violet, downy yellow violet, calico aster and tall hairy agrimony dominated the herbaceous layer.

Table 2. ELC Vegetation Types	
ELC Vegetation Type	Description
<b>Cultural Savanna (CUS)</b>	
<b>CUS1</b> Mineral Cultural Savanna	Groups of remnant sugar maple trees left amidst pastures to provide shade for cattle. There is virtually no shrub layer, and the herbs are represented by widespread and weedy species such as herb Robert and garlic mustard.
<b>DECIDUOUS SWAMP (SWD)</b>	
<b>SWD2-2</b> Green Ash Mineral Deciduous Swamp	Young to medium-aged forest dominated by green ash, with a high admixture of white elm, and smaller amounts of red maple, yellow birch, silver maple and balsam poplar. The shrub layer was well developed, and composed of elm, ash, balsam fir, silver maple and basswood. The herbs were represented by sensitive fern, yellow dog's-tooth violet, wood nettle, calico aster, spotted Joe-pye-weed, white snakeroot, woolly blue violet, and fowl meadow grass.
<b>SWD3-2</b> Red Maple Mineral Deciduous Swamp	Red maple-dominated swamp, flooded in the spring with up to 40 cm of water. A medium to old age, well structured community. Canopy sub-dominants included silver maple and yellow birch. The shrub layer was composed of red and silver maple saplings, yellow birch, elm, red-osier dogwood and balsam fir. The herb layer during spring flooding was only developed around elevated tree bases, but during the summer drawdown covered the entire forest floor, where it was represented by sensitive fern, dwarf raspberry and spinulose wood fern.
<b>MIXED SWAMP (SWD)</b>	
<b>SWM1-1</b> White Cedar-Hardwood Mineral Mixed Swamp	Balsam fir, yellow birch, green ash and trembling aspen accompanied eastern white cedar. Shrubs included choke cherry, round-leaved dogwood, as well as saplings of cedar, ash and birch. The herb layer was rich and composed of sensitive fern, wood fern, spotted Joe-pye-weed, spotted touch-me-not and bitter nightshade.
<b>SWT 2-5</b> Red-osier Mineral Thicket Swamp Type	Tree cover was less than 25% and the shrub layer was dominated by mostly hydrophytic species such as red-osier dogwood and willows.

#### 4.6.2 Vascular Plant Species

Field surveys carried out on the proposed license area recorded 120 species of vascular plants. Of these, 87 (73%) are native species, and 33 (28%) are exotic. All but two species are ranked S5 in Ontario (common and secure in the province). A complete list of plant species recorded from the proposed license area is provided in **Appendix A**.

Two species of provincial significance, Butternut (*Juglans cinerea*; S3?, *Endangered*) and Hart's-tongue fern (*Asplenium scolopendrium* 2; S3), were identified in the proposed extraction area.

The unpublished NHIC field notes (Jalava et al., 1993) indicated that the Duntroon Escarpment ANSI, part of which occurs on the proposed license area, contains the regionally and locally rare green spleenwort (*Asplenium viride*), male fern (*Dryopteris filix-mas*) and the locally rare pedicelled hawthorn (*Crataegus pedicellata*). These were not found on the proposed license area.

Another locally significant species recorded was tall goldenrod (*Solidago altissima*), ranked R4, which was found sparingly in open wetland communities, such as the White Cedar-Hardwood Mineral Swamp (SWM1-1 on **Figure 6**).

### **Butternut**

The Butternut occurs in eastern North America, ranging from Georgia, Alabama, Mississippi and Arkansas west to Iowa and Missouri, north to southern Ontario and Quebec, and east to New England. In Ontario it is found throughout southwestern Ontario north to the Bruce Peninsula and the edge of the Pre-Cambrian shield.

Butternut commonly grows on rich loamy soils in mixed hardwood forest and are normally found scattered at low density in forests. Historically, they have declined as forests have been cleared. Today, the main threat to Butternut is a serious fungal disease called Butternut Canker, which was first found in Ontario trees in 1991, but has been in North America for about 50 years. It is thought to have arrived accidentally in infected plants imported from overseas. The fungus can kill a tree within a few years of infection. It enters through cracks or wounds in the bark and multiplies rapidly, making sunken cankers that expand and girdle the branch or trunk, killing everything above the canker. Fungus spores can be transported in wet weather for miles, and the disease can spread quickly. In southeastern states such as Tennessee, the disease has already killed about 80% of the Butternuts. In Ontario, surveys in eastern Ontario show that most trees are infected, and perhaps one-third have been killed.

Butternut does grow in some national and provincial parks in Ontario where trees receive protection from cutting. Most trees, however, are on private land. There is no known cure for the canker disease, nor any effective techniques to slow or prevent the spread of the disease. The Ontario Forest Gene Conservation Association has established a Butternut Conservation Group, and one of its main objectives is to locate disease-resistant individuals and use these to propagate tree seedlings for planting (Royal Ontario Museum and the Ontario Ministry of Natural Resources, 2005). Currently no butternut selections are available that have known canker resistance. A few healthy butternut trees have been found growing among diseased and may be resistant to the disease. Seedlings planted in areas where the disease is not present, likely will survive (USDA, 1996).

The federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) currently ranks butternut (*Juglans cinerea*) as Endangered, although it has not yet been added to Schedule 1 of the Species at Risk Act, pending public consultation. In Ontario, it is designated as Endangered, but has not been added to regulations under the Endangered Species Act.

Two mature butternut and 5 saplings were identified in the proposed license area (**Figure 7**).

### **Hart's-tongue Fern**

Hart's-tongue fern (*Asplenium scolopendrium americanum*) is ranked R3 in the NHIC database. It is a perennial evergreen fern that usually grows in rocky areas, particularly on limestone rock outcrops in maple-beech forest. It is distinct from other Canadian ferns due to the long, strap-shaped fronds. Spores are produced from May through August and can disperse widely from the parent plant. Established plants can grow in exposed, rocky crevices and outcrops, but moist, mossy areas seem to be essential for spore germination and early plant development (Royal Ontario Museum, 2005).

Hart's-tongue fern is found in the northern hemisphere, and it is broadly split into the European variety and the American variety. American Hart's-tongue ferns are found at disparate sites in New York, Michigan, Tennessee, Alabama and Ontario. Ontario has the bulk of the North American populations; the species has been reported at more than 70 sites here, mostly on the Niagara Escarpment (Royal Ontario Museum, 2005). Many of the sites are in the general vicinity of the proposed quarry expansion.

Hart's-tongue fern is a strict calciphile (needs a basic, i.e., non-acidic, substrate). It is generally found only at sites on or near dolomitic limestone. Plants usually occur in damp crevices and on mossy, rock outcrops. In Ontario, many populations are found on steep, moderately moist slopes that face north to northeast, have calcareous soil derived from limestone bedrock and are under a hardwood canopy cover (Environment Canada, 2004a). American hart's-tongue fern reproduces only via spores. Sporelings apparently require the presence of cool, moist calcareous environments for development (Crispin and Penskar 1990). Bryophytes appear crucial to the survival of American hart's-tongue fern sporelings (Cinquemani-Kuehn and Leopold. in review). Bryophyte beds apparently enhance seedling regeneration, providing a favorable site for fertilization, spore germination, and gametophyte growth. Reduced temperature extremes and moisture maintenance likely protect *P. scolopendrium* from desiccation during its early stages of growth. Herbaceous cover also apparently affects American hart's-tongue fern. Cinquemani-Kuehn and Leopold found that most adult plants were found beneath 0-25 percent herbaceous cover, while most sporelings were found beneath a higher percentage (26-50 percent) of herb cover. Few individuals of any life stage were found where herbaceous cover exceeded 75 percent.

Hart's-tongue fern was found in several areas in the southwest-central sectors of the proposed extraction area (see **Figure 7**). The first population of approximately three-dozen was recorded in a 10m x 10m area adjacent to the south side of the access road along an intermittent watercourse. The ferns were growing on open limestone outcrops on the bottom of the valley within unit FOD6-5. The second population was recorded about 30m to the north, within unit FOD5-1, where several dozen specimens were growing in limestone outcrop crevices. The third population, also composed of several dozen plants, was recorded just to the west of the second population. In total, more than 100 plants were recorded in what appeared to be healthy populations.

Additional populations were encountered in the west central portion of the site in the dry-fresh sugar maple deciduous forest. This was an extensive population with hundreds of individuals plants observed growing on exposed limestone boulders and crevices on a slope facing generally north.

A literature search was conducted to identify potential locations of Hart's-tongue fern in the Duntroon Escarpment ANSI and a local naturalist from Owen Sound, Mr. Nelson Maher, was contacted. In a telephone conversation, he reported that, during his summer 2003 inventory, while on contract with the Ontario Ministry of Natural Resources, he did not confirm the presence of Hart's-tongue fern in the Duntroon Escarpment ANSI.

According to the ecology of Hart's-tongue fern, the species is most likely to be found in two types of habitats that occur in the vicinity of the proposed license area: (1) within the closed canopy sugar maple forest on shallow soils with bedrock outcrops at surface, a habitat similar to

that found within the proposed extraction area where large populations of hart's-tongue fern occur, and (2) in more open rocky or boulder habitats on talus slopes.

A survey of the ANSI was conducted on November 26, 2003; weather conditions were good, with a thin layer of snow on the ground slightly covering the ground herbs. The search effort concentrated on the eastern half of the ANSI. Slopes were walked along their entire length and the plateau forests were also checked.

During the survey, Hart's-tongue fern was found at two sites, about 100m apart. The first was a young sugar maple deciduous (FOD 5-1 on **Figure 7**) forest, located on a 15° northeast-facing slope, composed of large (0.5-2.0m across) boulders. The population consisted of at least 30 Hart's-tongue fern plants and the plants appeared to be healthy and the population self-sustaining.

The second location contained only one specimen of the fern; the habitat was a mixed white cedar-white birch forest on a steep northeast slope.

## **4.7 WILDLIFE**

Fifty-nine species of birds and casual observations of eleven mammals were recorded in the proposed license area. No nationally, provincially or regionally significant species were encountered. A complete list of the wildlife observed is provided in **Appendix B**.

### **4.7.1 Breeding Birds**

Of the 59 species of birds recorded from the proposed license area, all are ranked S5, very common and demonstrably secure in Ontario, with the exception of the pileated woodpecker, which is ranked S4/S5, common to very common in Ontario, and the wild turkey, veery and bobolink, which are ranked S4, common and apparently secure. Other exceptions include the European starling and house sparrow, which are ranked SE (exotic and not a native component of Ontario's fauna), and the snow bunting, which although it's status has not been confirmed, there are no clearly definable occurrences of breeding in the province.

Three locally significant open country species were found. These species are common in southern Ontario and in the County, and suitable habitat is present on agricultural and rural lands surrounding the site. Sixteen of the 59 species are considered to be area sensitive birds requiring a specific wooded area as preferred breeding habitat. The area requirements are included in Appendix A.

Although the regionally rare black-throated blue warbler (Riley 1996) was identified as a potential concern in the Level 1 assessment (ESG 2003), it is presently not considered to be regionally rare. The Blackburnian warbler is considered regionally rare and was identified on the Proposed license area. No nationally, provincially or regionally significant species were encountered during the breeding bird surveys.

Nine wild turkeys were sighted in the winter survey and a turkey nest with eggs was also found.

#### **4.7.2 Mammals**

Scattered evidence of wildlife was found throughout the site during all fieldwork and whitetail deer and porcupine were sighted.

No mammals were directly observed during the winter survey; however, species presence was derived from secondary evidence (i.e. tracks, scats, calls, etc.). Eleven mammal species were recorded in this fashion, including: white-tail deer, red squirrel, woodchuck, coyote, raccoon, grey squirrel, mink, eastern cottontail rabbit, red fox, short tailed shrew and snow shoe hare.

#### **4.7.3 Herpetofauna**

Few amphibians and no reptiles were observed during field surveys conducted for this purpose despite thorough searches of suitable habitat locations. Visual observations were limited to woodfrog and leopard frog. Spring peepers were heard calling in the vicinity of unit #2 of the Rob Roy Wetlands Complex. Potential reptile habitat was searched but no reptiles were encountered. It is assumed that representative populations of these animals occur on the proposed license area as well as adjacent lands.

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## 5.0 Analysis of Natural Heritage Features

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### Provincial Policy Statement

The seven natural heritage features to be considered under the ARA are defined in Policy 2.3 of the Provincial Policy Statement (PPS 2005), and are listed in **Section 1.2** of this report. With regards to the proposed license area, natural heritage features that may be present on or within 120m of the proposed license area, or that may be indirectly affected depending on the extent of water table drawdown resulting from the proposed quarry extraction, include:

- Wetlands:
  - Rob Roy Complex (northwest corner of proposed license area and west of existing quarry and expansion);
  - Northeastern Wetland Area (within the Duntroon ANSI); and,
  - Camarthen Wetland;
- Potential Significant Habitat of Endangered and Threatened Species:
  - Butternut;
- Fish Habitat:
  - Headwaters to the Beaver River, Batteaux Creek, and Pretty River;
- Potential Significant Woodlands;
- Potential Significant Wildlife Habitat:
  - Species of Conservation Concern (Hart's-Tongue Fern);
  - Specialized Habitat/Woodland Ponds;
  - Area-Sensitive Bird Species; and,
- Significant Areas of Natural and Scientific Interest (Duntroon ANSI).

These features are shown in **Figure 7**. The following sections present evaluations of the criteria for all seven natural heritage features considered under the ARA.

## 5.1 SIGNIFICANT WETLANDS

### 5.1.1 Rob Roy Complex

Field investigations identified three wetlands within the proposed license area and one wetland in proximity to the proposed license area. One of these wetlands is located in the northwest corner of the proposed license area, and lies adjacent to the large sugar maple forest that accounts for the majority of the natural area on this site. No wetlands are situated within the proposed extraction area. This wetland block includes two forested wetland types: Red Maple Mineral Deciduous Swamp and Green Ash Mineral Deciduous Swamp (SWD3-2 and SWD2-2, respectively, on **Figure 6** and in **Table 2**). The ground cover in this wetland was patchy, due mostly to the extensive presence of vernal pools. In areas where groundcover was present, tufted loosestrife, green sedge and foamflower were the dominant species. This wetland also contained spring peepers that likely breed in the vernal pools in the late spring.

The wetland is not identified in Schedule 5.2.2 (Evaluated Wetlands) of the Simcoe County Official Plan. However, discussions with the Grey Sauble Conservation Authority and review of the MNR's NRVIS mapping indicate that this wetland represents one of the seventeen wetlands (unit #2) that comprise the Rob Roy Swamp provincially significant wetland (PSW) complex. The current MNR boundaries of the Rob Roy Wetland Complex in the vicinity of the proposed license area are shown on **Figure 7**. Most of the individual wetlands comprising the complex are located to the west of Grey Road 31, both to the southwest and northwest of the proposed license area.

Surface water monitoring at station SW3 (Jagger-Hims, 2005), recorded intermittent very low flows, indicating only minor westward surface flow from this wetland toward the western portions of the PSW complex. Ontario Base Mapping shows a drainage course between wetland complex units #2 and #3 to the west. Field surveys revealed a poorly defined drainage course with a small culvert. Flow through the culvert was not observed during any of the summer fieldwork. Topographically, the same valley feature connects units #2 and #3, although Grey Road 31 separates them. Jagger-Hims (2005) concludes that there may be groundwater movement to the west, beneath the road along the valley feature.

Although the wetland unit #2 is located within the proposed license area, it is outside of the proposed area of extraction and will not be directly affected by the expanded quarry. Nonetheless, consideration of indirect impacts resulting from hydrological changes in the wetland catchment is essential. Appropriate mitigations to address indirect impacts on this wetland are presented in **Section 7**. The wetland boundary for wetland unit #2 shown on **Figure 7** as ELC areas SWD 3-2 and SWD 2-2 is based on field observations conducted by Stantec, and was confirmed by MNR in the spring of 2004.

Wetland unit #5 is a small pocket of the Rob Roy Wetland Complex (located on the Kekanovich property to the west of the proposed license area) that may have intermittent surface connection to unit #4 to the north. This unit is beyond the 120m study zone, but within the zone where hydrogeological changes are anticipated due to drawdown. Based on MNR information, this wetland pocket is dominated by tall shrubs with primary vegetation including such species as willow, dogwood, red maple, balsam poplar, sedges, grasses, jew-weed and ferns. Hydrogeological and hydraulic characteristics are considered to be similar to unit #3 where the surface water grade is flat and surface drainage and direct precipitation temporarily

accumulates in this area for periods during the spring melt and following high rainfall events before recharging into the groundwater.

Wetland unit #6 of the Rob Roy Wetland Complex is located to the west of the existing quarry and is hydraulically connected through twin culverts under Grey Road 31 to a wetland just west of the existing quarry which is also part of unit #6 of the Rob Roy complex. Water flow through the culverts is monitored at surface water monitoring station SW1 (Jagger Hims, 2005). At present, the existing quarry discharges excess water from the floor of the quarry to a new settling pond. Water is discharged to the adjacent wetland area as required. Historically, a significant component of that discharge water infiltrated into the ground in the wetland and recycled back into the quarry excavation. The remainder of the discharge water exited through the twin culverts.

The ground surface elevation in the wetland is approximately 512 to 513m asl, which is 12-13m above the floor of the existing quarry. The water table in the surficial soils varies seasonally from being at or above ground surface in the spring and late fall, to in excess of 1m below ground in the summer. Prior to extraction, the groundwater level in the wetland would have fluctuated on a seasonal basis. Changes to the species composition of the wetland may have occurred over time as a result of the existing quarry operation; however, the unit continues to exhibit the characteristics of a resilient and functional wetland, with hydric soils and swamp and scattered marsh communities.

Units #1 and #4 are at the outside edges of probable zones of indirect impact. The mitigation measures for units #'s 2, 3, 5 and 6, which are closer to the proposed extraction site, will protect these wetlands. These mitigation measures are discussed in **Section 7**.

### **5.1.2 Northeastern Wetland Areas**

The second wetland located within the proposed license area is comprised of two units classified as a White Cedar-Hardwood Mineral Green Ash Mineral Deciduous Swamp and Green Ash Mineral Deciduous Swamp (SWM1-1 and SWD2-2 on **Figure 6** and **Table 1**). This wetland has not been evaluated and its level of significance is unknown. It is located in the northeast corner of the proposed license area, within the Duntroon Escarpment ANSI, but outside of the proposed extraction area. The wetland is fed by surface run-off and by a number of seeps that are located upslope. Drainage from these wetland units flows to the north and east, away from the Rob Roy PSW complex. Appropriate mitigations for impacts on the wetlands and the ANSI are presented in **Section 7**.

### **5.1.3 Camarthen Wetland**

There is a relatively large wetland area located directly south of the existing quarry that is situated within the closed drainage basin that outlets at a sinkhole (SW26, Jagger Hims, 2005) at the southern limit of the wetland. This wetland has not been evaluated and its level of significance is unknown. The water table in the wetland has been monitored starting in July 1999, and it has varied from being at or above ground surface in the spring to about 1m below grade in the late summer. The seasonal groundwater level in the wetland has not changed significantly since monitoring began in 1999, and the wetland appears to be a healthy functioning system based on the presence of substantial surface flows and standing water observed in the summer of 2005 as well as hydric soils and wetland plant communities. Potential impacts on this wetland are discussed in **Section 7**.

## **5.2 POTENTIAL SIGNIFICANT HABITAT OF ENDANGERED AND THREATENED SPECIES**

Endangered and threatened species are identified by the OMNR using procedures established by the Committee on the Status of Species at Risk in Ontario (COSSARO).

### **5.2.1 Butternut**

The federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated butternut as Endangered in November 2003, although it has not yet been added to Schedule 1 of the federal Species at Risk Act, pending public consultation. In Ontario, it has been designated Endangered by COSSARO in the NHIC list, but has not been added to regulations under the Ontario Endangered Species Act. Butternut has been severely impacted by the butternut canker. Little is known about the extent of this disease in Ontario; however, in the United States, disease-free trees are rare but have been discovered growing alongside diseased trees (Anderson, 1996). According to the Canadian Forest Service web site (2004), control of infected trees is not possible. Management recommendations from the Canadian Forest Service include the following:

- Infected trees suitable for harvesting should be removed as soon as practical;
- Dead butternut and those showing poor vigour should be removed to promote regeneration and to lower inoculum load;
- Trees with a minimum of 30% dead crowns and a minimum of 20% of the main stem cankered; should be removed; and,
- Trees with up to 50% crown dieback can be maintained if their stems are not cankered.

The locations of the butternut trees observed within the proposed license area are shown on **Figure 7**.

The OMNR does not have guidelines for determining the significant habitat of this species. Without such guidelines, general ecological principles must be applied. Given that the focus in the PPS is on preserving “populations” of Endangered Species, and that species rarity for plants is evaluated on the basis of “occurrences” which are generally accepted to consist of plants of any one species growing within a 1km radius of each other,<sup>1</sup> it is reasonable and conservative to use “occurrence as a proxy for “population” .” On this basis, the habitat occupied by the few scattered butternuts in the extraction area is not significant when considered in the context of the available habitat in a one-kilometre radius. Little is known about specific habitat requirements for this species beyond rich loamy soil and lack of shade. Similar, and in many areas, better habitat for this shade-intolerant species occurs outside the proposed quarry extraction area, and this better quality habitat can be managed as discussed, in **Sections 6** and **7**, to protect the population. For this reason, the location of the individual butternut trees (shown on **Figure 7**) are not considered to be significant habitat of an endangered species.

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<sup>1</sup> (Definition of plant “occurrences” is subjective and arbitrary. The definition of “populations” can be more objective and suggests genetic similarities that could be quantified. “Occurrence” is a useful proxy in the absence of genetic “population” studies, but should be used with caution.

### **5.3 FISH HABITAT**

Fish habitat is defined as the spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes. As described in **Section 4.5**, the northwest tributary carries flow only during snowmelt events, is dry for the majority of the year and exhibits little channel development. It is not considered to provide fish habitat. The two ponds on site are isolated and not connected to tributaries and, as such, they are not considered part of Canadian water system and not considered fish habitat license area and the ponds are not connected to water features. No fish were observed in the southwest tributary to the Beaver River located inside the proposed licensed area and it is a short, isolated stretch of channel with highly variable flow regimes and no direct connection to downstream fish habitat.

Offsite, the headwaters of the Batteaux Creek and Beaver and Pretty Rivers beyond the proposed license area contain resident populations of brook trout. This fish habitat is removed from the proposed extraction area. However, in the Pretty River and Batteaux Creek system, viable fish habitat including brook trout habitat is found downstream of the seeps at the bottom of the escarpment. The seeps, which feed these headwater locations, are within the zone of drawdown influence. The determination of the exact boundaries of fish habitat under the Fisheries Act is a responsibility of Fisheries & Oceans Canada.

Watercourses found in the licensed area and in the areas surrounding the quarry expansion in the Pretty River, Batteaux Creek and Beaver River are shown in **Figure 7**. In general, physical barriers and flow conditions restrict fish habitat to portions of the Beaver River downstream of County Road 31 and the spring-fed headwaters of the Pretty River and Batteaux Creek.

### **5.4 POTENTIAL SIGNIFICANT WOODLANDS**

General guidelines for determining significance of woodlands are presented in the Natural Heritage Reference Manual (NHRM) for Policy 2.3 of the Provincial Policy Statement (MNR, 1999). Criteria suggested by the NHRM for designating significant woodlands include woodland size, shape, proximity to other woodlands or natural features, linkages, species diversity, uncommon characteristics, and economic and social values.

The contiguous forest shown inside the proposed extraction area on **Figure 7** is designated as Greenland and Escarpment Natural in the Simcoe County Official plan, but is not so designated in the Niagara Escarpment plan or Clearview Township Official Plan. As a result, its status at the local and regional planning levels is not clear. Under the circumstances, consideration of site-specific characteristics based on the detailed site and regional context information presented in this report can be helpful in determining the most appropriate designation for this feature.

While this area exhibits some characteristics suggested for consideration under significant woodland criteria, such as uncommon characteristics and proximity to other natural features, in the regional context as shown on **Figure 3**, this is a relatively small portion of forest with only relatively tenuous connections to a much larger and better connected forest systems.

The forest in the west of the proposed license area consists predominately of a highly managed mono-culture of sugar maple with very low species diversity and low ecological complexity, and it is only poorly connected to adjacent forests by a narrow (200m or less) east west linkage, and

a slightly wider (approximately 300m) north-south linkage, the function of which is limited by Simcoe Road 91. The wooded area provides habitat for two rare plant species and area sensitive bird species, but virtually all of the contiguous forest area shown on **Figure 3** would provide similar habitat, and much of the area shown on **Figure 3** could be reasonably expected to provide better quality, more diverse and generally more significant habitat and ecological functions.

For the reasons noted above, the wooded communities on the proposed license area, which might be considered as significant woodlands in a less forest rich landscape, do not merit such designation in the regional context of the north-western Simcoe County/Niagara Escarpment area. This conclusion is supported by the designation of most of the forested area on site as "Escarpment Rural" in both the Niagara Escarpment Plan and the Township of Clearview Official Plan.

Having reached the conclusion that the woodlands on the proposed license area do not meet the criteria for designation as significant woodland, it is still important to note that the areas do provide local habitat and ecological functions. Therefore detailed mitigation measures to protect and enhance the local ecological functions of the woodlands are discussed in **Section 7** of this report.

## **5.5 POTENTIAL SIGNIFICANT VALLEYLANDS**

Recommended criteria for designating significant valleylands include prominence as a distinctive landform, degree of naturalness, importance of its ecological functions, restoration potential, and historical and cultural values. Given a review of these criteria, there are no significant valleylands on or with 120m of the proposed license area.

## **5.6 POTENTIAL SIGNIFICANT WILDLIFE HABITAT**

The Significant Wildlife Habitat Technical Guide may be used to help decide what areas and features should be considered significant wildlife habitat (OMNR, 2000). The different categories that require consideration in order for areas to be considered as significant wildlife habitat are as follows:

- Seasonal concentration areas;
- Migration corridors;
- Rare or specialized habitat; and,
- Species of conservation concern

### **5.6.1.1 Seasonal Concentration Areas**

Seasonal concentration areas are those sites where large numbers of a species gather together at one time of the year, or where several species congregate. The Significant Wildlife Habitat Technical Guide identifies 14 potential types of seasonal concentration areas. Only the best examples of these concentration areas are usually designated as significant wildlife habitat. Areas that support a species at risk, or if a large proportion of the population may be lost if the

habitat is destroyed, are examples of seasonal concentration areas which should be designated as significant.

The 14 types of seasonal concentrations are:

1. winter deer yards;
2. moose late winter habitat;
3. colonial bird nesting sites;
4. waterfowl stopover and staging areas;
5. waterfowl nesting sites;
6. shorebird migratory stopover areas;
7. landbird migratory stopover areas;
8. raptor winter feeding and roosting areas;
9. Wild Turkey winter range;
10. Turkey Vulture summer roosting areas;
11. reptile hibernacula;
12. bat hibernacula;
13. bullfrog concentration areas; and,
14. migratory butterfly stopover areas.

None of these features are found on the proposed license area. Deer, wild turkeys and turkey vultures have all been observed on or in vicinity of the site but the habitat features for these species do not meet the established criteria

Although nine wild turkeys were identified, the site is not considered wild turkey winter range based on the Guidelines for Significant Wildlife Habitat given that: it is not the only known site in the planning area, it does not have a high number of individuals, larger sites are prevalent in the area, it does not have the best habitat (no extensive large conifers and limited springs and seeps), the site does not provide key foraging areas - cropped agricultural lands or oak woods.

Studies and background review conducted for this study did not identify any seasonal concentration areas on the proposed license area.

#### **5.6.1.2 Migration Corridors**

Migration corridors are areas traditionally used by wildlife to move to one habitat from another. This is usually in response to different seasonal habitat requirements. Some examples are trails used by deer to move to wintering areas, and areas used by amphibians between breeding and summering habitat.

No migration corridors were found on the proposed license area.

### **5.6.1.3 Rare or Specialized Habitat**

Rare, or specialized, habitats are two separate components. Rare habitats are those with vegetation communities considered rare in the Province. SRANKS are rarity rankings applied to species at the “state”, or in Canada at the provincial level, and are part of a system developed under the auspices of the Nature Conservancy (Arlington, VA). Generally, community types with SRANKS of S1 to S3 (extremely rare to rare-uncommon in Ontario), as defined by the Natural Heritage Information Centre (NHIC), could qualify. It is assumed that these habitats are at risk and that they are also likely to support additional wildlife species that are considered significant. No rare habitat occurs on the proposed license area.

Specialized habitats are microhabitats critical to some wildlife species. The Significant Wildlife Habitat Technical Guide identifies the following potential specialized habitats:

1. habitat for area-sensitive species;
2. forests providing a high diversity of habitats;
3. old-growth or mature forest stands;
4. foraging areas with abundant mast;
5. amphibian woodland breeding ponds;
6. turtle nesting habitat;
7. specialized raptor nesting habitat;
8. moose calving areas;
9. moose aquatic feeding areas;
10. mineral licks;
11. mink, otter, marten, and fisher denning sites;
12. highly diverse sites;
13. cliffs; and
14. seeps and springs.

Three of the above-specialized habitats were observed on site: amphibian woodland breeding ponds, habitat for area-sensitive species and seeps and springs.

Bird species considered to be area-sensitive forest birds were encountered on the proposed license area. Depending on the species, these birds require a minimum of 10 (veery) to 100 ha (black-throated blue and black-and-white warblers) of suitable forest habitat for breeding.

The Significant Wildlife Habitat Technical Guide (OMNR, 2000) provides guidance for evaluating the relative significance of wildlife habitat and explicitly recognizes that not all occurrences of specialized habitat need to be protected. In a relatively habitat rich landscape, the guide recommends ranking features and ensuring that the best quality representatives of habitat are designated and protected. Habitat for area sensitive birds is extremely well represented in the regional area of the site, and the relatively small areas of habitat in the forested areas on the proposed license area are not significant in that context.

The woodland amphibian breeding ponds associated with wetland unit #2 of the Rob Roy complex are small and ephemeral; however, unlike the interior forest habitat, data are not readily available to allow a relative comparison of their importance in the regional context. Therefore, to be conservative, it is assumed that the woodland ponds in the northwest corner of the proposed license area (outside the area to be extracted) constitute significant wildlife habitat and mitigation measures to protect the amphibian habitat are presented in **Section 7**.

Several seeps were identified in the proposed license area, and multiple, strongly flowing seeps and springs are known to occur in the regional context associated with the Niagara Escarpment (Jagger Hims, 2005). The seeps in the proposed license area did not exhibit any highly specialized habitat conditions and were not observed to support specialized wildlife activity or life cycle functions *in situ*. For this reason, the seeps have not been designated as significant wildlife habitat. However, the seeps and springs support downstream wetlands and fish habitat. Therefore, mitigation measures for this functional role of the seeps and springs are presented in **Section 7**.

#### **5.6.1.4 Species of Conservation Concern**

The final criterion for the determination of significant wildlife habitat is evidence of species of conservation concern. This includes four types of species: those that are rare, those whose populations are significantly declining, those that have been identified as being at risk to certain common activities, and those with relatively large populations in Ontario compared to the remainder of the globe.

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

The background review and inventory work conducted on the proposed license area identified the following species of conservation concern: the endangered Butternut (*Juglans cinerea*), provincially rare (S3) Hart's-tongue fern (*Asplenium scolopendrium*), five local or regionally rare species including: green spleenwort (*Asplenium viride*), male fern (*Dryopteris filix-mas*), pedicelled hawthorn (*Crataegus pedicellata*), the black-throated blue warbler (*Dendroica caerulescens*) and tall goldenrod (*Solidago altissima* var. *altissima*).

Again referring to the concept of relative ranking as outlined in the Significant Wildlife Habitat Technical Guide (OMNR, 2000), not all occurrences of habitat for species of conservation concern are to be automatically considered significant wildlife habitat. In addition, endangered and threatened species (i.e. Butternut) are treated separately by the PPS under significant habitat of endangered and threatened species, not under this category. The focus is on protecting a reasonable amount of the habitat to maintain local populations of the species of concern. Significant areas of habitat for all of these species of concern exist in the surrounding landscape and much of the habitat is in protected areas such as the wetlands, ANSIs (Niagara Escarpment Natural and Protection Areas), and a provincial park to the north. Given the relative abundance of habitat for these species of concern in the surrounding landscape the relatively small portion of habitat in the proposed license area is not considered significant wildlife habitat. Notwithstanding this conclusion it is recognized that habitat or occurrence of a species of conservation concern should be carefully managed. Mitigation measures to enhance the habitat in the broader landscape are recommended in **Section 7**.

## **5.7 SIGNIFICANT AREAS OF NATURAL AND SCIENTIFIC INTEREST (ANSIS)**

The Province determines the significance of ANSIs according to standardized evaluation procedures. The Duntroon Escarpment ANSI is a regionally significant life science ANSI that is partially located on the proposed license area. The extraction area, however, is completely outside the ANSI. The Duntroon Escarpment ANSI is a regional life science ANSI of approximately 98 ha in area, spanning across Lots 25-26, Clearview Township Concessions 11-12. The ANSI supports 15 vegetation community types sustaining 213 vascular plant species. Thirty-eight species of breeding birds were recorded in the proposed license area, including the regionally rare black-throated blue warbler, as well as 11 forest-interior bird species (Riley et al., 1996:351).

While, as a regional ANSI, the site is not identified under the ARA as a matter of provincial concern, it does have regional and local importance. Development may be permitted in or adjacent to a regionally significant ANSI if it is determined that the development will not have a negative impact on the ANSI feature (Simcoe County OP, Section 3.7). Although the ANSI is located within the proposed license area, it is located outside of the proposed extraction area and there will be no direct negative input on this regional ANSI feature. Potential indirect impacts on the ANSI are discussed in **Section 7** of this report.

## **5.8 SIGNIFICANT FEATURES SUMMARY**

Based on the analysis presented above, the following significant natural heritage features, as outlined in the ARA and PPS, occur outside of the proposed extraction area, but within the proposed license area or within adjacent lands:

- Rob Roy Provincially Significant Wetland Complex (unit #2 within proposed license area, other units within predicted area of indirect hydrologic impacts);
- Fish habitat in portions of the Beaver River, Batteaux Creek and Pretty River tributaries within the predicted area of indirect hydrologic impacts; and,
- Significant wildlife habitat (amphibian breeding pond in unit #2 of Rob Roy wetland complex).

In accordance with the PPS and ARA, site alteration and development, which would result in negative impact to these features is not permitted. Mitigation measures to prevent negative impact to these features are discussed in **Sections 6** and **7** of this report.

The following features, while not significant at the provincial level, are part of the local or regional landscape ecology and should be sensitively managed as part of the design and operation of the proposed quarry:

- the Duntroon ANSI, including unevaluated wetlands, woodlands and potential rare species habitat);
- Camarthen unevaluated wetland;
- woodlands (including areas sensitive bird species habitat and landscape linkages); and,
- scattered occurrences of rare species (Hart's-tongue fern and butternut).

Measures to manage and enhance the function of these features are presented in **Sections 6** and **7**.

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## **6.0 Project Description**

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### **6.1 QUARRY OPERATIONS**

The existing Duntroon Quarry has been in operation on Simcoe Road 91 since 1964 and has been operated since 1995 by Georgian Aggregates, a wholly owned subsidiary of Walker Industries Holdings Ltd. The existing quarry, located at Lot 24, Concession 12, is mined to a depth of approximately 25m and is approximately 58 ha in size.

As part of long-term planning to continue to supply the existing and future markets, Georgian Aggregates is proposing to expand the quarry operation onto the lands directly north of Simcoe Road 91. The proposed license area is in Part Lots 25 and 26, Concession XII, as shown on **Figure 8**. The proposed license area comprises 127.02 ha, of which 68.92 ha are proposed for extraction.

The proposal is to extract the dolostone rock down to a general elevation of 500m asl and down to 490m asl in the central/southern part of the site. The height of the rock extraction face generally will vary from a minimum of 4m along the north-central boundary to a maximum of almost 39m in the south-central area, and up to three lifts may be used to extract the rock. Water accumulating in the excavation from direct precipitation/surface water runoff, as well as from groundwater inflow, will be pumped to maintain dry working conditions across the quarry floor. There are approximately 43 million tonnes of recoverable aggregate resource within the proposed limit of extraction. The extraction operation is to be completed in three Phases, commencing in the south central part of the property, and then moving in a clockwise direction. The last phase (Phase 3) to be extracted will be along the northern and then eastern sections of the property, followed by extraction of the rock beneath Phase 1 down to elevation 490m asl. Based on an extraction rate of between 1 million and 3 million tonnes per year, the life expectancy of the quarry will be between 14 and 43 years.

The application is for a maximum extraction rate of 3 million tonnes per year. Initially, extraction in Phase 1 of the proposed quarry extraction, down to an elevation of 500m asl, will occur concurrently with mining in the existing quarry until that latter resource is extracted. It is proposed that the two sites are to be connected by means of a tunnel beneath Simcoe Road 91, subject to municipal approval. The base of the tunnel will be at elevation 500m asl. Blasted rock from Phase 1 of the proposed quarry expansion will be transported to the existing quarry site for processing. As soon as sufficient space exists in Phase 1, the processing plant will be moved from the current location to the floor of the new quarry. The aggregate remaining in the existing quarry will then be extracted and transported to Phase 1 of the new quarry for processing. Once extraction is complete in the existing quarry, the tunnel will be closed and sealed, and the existing quarry rehabilitated. The proposed rehabilitation for both locations is to include lakes, wildlife and recreation lands (MHBC, 2005).

Extensive reforestation is proposed for the lands on/adjacent to the existing quarry and the proposed quarry expansion.

## **6.2 QUARRY REHABILITATION PLAN**

A significant component of the proposed quarry expansion is the progressive rehabilitation plan. The proposed rehabilitation plan has been created to comply with Provincial, County and Township environmental planning policies and embodies key goals as follows:

- Provide a net gain in biological diversity of habitat types after quarrying;
- Use of native species in rehabilitation efforts;
- Linking habitats within the proposed license area to regional habitats;
- Minimize visual and noise impacts to receptors adjacent to quarry; and,
- Introduce rehabilitation measures progressively throughout project phasing.

The proposed quarry expansion will be implemented in three Phases. This approach has the advantage of allowing progressive monitoring of surface and groundwater levels and confirming the effectiveness of mitigation measures such as the use of groundwater recharge wells, if necessary.

The rehabilitation plan also includes the creation or enhancement of three terrestrial habitats within the proposed license area. This will result in an increase in biological diversity of the existing heavily managed forests and agricultural fields. The three proposed terrestrial habitat areas are shown on **Figure 9** and are as follows:

- Meadow Marsh Wetland;
- Limestone Cliff; and,
- Shrub Swamp Enhancement.

Aquatic habitat will also be created as the quarry fills with groundwater. The dominant aquatic habitat type will be deepwater ponds, but there will be also littoral zones, shoals, and reef structures incorporated around the edges of the quarry excavation.

### **6.2.1 Meadow Marsh Wetland**

The meadow marsh wetland area is proposed for the quarry floor in the northwest area of the proposed extraction area with a link to the existing green ash mineral deciduous swamp, which is outside the proposed quarry expansion. The meadow marsh habitat will be created through transplanting and culturing of existing plant material. The resulting introduction of open meadow marsh in the proposed license area after quarrying will provide quality habitat for nearby marsh birds, including the northern harrier.

To further improve habitat in this area, islands will be created on the top of the second lift using on-site resources and overburden. A variety of substrates will be incorporated around the edge of the islands. These may include, but are not limited to boulders, gravel, sand and muck. Shoals to promote fish habitat will be created near the finished quarry floor. Fines from the

wash plant will be deposited between the berm and the quarry walls to a depth that will permit establishment of wetland habitat as set out in the site plans (MHBC, 2005).

The establishment of these islands will provide additional habitat for migratory birds and further enrich the habitat value of the meadow marsh wetland area.

### **6.2.2 Shrub Swamp Enhancement**

In order to enhance the green ash mineral deciduous swamp located in the northern portion of the proposed license area, a combination of transplanting existing native stock and the seeding of wetlands shrubs will be directed to the inner core of this wetland area. The enhancement of the shrub layer with a diversity of shrubs would result in enriched wetland avifauna and herpetofauna by increasing the amount of shade cover, thereby moderating temperatures and increasing moisture levels.

### **6.2.3 Limestone Cliff**

During extraction in Phase 3 of the proposed quarry extraction, cliff faces will be created along the east side of the proposed extraction area. Blasting will be placed in such a way that the cliff face will not be shear, but instead will have a craggy appearance with crevices and small rock projections. Overburden and topsoil will be dumped from the top to create a growing medium for natural revegetation.

## **6.3 MITIGATION MEASURES**

### **6.3.1 Reforestation Plan**

A total of 133.6 ha of forest is present on lands owned by Georgian Aggregates, including 40.5 ha within the proposed extraction area and 93.1 ha of forest on properties owned by Georgian Aggregates that are adjacent to the proposed extraction area (**Figure 10**).

The shape of natural areas affects their value as wildlife habitat and their resilience to disturbance effects. Round or block-shaped patches contain less “edge” per unit of area than long, narrow patches. Edge refers to the area where different habitats meet. Although many species of wildlife require “edge” habitat, other species require large continuous blocks of habitat well away from habitat edges. These areas are often termed interior habitats. Some interior habitat dwelling species will only use an area if it is 100m or more away from an edge. In parts of southern Ontario, the fragmentation of natural habitats has created an abundance of edge habitat, while at the same time, reducing the availability of interior habitats. Consequently, forest areas with large amounts of interior habitat have become a greater conservation priority (OMNR, 2000). At present, there are 38.4 ha of interior forest on Georgian Aggregate-owned lands within and adjacent to the proposed extraction area (**Figure 10**). The interior habitat is divided into 4 separate parcels ranging in size from 2.0 to 15.6 ha.

Another important forest habitat consideration is forest connectivity. Forest connections may facilitate movement of certain wildlife species between two or more habitats that are critical to the maintenance of a population of a particular species or group of species. The key ecological function of wildlife movement corridors is to enable wildlife to move to, and between, areas of

significant wildlife habitat or core natural areas, with a minimum of mortality (OMNR, 1999). The existing forest connections traversing the extraction area and link to adjacent woodland blocks are shown on **Figure 10**.

In order to offset the area of forest lost as a result of the proposed quarry expansion, Georgian Aggregates has included a program of forest creation on portions of the proposed license area that are not part of the proposed extraction area and lands adjacent and outside of the proposed license area owned by Georgian Aggregates. These areas are shown on **Figure 11**. The total area of forest present on Georgian Aggregate lands at project closure, which includes new plantings and forest areas unaffected by the proposed quarry extraction, is 145.3 ha. This represents a net increase in forest area of 11 ha. These areas have been chosen in part due to the increase in forest connectivity that would result from these plantings. Additionally, as a result of the reforestation plan, interior forest habitat will increase post closure from 38.3 ha to 52.4 ha, a net increase of 14.1 ha of interior habitat. The new forest connectivity to adjacent woodland blocks resulting from the forest creation is show on **Figure 11**.

In addition to plantings that were initiated in 2004, Georgian Aggregates is committed to further develop a detailed Reforestation Plan for the proposed replanting in consultation with the regulatory agencies.

### **6.3.2 Maintaining Adequate Flow in Headwaters**

In order to maintain flow to headwaters of Beaver River, Pretty River, and Batteaux River, a combination of mitigation measures will be implemented as required, including pumping water from dewatering operations to the headwaters, and, if necessary, installing groundwater recharge wells. The likely locations where these mitigation measures will be implemented are further discussed in **Sections 7.1 and 7.5** and shown on **Figure 9.0**.

### **6.3.3 Visual and Noise Impact Mitigation**

In order to provide a sufficient level of visual and noise screening from roadways, the Bruce Trail, and neighboring receptor homes, a combination of berms and natural vegetation screens will be put in place. Based on the results of the Duntroon License Expansion Visual Impact Assessment (Stantec Consulting Ltd, 2004), the following measures will be implemented:

- The setback zone will be planted with a mix of deciduous and coniferous trees and shrubs at a range of sizes planted at grade in randomly spaced groupings to create a natural-appearing arrangement. Vegetation shall be selected for salt tolerance, hardiness, and consistency with restoration plan. Native plant materials that are complementary to the regional and local landscape will be utilized where possible. Buffer planting will be maintained to ensure survival and good growth rate, and managed to ensure that it remains effective over time for screening purposes while allowing natural succession to occur in keeping with restoration objectives.
- Areas adjacent to, but outside of, the setback zone (beyond property boundaries) should be planted to screen views and provide additional ecological benefits at key locations subject to agreement with landowners.

- Existing vegetation within the setback zone will be retained. No additional berming shall occur within forested areas being used as a natural screen unless required for noise mitigation. Infill plantings of coniferous trees or understory shrubs shall occur where necessary to create an effective, year-round visual screen and to compensate for any dieback resulting from exposure or damaged root zones.
- Berms shall be constructed within the setback zone where necessary for noise attenuation. Berms shall be constructed in a smooth, meandering fashion with a range of highpoints to create a natural appearance and will be screened by additional plantings in front of the berm. Berming is proposed for a portion of Grey Road 31, where the berm will be setback and screened from the road by planting.
- Wood fencing with plantings will be installed above the proposed tunnel under County Road 31, where there is insufficient space for berming/planting for screening purposes. All fencing shall be constructed of natural materials and finished in natural colours to blend into surrounding landscape.
- Any plantings to mitigate visual impacts will be installed as early as possible to ensure sufficient time for optimum plant growth and establishment (i.e. prior to commencement of extraction of adjacent land).

#### **6.3.4 Quarry Closure**

The final rehabilitation plans for the proposed quarry extraction includes lakes in the extraction area that will progressively fill with water once the dewatering systems in place during operation are shut down. It is expected that lakes will require several decades to fill with water. Ultimately, the lakes will achieve levels that are in equilibrium with the annual influx of water and the outflow of water, as groundwater through the rock.

Rehabilitated side slopes will be established using a cut-fill method, with side slopes having at least a 2:1 ratio of horizontal to vertical slope. The slope will be more gradual at water's edge where near shore zones and islands are to be established. Shoreline areas will be graded to provide irregular shaped shore areas that will enhance habitat diversity and cover. Shallow shoreline areas will be created around the lake perimeter in order to maximize habitat creation. Habitat diversity will be further improved through the addition of brush piles, logs, stumps, and boulders along the shoreline zone both above and below the water.

Following establishment of the side slopes, on-site topsoil/overburden will be spread to a minimum thickness of 15cm on the established slopes. Slopes will then be seeded using a grass/legume seed mix, which will be maintained and replanted as necessary to control erosion, until natural vegetation succession stabilizes the slopes.

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## **7.0 Potential Impacts and Mitigation**

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The analysis of the seven natural heritage features to be considered under the PPS has identified the following significant environmental elements on, or on adjacent lands to, the proposed license area:

- Provincially Significant Wetlands;
- Fish Habitat; and,
- Significant Wildlife Habitat.

These features are all outside the proposed extraction area.

In addition, locally or regionally important features have been identified including:

- the Duntroon ANSI, including unevaluated wetlands, woodlands and potential rare species habitat (outside proposed extraction area);
- Camarthen unevaluated wetland (outside proposed extraction area);
- Woodlands including area-sensitive bird species habitat and landscape linkages (both within and beyond the proposed extraction area); and,
- scattered occurrences of rare species (Hart's-tongue fern and butternut).

The application is for below water table extraction. Details of the extraction limits, phasing of extraction and site design are provided on the site plans. In addition to direct impacts resulting from development of the proposed quarry extraction lands, the extraction of aggregate resources from the proposed extraction area, particularly from below the water table level, has the potential to impact aquatic and wetland resources indirectly in two primary ways:

- Changes in contributing surface waters due to the removal of portions of a catchment during and post extraction; and,
- Alterations to the ground water table associated with extraction below the water table.

The potential impacts on these features as a result of the proposed quarry development, operations, and rehabilitation are discussed in the following sections. Where applicable, mitigation recommendations are provided.

### **7.1 SIGNIFICANT WETLANDS AND UNEVALUATED WETLANDS**

Under Ontario's Provincial Policy Statement (PPS), development is not permitted within significant wetlands in Ecoregions 5E, 6E, and 7E. Development may occur on adjacent lands provided that it can be demonstrated that there will be no negative impacts on the features or ecological functions for which the area is designated. Consideration must be given to the potential for indirect impacts on the PSW through the alteration of surface water flows and groundwater levels. The PPS also recognizes the need for aggregate resources and requires a balanced consideration of wetland protection and aggregate resource management.

Although no extraction will take place in any of the wetland areas on the proposed license area, the proposed quarry expansion will alter surface flow and water table levels, which may affect some of the identified wetland areas.

The following sections describe the potential impacts on the individual wetland areas that may be affected by the proposed quarry expansion, present mitigation measures, and discuss net impacts anticipated after mitigation measures are implemented.

### **7.1.1 Rob Roy Wetland Complex Unit #2 (Northwest Corner of Proposed license area)**

#### **Current Hydrology**

The site plans indicate the following ground surface elevations in the wetland area:

- Southeast corner, south of mail road, approximately 511.9m asl;
- Main area of wetland, north of mail road, approximately 510.8m asl; and,
- Culvert, east side of Grey Road 31, approximately 510m asl.

The seasonal variation of the water table in the overburden is monitored in the southern part of the wetland at Borehole BH03-07 (Jagger Hims, 2005), which is located on the former mail road that transects the wetland. The recorded water levels have varied from near-ground-surface or above (i.e. standing water), to a maximum of 1.52m below grade (October, 2004). The average value of all of the measurements is 509.7m asl, which reflects a water table that is approximately 0.6m below grade.

The corresponding groundwater level in the underlying bedrock exhibits a similar pattern that generally is slightly lower than the water table in the overburden, although there are exceptions. The average value of all of the measurements is 509.64m asl, which is 0.06m lower than the water table value.

These data indicate that groundwater gradients generally are downward from the overburden to the underlying bedrock, which reflects a groundwater recharge condition. This suggests that the wetland hydrology is sustained by surface precipitation and run-off, rather than by groundwater discharge gradients beneath the wetland.

The soil profile at BH03-07 consists of 1.4m of clay-like silt (which may reflect the former mail road), overlying silty sand to a depth of 5.5m. Beneath the sand is very stiff to hard sandy silt till (trace clay) soil to a depth of 6.6m, beneath which is the dolostone bedrock. This soil profile, combined with the water level data and the general absence of surface flow out of the wetland at station SW3 indicates that the wetland is dependent on direct precipitation and surface run-off for its hydrology, rather than groundwater from the underlying bedrock.

The surface catchment area of this wetland is relatively large and includes lands to the north and south, with approximately two thirds of the catchment being located outside the proposed

extraction area. The old mail road also acts a dam, preventing a portion of overland flows from the proposed license area from reaching the main part of the wetland to the north.

### **Ground Water Impacts and Mitigation**

This wetland is sustained primarily by surface water and therefore is not highly sensitive to groundwater drawdown; however, any changes in hydrology need to be considered.

Drawdown of the water table in the overburden and bedrock will occur during Phase 1 of the proposed quarry expansion and will become more pronounced, in particular during Phase 3, as operations get closer to the wetland area. Drawdown of the water table, the overburden in particular, has the potential to alter wetland functions and the species composition of the wetland.

Monitoring of groundwater levels in the wetland will be performed on a regular basis and results compared to levels predicted through modeling. This information will be incorporated into the groundwater model so that the model can be refined to assist in planning for future mitigation, as required. Implementation of mitigation measures will be undertaken on a progressive basis as necessary, but they will be in place, tested and ready for operation before they are actually required. Water level monitoring and biological monitoring will form integrated parts of an Adaptive Management Plan (AMP) for the quarry. This AMP will be prepared and approved by MNR prior to extraction commencing.

Excess quarry water will be discharged to the east end of the wetland to maintain surface water conditions in the wetland, similar to the operations at the existing quarry. This discharge will also help maintain groundwater levels. Should monitoring predict that additional measures are required, groundwater recharge wells will be developed to help maintain acceptable water table conditions in the wetland.

During closure and reclamation, the quarry will be allowed to fill with water to a predicted average final lake level of 510-511m asl, approximately 510.7m asl. This elevation is similar to the ground elevation at BH03-07, and represents an increase of 0.6m with respect to the recorded average water table elevation at that location. In other words, significant drawdown will not occur in the wetland area upon final reclamation. However, the lake will take a number of years to fill and some lake water will have to be pumped to maintain wetland functions in surrounding areas until the lake level has risen to a sufficient level to prevent drawdown on surrounding lands.

### **Surface Water Impacts and Mitigation**

As the quarry is expanded in Phases 2 and 3, surface water runoff contributions to the southern section of the wetland from the proposed license area will be slightly reduced as the surface catchment area is reduced. The catchment area does not have a high runoff coefficient and no major flowpaths are affected. In addition, only approximately a third of the surface runoff currently comes from lands affected by the extraction area and this portion is reduced by the dam effect of the mail road, so this effect will be relatively minor. The quarry water discharge to

the wetlands will further mitigate this impact. If monitoring suggests further mitigation is required, the old mail road could be removed or altered to increase surface flow from the lands to the south.

### **Net Impacts**

Any changes with respect to groundwater and surface water flows will occur gradually and the wetland will adapt over time. The communities potentially affected: the Red Maple Mineral Deciduous Swamp and Green Ash Mineral Deciduous Swamp; are resilient communities that have adapted to major fluctuations in hydrology and will readily adapt to the predicted changes. There may be minor shifts in the ground flora of the wetland but the basic community structure and wetlands functions will persist over the long term. There were no highly specialized vegetation communities observed. Wildlife habitat impacts are discussed under Section 7.3, but a slight reduction in overland runoff from storm events will not have any significant effect on amphibian habitat. Evidence of this can be seen at wetland unit #6 and the Camarthen Lake wetland which have been subject to altered hydrology as a result of the existing quarry, yet persist as functional wetlands. On this basis, we conclude that there will be no negative impact on the PSW.

#### **7.1.2 Rob Roy Wetland Complex Unit #5**

### **Current Hydrology**

The hydrology of units #5 is similar to that of unit #3. The wetland receives water primarily from surface drainage from adjacent lands and direct precipitation. There is no apparent permanent surface water discharge. The water gradient at this location is also interpreted to be downward, like unit #3.

### **Ground Water Impacts and Mitigation**

Extraction of the rock resource out to the western limit of Phase 2 is predicted to result in drawdown in the order of 2-4m in the rock beneath the property to the west (Jagger Hims, 2005). That drawdown has the potential to affect the hydrology within the wetland unit #5 on the Kekanovich property, depending on the relationship between the water table and the groundwater in the underlying bedrock. A program of well monitoring is proposed which will include wetland water level monitoring subject to landowner permission.

If monitoring indicates an impact to the wetland during Phase 1 or Phase 2 wetland water levels, groundwater recharge wells will be developed as mitigation (Jagger Hims, 2005) in Phase 2 in the setback areas along the western limit of the quarry property. This will reduce the extent and magnitude of drawdown in the bedrock to a level where wetland functions are not negatively impacted.

### **Surface Water Impacts**

No significant surface water inflows were observed for this wetland and the proposed quarry will have no impact on the catchment area.

**Net Impacts**

There will be no negative impacts during operations of the proposed quarry with the proposed monitoring and mitigation. Upon closure of the expansion quarry, the predicted average lake level is 510.7m asl. The presence of the lake will not affect the surface catchment area of the wetland. The wetland will continue to receive direct precipitation, snowmelt and surface run-off similar to the existing situation. The predicted residual drawdown in the bedrock to the west of the lake is in the order of 1-2m beneath the eastern part of the wetland. This is not expected to result in any significant change to the hydrology or function of the wetland, and there will be no negative impacts to the wetland.

**7.1.3 Rob Roy Wetland Complex Unit #6****Current Hydrology**

This wetland has a large surface catchment area and includes extensive organic deposits that have developed on the underlying mineral soil and bedrock. Ecological characteristics indicate a wetland more reliant on surface water than ground water. Given topographic position, soils, and stream flows characteristics, it can be concluded that this wetland and stream system is primarily reliant on incident precipitation, surface water and reduced drainage efficiency due to low gradients and flow obstructions for the paludification effect.

**Ground Water Impacts and Mitigation**

The proposed expansion with mitigation in place, including surface water contributions and progressive filling of the existing quarry, will have little additional drawdown effect on these wetlands. To the south and southwest of the existing quarry, the groundwater configuration remains similar to the existing conditions, and there is no additional drawdown influence in that area. Thus, no changes are predicted with respect to wetland function located to the west and south of the existing quarry (Jagger Hims, 2005).

**Surface Water Impacts and Mitigation**

During Phase 2 of the proposed quarry expansion, excavation will result in a predicted loss of the spring in the southwest corner of the proposed license area and the associated surface water flow into this wetland to the south of Simcoe Road 91, at least seasonally (Jagger Hims, 2005). At present, the spring contributes surface flow to the wetland located to the west of the existing quarry.

If necessary, a small dewatering sump can be developed in the southwest corner of Phase 2, equipped with a discharge pump to deliver excess water into the adjacent surface drainage channel that feeds down into the wetland and mitigate potential impacts. Surface flows will be maintained similar to historical seasonal averages.

Surface water impacts on this wetland can be completely mitigated during quarry operations by discharging water from the existing quarry and from Phase 2 of the expansion quarry.

After closure of the proposed expansion quarry, some changes in surface flow into the wetland are predicted due to the cessation of pumping to replace flows from the groundwater spring source in the southwest corner of the proposed license area. The final lake level is not predicted to rise to an elevation that would provide long term flow to this area. Therefore it is recommended that prior to quarry closure, pumping to this area be gradually reduced over a number of years to slowly “wean” the system and allow the downstream wetland to adapt gradually to a reduction in flow. This adaptation should be monitored as part of the adaptive management plan (AMP) which will be developed prior to extraction taking place, and flow changes managed to mitigate impacts on the wetland. There may be some residual drawdown of bedrock ground water under the wetland, but this ground water plays a relatively minor role in hydrology of the system.

### **Net Impacts**

With regular monitoring and mitigation, there will be no negative impact on this wetland due to the proposed quarry expansion in accordance with the AMP. Wetland composition is likely to change over time due to broader climatic patterns and residual effects of the quarry. Such change is part of the natural dynamics of a wetland system and, if managed by an AMP, does not constitute “negative impact.”

#### **7.1.4 Duntroon Escarpment ANSI Wetlands (SWM 1-1 and SWD 2-2)**

These wetlands are not evaluated, so their significance is unknown. To be conservative, it is recommended that they be treated as significant and managed to ensure no negative impact.

### **Current Hydrology**

These wetlands receive direct precipitation and seasonal overland flow from upstream lands as well as seepage from springs in the vicinity of the Bridson and Millar ponds. Seasonal wetland conditions are a combination of these three input sources.

The depth of the water table in the overburden in the wetland is monitored at the Bridson Drivepoint monitor, located northeast of the Bridson Pond. The elevation of the water table has varied from at or above ground level (i.e. standing water), to summertime low of 509.7m (September 2004), which reflects a depth of 0.7m below grade. These water table fluctuations indicated that the hydrology of the wetland is primarily dependent on surface inputs rather than groundwater from the underlying bedrock.

### **Ground Water Impacts**

Drawdown in the water table has the potential to alter wetland functions and the species composition of the wetland. Drawdown in this area is predicted to be in the order of 1-2m. Mitigation options include the surface discharge of excess quarry water into the pond/wetland system, which would then infiltrate into the exposed rock surface, as currently occurs. This would maintain seasonal flows at the groundwater springs to the east and northeast. If additional mitigation is required, groundwater recharge wells will be established to the east and

the north so that seasonal groundwater and surface water conditions can be maintained in the wetland and at the springs to the east (Jagger Hims, 2005).

### **Surface Water Impacts**

This wetland will continue to receive direct precipitation, snowmelt and surface run-off from the adjacent lands. The proposed extraction area comprises approximately one third of the overall catchment area of this wetland. Water will be discharged from the quarry to mitigate for any losses. Upon closure of the expansion quarry, the predicted average lake level will be 510.7m asl. If deemed necessary, an outlet structure can be developed to discharge lake water into the wetland area on a seasonal basis, when the lake level is high.

### **Net Impacts**

Resilient swamp communities that adapted to fluctuations in water levels dominate these wetlands. Due to the continued hydraulic contribution to this wetland from direct precipitation, snowmelt and surface run-off from the adjacent lands and direct discharge, any minor groundwater drawdown that may occur after mitigation is not expected to result in a negative impact to the wetland. Changes in hydrology and vegetation response will be monitored and managed through the AMP.

#### **7.1.5 Camarthen Wetland**

### **Current Hydrology**

This wetland is located directly south of the existing quarry and occupies a depression surrounded on all sides by bedrock hills. It receives runoff and overburden ground water contributions from the surrounding hills. The depression outlets via a surface channel to a sinkhole at surface water monitoring station #26 (SW26) (Jagger Hims, 2005) (**see Figure 5**) during spring and fall, but is self-contained during the low flow summer periods. The wetland is underlain by more than 2m of peat. This wetland system is sustained by surface flows and is largely independent of deep bedrock ground water, as can be seen by the lack of any apparent effect of the adjacent existing quarry on wetland characteristics or stream flows.

The surface catchment area of the wetland is approximately 130 ha. The elevation of the water table in the wetland at DP3 varies seasonally between 513.6m asl (i.e. at ground surface) and 512.3m asl, which reflects a water table that is 1.3m below grade during a dry summer.

### **Ground Water Impacts**

This wetland is located outside of the groundwater impact zone.

### **Surface Water Impacts**

The proposed quarry expansion has no effect on surface water flows to this system.

## **Net Impacts**

There have been no apparent negative impacts on this wetland from the adjacent existing quarry and there will be no negative impact on this wetland as a result of the proposed quarry expansion.

### **7.1.6 Wetland Impact Summary**

There will be no site alteration or development in the wetland communities. There will be no negative impacts on any of the wetlands adjacent to the proposed quarry expansion or within the area of influence through ground and surface water alterations. Wetlands are expected to continue to adapt to climate and drainage patterns, but the proposed quarry will not alter wetland hydrology to the point of degradation threatening the health and integrity of the wetland systems. There are ample opportunities through adaptive management of the groundwater in the proposed quarry expansion to mitigate negative impacts and ensure long-term health and sustainability of the wetlands. The AMP will integrate water and biological monitoring to direct and refine mitigation measures.

## **7.2 FISH HABITAT**

### **Potential Impacts**

Groundwater modelling indicates that, during operations with no mitigation, there would be a loss of groundwater contribution to the Pretty River and Batteaux Creek systems and a direct loss of surface water input into the Beaver River system. Change in upwelling contribution in the Pretty River and Batteaux Creek system could result in an indirect impact to the known brook trout population found further downstream within these systems. The loss of surface flow in the southwest tributary of the Beaver River, would not directly affect brook trout habitat but may impact some flow contribution to downstream reaches at various times of the year. It should be noted, however, that this contribution to downstream fisheries is intermittent and has been influenced by the pumping schedule of the existing quarry since below water extraction commenced.

Groundwater modelling also indicates that, post-closure, there will be a minor shift in the watershed divide on the property and some portion of the groundwater surface water that flowed into the Beaver River systems will flow into the Pretty River and Batteaux Creek systems. This will result in an increase of groundwater contribution in the Pretty River and Batteaux Creek river which, given the location of the Niagara Escarpment and associated topography, will result in increased contributions to headwater springs in those tributaries below the escarpment.

This increase in headwater spring production will result in augmented surface flows and is anticipated to have a positive impact as discussed in **Section 4.7** of this report.

The shift in watershed divide will reduce the groundwater and surface water contribution to the Beaver River system. The change in groundwater contribution into the overall system will not be directly evident, as on the east of the property, where the groundwater springs below the

brow of the Niagara Escarpment provide point source flows to fish habitat. To the west in the Beaver River watershed, the loss of groundwater will be expressed over a greater area and will be relatively insignificant compared to the larger volumes of groundwater involved. In short, the groundwater change will be negligible in the overall groundwater system associated with the headwater of the Beaver River. From a groundwater contribution perspective, no negative impacts are anticipated to the trout fisheries found much further downstream in the Beaver River system.

As noted in the Geological Report and Level 2 Hydrogeological Assessment (Jagger Hims, 2005), post-closure, there will be a permanent decrease in surface water flow conditions at the groundwater spring that discharges into the southwest tributary of Beaver River. Some seasonal surface water flow in the channel would be maintained as a result of local snowmelt and run-off during storm events.

### **Mitigation**

In order to eliminate impacts to the tributaries and fisheries resources of Pretty, Batteaux, and Beaver River during the operations phases of the quarry (1, 2, and 3), a series of mitigation measures including direct surface water pumping, strategic discharge, installation of recharge wells, if necessary, and flooding of the existing quarry are proposed to mitigate changes in the groundwater and surface water volumes. These mitigation methods are described in detail in Jagger Hims, 2005.

These mitigation measures will be monitored to ensure that changes in the surface water systems are maintained within acceptable limits.

After all extraction has been completed and the quarry allowed to fill, the new water elevation will support the fisheries baseflows with minor modifications in volumes; i.e. An increase to Pretty River and Batteaux Creek and a minor decrease to Beaver River. The minor decrease to Beaver River will not affect downstream fish habitat conditions. However, the presence of a brook trout fishery in reaches of the Beaver River further downstream does provide an opportunity to enhance areas where brook trout populations can directly benefit from aquatic habitat enrichment. As such, it is recommended that, as a proactive initiative, the brook trout fishery found downstream be enhanced in the Beaver River. Details of the enhancement opportunity will be determined in consultation with relevant public agencies, and completed in conjunction with any prescribed fisheries management plan for the area.

### **Net Impacts**

During operation, the proposed mitigation measures will protect the existing surface water features and associated wetland and aquatic resources.

Post operation, the shift in the watershed divide and associated shifts in water contribution to baseflow will enhance aquatic systems in the Pretty River and Batteaux Creek watersheds given their locations below the escarpment. The change in the groundwater volume in the Beaver River watershed will be relatively minor and will not have an impact on aquatic

resources. This is based on the relatively small change in relation to the large overall volume of groundwater discharging towards the Beaver Creek headwater system, as well as surface discharge from other sources within the headwater system.

Surface water changes to the southwest tributary of the Beaver River will occur post rehabilitation as a result from the loss of the spring on the southwest portion of the licensed area. This change is lessened by the continuing contribution of snowmelt and run-off to the tributary and will not affect fisheries located in downstream portions of the Beaver River that supports productive brook trout fisheries.

With the proposed mitigation and recommended enhancement, aquatic ecosystems and fish habitat will be enhanced in the Pretty River, Batteaux Creek and Beaver River systems. The Pretty River and Batteaux Creek will benefit from increased flow from escarpment springs, and the Beaver River system will benefit from downstream trout habitat enhancements proposed as a proactive approach to furthering fisheries management objectives.

### **7.3 WOODLANDS**

#### **Potential Impact**

Development of the proposed quarry during Phases 1, 2 and 3 will result in the clearing of forest from the proposed extraction area. The forest is mostly comprised of heavily managed, even-aged Sugar Maple forest, and is in a forest-rich landscape, where an extremely large woodland complex spreads across thousands of hectares. In total, the area of vegetation that would be temporarily removed within the extraction limits of the proposed quarry is 40.5 ha.

Temporary removal of 40.5 ha of forest in a forest-rich landscape will have negligible effects on broad landscape level ecological processes. There will, however, be localized impacts on wildlife habitat and ecological linkages.

#### **Mitigation**

**Figure 9** illustrates areas on and adjacent to the proposed license area where compensatory planting will occur. The Reforestation Plan makes full use of adjacent lands owned by Georgian Aggregates, as well as opportunistic use of appropriate adjacent lands that are owned by others. The total area identified in the reforestation plan covers 52.2 ha. Implementation of this strategy would result in an increase of 11.7 ha of forest cover over the existing situation. In addition to planting that has already taken place, a detailed reforestation planting strategy will be prepared in consultation with Georgian Aggregates and the appropriate regulatory agencies over the winter of 2005-2006. The final plan will be prepared as a part of the AMP.

Planting has commenced and should continue during Phase 1 of extraction. By the time that forests are cleared during Phase 2, and particularly during Phase 3, the restored forest link should be sufficiently aged to replace the attributes of the current woodlots. In order to ensure the natural function of this re-established forest, the reforestation process should use native

species in a way that incorporates the restored forest block with the natural successional stages of the surrounding forest blocks.

### **Net Impact**

At a regional scale the loss of woodland from the proposed extraction area is deemed to be an acceptable impact, as the network of contiguous forest north of Simcoe Road 91 and east of Grey Road 31 will remain intact and the total area of forest in the landscape will increase over time. The areas planted in compensation for removal of forest in the quarry expansion area would form a large contiguous block of forest that incorporates the Rob Roy PSW and the Duntroon Escarpment ANSI to the larger regional forest network.

**Section 3.7** of the Simcoe County Official Plan emphasizes the importance of Greenlands and Greenland Linkages. In addition to compensating for the removal of existing forests as described above, the Compensation Planting Strategy also improves linkages between existing and planned forest blocks with the larger regional network of forests through the establishment of the following wooded corridors:

- Planting to the west of the proposed expansion (blocks the north and south, of Simcoe Road 91 (see **Figures 9** and **11**) will re-establish a corridor between the Duntroon Escarpment ANSI and the woodlands to the south and east of the existing Duntroon quarry; and,
- A forested/planted strip varying in width between 30-60m between the western limits of Phase 2 and Grey Road 31 will be left intact as part of the visual and noise-buffering system and this strip will maintain a degree of connectivity to the wetlands to the south of Simcoe Road 91.

The woodlands to be removed do not meet the criteria for significant woodlands but they do have an ecological function in the landscape. The proposed forest removal and replanting will have an overall positive impact on the ecological functions of woodlands in the vicinity of the proposed license area. Benefits of forest planting will begin to accrue immediately, and by the time of quarry closure the following benefits are predicted:

- An increase in the total amount of woodland (133.6 ha to 145.4 ha);
- An increase in the functionality of woodland connections;
- An increase in forest interior habitat (38.3 ha to 52.4 ha); and,
- An improvement in the overall quality of the forest communities.

## **7.4 WILDLIFE HABITAT**

### **7.4.1 Amphibian Breeding Ponds**

#### **Potential Impacts**

The small ephemeral woodland ponds associated with unit #2 of the Rob Roy wetland complex are considered to be amphibian breeding ponds. These ponds, although small, occur in sufficient abundance within this feature to warrant protection and mitigation. Changes can occur as a result of the groundwater changes resulting from drawdown as well as loss of surface water contributions caused by loss of catchment areas. As noted in the wetland section of this report and discussed in the Jagger Hims report (2005), the impacts to the wetland are anticipated to be minor given that other direct precipitation and snowmelt continue to provide the wetland with water. Nonetheless, even minor changes to the water regime in this wetland may affect the hydro-period of these ephemeral ponds.

#### **Mitigation**

The direct pumping of excess quarry water during operations will be used to mitigate any affects to the wetland and pond environments during operations. In addition, should monitoring predict that additional measures are required, groundwater recharge wells will be developed to help maintain acceptable water table conditions in the wetland.

Post closure the filled quarry will eliminate drawdown effects and re-establishing the higher water table will assist in maintaining the hydro-period of the ephemeral ponds.

#### **Net Impact**

During operations there may be some change in the location of the ponds but generally pumped water will move to the existing low lying areas where the ponds currently occur. There are no anticipated impacts to the function of these ponds through the implementation of the mitigation during operations

### **7.4.2 Hart's-Tongue Fern**

#### **Potential Impact**

Development of the proposed quarry during Phase 2 will result in the loss of Hart's-tongue fern plants. Given the abundance of suitable habitat in the vicinity, this habitat is not considered significant. However, the loss of these specimens could have an impact on local and regional populations of the species, and should be mitigated.

**Mitigation**

Within the Duntroon ANSI there are areas that are suitable for the preservation of local populations of Hart's-tongue fern. The ANSI populations were found to be smaller than those from the proposed extraction area, and there is physical space for increasing their size. The reforestation areas may also present opportunities to transplant Hart's-tongue fern.

The important consideration is the availability of suitable substitute habitat. Within the immediate vicinity of the first station within the ANSI there are areas that are ecologically appropriate for the fern to grow, i.e. semi-open patches with shallow soil and rock outcroppings at surface. It is not known at this point if the second station will be as conducive to the species transplantation and survival success, as it is more of a closed-canopy environment and the soil could be less alkaline due to the presence of coniferous trees.

The selection of the transplanting locations in the ANSI will be based on the ecology of the plants. Transplanting will involve the collection of individual plants that will be carefully dug out and tightly put into containers to reduce evaporation as well as collection of larger plugs containing plants and surface soil material. The choice of specimens to transplant should be limited to young or medium-aged individuals that should exhibit good growth in new conditions. The transplanting time should be either in the spring (when plants begin to grow vigorously and can withstand stress) or in the fall (when plants go into dormancy).

**Net Impact**

The local and regional populations of Hart's-tongue fern appear to be robust, healthy and widespread. Transplanting individuals from one suitable habitat to another will not have negative impact on either local or regional populations.

**7.4.3 Butternut****Potential Impact**

Access to mineral resources in the proposed extraction area will require the removal of several specimens of butternut. There is no habitat associated with the locations of these specimens that is not abundantly available in the surrounding area, and the habitat was not evaluated through this report as significant. The potential impact on the local population of butternut is concluded to be minimal. Notwithstanding this conclusion, it is recommended that the loss of any butternut specimens be mitigated as outlined below.

**Mitigation**

The response to the butternut issue in Ontario is currently evolving. Staff from the OMNR, Canadian Forestry Services and the Forest Gene Conservation Association (FGCA) are heading up a recovery effort. The following is a brief extract from the FGCA website ([http://www.fgca.net/conservation/sar/butternut\\_recovery\\_team.aspx](http://www.fgca.net/conservation/sar/butternut_recovery_team.aspx)) outlining progress to date.

*“... starting in January 2005, an Ontario Butternut Recovery Team was formed to address conservation efforts and continue the work begun by the FGCA and the Butternut Conservation Coalition. As of May 2005 the Team has met twice and has hosted two sessions to update stakeholders on conservation efforts. A draft Recovery Strategy is being developed, but ahead of the Strategy being finalized several activities will be started. These include:*

- *Butternut education and fundraising;*
- *Diseased tree assessment guidelines to help landowners and consultants determine the vigour of infected trees*
- *Butternut management practices to help landowners increase its vigour and promote natural regeneration*
- *Location of vigorously surviving butternut for seed collection.”*

Detailed mitigation measures for the butternut loss at Duntroon can be developed in the context of the recovery plan and in cooperation with the recovery team. Potential recovery measures could include, among others:

- genetic research to identify canker resistant strains;
- seed collection from, and transplantation of, apparently resistant specimens;
- grafting of apparently resistant specimens to nursery root stock and transplantation; and,
- long-term investigation of the canker and control methods.

It is recommended that seed collection, transplantation and grafting measures be explored for the Duntroon property in cooperation with the butternut recovery team. There is a large area of potential butternut habitat outside the proposed extraction area that will be reforested. Suitable un-shaded locations for the shade intolerant butternut will be abundant in edge areas and as part of plantings for visual screening. A variety of ecologically differing habitats, with substantial spatial separation could be identified, based on an understanding of the infection mechanisms of the canker.

### **Net Impact**

There is a significant opportunity for Georgian Aggregates to assist the recovery team in research and site specific case studies of butternut regeneration. Georgian Aggregates is willing to commit resources to participating in a properly supervised scientific effort that will enhance the long-term prospects of butternut in Ontario. The net impact of such a program will be positive, not only for the local population of butternut, but for butternut throughout its range.

#### **7.4.4 Interior Birds**

##### **Potential Impact**

Development of the quarry during Phases 1, 2, and 3 will result in the temporary loss of mature forests. These forested habitats are not considered significant wildlife habitat under the Significant Wildlife Habitat Technical Guide (OMNR, 2000), as a result of the presence of low number of common area-sensitive bird species and a regional abundance of interior habitat.

However, the loss of any interior forest habitat, whether significant or not, should be mitigated to the extent possible.

### **Mitigation**

The Reforestation Plan described in **Section 6.2** will enhance interior forest habitat. Total forest area on properties owned by Georgian Aggregates will increase from 133.6 ha to 145.4 ha, and interior forest habitat will also increase by more than 35% from 38.3 ha to 52.4 ha. Finally, the quality of the habitat as measured by species diversity, age class distribution and structural diversity will also improve.

### **Net Impact**

The proposed expansion and mitigation will result in a net positive impact on forest interior bird habitat with the eventual increase of 14.1 hectares and a significantly larger single block of interior area compared to the existing smaller 4 parcels.

## **7.5 DUNTROON ESCARPMENT ANSI**

### **Potential Impact**

The southwest corner of the Duntroon Escarpment ANSI is located adjacent to Phase 3 of the proposed extraction area. Although the proposed extraction area will not intrude into the ANSI, development of the quarry during Phase 3 could potentially impact upon vegetation dynamics in the ANSI and its associated subcatchment. As a regional life science ANSI, this area should be protected from adverse impacts.

### **Mitigation**

In order to reduce the impact upon the features that the ANSI is intended to protect, a vegetated buffer of 10m is recommended between the dripline of the limits of the ANSI and the limit of extraction. This is reflected on the site plan in the 10m setback located along the northern limit of the proposed extraction area.

### **Potential Impact**

Development of the proposed quarry during Phase 3 has the potential to impact upon the seeps on the former Millar property that currently feed into the ANSI and its associated wetlands.

### **Mitigation**

To maintain natural surface water flows into the ANSI and its wetlands, water will be directed towards the ANSI to match the existing flow regime via mechanical means, during Phase 3 of the proposed quarry development and operation, and continued post-closure until such time that the flooded quarry establishes a natural flow regime. Details are provided in Jagger Hims 2005.

### **Net Impact**

With mitigation there will be no negative impact on the ANSI.

## **7.6 ADAPTIVE MANAGEMENT PLAN - ECOLOGICAL MONITORING AND RESPONSE PROGRAM**

Predicted effects to environmental features can only be determined as significant within the context of the natural range of changes that occur in the environment seasonally and over time. Natural environments tend to be very dynamic and subject to continuous successional change. To assess predicted effects, a monitoring and response program is recommended. The program should be designed to track changes and assess their overall impact to the feature. The program should also provide a response mechanism, based on triggers that can be used to support the implementation of mitigation measures or modifications to operations as necessary. The first component of the monitoring and response program is to monitor hydrogeological parameters to ensure that the changes do not exceed the levels that are predicted to be acceptable. The Jagger Hims 2005 report provides details of the first level of proposed monitoring which is focused on ground and surface water. This water monitoring will be used as a primary trigger to identify when a threshold has been reached, which in turn may result in an effect to the biological attributes associated with the potential zone of influence around the quarry. Biological monitoring, conducted concurrently, will support the hydrogeological monitoring.

In order to develop an effective and meaningful monitoring program, the purpose of the program must first be determined. In this case, the monitoring program is intended to track changes in the condition of various resources (wetlands, springs (groundwater discharges) and surface waterflow) within the boundaries of the site and zone of influence and to determine if those changes are due to natural variability or due to site alteration. Changes attributed to site alterations can be mitigated through changes in quarry operations. This process of collection of information, analyses and adjustment of operations is based on an adaptive management approach to resource protection and is the core of the Adaptive Management Plan (AMP) for the quarry.

A successful monitoring program relies on the collection of existing conditions data to establish baseline information about the resources on site and their natural variability, and includes an approach that allows for early warning of potential impacts.

The hydrogeological and hydrologic monitoring will identify the baseline and threshold changes at the various stations that would trigger a potential response in sensitive features such as wetlands. The threshold will be determined as a level of impact that would be deemed acceptable and unlikely to cause harm to the resource, but which provides an early warning that the true threshold for unacceptable impact is being approached.

The biological monitoring program proposed will assist in verifying the findings of the hydrogeological and hydrological monitoring. If changes in groundwater and surface water flow are within an acceptable range, biological changes should be stable and within the range of naturally occurring changes. The following general ecological monitoring program is proposed to confirm that no negative impacts are occurring. The program will be refined in conjunction with the water monitoring program.

### **Scope and Purpose of Ecological Monitoring Program**

There are generally three natural heritage features that will warrant biological monitoring on and around the proposed expansion area, fisheries resources, wetland resources and forest habitat.

#### **Fisheries Monitoring**

No direct impact to fish habitat is predicted. Indirect impacts may arise from changes in groundwater and surface water flows. These impacts will be monitored through the hydrogeologic monitoring program, and no monitoring of aquatic ecosystems is proposed. Downstream habitat enhancement will be monitored in consultation with the relevant public agencies.

#### **Wetland Monitoring**

A wetland biological monitoring program is recommended for wetland units in the licensed area and adjacent to the proposed quarry.

The wetland monitoring program will be designed to:

1. Establish pre-extraction baseline ecological conditions at transects/plots;
2. Establish pre-extraction baseline ecological conditions in a wetland not within impact zone (control station);
3. Once dewatering and groundwater drawdown occurs, allow for bi-annual (twice per year) evaluation of transects/plots in potential impacted wetland feature and control station;
4. Review ongoing hydrogeological monitoring and compare to ongoing biological changes (impact zone and control); and
5. Provide a mechanism to respond to changes that might have a negative effect on ecological function through increase in hydrogeological mitigation or other water management measures.

Five wetland monitoring locations and one control location are suggested for biological monitoring. The locations correspond to potential impact areas and established hydrogeological monitoring locations, specific transect/plot locations will be chosen in consultation with the regulatory agencies. Wetland monitoring locations include the Rob Roy wetland to the North West (unit #2), Rob Roy wetland to the SW west of Grey County Road 31 (unit #6), and the two wetland pockets found in the Duntroon regional ANSI.

A control monitoring station would be established in the southern portion of the Camarthan wetland located south of the existing quarry. This control would be used to establish potential naturally occurring changes associated with prevailing climatic trends.

Analysis will be based on vegetation community composition using sampling protocols consistent with Ecological Monitoring and Assessment Network (EMAN). Transect/plot locations will be determined in consultation with the regulatory agencies and documented in a

biological monitoring program detailing the location of plots, sampling protocol, schedule and means of assessment.

The biological monitoring plan will be developed to include such intricacies as establishing two transect/plots within the Rob Roy wetland located to the north west of the quarry expansion; one closer to the quarry and one further downgradient in order to determine if noticeable biological changes are evident as the watertable drawdown cone expands as each Phase proceeds.

### **Response**

Should ecological changes be noticeable beyond those assessed to be natural, the response will be as follows:

- 1a) Implement the additional hydrogeological mitigations suggested to counter such impacts - increase surface water contribution and installation of recharge wells;
- 1b) Concurrently undertake detailed assessment of hydrogeological models; and triggers relative to biological findings; and,
- 2) Assist hydrogeologist in providing recommendations concerning options for mitigation initiatives and how operations should proceed.

The full extent of the biological monitoring program for pre and during, extraction conditions will be developed in consultation with the regulatory agencies in order to develop appropriate protocols and determine benchmarks that would be used to implement corrective management approaches.

### **Forest Monitoring**

A detailed reforestation plan based on ecological principles will be developed in consultation with the agencies. The plan will include specific ecological goals such as species and immunity diversity, topographical and structural diversity in support of a range of habitat riches, rare species (Hart's-tongue fern and Butternut) representation and others. The monitoring program will be designed to focus on the specific goals and measures will be taken to ensure that the forests created provide a wide range of ecological benefits and represent a net enhancement to ecological landscape functions compared to the forests to be removed.

## 8.0 Conclusions and Recommendations

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### Features

This Level II Natural Environment study was undertaken for the proposed expansion of the existing Duntroon Quarry, in the Township of Clearview, County of Simcoe. The assessment was completed under the requirements of the Aggregate Resources Act (ARA) to determine if any significant natural heritage features or areas, as identified in the Ontario Provincial Policy Statement (PPS), occur on the proposed extraction area, or on adjacent lands to the proposed extraction area, and to assess the potential direct and indirect impacts of the proposed aggregate extraction plan on such features. For the purpose of this assessment adjacent lands were defined as lands within 120m of the extraction area as well as lands beyond 120m where indirect impacts such as ground or surface water alterations might lead to indirect impacts on significant natural features.

This study also considered the natural environment policies and features identified in the County of Simcoe and Township of Clearview Official Plans as well as the policies of the Niagara Escarpment Plan.

Based on a thorough review of the existing natural resources and the policies, guidelines and scientific criteria associated with the PPS, it is concluded that no significant natural features as identified in the PPS occur within the proposed extraction area; however, significant features were identified on adjacent lands. These features include:

- The Rob Roy Complex Provincially Significant Wetland Complex;
- Cold water fisheries habitat with naturally reproducing native brook trout (tributaries of the Batteaux Creek and the Pretty and Beaver Rivers); and,
- Significant wildlife habitat.

Natural environment features considered significant at the local or regional levels also occur on adjacent lands. These features include:

- Regionally significant Duntroon Life Science ANSI; and,
- Unevaluated wetlands, included in the regional ANSI.

In addition, the following planning designations are also found on the proposed license area and adjacent lands:

- County of Simcoe Greenlands; and,
- Niagara Escarpment Natural Area and Protection Area designations.

Finally, locally significant natural environment features, in the form of County of Simcoe Greenland designations occur within the proposed extraction area.

## **Impacts**

### **Direct Impacts**

There will be no direct impact on any significant features on adjacent lands.

The designated Greenlands features (40.5 ha of forest) that occur within the proposed extraction area will be removed, in phases, as part of the proposed extraction. Replanting 52.2 ha of forest will mitigate this direct impact on a locally significant feature. The area, landscape position, species diversity and special characteristics of the planted forest will all be enhanced relative to existing conditions and will result in a long-term gain in the ecological function of the surrounding landscape, leading to enhancement of regional forest functions.

### **Indirect Impacts**

The proposed extraction will alter ground and surface water conditions in adjacent lands. These alterations may lead to potential indirect impacts on the significant features on adjacent lands. In accordance with provincial policy, any potential indirect impacts must be mitigated to ensure that any net or residual impact after application of the mitigation measures will not result in *negative impact* on the significant features. The potential net indirect impacts on significant features were assessed by:

1. predicting the potential indirect effects of the proposed aggregate operations on the ecology of the area surrounding the extraction area including changes to forest cover, landscape linkages and ground and surface water dynamics;
2. evaluating the significance of predicted effects on the form, function and long-term sustainability of the significant features;
3. adapting the proposed plan to mitigate effects evaluated as likely to result in negative impact on significant features. Adaptation of the plan included changing the extent, depth and location of aggregate extraction and recommending mitigation and management measures to reduce indirect impacts; and,
4. recommending development of a monitoring program to compare predicted effects and impacts to those observed through monitoring so that further adaptation in the operations can be implemented as necessary.

### **Net Impacts**

Based on this review the following net impacts were predicted:

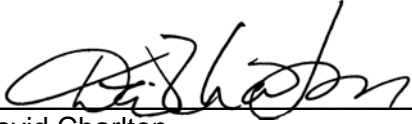
- No negative impact on the Rob Roy Complex Provincially Significant Wetland Complex;

- Long-term loss of a small spring contributing flow to downstream fisheries habitat in the Beaver River, which will be gradual and can be fully mitigated through downstream enhancement works, resulting in a net gain in the productive capacity of the Beaver River aquatic ecosystem;
- Long-term increases in base flow to fisheries habitat in the Batteaux Creek and Pretty River systems, resulting in net gains in the productive capacities of these aquatic ecosystems;
- Long-term increases in the quality and quantity of forest cover and landscape linkages resulting in no negative impact to significant woodlands and a net gain in the ecological functionality of the surrounding landscape associated with the presence of significant woodlands, and,
- No negative impact on significant wildlife habitat.


### **Recommendations**

These conclusions are based on the following recommendations being implemented:

- Extraction limits phasing and progressive rehabilitation as outlined in the site plans (MHBC, 2005);
- Maintenance of groundwater levels and surface flows as outlined in the Geological and Level 2 Hydrogeology Assessment (Jagger Hims, 2005);
- Opportunity for Beaver River fish habitat enhancement in cooperation with relevant agencies;
- Preparation and implementation of a detailed ecologically diverse forest restoration plan in consultation with the appropriate agencies. The plan will include:
  - Woodland enhancement and creation on lands adjacent to the extraction area based on principles as outlined in this Level II Natural Environment Technical Report;
  - Wildlife habitat enhancement and creation on lands adjacent to the extraction area based on principles as outlined in this Level II Natural Environment Technical Report;
  - Transplantation, management and monitoring of representative populations of Hart's-tongue fern and butternut on lands adjacent to the extraction area based on principles as outlined in this Level II Natural Environment Technical Report;
- Development and application of long term Adaptive Monitoring Plans (AMPs) for water, as outlined in Jagger Hims 2005, and for adjacent significant natural features as outlined in this report, with integration between the programs as required.



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## Figures



## **Appendix A**

### **List of Vascular Plants**



**List of the Vascular Plants Recorded from Duntroon Quarry Expansion**

LATIN NAME		COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	WEEDINESS INDEX	PROVINCIAL STATUS	OMNR STATUS	COSEWIC STATUS	GLOBAL STATUS	LOCAL STATUS SW ONT	LOCAL STATUS GREY	LOCAL STATUS SIMCOE
	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									OLDHAM 1993		RILEY 1989  Aug 2002/KH
<b>PTERIDOPHYTES</b>		<b>FERNS &amp; ALLIES</b>										
<b>Aspleniaceae</b>		<b>Spleenwort Family</b>										
<i>Asplenium</i>	<i>scolopendrium var. americanur</i>	Hart's-tongue	10	5		S3			G5T3		X	R6
<b>Dryopteridaceae</b>		<b>Wood Fern Family</b>										
<i>Athyrium</i>	<i>filix-femina var. angustum</i>	Northern Lady Fern	4	0		S5			G5T5		X	X
<i>Cystopteris</i>	<i>bulbifera</i>	Bulblet Bladder Fern	5	-2		S5			G5		X	X
<i>Dryopteris</i>	<i>carthusiana</i>	Spinulose Wood Fern	5	-2		S5			G5		X	X
<i>Matteuccia</i>	<i>struthiopteris var. pensylvanica</i>	Ostrich Fern	5	-3		S5			G5		X	X
<i>Onoclea</i>	<i>sensibilis</i>	Sensitive Fern	4	-3		S5			G5		X	X
<i>Polystichum</i>	<i>acrostichoides</i>	Christmas Fern	5	5		S5			G5		X	X
<b>Equisetaceae</b>		<b>Horsetail Family</b>										
<i>Equisetum</i>	<i>arvense</i>	Field Horsetail	0	0		S5			G5		X	X
<b>Pteridaceae</b>		<b>Maidenhair Fern Family</b>										
<i>Adiantum</i>	<i>pedatum</i>	Northern Maidenhair Fern	7	1		S5			G5		X	X
<b>GYMNOSPERMS</b>		<b>CONIFERS</b>										
<b>Cupressaceae</b>		<b>Cedar Family</b>										
<i>Thuja</i>	<i>occidentalis</i>	Eastern White Cedar	4	-3		S5			G5		X	X
<b>Pinaceae</b>		<b>Pine Family</b>										
<i>Abies</i>	<i>balsamea</i>	Balsam Fir	5	-3		S5			G5		X	X
<i>Picea</i>	<i>glauca</i>	White Spruce	6	3		S5			G5		X	X
<i>Pinus</i>	<i>strobus</i>	Eastern White Pine	4	3		S5			G5		X	X
<i>Pinus</i>	<i>sylvestris</i>	Scotch Pine		5	-3	SE5			G?			X
<b>DICOTYLEDONS</b>		<b>DICOTS</b>										
<b>Aceraceae</b>		<b>Maple Family</b>										

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	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									OLDHAM 1993		RILEY 1989  Aug 2002/KH
<i>Acer</i>	<i>negundo</i>	Manitoba Maple	0	-2		S5			G5		X	X
<i>Acer</i>	<i>rubrum</i>	Red Maple	4	0		S5			G5		X	X
<i>Acer</i>	<i>saccharinum</i>	Silver Maple	5	-3		S5			G5		X	X
<i>Acer</i>	<i>saccharum</i> ssp. <i>saccharum</i>	Sugar Maple	4	3		S5			G5T?		X	X
<b>Apiaceae</b>		<b>Carrot or Parsley Family</b>										
<i>Daucus</i>	<i>carota</i>	Wild Carrot		5	-2	SE5			G?			X
<b>Apocynaceae</b>		<b>Dogbane Family</b>										
<i>Vinca</i>	<i>minor</i>	Periwinkle		5	-2	SE5			G?			X
<b>Araliaceae</b>		<b>Ginseng Family</b>										
<i>Aralia</i>	<i>nudicaulis</i>	Wild Sarsaparilla	4	3		S5			G5		X	X
<b>Aristolochiaceae</b>		<b>Duchman's-pipe Family</b>										
<i>Asarum</i>	<i>canadense</i>	Wild Ginger	6	5		S5			G5		X	X
<b>Asclepiadaceae</b>		<b>Milkweed Family</b>										
<i>Asclepias</i>	<i>incarnata</i> ssp. <i>incarnata</i>	Swamp Milkweed	6	-5		S5			G5T5		X	X
<i>Asclepias</i>	<i>syriaca</i>	Common Milkweed	0	5		S5			G5		X	X
<b>Asteraceae</b>		<b>Composite or Aster Family</b>										
<i>Arctium</i>	<i>minus</i> ssp. <i>minus</i>	Common Burdock		5	-2	SE5			G?T?			X
<i>Aster</i>	<i>lanceolatus</i> ssp. <i>lanceolatus</i>	Tall White Aster	3	-3		S5			G5T?		X	X
<i>Chrysanthemum</i>	<i>leucanthemum</i>	Ox-eye Daisy		5	-1	SE5			G?			X
<i>Cirsium</i>	<i>arvense</i>	Canada Thistle		3	-1	SE5			G?			X
<i>Cirsium</i>	<i>vulgare</i>	Bull Thistle		4	-1	SE5			G5			X
<i>Erigeron</i>	<i>strigosus</i>	Daisy Fleabane	0	1		S5			G5		X	
<i>Inula</i>	<i>britannica</i>	British Inula				SE1			G?			
<i>Solidago</i>	<i>altissima</i> var. <i>altissima</i>	Tall Goldenrod	1	3		S5					X	R4

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	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									OLDHAM 1993		RILEY 1989  Aug 2002/KH
<i>Solidago</i>	<i>canadensis</i>	Canada Goldenrod	1	3		S5			G5		X	X
<i>Solidago</i>	<i>nemoralis</i> ssp. <i>nemoralis</i>	Gray Goldenrod	2	5		S5			G5T?		X	X
<i>Taraxacum</i>	<i>officinale</i>	Common Dandelion		3	-2	SE5			G5			X
<i>Tussilago</i>	<i>farfara</i>	Coltsfoot		3	-2	SE5			G?			X
<b>Balsaminaceae</b>		<b>Touch-me-not Family</b>										
<i>Impatiens</i>	<i>capensis</i>	Spotted Touch-me-not	4	-3		S5			G5		X	X
<b>Berberidaceae</b>		<b>Barberry Family</b>										
<i>Caulophyllum</i>	<i>thalictroides</i>	Blue Cohosh	6	5		S5			G		X	
<b>Betulaceae</b>		<b>Birch Family</b>										
<i>Betula</i>	<i>alleghaniensis</i>	Yellow Birch	6	0		S5			G5		X	X
<i>Betula</i>	<i>papyrifera</i>	White Birch		2		S5			G5		X	X
<i>Corylus</i>	<i>americana</i>	American Hazel	5	4		S5			G5			
<i>Ostrya</i>	<i>virginiana</i>	Hop Hornbeam	4	4		S5			G5		X	X
<b>Brassicaceae</b>		<b>Mustard Family</b>										
<i>Alliaria</i>	<i>petiolata</i>	Garlic Mustard		0	-3	SE5			G5			X
<i>Barbarea</i>	<i>vulgaris</i>	Yellow Rocket		0	-1	SE5			G?			X
<i>Cardamine</i>	<i>concatenata</i>	Cut-leaved Toothwort	6	3		S5			G5		X	X
<i>Cardamine</i>	<i>diphylla</i>	Two-leaved Toothwort	7	5		S5			G5		X	X
<b>Caprifoliaceae</b>		<b>Honeysuckle Family</b>										
<i>Sambucus</i>	<i>canadensis</i>	Common Elderberry	5	-2		S5			G5		X	X
<i>Sambucus</i>	<i>racemosa</i> ssp. <i>pubens</i>	Red-berried Elderberry	5	2		S5			G5T4T5		X	X
<b>Cornaceae</b>		<b>Dogwood Family</b>										
<i>Cornus</i>	<i>alternifolia</i>	Alternate-leaved Dogwood	6	5		S5			G5		X	X
<i>Cornus</i>	<i>stolonifera</i>	Red-osier Dogwood	2	-3		S5			G5		X	X

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	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									OLDHAM 1993		RILEY 1989  Aug 2002/KH
<b>Dipsacaceae</b>		<b>Teasel Family</b>										
<i>Dipsacus</i>	<i>fullonum</i> ssp. <i>sylvestris</i>	Wild Teasel		5	-1	SE5			G?T?			X
<b>Elaeagnaceae</b>		<b>Oleaster Family</b>										
<i>Shepherdia</i>	<i>canadensis</i>	Canada Soapberry	7	5		S5			G5		X	X
<b>Fabaceae</b>		<b>Pea Family</b>										
<i>Lotus</i>	<i>corniculatus</i>	Bird's-foot Trefoil		1	-2	SE5			G?			X
<i>Trifolium</i>	<i>pratense</i>	Red Clover		2	-2	SE5			G?			X
<i>Vicia</i>	<i>cracca</i>	Tufted Vetch		5	-1	SE5			G?			X
<b>Fagaceae</b>		<b>Beech Family</b>										
<i>Fagus</i>	<i>grandifolia</i>	American Beech	6	3		S5			G5		X	X
<b>Geraniaceae</b>		<b>Geranium Family</b>										
<i>Geranium</i>	<i>robertianum</i>	Herb-robert		5	-2	SE5			G5			X
<b>Grossulariaceae</b>		<b>Currant Family</b>										
<i>Ribes</i>	<i>americanum</i>	Wild Black Currant	4	-3		S5			G5		X	X
<i>Ribes</i>	<i>cynosbati</i>	Prickly Gooseberry	4	5		S5			G5		X	X
<i>Ribes</i>	<i>triste</i>	Wild Red Currant	6	-5		S5			G5		X	X
<b>Guttiferae</b>		<b>St. John's-wort Family</b>										
<i>Hypericum</i>	<i>perforatum</i>	Common St. John's-wort		5	-3	SE5			G?			X
<b>Hydrophyllaceae</b>		<b>Water-leaf Family</b>										
<i>Hydrophyllum</i>	<i>virginianum</i>	Virginia Water-leaf	6	-2		S5			G5		X	X
<b>Juglandaceae</b>		<b>Walnut Family</b>										

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	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									OLDHAM 1993		RILEY 1989  Aug 2002/KH
<i>Juglans</i>	<i>cinerea</i>	Butternut	6	2		S3?	END	END	G3G4		X	X
<b>Lamiaceae</b>		<b>Mint Family</b>										
<i>Glechoma</i>	<i>hederacea</i>	Creeping Charlie		5	-2	SE5			G?			X
<i>Prunella</i>	<i>vulgaris</i> ssp. <i>vulgaris</i>	Common Heal-all		0	-1	SE3			G5T?			X
<b>Oleaceae</b>		<b>Olive Family</b>										
<i>Fraxinus</i>	<i>pennsylvanica</i>	Red Ash	3	-3		S5			G5		X	X
<i>Syringa</i>	<i>vulgaris</i>	Common Lilac		5	-2	SE5			G?			X
<b>Onagraceae</b>		<b>Evening-primrose Family</b>										
<i>Circaea</i>	<i>lutetiana</i> ssp. <i>canadensis</i>	Yellowish Enchanter's Nightshade	3	3		S5			G5T5		X	X
<b>Plantaginaceae</b>		<b>Plantain Family</b>										
<i>Plantago</i>	<i>lanceolata</i>	Ribgrass		0	-1	SE5			G5			X
<b>Polygonaceae</b>		<b>Smartweed Family</b>										
<i>Rumex</i>	<i>crispus</i>	Curly-leaf Dock		-1	-2	SE5			G?			X
<i>Rumex</i>	<i>obtusifolius</i> ssp. <i>obtusifolius</i>	Bitter Dock		-3	-1	SE5			G5			X
<b>Ranunculaceae</b>		<b>Buttercup Family</b>										
<i>Actaea</i>	<i>rubra</i>	Red Baneberry	5	5		S5			G5		X	X
<i>Anemone</i>	<i>acutiloba</i>	Sharp-lobed Hepatica	6	5		S5			G5		X	X
<i>Caltha</i>	<i>palustris</i>	Marsh-marigold	5	-5		S5			G5		X	X
<i>Ranunculus</i>	<i>abortivus</i>	Kidney-leaf Buttercup	2	-2		S5			G5		X	X
<i>Ranunculus</i>	<i>acris</i>	Tall Buttercup			-2	SE5			G5			X
<i>Thalictrum</i>	<i>dioicum</i>	Early Meadow-rue	5	2		S5			G5		X	X
<b>Rosaceae</b>		<b>Rose Family</b>										
<i>Cotoneaster</i>	<i>horizontalis</i>	Ornamental Thorn				SE1			G?			

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	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									OLDHAM 1993		RILEY 1989  Aug 2002/KH
<i>Fragaria</i>	<i>virginiana</i> ssp. <i>virginiana</i>	Scarlet Strawberry	2	1		SU			G5T?		X	X
<i>Malus</i>	<i>pumila</i>	Common Crabapple		5	-1	SE5			G5			X
<i>Potentilla</i>	<i>recta</i>	Rough-fruited Cinquefoil		5	-2	SE5			G?			X
<i>Prunus</i>	<i>serotina</i>	Black Cherry	3	3		S5			G5		X	X
<i>Prunus</i>	<i>virginiana</i> ssp. <i>virginiana</i>	Choke Cherry	2	1		S5			G5T?		X	X
<i>Rubus</i>	<i>allegheniensis</i>	Alleghany Blackberry	2	2		S5			G5		X	X
<i>Rubus</i>	<i>idaeus</i> ssp. <i>melanolasius</i>	Wild Red Raspberry	0	-2		S5			G5T		X	X
<i>Rubus</i>	<i>pubescens</i>	Dwarf Raspberry	4	-4		S5			G5		X	X
<i>Spiraea</i>	<i>alba</i>	Narrow-leaved Meadow-sweet	3	-4		S5			G5		X	X
<b>Salicaceae</b>		<b>Willow Family</b>										
<i>Populus</i>	<i>balsamifera</i> ssp. <i>balsamifera</i>	Balsam Poplar	4	-3		S5			G5T?		X	X
<i>Populus</i>	<i>tremuloides</i>	Trembling Aspen		0		S5			G5		X	X
<b>Saxifragaceae</b>		<b>Saxifrage Family</b>										
<i>Mitella</i>	<i>diphylla</i>	Two-leaved Bishop's Cap	5	2		S5			G5		X	X
<i>Mitella</i>	<i>nuda</i>	Naked Mitrewort	6	-3		S5			G5		X	X
<b>Scrophulariaceae</b>		<b>Figwort Family</b>										
<i>Verbascum</i>	<i>thapsus</i>	Common Mullein		5	-2	SE5			G?			X
<i>Veronica</i>	<i>peregrina</i> ssp. <i>peregrina</i>	Purslane Speedwell	0	-4		S5			G5T?			X
<b>Solanaceae</b>		<b>Nightshade Family</b>										
<i>Solanum</i>	<i>dulcamara</i>	Bitter Nightshade		0	-2	SE5			G?			X
<b>Tiliaceae</b>		<b>Linden Family</b>										
<i>Tilia</i>	<i>americana</i>	American Basswood	4	3		S5			G5		X	X
<b>Ulmaceae</b>		<b>Elm Family</b>										
<i>Ulmus</i>	<i>americana</i>	White Elm	3	-2		S5			G5?		X	X

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LATIN NAME		COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	WEEDINESS INDEX	PROVINCIAL STATUS	OMNR STATUS	COSEWIC STATUS	GLOBAL STATUS	LOCAL STATUS SW ONT	LOCAL STATUS GREY	LOCAL STATUS SIMCOE
	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									OLDHAM 1993		RILEY 1989  Aug 2002/KH
<b>Urticaceae</b>		<b>Nettle Family</b>										
<i>Laportea</i>	<i>canadensis</i>	Wood Nettle	6	-3		S5			G5		X	X
<i>Urtica</i>	<i>dioica</i> ssp. <i>gracilis</i>	American Stinging Nettle	2	-1		S5			G5T?		X	X
<b>Violaceae</b>		<b>Violet Family</b>										
<i>Viola</i>	<i>canadensis</i>	Canada Violet				S5			G5		X	X
<i>Viola</i>	<i>pubescens</i>	Downy Yellow Violet				S5			G5		X	X
<i>Viola</i>	<i>sororia</i>	Woolly Blue Violet				S5			G5		X	X
<b>MONOCOTYLEDONS</b>		<b>MONOCOTS</b>										
<b>Araceae</b>		<b>Arum Family</b>										
<i>Arisaema</i>	<i>triphyllum</i> ssp. <i>triphyllum</i>	Small Jack-in-the-pulpit	5	-2		S5			G5T5		X	X
<b>Cyperaceae</b>		<b>Sedge Family</b>										
<i>Carex</i>	<i>pedunculata</i>	Long-stalked Sedge	5	5		S5			G5		X	X
<i>Carex</i>	<i>stipata</i>	Awl-fruited Sedge	3	-5		S5			G5		X	X
<b>Iridaceae</b>		<b>Iris Family</b>										
<i>Iris</i>	<i>versicolor</i>	Multi-coloured Blue-flag	5	-5		S5			G5		X	X
<b>Liliaceae</b>		<b>Lily Family</b>										
<i>Allium</i>	<i>tricoccum</i>	Wild Leek	7	2		S5			G5		X	X
<i>Erythronium</i>	<i>americanum</i> ssp. <i>americanum</i>	Yellow Dog's-tooth Violet	5	5		S5			G5T5		X	X
<i>Maianthemum</i>	<i>canadense</i>	Wild Lily-of-the-valley	5	0		S5			G5		X	X
<i>Maianthemum</i>	<i>stellatum</i>	Star-flowered Solomon's Seal	6	1		S5			G5		X	X
<i>Polygonatum</i>	<i>pubescens</i>	Hairy Solomon's Seal	5	5		S5			G5		X	X
<i>Trillium</i>	<i>cernuum</i>	Nodding Trillium	8	0		S5			G5		R	X
<i>Trillium</i>	<i>grandiflorum</i>	White Trillium	5	5		S5			G5		X	X

**List of the Vascular Plants Recorded from Duntroon Quarry Expansion**

LATIN NAME		COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	WEEDINESS INDEX	PROVINCIAL STATUS	OMNR STATUS	COSEWIC STATUS	GLOBAL STATUS	LOCAL STATUS SW ONT	LOCAL STATUS GREY	LOCAL STATUS SIMCOE
	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									OLDHAM 1993		RILEY 1989  Aug 2002/KH
<i>Uvularia</i>	<i>grandiflora</i>	Large-flowered Bellwort	6	5		S5			G5		X	X
<b>Poaceae</b>		<b>Grass Family</b>										
<i>Bromus</i>	<i>inermis</i> ssp. <i>inermis</i>	Awnless Brome		5	-3	SE5			G4G5T?			X
<i>Dactylis</i>	<i>glomerata</i>	Orchard Grass		3	-1	SE5			G?			X
<i>Phalaris</i>	<i>arundinacea</i>	Reed Canary Grass	0	-4		S5			G5		X	X
<i>Phleum</i>	<i>pratense</i>	Timothy		3	-1	SE5			G?			X
<i>Phragmites</i>	<i>australis</i>	Common Reed	0	-4		S5			G5		R	X
<i>Poa</i>	<i>pratensis</i> ssp. <i>pratensis</i>	Kentucky Bluegrass	0	1		S5			G5T		X	X
<b>Typhaceae</b>		<b>Cattail Family</b>										
<i>Typha</i>	<i>latifolia</i>	Broad-leaved Cattail	3	-5		S5			G5		X	X
<b>FLORISTIC SUMMARY &amp; ASSESSMENT</b>												
<b>Species Diversity</b>												
Total Species:		120										
Native Species:		87	73%									
Exotic Species		33	28%									
Regionally Significant Species		enter manually										
S1-S3 Species		2	2%									
S4 Species		0	0%									
S5 Species		84	98%									
<b>Co-efficient of Conservatism and Floristic Quality Index</b>												
Co-efficient of Conservatism (CC) (average)		4.1										
CC 0 to 3	lowest sensitivity	26	32%									
CC 4 to 6	moderate sensitivity	50	61%									
CC 7 to 8	high sensitivity	5	6%									
CC 9 to 10	highest sensitivity	1	1%									

**List of the Vascular Plants Recorded from Duntroon Quarry Expansion**

LATIN NAME		COMMON NAME	COEFFICIENT OF CONSERVATISM	WETNESS INDEX	WEEDINESS INDEX	PROVINCIAL STATUS	OMNR STATUS	COSEWIC STATUS	GLOBAL STATUS	LOCAL STATUS SW ONT	LOCAL STATUS GREY	LOCAL STATUS SIMCOE
	LOCAL STATUS SOURCE LAST UPDATE/ INITIALS									OLDHAM 1993		RILEY 1989  Aug 2002/KH
<b>Floristic Quality Index (FQI)</b>		<b>38</b>										
<b>Presence of Weedy &amp; Invasive Species</b>												
mean weediness		<b>-1.7</b>										
weediness = -1	low potential invasiveness	12	39%									
weediness = -2	moderate potential invasiveness	15	48%									
weediness = -3	high potential invasiveness	4	13%									
<b>Presence of Wetland Species</b>												
average wetness value		<b>1.1</b>										
upland		32	28%									
facultative upland		27	24%									
facultative		21	18%									
facultative wetland		28	25%									
obligate wetland		6	5%									



**Appendix B**  
**Wildlife Recorded**



**Wildlife Recorded from Duntroon Quarry Expansion**

COMMON NAME	SCIENTIFIC NAME	ONTARIO STATUS	GLOBAL STATUS	COSSARO	COSEWIC	REGION	AREA	COMMENTS
<b>BUTTERFLIES</b>								
European Skipper	<i>Thymelicus lineola</i>	SE	G5					
Canadian Tiger Swallowtail	<i>Papilio canadensis</i>	S5	G5					
Pearl Crescent	<i>Phyciodes tharos</i>	S4	G5					
Orange Sulphur	<i>Colias eurytheme</i>	S5	G5					
Common Ringlet	<i>Coenonympha tullia</i>	S5	G5					
<b>AMPHIBIANS</b>								
Spring Peeper	<i>Pseudacris crucifer</i>	S5	G5					
Wood Frog	<i>Rana sylvatica</i>	S5	G5					
<b>BIRDS</b>								
Great Blue Heron	<i>Ardea herodias</i>	S5	G5					
Turkey Vulture	<i>Cathartes aura</i>	S4	G5					
Broad-winged Hawk	<i>Buteo platypterus</i>	S5	G5				100	
Red-tailed Hawk	<i>Buteo jamaicensis</i>	S5	G5	NIAC	NAR			
Wild Turkey	<i>Meleagris gallopava</i>	S4	G5					nest with eggs
Killdeer	<i>Charadrius vociferus</i>	S5	G5					
Ring-billed Gull	<i>Larus delawarensis</i>	S5	G5					
Mourning Dove	<i>Zenaidura macroura</i>	S5	G5					
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	S4	G5					
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	S5	G5					
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	S5	G5				30	
Downy Woodpecker	<i>Picoides pubescens</i>	S5	G5					
Hairy Woodpecker	<i>Picoides villosus</i>	S5	G5				10	
Northern Flicker	<i>Colaptes auratus</i>	S5	G5					
Pileated Woodpecker	<i>Dryocopus pileatus</i>	S4S5	G5				30-50	
Eastern Wood-Pewee	<i>Contopus virens</i>	S5	G5					
Least Flycatcher	<i>Empidonax minimus</i>	S5	G5					
Eastern Phoebe	<i>Sayornis phoebe</i>	S5	G5					
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	S5	G5					
Eastern Kingbird	<i>Tyrannus tyrannus</i>	S5	G5					
Warbling Vireo	<i>Vireo gilvus</i>	S5	G5					
Red-eyed Vireo	<i>Vireo olivaceus</i>	S5	G5					nest with eggs
Blue Jay	<i>Cyanocitta cristata</i>	S5	G5					

**Wildlife Recorded from Duntroon Quarry Expansion**

<b>COMMON NAME</b>	<b>SCIENTIFIC NAME</b>	<b>ONTARIO STATUS</b>	<b>GLOBAL STATUS</b>	<b>COSSARO</b>	<b>COSEWIC</b>	<b>REGION</b>	<b>AREA</b>	<b>COMMENTS</b>
American Crow	<i>Corvus brachyrhynchos</i>	S5	G5					
Tree Swallow	<i>Tachycineta bicolor</i>	S5	G5					
Bank Swallow	<i>Riparia riparia</i>	S5	G5					
Barn Swallow	<i>Hirundo rustica</i>	S5	G5					
Black-capped Chickadee	<i>Poecile atricapilla</i>	S5	G5					
Red-breasted Nuthatch	<i>Sitta canadensis</i>	S5	G5				10	
White-breasted Nuthatch	<i>Sitta carolinensis</i>	S5	G5				10	
House Wren	<i>Troglodytes aedon</i>	S5	G5					
Winter Wren	<i>Troglodytes troglodytes</i>	S5	G5				30	
Veery	<i>Catharus fuscescens</i>	S4	G5				10	
Wood Thrush	<i>Hylocichla mustelina</i>	S5	G5					
American Robin	<i>Turdus migratorius</i>	S5	G5					
Gray Catbird	<i>Dumetella carolinensis</i>	S5	G5					
European Starling	<i>Sturnus vulgaris</i>	SE	G5					
Cedar Waxwing	<i>Bombycilla cedrorum</i>	S5	G5					
Nashville Warbler	<i>Vermivora ruficapilla</i>	S5	G5					
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	S5	G5					
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	S5	G5				100	
Yellow-rumped Warbler	<i>Dendroica coronata</i>	S5	G5			7	30	
Black-throated Green Warbler	<i>Dendroica virens</i>	S5	G5				30	
Blackburnian Warbler	<i>Dendroica fusca</i>	S5	G5			7	50	
Black-and-white Warbler	<i>Mniotilta varia</i>	S5	G5				100	
American Redstart	<i>Setophaga ruticilla</i>	S5	G5				30	
Ovenbird	<i>Seiurus aurocapillus</i>	S5	G5				20	
Northern Waterthrush	<i>Seiurus noveboracensis</i>	S5	G5				20	
Mourning Warbler	<i>Oporornis philadelphia</i>	S5	G5				30	
Common Yellowthroat	<i>Geothlypis trichas</i>	S5	G5					
Scarlet Tanager	<i>Piranga olivacea</i>	S5	G5				30	
Chipping Sparrow	<i>Spizella passerina</i>	S5	G5					
Field Sparrow	<i>Spizella pusilla</i>	S5	G5					
Savannah Sparrow	<i>Passerculus sandwichensis</i>	S5	G5					
Song Sparrow	<i>Melospiza melodia</i>	S5	G5					
Snow Bunting	<i>Plectrophenax nivalis</i>	SZB?	G5					winter observation
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	S5	G5					
Indigo Bunting	<i>Passerina cyanea</i>	S5	G5					
Bobolink	<i>Dolichonyx oryzivorus</i>	S4	G5					



**Wildlife Recorded from Duntroon Quarry Expansion**

<b>COMMON NAME</b>	<b>SCIENTIFIC NAME</b>	<b>ONTARIO STATUS</b>	<b>GLOBAL STATUS</b>	<b>COSSARO</b>	<b>COSEWIC</b>	<b>REGION</b>	<b>AREA</b>	<b>COMMENTS</b>
<b>Explanation of Status and Acronyms</b>								
COSSARO: Committee on the Status of Species at Risk in Ontario								
COSEWIC: Committee on the Status of Endangered Species in Canada								
REGION: Rare in a Site Region								
S1: Extremely rare in Ontario; usually fewer than 5 occurrences								
S1S2: Extremely rare to very rare in Ontario								
S2: Very rare in Ontario; usually between 5-20 occurrences								
S2S3: Very rare to uncommon in Ontario								
S3: Rare to uncommon in Ontario; usually between 20-100 occurrences								
S3S4: Rare to common in Ontario								
S4: Common in Ontario: apparently secure, usually more than 100 occurrences								
S4S5: Common to very common in Ontario								
S5: Very common in Ontario, demonstrably secure								
SE: Exotic; not believed to be a native component of Ontario's fauna								
SH: Hypothetical; not positively confirmed in Ontario								
SHB: Hypothetical breeder; not positively confirmed breeding in Ontario								
SZ: Not of practical conservation concern as there are no clearly definable occurrences								
SZB: No clearly definable occurrences of breeding								
SZN: no clearly definable occurrences of a non-breeding species								
?: Not yet ranked; or, following a ranking, rank inexact or uncertain								
G1: Extremely rare globally; usually fewer than 5 occurrences in the overall range								
G1G2: Extremely rare to very rare globally								
G2: Very rare globally; usually between 5-10 occurrences in the overall range								
G2G3: Very rare to uncommon globally								
G3: Rare to uncommon globally; usually between 20-100 occurrences								
G3G4: Rare to common globally								
G4: Common globally; usually more than 100 occurrences in the overall range								
G4G5: Common to very common globally								
G5: Very common globally; demonstrably secure								
T: Denotes that the rank applies to a subspecies or variety								
END: Endangered								
THR: Threatened								
VUL: Vulnerable								
SC: Special Concern								
NAR: Not At Risk								

**Wildlife Recorded from Duntroon Quarry Expansion**

<b>COMMON NAME</b>	<b>SCIENTIFIC NAME</b>	<b>ONTARIO STATUS</b>	<b>GLOBAL STATUS</b>	<b>COSSARO</b>	<b>COSEWIC</b>	<b>REGION</b>	<b>AREA</b>	<b>COMMENTS</b>
NIAC: Not In Any Category of risk								
IND: Indeterminant, insufficient information to assign status								
DD: Data Deficient								
6: Rare in Site Region 6								
7: Rare in Site Region 7								
Area: Minimum habitat area for are	ive species (ha)							



**Appendix C**  
**Curricula Vitae**



## PRINCIPAL, ENVIRONMENTAL MANAGEMENT

**David L. Charlton** M.Sc., B.Sc., P.Ag.



David has been contributing to sustainable resource management practices since 1982. He has developed a practical approach to impact assessment and conflict resolution through his central role in a number of Environmental Assessments and watershed management plans dealing with the protection, restoration and management of a range of ecosystems. David has written more than 200 impact assessments, and has been cited for his work by the Ontario Provincial Planning Institute and the Ontario Municipal Board, among others. He has provided planning and management services to a range of industrial resource sectors including aggregate, forestry and agriculture. He has conducted pure and applied scientific research for federal governments on topics ranging from wetland management to agricultural land stewardship. He has worked closely with all interests, ranging from development proponents to public interest groups, to solve difficult resource management issues. David has served on several advisory committees, such as the City of Guelph Environmental Advisory Committee, and has appeared as an expert witness in front of Boards and Tribunals including the Ontario Municipal Board and the Ontario Court of Justice.

### EDUCATION

M.Sc., Resources Development, University of Guelph, Guelph, Ontario, 1986

B.Sc., Agriculture, University of Guelph, Guelph, Ontario, 1982

Ontario Wetland Evaluation System, Southern Manual, (3rd Edition) and Ontario Wetland Evaluation System, Northern Manual, (1st Edition), Ontario Ministry of Natural Resources, Lowville, Ontario, 1995

Temperate Wetland Restoration Training Course, Ontario Ministry of Natural Resources, Peterborough, Ontario, 2004

### PROFESSIONAL ASSOCIATIONS

Professional Agrologist, Agricultural Institute of Canada

### RECENT AWARDS

1999 Outstanding Planning, Ontario Professional Planners Institute, Lynde Shores Environmental Homeowner's Guide

1983 Natural Science and Engineering Research Council Graduate Scholarship, Vegetation and Soil Ecology - Bruce Peninsula Wetlands

## PRINCIPAL, ENVIRONMENTAL MANAGEMENT

David L. Charlton M.Sc., B.Sc., P.Ag.



Stantec



### PROJECT EXPERIENCE

#### ENVIRONMENTAL ASSESSMENT

Environmental Assessment Training Activities  
Canadian Forces Base Borden (1997 to 1999)  
(Technical Advisor)

*Advised on ecological inventories, application of Valued Ecosystem Components approaches, impacts and impact mitigation, ongoing forest resource management*

Environmental Assessment Training Activities  
Canadian Forces Base Val Cartier (1994 to 1995) (Project Manager)

*Managed ecological inventories, Valued Ecosystem Component identification, impacts and impact mitigation analysis, forest, fish and wildlife and recreational resource management*

Highway 10 Widening and Turning Lane  
Improvements - Orangeville (Project Director)

*Supervised ecological data collection and analysis; recommended mitigation measures to protect cold water stream and terrestrial habitat; provided sediment control and site restoration guidelines*

Interim Waste Authority Metro-York and Durham  
EAs (1994 to 1995) (Project Director)

*Peer reviewed biological components of the IWA process on behalf of Municipalities with identified sites (Vaughan and Pickering); evaluated the study process, data, analysis techniques and final decisions for appropriateness, comprehensiveness, consistency, accuracy, reliability and comprehensibility; worked with legal counsel to prepare interrogatories and witness statements; met with proponent representatives, recommended process improvements and modifications*

Kingston Master Drainage Plan and Class EAs for  
stormwater Retrofit - Kingston (2000 to 2001)  
(Project Director, Environmental Sciences)

*part of a multidisciplinary team reviewing stormwater management policies and practices for the City of Kingston; reviewed background information; met with agencies, conducted field work and mapping; set priorities on a Subwatershed basis; identified and evaluated alternative stormwater retrofit locations, recommended policy changes and management protocols, contributed to public participation process*

Medway Valley Trunk Sewer Schedule C Class  
EA - London, Ontario (2000 to 2003) (Project  
Director, Environmental Sciences)

*Coordinated data collection, analysis and mapping for the terrestrial ecology and aquatic ecology components of the study; worked with other team members to integrate ecological issues with servicing and cost concerns; responsible for natural science input to the public participation process; led technical meetings with government agencies and public on environmental issues; developed mitigation and rehabilitation plans, supervised applications for DFO and CA permits, replanting of disturbed areas, and performance monitoring for stream crossings and ecological restoration*

Environmental Assessment Training Activities  
Canadian Forces Base Petawawa (1993 to  
1994) (Project Manager)

*Managed ecological inventories, GIS, Valued Ecosystem Component identification, impacts and impact mitigation analysis, forest, fish and wildlife and recreational resource management*

\* denotes projects completed with other firms

## PRINCIPAL, ENVIRONMENTAL MANAGEMENT

David L. Charlton M.Sc., B.Sc., P.Ag.



Stantec



### MINING

Craig Pit Expansion, Mono Centre, Ontario  
(Project Director)

*Natural Environment Technical Reports for gravel pit expansion, impacts on adjacent wetlands and fish habitat, cross watershed boundary issues, recreational impacts.*

Carden Quarry Aggregates License, Brechin, Ontario (Project Director)

*Natural Environment Technical Reports and Feasibility Study for a Category 2 Aggregate License; alvar ecology, rare species, significant wildlife habitat issues, water balance, quarry rehabilitation*

Georgian Aggregates Duntroon Quarry Expansion, Collingwood, Ontario (Project Director)

*Completing Natural Environment Technical Reports for extension of a Category 2 Aggregate License; issues include Niagara Escarpment, ANSI, provincially significant wetlands, rare species, brook trout habitat, water balance, agricultural impacts and quarry rehabilitation*

Georgian Aggregates Orillia Quarry License, Orillia, Ontario (Project Manager)

*Managed environmental reports in support of Official Plan Amendment and Aggregate License; rare species management plan, water balance to maintain streams and wetlands, heronry impacts and monitoring, wetland policy application, Ontario Municipal Board hearing*

Seeley and Arnill Aggregates Drysdale Pit Rehabilitation, Meaford Township, Ontario (Restoration Advisor)

*Rehabilitation guidelines for gravel pit restoration to specialty crop production, microclimate and soils.*

Fonthill Pit, Fonthill, Ontario (Restoration Advisor)

*Rehabilitation guidelines for gravel pit restoration to specialty crop production, microclimate and soils.*

Staff Seminars, Toronto, Ontario (Restoration Advisor)

*Rehabilitation guidelines for gravel pit restoration to specialty crop production, microclimate and soils.*

### MULTI-UNIT / FAMILY RESIDENTIAL

Brentwood Subdivision - Aurora, Ontario (2000 to 2003) (Project Director)

*Environmental policies, approvals and design - Secondary Plan and plan of subdivision, recreational and aquatic corridor, forest and ravine buffers, naturalized stormwater management*

Aberfoyle Creek Estates: Phases 2 and 3 - Puslinch, Ontario (1999 to 2003) (Project Director)

*Environmental policies, approvals and design - wetland buffer, site plan control, naturalized stormwater management, protection of trout habitat, groundwater and fisheries interactions*

Huron Road Subdivision - Kitchener, Ontario (1998 to 1999) (Project Director)

*Environmental approvals and design - Plan of subdivision, forest and wetland buffers, tree preservation, naturalized stormwater management, cold-water stream protection*

\* denotes projects completed with other firms

## PRINCIPAL, ENVIRONMENTAL MANAGEMENT

David L. Charlton M.Sc., B.Sc., P.Ag.



Jackson's Landing - Sutton, Ontario (1994 to 2003) (Project Director)

*Environmental policies, approvals and design - Secondary Plan to Master Site Plan, site design and impact mitigation for high water table and sensitive vegetation, natural corridor functions and forest edges, Ontario Municipal Board*

The Neighbourhoods of Sunningdale - London, Ontario (1995 to 2003) (Project Director)

*Coordinated all environmental input for the design and approval of The Neighbourhoods of Sunningdale; project started with a Secondary Plan, progressing through alternative servicing analyses, plans of subdivision and detailed design exercises; was responsible for all environmental components of the project approval included extensive public input, negotiations with Conservation Authorities and an Ontario Municipal Board hearing. Located adjacent to the Medway Valley Environmentally Sensitive Area, The Neighbourhoods of Sunningdale was designed to take advantage of the natural beauty of the valley while protecting and enhancing the significant ecological resources in the ESA. The location and market thrust presented significant design and approval challenges that David helped overcome. His involvement continued into the marketing phase of the project as he contributed to the production of a Community Environmental Guide, which won the London Homebuilder's Association award for Best Brochure in 2002.*

### NATURAL SCIENCES AND HERITAGE RESOURCES

Credit Valley Secondary Plan, City of Brampton (1997 to 2003) (Project Director, Environmental Sciences)

*Planned, implemented and managed the multidisciplinary natural science inputs to a Subwatershed study done in support of this Secondary Plan, completed for the City of Brampton. He coordinated data collection, analysis and mapping for the terrestrial ecology and aquatic ecology components of the study; worked with other team members to integrate ecological issues with water quality and quantity analyses and policy formation; responsible for natural science input to the public participation process and participated in technical meetings with government agencies. The project and the ultimate policy recommendations were controversial, and the scientific basis for recommendations as well as the validity and interpretation of data were challenged by many interests. David's scientific credibility and his firm focus on objective interpretation of data were instrumental in helping arrive at an appropriate balance between competing interests, and provided the City with practical and effective ecological policies.*

Environmental Impact Studies Guidelines and Training - Province of Ontario (1995 to 1996) (Trainer)

*Assisted Ontario Ministry of Natural Resources in designing and delivering training programs on how to prepare environmental impact studies in compliance with Provincial Policies; established minimum standards, developed case studies; designed model mitigation measures; delivered nine, two-day training sessions to more than 400 people*

\* denotes projects completed with other firms

## PRINCIPAL, ENVIRONMENTAL MANAGEMENT

David L. Charlton M.Sc., B.Sc., P.Ag.



Fletcher's Creek Subwatershed Study City of Brampton (1994 to 1996) (Project Manager, Environmental Sciences)

*Directed ecological inventory, analysis and policy formation, resource management and land use policies and implementation guidelines, intermittent headwater tributary and swale management*

Laurel Creek Subwatershed Study City of Waterloo (1992 to 1995) (Project Manager, Environmental Sciences)

*Directed ecological inventory, analysis and policy formation, resource management and land use policies and implementation guidelines, integrated modeling of water quality and quantity and fish habitat, GIS mapping and extensive public involvement and consultation*

Technology Evaluation and Development Subprogram of Soil and Water Environmental Enhancement Program, Ontario (1986 to 1993) (Project Manager)

*On behalf of Agriculture Canada, planned and managed \$3.5 million of research into technologies for farm level control of soil erosion and sediment and chemical transport to waters in south western Ontario; coordinated a team responsible for identifying research needs, planning and implementing research program; multi-disciplinary workshops, statements of work, evaluating proposals, quality control and trouble shooting for research projects, control of a large budget and an ambitious communications program*

Terrestrial Effects of Acid Rain - Ontario (1992 to 1996) (Project Manager)

*Managed crews evaluating the impact of acid rain on the tolerant hardwood forests of Ontario, involved visual assessment of trees, tissue sampling and soil sampling, data analysis*

The Effect of Lake Levels on Great Lakes Coastal Wetlands (Project Director)

*Detailed historic air photo and GIS analysis of wetland community dynamics in response to lake level fluctuations, input to management responses*

Torrance Creek Subwatershed Study City of Guelph (1997 to 1999) (Project Director, Environmental Sciences)

*Directed ecological inventory, analysis and policy formation, guidelines for recreational trail location and design in provincially significant wetlands, resource management and land use policies and implementation guidelines, invasive species control and fisheries enhancement recommendations.*

### SPORTS, RECREATION & LEISURE

Aikers Marina - Long Point, Ontario (Project Director)

*Environmental impacts and mitigation for marina expansion: waterfowl staging, fish habitat, shoreline stability, World Biosphere Reserve, Ontario Municipal Board*

\* denotes projects completed with other firms

## PRINCIPAL, ENVIRONMENTAL MANAGEMENT

David L. Charlton M.Sc., B.Sc., P.Ag.



Dallaire Golf Course - Orillia, Ontario (Project Director)

*Environmental design and Approvals - forest buffers, tree preservation, significant wildlife habitat, wild turkey management, naturalized stormwater management, turf and water management, cold water stream protection*

Emerald Hills Golf Course - Whitchurch-Stouffville, Ontario (Project Director)

*Impacts of course changes, wetland and forest buffers, turf and water management, compliance with Oak Ridges Moraine policies*

Lake Fanshawe Rowing Centre Course Upgrades - London, Ontario (Project Director)

*Directed staff in evaluating fish habitat impacts of course improvements, designing mitigation measures and obtaining all necessary work permits*

Maskinonge Waterfront Development - Georgina, Ontario (2001 to 2003) (Project Director)

*Environmental feasibility studies for recreational development on Lake Simcoe, wetland, shoreline and fish habitat impact and mitigation studies*

Sandhills Golf and Residential Community - Uxbridge, Ontario (1999 to 2003) (Project Director)

*Environmental design and Approvals - Plan of subdivision, forest and wetland buffers, tree preservation, naturalized stormwater management, cold water stream protection, Oak Ridges Moraine policies, Ontario Municipal Board*

Cardinal Golf Course, King Township, Ontario (Project Director)

*Impacts of construction and expansion, wetland and forest preservation and buffers, turf and water management, Oak Ridges Moraine policies, restoration of an aggregate operation.*

York Major Golf Club - Vaughan, Ontario (2001 to 2003) (Project Director)

*Environmental design and Approvals - forest buffers, tree preservation, naturalized stormwater management, turf and water management, ESA and ANSI impacts, cold water stream protection, restoration of an aggregate operation.*

\* denotes projects completed with other firms

## SENIOR ENVIRONMENTAL PLANNER

### Daniel Eusebi BES



Mr. Eusebi has extensive environmental planning experience, from site assessment/route selection for linear facilities (roads, hydro corridors, sewers and petroleum pipelines) and aggregate site development, to remediation for brownfield and spill sites. He has coordinated the environmental planning components for environmental screenings, detailed natural science-based environmental assessment and design, rehabilitation, construction inspection and post-development monitoring. Dan has worked closely with public and private clients on industrial and development projects, and has managed extensive terrestrial and aquatic field studies. He provides a wealth of knowledge concerning permitting and approvals for a number of environmental disciplines. One of Dan's greatest strengths is his communication skills with various project stakeholders. His range of experience allows him to manage large projects with detailed policy and planning requirements, and he excels at coordinating projects involving multidisciplinary professionals.

#### EDUCATION

BES (Honours), Major in Environmental and Resource Studies, University of Waterloo, Waterloo, Ontario, 1988



## PROJECT EXPERIENCE

### ENVIRONMENTAL ASSESSMENT

Fox Hollow Subdivision Phase 1 External Sanitary Sewer - Water crossing, permits and approval package (Project Manager)

Transportation Design, Construction Report and Aquatic Assessment. Highway 3 Road Improvement St. Thomas to Aylmer, Ontario Ministry of Transportation (Environmental Planner)

Fisheries Assessment and Letter of Intent - Highway 3 Improvements/Aquatic Crossings, Ministry of Transportation

Levels 1 & 2 Natural Environment Assessment, Holman Pit, Guelph Eramosa Township, Ontario (Environmental Planner)

Level 2 Natural Environmental Assessment Natural Environmental Report, Puslinch Township, Ontario (Environmental Manager)

Level 2 Natural Environmental Technical Assessment Report Aggregate Application, Region of Halton, City of Burlington, Ontario (Environmental Coordinator)

Levels 1 & 2 Natural Environmental Technical Assessment Report for Proposed Aggregate Application, Brant County, Ontario (Environmental Planner)

Level 1 Natural Environmental and Aquatic Assessment - Aggregate Application, Oxford County, Ontario (Project Manager)

Environmental Impact Study Report Aggregate Application, Flamborough, Ontario (Project Coordinator)

Transportation Environmental Study Report, Highway 401 Bridge Rehabilitation at County Road 36 and Concession Road 7, Puslinch Township, Wellington County, Ministry of Transportation Ontario (MTO) (Environmental Planner)

Environmental Screening Document, Terrestrial and Fisheries Technical Report, Hopewell Creek Bridge Rehabilitation at Highway 7, Ministry of Transportation Ontario (MTO) (Natural Environment Planner)

Agricultural Economic Assessment, Agricultural Assessments of Tom Howe Landfill Site and Canborough Landfill Site (Project Manager)

Sithe Goreway Station, Sithe Energies Canadian Development Ltd. (Project Manager)

*Represented client at public forums*

Public Consultation Program for Remediation of Brownfield Site in Residential Neighbourhood, Pirelli Cable Inc (Project Manager)

*Developed two phase public consultation program for remediation of brownfield site. Presented information and completed individual liaison with affected landowners*

Orlean Pipeline Environmental Assessment Public Consultation Program, Consumers Gas (Project Manager)

*Preparation of announcements and public forum presentations for pipeline project approvals*



NEB Environmental Assessment, Great Lakes Power Ltd. (Project Manager)

*Coordinated public consultation program for high voltage power cable line – NEB Environmental Assessment. Involved preparation of notifications, presentation materials and establishment of public input database*

Link Pipeline Project, Environmental Assessment and Route Selection, Niagara Gas Transmission Limited (Environmental Planner)

International Power Line Project - Environmental Site Assessment and Linear Facility Route Selection, Great Lakes Power Ltd. (Environmental Planner)

Groundwater Assessment Investigations and Remediation Initiatives for southwestern Ontario Tank Farm and Pumping Station, Enbridge Pipeline Inc. (Project Manager)

Fisheries Habitat Assessment, Oshawa/Newcastle proposed Highway 407, Route Location and Environmental Assessment Study (Project Manager)

Environmental Property Assessments, Preliminary Phase I Assessment for Contamination Identification, 50 Sites, Canadian National Real Estate Division (Project Manager)

Environmental Management System Audit of Enbridge Pipeline Division, Enbridge Pipeline Inc. (Project Manager)

Detailed Phase II Investigations for Former Massey Ferguson Brownfield Site, City of Brantford, Ontario (Project Manager)

City of London: Fisheries Habitat Assessment - Medway Creek Trunk Sewer, City of London (Project Manager)

Brownfield Phase I Investigations for 16 Sites in the City of Brantford, City of Brantford (Project Manager)

Westover Station - Initial Screening Level Risk Assessment, Enbridge Pipeline Inc.\* (Project Manager)

Meyer Pier Park - Risk Assessment Peer Review, City of Belleville, Ontario\* (Senior Environmental Planner)

Sudbury Area Community Risk Assessment - Soil and Groundwater Project Component Assessments, Inco\* (Planner)

New Orleans/Gatineau Pipeline Environmental Assessment and Route Selection, Consumer Gas\* (Project Manager)

Site Remediation Program at Six Remote Fly-in Sites in Northern Ontario, Bell Canada\* (Site Remediation Program Manager)

*Conducted preliminary site assessments and coordinated site construction contractors*

Peer Review of Environmental Screening Reports and Phase 1 Assessments in South Western Ontario for Property Transactions, Union Gas\* (Project Manager)

Vector Pipeline Project: Phase I and II Property Investigation, Vector Pipeline Ltd.\* (Project Manager)



Nanticoke Junction: Phase I and II Environmental Site Assessment, Enbridge Pipeline Inc.\* (Project Manager)

Peer Review of Phase I and II ESA's for Legal Counsel, Smith Valeriotte, Barristers and Solicitors\* (Project Manager)

Phase I and II Environmental Property Site Assessments\* (Manager)

*More than 250 Phase I, and II Environmental Property Site Assessments in Ontario and Quebec for private industry, as well as federal and municipal governments*

Natural Science Route Selection Environmental Assessment for Line 9C portion of the Line 9 Reversal Project, Enbridge Pipeline Inc.\* (Project Manager)

Ontario Manitoba Interconnection Project. Data Collection and Regulatory Agency Issue Assessment, Ontario Hydro\* (Resource Planner)

PRISM Pipeline Project Environmental Site Assessment and Route Selection, Imperial Oil Ltd\* (Environmental Planner)

#### ENVIRONMENTAL SITE MANAGEMENT

PRISM Pipeline Project, Imperial Oil Ltd. (Project Manager)

*Conducted on-going monitoring and compliance requirements for directional drilling operation at the Grand River*

St. Clair River Directional Drilling Operations and Regulatory Approvals, Vector Pipelines Ltd. (Project Manager)

*Development of environmental protection procedures for directional drilling operations of the St. Clair River and coordinated regulatory approval requirements*

PRISM Pipeline Project, Imperial Oil Ltd. (Project Manager)

*Managed approvals for the implementation of a drill slurry management program*

Grand River Crossing at Cambridge, Union Gas (Project Manager)

*Preparation of Sediment Control Plan and Watercrossing Plans*

First Nations Consultation Program and Training Program at Remote Site in Northern Ontario, Bell Canada (Project Manager)

*Programs involved presenting project remediation information to First Nations groups and providing training for community based employment opportunities*

Crude Oil Leak Site, Enbridge Pipeline Inc. (Project Manager)

*Conducted public liaison in emergency response scenario at crude oil leak site. Maintained ongoing public information liaison with affected landowners*

Terrace Pipeline Project, Enbridge Pipeline Inc. (Project Manager/Inspector)

*Environmental supervision of the directional drill, South Saskatchewan River (1100m drill)*



St. Clair River Sediment Quality Sampling Investigations, Vector Pipelines Ltd. (Project Manager)

*Coordinated sediment quality sampling investigations of the St. Clair River for proposed directional drilling operations*

Westover Tank 222 Spill Response, Enbridge Pipeline Inc. (Project Manager)

Spill Response and Regulatory Agency Consultation, RCAN Environmental (Project Manager)

Line 8 Hydrostatic Testing, Interprovincial Pipe Line Inc. (Project Manager)

*Coordinated environmental components and developed emergency response program and obtained regulatory approval for Line 8 hydrostatic testing*

Emergency Response Management Services - Wolverton Leak Site, Enbridge Pipeline Inc. (Project Manager)

Emergency Response Management Services - Bronte Junction Historic Leak Site, Enbridge Pipeline Inc. (Project Manager)

Emergency Response Management Services - Binbrook Leak Site (Spill Response and Land Rehabilitation), Enbridge Pipeline Inc. (Project Manager)

Emergency and Spill Response Services, Alltech Canada Inc. (Project Manager)

Emergency and Spill Response Management, Sarnia Suncor Metering Facility (Project Manager)

Clarkson Station - Spill Response and Site Management, Enbridge Pipeline Inc. (Project Manager)

Decommissioning of Four Crude Oil Pumping Stations, Interprovincial Pipe Line Inc.\* (Project Manager)

*Managed decommissioning of Four Crude Oil Pumping Stations: Keyser, Smithville, Wolverton and Bryanston*

Golf Course and Estate Residential Facility, Town of Aurora\* (Project Manager)

*Environmental site peer review of mitigation and construction of golf course and estate residential facility*

Denso Manufacturing Inc., Guelph Industrial Site Phase I and II Environmental Site Assessment\* (Project Manager)

*Phase I and II Environmental Site Assessment and managed site remediation program*

Plant Demolition, Building Decommissioning, Pirelli Cables and Systems Inc.\* (Project Manager)

*Identification and removal of PCB containing ballast*

Decommissioning of Hydro Electric Transformer Stations, Guelph Hydro\* (Project Manager)

*Initiated soil studies and coordinated contracting of site remediation program*

Pirelli Cables Corporation Site Decommissioning, Guelph, Ontario, Pirelli Cables and Systems Inc.\* (Project Manager)

*Site assessment and remediation of Pirelli Cables Corporation Site Decommissioning*

\* denotes projects completed with other firms



Bronte Junction Compound Facility, Enbridge Pipelines Inc.\* (Project Manager)

*Remediation and Clean-up site management for the Bronte Junction compound facility*

Binbrook Leak Site, Enbridge Pipelines Inc.\* (Project Manager)

*Remediation and Clean Up of Binbrook leak site, 600,000 L Crude Oil spill site*

Housing Development On-going Site Monitoring, City of Guelph\* (Project Manager)

*On-going Site Monitoring of South Creek, Clairfields, Clarington Place and Whitetail Sites*

Meadowlily ESA, City of London\* (Project Manager)

*Environmental Inspection, Meadowlily ESA, Subdivision development project. Inspection of topsoil stripping, vegetation clearing, erosion and silt control, construction activities, dewatering and rehabilitation monitoring*

Line 8 Oil Products Transportation System, Interprovincial Pipe Line Inc.\* (Project Manager)

*Coordinated and Conducted Environmental Inspection of Line 8 Construction Program, Southern Ontario*

#### NATURAL SCIENCES & HERITAGE RESOURCES

Vector Pipeline Project, Vector Pipeline Ltd. (Project Manager)

*Development of watercrossing technique design for environmental protection. Coordination of regulatory approval requirements*

PRISM Pipeline Project, Imperial Oil Ltd. (Project Manager)

*Environmental Construction permits and approvals for all natural environmental features*

OCWA Water Pipeline at the Ausable River Watercrossing, Ontario Clean Water Agency (Project Manager)

*Developed and implemented environmental protection methods on-site.*

Medway Creek Trunk Sewer Crossings (5), City of London (Project Manager)

*Preparation of watercrossing plans / bed-level crossing, permits and approval package.*

Line Lowering at 403 Burlington - Rambo Creek Crossing, Interprovincial Pipe Line Inc. (Project Manager)

*Preparation of Sediment Control Plan and Watercrossing Plans*

Line 9C, Shell Take off to Sarnia Terminal, Interprovincial Pipe Line Inc. (Project Manager)

*Preparation of Sediment Control Plan and Watercrossing Plans*

Line 9C Sarnia Delivery Line, Enbridge Pipeline Inc. (Project Manager)

*Development of watercrossing design for protection of water resource*

Highway 9 Project, 5 Watercrossings, Consumers Gas (Project Manager)

*Preparation of Sediment Control Plan and Watercrossing Plans*

SENIOR ENVIRONMENTAL PLANNER  
Daniel Eusebi BES



Consumers Gas Link Project, Baby Creek (Project Manager)

*Preparation of Sediment Control Plan and Watercrossing Plans*

Conceptual Restoration Plans, Smithville and Wolverton Pumping Station, Interprovincial Pipe Line Inc. (Project Manager)

Link Pipeline Project, Niagara Gas Transmission Limited\* (Project Manager)

*Conducted pre-construction woodlot appraisal for construction compensation*

*\* denotes projects completed with other firms*

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**PUBLICATIONS**

Unique Features of Environmental Management System/ISO-14001 Application to Linear Facilities, 7th International Symposium on Environmental Concerns in Right-of-Way Management (2002)