



**DILLON**  
CONSULTING

OSCO AGGREGATES LIMITED

# **Glenholme Pit No. 4 Aggregate Extraction Project**

Nova Scotia Environmental Assessment Registration

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## Acronyms, Abbreviations, Definitions

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# Acronyms, Definitions

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<b>ACCDC</b>	Atlantic Canada Conservation Data Center
<b>ARD</b>	Acid Rock Drainage
<b>ASL</b>	Above sea level
<b>ATV</b>	All-terrain Vehicle
<b>CCME</b>	Canadian Council of Ministers of the Environment
<b>CEAA</b>	<i>Canadian Environmental Assessment Act</i>
<b>CEPA</b>	<i>Canadian Environmental Protection Act</i>
<b>CO</b>	Carbon monoxide
<b>COSEWIC</b>	Committee on the Status of Endangered Wildlife in Canada
<b>DFO</b>	Fisheries and Oceans Canada (Department of)
<b>DU/DUC</b>	Ducks Unlimited Canada
<b>EA</b>	Environmental Assessment
<b>EARD</b>	Environmental Assessment Registration Document
<b>ECCC</b>	Environment and Climate Change Canada
<b>FWAL</b>	Fresh Water Aquatic Life (guidelines)
<b>GHG</b>	Green House Gases
<b>IBA</b>	Important Bird Area
<b>iBoF</b>	Inner Bay of Fundy population
<b>NO<sub>x</sub></b>	Nitrogen gases
<b>NO</b>	Nitrogen monoxide
<b>NO<sub>2</sub></b>	Nitrogen dioxide
<b>NSDNR</b>	Nova Scotia Department of Natural Resources
<b>NSE</b>	Nova Scotia Environment (Department of)
<b>NSEL</b>	Nova Scotia Environment and Labour (Department of) – now NSE
<b>NSESA</b>	<i>Nova Scotia Endangered Species Act</i>
<b>NWWG</b>	National Wetlands Working Group
<b>O<sub>3</sub></b>	Ground level ozone
<b>OAA</b>	Office of Aboriginal Affairs
<b>PM2.5</b>	<i>Fine particulate matter</i>
<b>PID</b>	Property Identification Description
<b>POL</b>	Petroleum, oil, lubricant
<b>SARA</b>	<i>Species at Risk Act</i> (federal)
<b>SES</b>	Sites of Ecological Significance
<b>Species General Status</b>	<p>“Sensitive” indicating they are potentially susceptible to human activities or natural events in the province.</p> <p>“May be at Risk” therefore considered here to be of high conservation concern within the province.</p>

“Undetermined” indicating that there is currently insufficient data, information, or knowledge available to evaluate its status within the province.

## S-Rank

- S1** **Critically Imperiled** - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
- S2** **Imperiled** - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
- S3** **Vulnerable** - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
- S4** **Apparently Secure** - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
- S5** **Secure** - Common, widespread, and abundant in the province.
- SNR** **Unranked** - Nation or state/province conservation status not yet assessed.
- SU** **Unrankable** - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
- SNA** **Not Applicable** - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
- S#S#** **Range Rank** - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).



<b>TIR</b>	Transportation and Infrastructure Renewal (Nova Scotia Department of)
<b>TSS</b>	Total Suspended Solids
<b>UTM</b>	Universal Transverse Mercator
<b>VEC</b>	Valued Environmental Component
<b>VOC</b>	Volatile Organic Compound

#### MEASUREMENT UNITS

<b>°C</b>	degrees Celsius
<b>cm</b>	centimeter
<b>dB</b>	decibel
<b>dBA</b>	A-weighted decibel
<b>ha</b>	hectare
<b>km</b>	kilometer
<b>km/hr</b>	kilometers per hour
<b>L/min</b>	litres per minute
<b>Leq</b>	sound level equivalents
<b>LeqA</b>	A-weighted maximum, minimum and mean hourly sound level equivalents
<b>Lp90</b>	90th percentile sound levels
<b>m</b>	meter
<b>mg/L</b>	milligrams per liter
<b>mm</b>	millimeter
<b>ppb</b>	parts per billion
<b>uS/cm</b>	microSiemens per centimeter
<b>ug/L</b>	micrograms per liter
<b>ug/m<sup>3</sup></b>	micrograms per cubic meter

# Executive Summary

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OSCO Aggregates Limited (“OSCO”) is proposing to undertake aggregate extraction on a property located along Little Dyke Road, Glenholme, Nova Scotia as an expansion of existing operations. The proposed Project property has experienced sporadic aggregate excavation activities by other proponents for several decades. A Class 1 environmental assessment (EA) approval is required for this Project under the Nova Scotia Environment Act Environmental Assessment Regulations.

The Project will be operated by OSCO Aggregates personnel who have been operating pits in the area for 30 years and live in the community. The Glenholme facility has made a significant contribution to the local economy, with employment of approximately 15 people (full time and seasonal) on an annual basis, and has paid over 2.5 million dollars in wages, royalties, fees and taxes over the last 5 years, and more previously. The Project would primarily result in a continued supply of high quality aggregate (stone and sand) for concrete plants in the northern Nova Scotia corridor and Halifax areas. Aggregate (sand and gravel, as well as clean stone) would also be available for various local markets and road building. The Project will extend the life of the OSCO Aggregates Glenholme Wash Plant facility for up to 20 years, providing continued employment in the area.

## Project Site

The proposed Pit No. 4 site is located on private lands (PID #: 20134177) along Little Dyke Road approximately 3 kilometers south of Exit 11 Highway 104. There is an existing gravel pit on the site (known locally as the Lafarge Pit), which has been in sporadic use, operated by others, for approximately 25 years. This currently inactive pit and aggregate stockpiles occupy approximately 4 hectares (10 acres) of the northern portion of the property. Most of the Project study area was also historically cut-over. OSCO intends to extract available aggregates on up to approximately 30.5 hectares (75.4 acres) of the property.

## Project Activities

The scope of the Project activities will include pit development/aggregate extraction, screening, mobile crushing, stockpiling of aggregate, and transport to the existing OSCO Aggregates Glenholme Wash Plant facility (approximately 700 meters (m) northward along Little Dyke Road). Details of the Project operation include:

- No blasting will occur at the Pit No. 4 site.
- The pit excavation will remain at least 0.5 m above the ground water table.
- The scheduling of aggregate extraction and mobile crushing operations will vary depending on market conditions but is generally expected to occur 12-14 hours/day, 6 days/week. There is the potential for short periods of increased operations to 22-24 hours/day.
- Annual aggregate extraction from Pit No. 4 will vary with market conditions but is expected to be between 50,000 and 250,000 metric tonnes.

- Activities related to the OSCO Aggregates Glenholme Wash Plant facility (under existing approval), including transportation routes to market, will not change due to the new aggregate source.
- Progressive reclamation will occur in stages as aggregate removal is completed from sections of the Project area.
- Final reclamation will be completed following regulatory requirements.

### Regulatory Regime

Pit development activities will be undertaken in accordance with the Nova Scotia Pit and Quarry Guidelines (Nova Scotia Department of Environment and Labour (now NSE) 1999) and other applicable provincial and federal regulatory requirements. Other relevant provincial regulations include the Activities Designation Regulations, which requires an Industrial Approval from the Nova Scotia Department of Environment for the pit operation. OSCO will submit an application for the Industrial Approval and other regulatory requirements on approval of the EA.

### Existing Environment Features

The Project study area is comprised of a mix of forest types (predominately softwoods), wetlands, agriculture (a cornfield in 2016), and the existing areas of disturbance (including the existing pit). The majority of the Project area has been historically disturbed. The forest areas are regeneration from prior harvest activities and have experienced extensive blow-down from storm events. Key consideration for habitat features and species include:

- No permanent watercourses and no fish habitat are present within the proposed Project footprint. Surface water drainage features are present downgradient of the existing pit and along the access road ditching.
- The nearest potential fish habitat borders the study area with McCurdy Creek to the east and a Ducks Unlimited (DU) pond to the west.
- Six wetlands were identified within the study area – It is OSCO's intent to develop the property so as not to alter wetlands. Wetland alteration, if it occurs, will meet Nova Scotia Wetland Conservation Policy and Environment Act approval requirements.
- No Species at Risk (SAR) listed by the Committee on the Status of Wildlife in Canada (COSEWIC), the federal *Species at Risk Act* (SARA) or the *Nova Scotia Endangered Species Act* (NSESAs) were observed in August to October 2016 field surveys.
- No SAR or priority plant species were observed in August 2016 field surveys or are anticipated based on habitat identified. Based on habitat identified, priority plant species are not expected at the property.
- A wide variety of bird species may nest at the property including potential SAR birds. No clearing activities will be undertaken during the bird nesting season.
- There is limited potential for SAR animals (monarch butterfly, mainland moose, bats, snapping turtle and wood turtle) and other priority butterflies to occasionally use the property; however, the habitat identified is not a key component of overall habitat requirements or critical for populations.

Other study area features include:

- Potential receptors for noise and dust are located at least 200 m from the Pit.
- No acid generating bedrock and limited potential for erodible soils.
- Highly permeable surficial geology.
- No archeological/heritage potential identified.
- The setting is within an area used extensively for aggregate extraction and Project effects will not change existing conditions for traffic except for the 700 m along Little Dyke Road between the Project and the Glenholme Wash Plant.

### **Public Consultation**

Project information was provided to local residents and aboriginal contacts. No comments were received from aboriginal contacts other than their intent to review the EA document. Based on responses and comments from local residents additional consultation was completed. OSCO staff met with and discussed residents' concerns on multiple occasions during the course of the EA. A Project update newsletter was distributed to the local community to provide an update the EA. Additionally, a residents meeting was facilitated by MLA Karen Casey.

Public concerns identified throughout the EA process were primarily related to: accidental spills; truck crossings of the Little Dyke Road; damage to the Little Dyke Road from truck traffic; crusher noise in the evenings; and, potential impacts to birds, wetlands, and McCurdy Creek.

Concerns have been addressed through project design, as applicable, and include key mitigation items noted below.

### **Key Mitigation Measures and Contingency Planning**

OSCO will implement best management practices and standards applicable to pit development. Key mitigation measures include:

- Following the Erosion and Sediment Control approach as outlined in the NSE Handbook (NSE 1988) to minimize areas exposed throughout the pit advancement, progressive reclamation, diversion of clean upgradient flows, and design of the pit to direct runoff inward.
- Following the Nova Scotia Pit and Quarry Guidelines.
- Commitment to follow-up spring vegetation and breeding bird surveys in 2017.
- Clearing to be conducted in stages, with only one-third of forest harvest to occur at a time.
- Clearing of vegetation outside of the bird nesting season.
- Pit design to include berms where appropriate to direct runoff and mitigate noise and dust.
- Mitigation to limit noise concerns includes a commitment to no work on Sundays at Pit No. 4 and the consideration of conducting crushing for the year within a seasonal window on discussion with local residents.

- Avoidance of watercourses and wetlands. Establishment of 30 m buffers around wetlands with the exception of wetland WL-3 and WL-4 where a road corridor is proposed within the 30 m buffer between the two wetlands. For this road corridor additional mitigation to limit erosion and sediment generation and maintain wetland hydrology will be implemented.
- Progressive reclamation to include revegetation within the growing season reclamation occurs.
- Contingency and emergency response planning for unexpected events such as observation of a SAR species or bird nest, archaeological finding, extreme storm event, pit slope failure, fire, vehicle accidents or accidental spill.

### **Impact Assessment Summary**

The Project is not predicted to result in significant environmental impact with the implementation of the identified mitigation measures.

## 1.0 Introduction

OSCO Aggregates Limited (“OSCO”) is proposing to undertake aggregate extraction on a property located along Little Dyke Road, Glenholme, Nova Scotia as an expansion of existing operations – the Glenholme Wash Plant (Nova Scotia Environment Approval #2008-060731). The proposed Project property has had sporadic aggregate excavation activities by other proponents for several decades. A Class 1 environmental assessment (EA) approval is required for this Project under the *Nova Scotia Environment Act* Environmental Assessment Regulations.

### Concordance Table with Nova Scotia Environmental Assessment Registration and Class 1 Requirements

EA Requirement	Location in Document
i) Name of Undertaking	Section 2.1
ii) Location of Undertaking	Section 2.2
iii) Proponent Name, Address, Identification	Section 1.1
iv) Undertaking Contact	Section 1.1
v) Signing Authority	Section 1.1
vi) Nature and Sensitivity of Surrounding	Section 6
vii) Purpose and Need of Undertaking	Section 2.4
viii) Proposed Construction and Operation Schedules	Section 2.6.1 and 5.2
ix) Description/Nature of Undertaking	Section 2.2 and 5
x) Environmental Baseline	Section 6
xi) List of Various Authorizations Required	Section 4
xii) Sources of Public Funding for the Undertaking	Section 1.1
xiii) Steps to Identify Public and Aboriginal Concerns about Adverse Effects or Environmental Effects	Section 3
xiv) List of Public and Aboriginal Concerns about Adverse Effects or Environmental Effects	Section 3
xv) Steps to Address Public and Aboriginal Concerns about Adverse Effects or Environmental Effects Identified	Section 3, 5.4 and 12

The EA approach is based on the Nova Scotia Environment document, “Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia” (Nova Scotia Environment – NSE 2009).

## 1.1 Proponent

**Proponent:** OSCO Aggregates Limited (OSCO)  
**Mailing:** 17 Estates Drive, Lower Sackville, Nova Scotia, Canada B4C 3Z2  
**Street Address:** 749 Little Dyke Road  
**Telephone:** 902-864-3230  
**Fax:** 902-865-3033  
**Email:** bancroft.david@ocalns.com  
**Web:** <http://www.oscoconstructiongroup.com>

OSCO is a private Canadian company conducting aggregate related business. It is incorporated under the laws of Nova Scotia and registered in Nova Scotia under the *Nova Scotia Corporations Registration Act*. The Registry of Joint Stock Certificate is attached in **Appendix A**.

No public funding is proposed for this project. The proposed Pit No. 4 would be operated by the operator of the OSCO Glenholme Wash Plant facility who has operated this facility and aggregate pits in this area for 30 years and has extensive experience with environmentally responsible aggregate extraction.

### Proponent Contact Information:

Proponent President	Contact for the Purposes of Environmental Assessment
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President	General Manager, OSCO Concrete
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 Dillon Consulting Limited  
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 Telephone: 902-450-4000  
 Fax: 902-450-2008



Signature of President

April 28, 2017

Date

OSCO Aggregates Limited

Glenholme Pit No. 4 Aggregate Extraction Project – Nova Scotia Environmental  
 Assessment Registration  
 Final April 2017 #16-4517



## 2.0 Project Information

### 2.1 Project Name

Glenholme Pit No. 4 Aggregate Extraction Project (the Project).

### 2.2 Location

The proposed Project site (PID 20134177) is located just south of the community of Glenholme, Nova Scotia in central Nova Scotia. The property is currently owned by Lafarge Canada Inc. It is OSCO's intent to purchase the property for the Project. **Figure 1** provides the project location. The approximate center of the study area is at Latitude: 45.390620°, Longitude: -63.552214°. The study area is accessed from Little Dyke Road, approximately 3 kilometers (km) south of Exit 11 on Highway 104.

### 2.3 Nature of the Undertaking

OSCO intends to utilize the proposed Project site for the purpose of extracting aggregate. Aggregate will include sand and gravel and would be extracted and stockpiled at the property. No blasting is proposed.

Portions of the site were used for aggregate extraction for approximately 25 years. The most recent extraction was undertaken by a different proponent, occurring over 15 years ago, and resulted in the residual existing un-vegetated pit area in the northern portion of the property. Additional historic aggregate removal occurred throughout the property in areas that are currently vegetated.


**Figure 2** illustrates the Project area and **Figure 3** the setting. The proposed area available for OSCO's aggregate removal consists of approximately 30.5 hectares (ha) (75.4 acres (ac)) and includes the existing pit excavated by another proponent (which is approximately 4 ha). The existing OSCO Glenholme operation to date has included three other pits in the area. Reclamation on two of the Pits (Pit No. 1 and No. 3) has been accepted by Nova Scotia Environment (NSE) and these pits no longer have a reclamation bond. The Pit areas include the 22.7 ha (56 ac) Pit No. 1, the 19 ha (47 ac) main pit and 5.7 ha (14 ac) "Jackson" property (which combined are Pit No. 2), and the 19 ha (47 ac) Pit No. 3; totalling 66.4 ha (164 ac) of pit area.

For the proposed Project is anticipated that excavation will be to within 0.5 metres (m) above the water table. The proposed aggregate extraction amount from the Pit No. 4 Project is estimated to be between 50,000 and 250,000 (metric) tonnes per year, depending on market conditions. The total estimated reserve of material is 1.13 million tonnes.

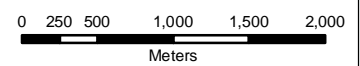


OSCO Aggregates Limited  
 Glenholme Pit No. 4  
 Extraction Project  
 Environmental Assessment

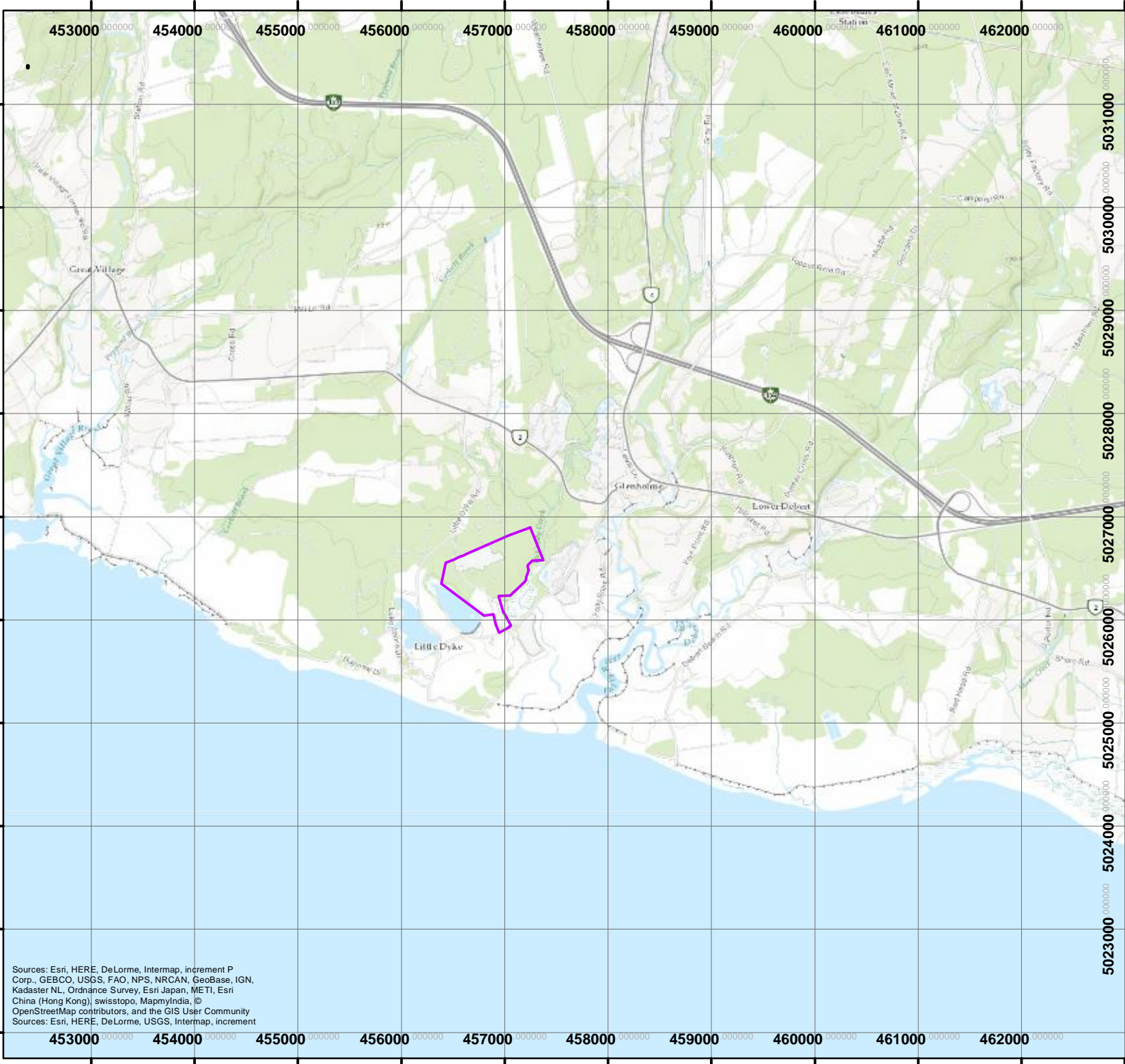
Figure1  
 Project Location

 Study Area

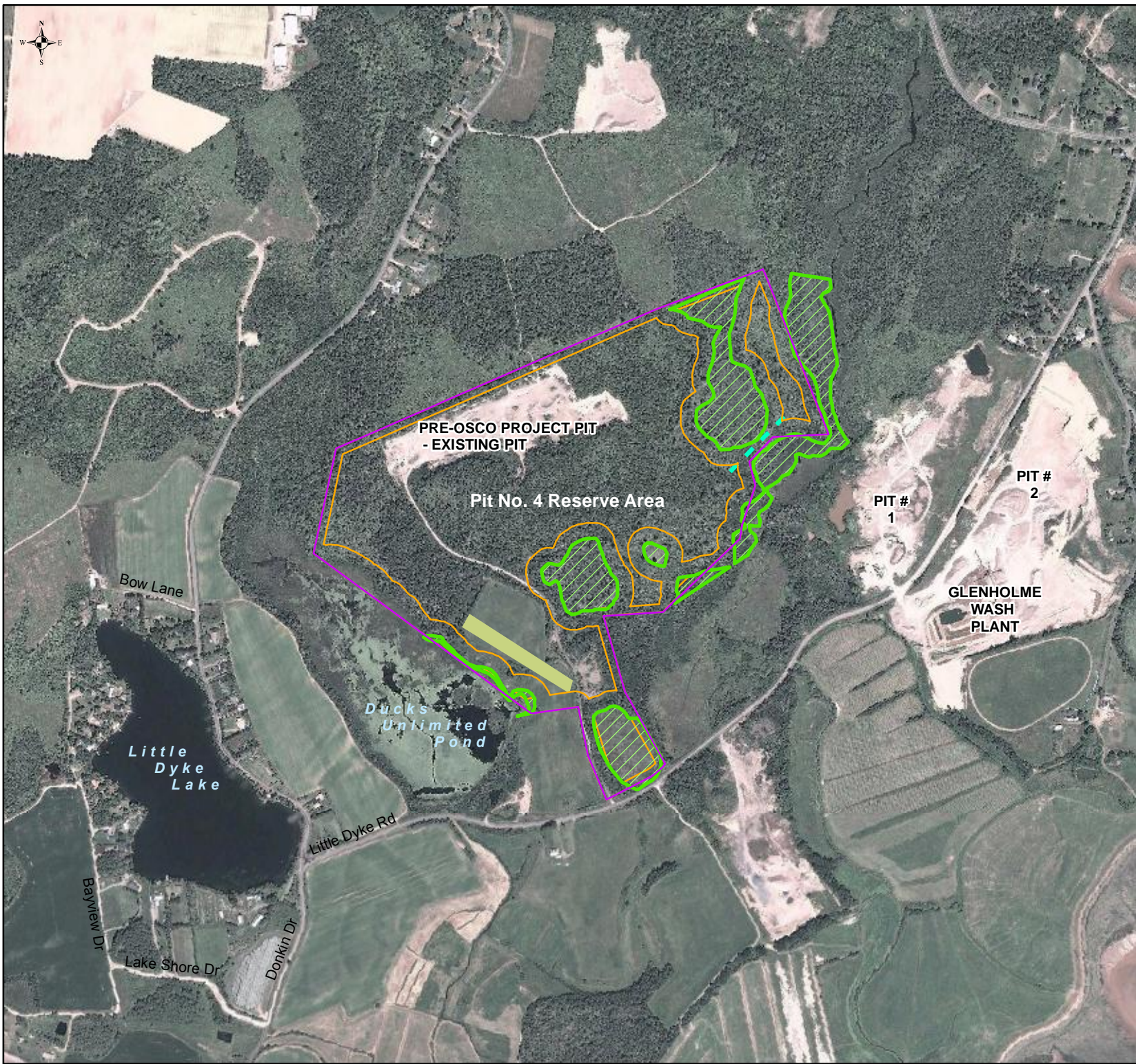
PROPERTY AS PROVIDED  
 BY PROPERTY ONLINE  
 NOV 2016



MAP CREATED BY: SCM  
 MAP CHECKED BY: KLM  
 MAP PROJECTION: 1983 CSRS UTM Zone 20N  
 MAP DRAWING INFORMATION  
 DATA PROVIDED BY ESRI, OSCO  
 Date: 3/24/2017



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community  
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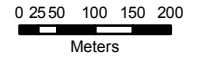
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 Glenholme Pit No. 4  
 Extraction Project  
 Environmental Assessment

Figure 2  
 Project Area

- - - Temporary Access Road
- Study Area
- Field Identified Wetlands
- Setbacks
- Approximate Area of Berm



PROPERTY AS PROVIDED  
 BY PROPERTY ONLINE  
 NOV 2016

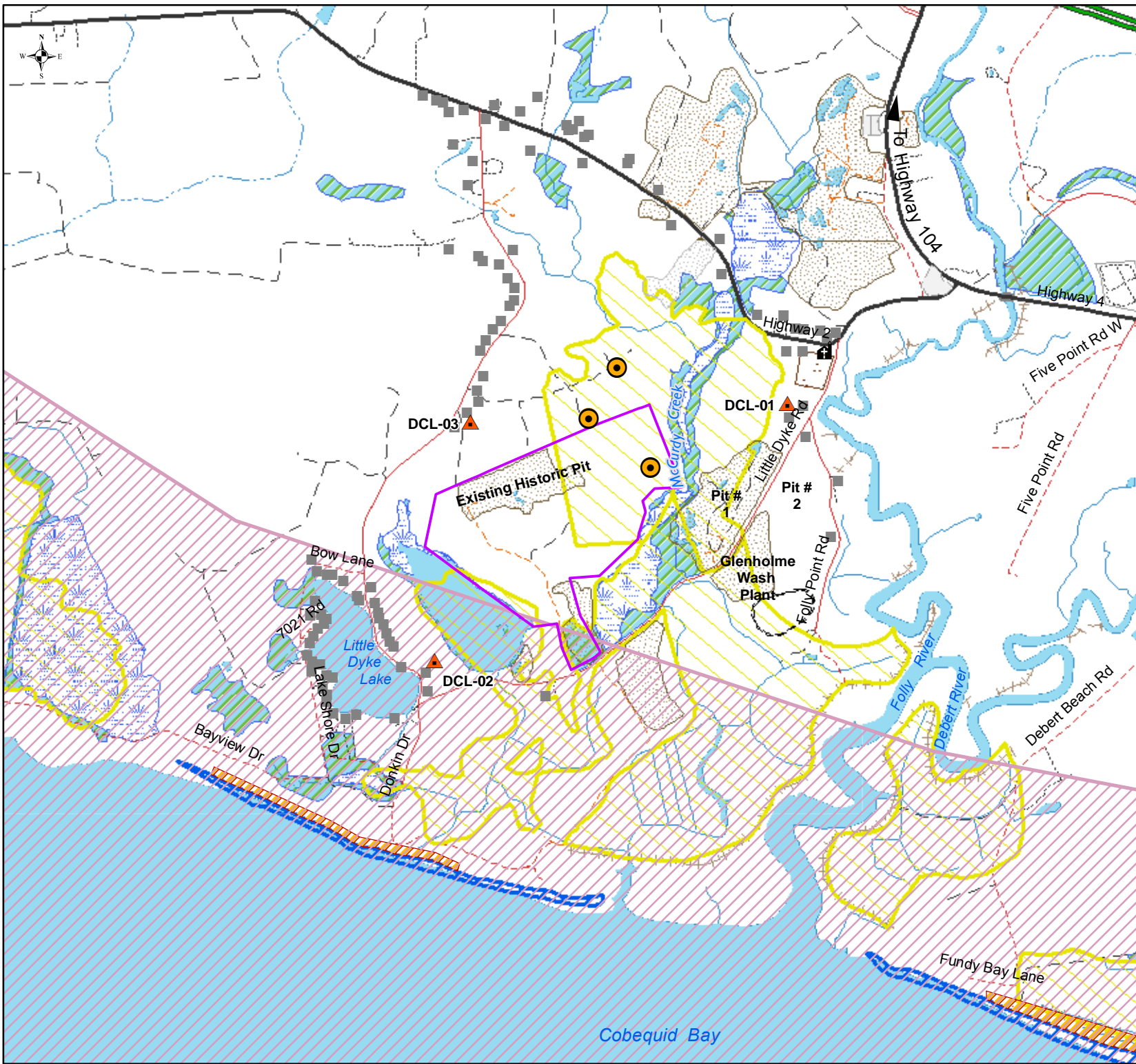


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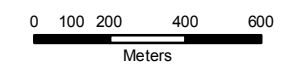
OSCO Aggregates Limited  
 Glenholme Pit No. 4  
 Extraction Project  
 Environmental Assessment

Figure 3  
 Setting and  
 Noise Meter Locations



- Study Area
- ▲ Noise Monitoring Location
- NS Significant Habitats**
- Migratory Bird Habitat
- Other Significant Habitat
- Cobequid Bay IBA (NS 019)
- Historic Eagle Nest
- Protected Beaches
- ⛪ Church
- Residence
- Pit
- Cemetery
- Wetland NSDNR Database
- Wetland (from NS Topbase)
- Open Water

PROPERTY AS PROVIDED  
 BY PROPERTY ONLINE  
 NOV 2016



MAP CREATED BY: SCM  
 MAP CHECKED BY: KLM  
 MAP PROJECTION: NAD 1983 CSRS UTM Zone 20N  
 MAP DRAWING INFORMATION  
 DATA PROVIDED BY NSDNR, GeoNova, OSCO  
 Date: 3/28/2017

Cobequid Bay

Material handling on the property will be limited to screening and some crushing. Mobile crushing equipment would be stationed based on the location of extraction at any given time. Initially crushing equipment is expected to be located within the existing pit areas. Stockpiles are also currently located within the existing pit area. Additional stockpiles, mobile crushing locations and a weigh scale are anticipated associated with working areas as the extraction area progresses. As needed, material would be transported to the existing OSCO aggregate Pit No. 2, part of the existing OSCO Glenholme Wash Plant facility, located just to the east of the Proposed Pit No. 4 site. Transportation of the aggregate to the existing Pit No. 2 would be along the Little Dyke Road (public) for approximately 700 m.

The EA includes the Pit No. 4 preconstruction, construction and operation activities. Preconstruction activities are anticipated to take in the order of one year, with pit development and operation/ progressive reclamation occurring over the next 10 to 20 years. The Pit No. 4 lifetime is anticipated to be approximately 20 years. Final decommissioning will include completion of progressive reclamation and site stabilization. The timeline for establishment of final condition is to be developed as part of the approval conditions and will depend on the timing of material removal (which will be based on market conditions at the time).

Operation of the existing OSCO Glenholme Wash Plant facility (“existing Glenholme facility”) is not part of the Pit No. 4 extraction Project EA scope. The Glenholme Wash Plant facility and pits were approved with conditions under the provincial EA regulations in 2007 and currently operates under a Nova Scotia Environment (NSE) Industrial Approval. The current Proposal for Pit No. 4 development will not result in changes to the types of activities undertaken at the Glenholme facility, as described in the 2007 EA (AMEC 2007).

If revision of the Project Undertaking is determined necessary to the operation of the site, additional approval will be obtained prior to such works as required by Nova Scotia Environment (NSE).

## 2.4 Purpose and Need for the Undertaking

The Project will contribute to the natural resource sector of the economy and provides essential raw materials to the province’s construction industry.

- The primary purpose for the Project will be to provide a source for high quality sand and stone required in concrete production in northern Nova Scotia (Truro to Antigonish) and in the Halifax metro area. Aggregate will be used by the current Glenholme Wash Plant facility which supplies aggregate to all concrete plants in the northern Nova Scotia corridor.
- The Glenholme area is also a key source for concrete stone for marine based projects due to its non-reactive properties. Several major wharf and jetty projects in the Halifax area (Department of National Defence and Harbour Authority facilities) have relied on stone from the area as a preferred source.

- The aggregate will also be used in highway construction and maintenance projects in the region, as well as for municipal and residential construction projects.

The Pit No. 4 development also provides direct and indirect employment for its workers and suppliers, as well as for the transportation and construction industries. Pit No. 4 is required to extend aggregate production at the existing Glenholme facility beyond the next three to four years.

The existing Glenholme facility has made a significant contribution to the local economy with employment of approximately 15 people (full time and seasonal) on an annual basis and has paid over 2.5 million dollars in wages, royalties, fees and taxes over the last 5 years, and more previously. A large proportion of these local earnings are expected to go directly back into the economy of the area.

## 2.5 Consideration of Alternatives

The proposed Project provides an opportunity to develop a needed aggregate resource within a largely pre-disturbed property in close vicinity to an existing processing facility and with existing access. The operation is proposed in an area that has already been exposed to aggregate excavation for several decades. No alternatives to the Pit No. 4 site are currently available within the local resource area. In order to find a comparable resource to the high quality Glenholme aggregate, significantly increased transportation routes to both processing facilities and markets would be required; and, more extensive development disturbance and conflict with other land uses (e.g., forestry, agriculture) would be anticipated.

The proposed Project supplies a needed material; minimizes potential for environmental interactions; is located within an area of existing aggregate extraction; and, is a preferred option from a market based perspective.

## 2.6 Scope of the Environmental Assessment

OSCO met with the Nova Scotia Environmental Assessment Branch initially in August 2016 to confirm the EA requirements, including requirements for wildlife assessment, and to preliminarily evaluate the scope of the Project and assessment. Scope of assessment refers to the determination of the environmental effects to be addressed, the scope of those effects to be addressed, and the effects to be considered in making decisions regarding the project.

The scope of the assessment has been determined based on the proposed Project components and activities, the existing environment, stakeholder/regulatory consultations and regulatory framework, and on the associated identification of, and evaluation of the potential for the Project to interact with the Valued Environmental Components (VECs) following mitigation. Additional detail on each of these factors is provided in subsequent sections (**Section 3 to 9**). Consistent with NSE guidance, potential environmental effects were evaluated for each of the Project phases for VECs that include:

- Air quality (including noise).
- Groundwater resources.
- Surface water resources
- Fish and fish habitat.
- Wetlands.
- Priority plant and animal species (based on discussions with the Department of Natural Resources (NSDNR) Species at Risk Biologist in August 2016, and on NSE’s Guide to Addressing Wildlife Species and Habitat in an EA Registration Document, 2005).
- Archaeological and heritage resources.
- Socio-cultural considerations.

The scope of the Project was evaluated based on the Project Description (**Section 5**) and is summarized in the assessment methodology section (**Section 7**).

### 2.6.1 Study Boundaries

The assessment examines both a regional and local study area based on potential nature of the VEC. The regional study area reflects the regional atmospheric area, transportation to the processing facility, and the communities connected to the proposed Project. The local study area focuses on the Pit No. 4 property and extraction area footprint or “disturbed area” and associated buffers in relation to VECs “on-site”, as well as watershed and “wetland-shed” considerations for sensitive downgradient receptors.

The time frame of interest reflects a proposed 2017 Project initiation through to a potential long term reclamation completion by 2037. It is noted that, depending on market conditions, final reclamation may occur before this date.

## 3.0 Consultation

The Glenholme operations manager has operated the existing Glenholme Wash Plant and associated pits for 30 years. The Glenholme operations manager lives in the community and has actively engaged neighbouring stakeholders as part of the existing facility operations.

### 3.1 Methods of Public Engagement

The goals of the public engagement were: to inform the local community of the proposed Project; to provide an opportunity for public comment on the Project and identify concerns regarding adverse effects or environmental effects; and, to identify means that Project concerns may be addressed as applicable.

A description of the proposed Pit No. 4 Project and pending EA, were distributed to homeowners and local businesses within approximately 1 km of the proposed Project on November 10, 2016. Information sheets were hand delivered to each of the homes along Little Dyke Road and to the houses on Highway No. 2 between Little Dyke Road and Highway 4. The Glenholme Wash Plant operations manager personally made the deliveries, and discussed the Project with homeowners who were at home at the time of the November 10th delivery. The Information sheet was also posted on the bulletin board at the local store.

Subsequent to the distribution of Project material, some of the residents held several meetings to discuss the Project. On November 25, 2016 the Glenholme facility operations manager presented the proposed Project to approximately 20 residents. The residents provided OSCO with a draft of the summary of concerns following the November 25, 2016 meeting. OSCO has requested the final meeting summary, but has not received it to date.

An update information sheet was provided by email to those expressing interest in the Project (February 12, 2017) and was again posted on the bulletin board at the local store. The Glenholme operations manager offered to meet with local residents to address concerns on several occasions; however, no meeting was requested directly to OSCO by the residents.

A copy of the Project information was also forwarded to political representatives (District Councillors, MP and MLA).

Upon public request, Colchester North MLA Karen Casey hosted an information session on the proposed Project in Glenholme for property owners on April 21, 2017. OSCO local and corporate representatives presented a summary of the proposed Project and were available to answer questions.

A summary of public concerns identified is provided below in **Section 3.2**. Copies of consultation materials and comments received are included in **Appendix B**.

### 3.2 Public Concerns and Steps Taken to Address

During the distribution of Project information on November 10, 2016, seven property owners were spoken to directly by the Glenholme Operations Manager. All responded positively to the Project and did not identify any concerns.

**Table 3-1** summarizes comments received at meetings with local residents on November 25, 2016 and April 21, 2017, as described above, and identifies the Proponent's response.

**Table 3-1 Summary of Public Concerns and Proponent Response/Resolution**

Issue/Concern	Response/Proposed Resolution
Noise - particularly to the west due to sound travelling over water	<p><b>North boundary</b> - The existing berm on the northern property boundary will be maintained. No trees will be cut within the property buffers. Residences do not directly abut the Project property.</p> <p><b>East boundary</b> – nearest neighbor is the existing Glenholme Wash Plant.</p> <p><b>West boundary</b> – as requested by the residents, OSCO plans to construct a berm along the west edge of the pit within the lowlying farmland area outside of the proposed wetland buffer. A treed buffer will be left along the remaining western boundary.</p> <p><b>South boundary</b> – the proposed pit will not be located within 200 m of the south boundary due to a wetland and its buffer.</p> <p><b>General</b> - Back-up beepers on equipment - will be turned off during the night shift (6 pm to 6 am). No Sunday operation at Pit No. 4 as noted below.</p> <p><b>Evening crusher work</b> – Concerns about noise after 4 pm were identified. OSCO will consider crushing the year's supply of material at one time (possibly in the fall) to minimize the duration of crusher noise.</p>
Limiting time and days of operations at Pit No. 4	OSCO will meet resident request for no Sunday operation; however, 24 hour operation on other days may still be required. OSCO will meet NSE requirements for noise at the property.
Un sightliness  Crossing of Little Dyke Road by equipment at the Wash Plant (existing operations)	<p>Concern that the view from the residences along the lake to the west (Little Dyke Lake) of the Ducks Unlimited (DU) pond would be unsightly was raised. OSCOs proposal to limit noise through a berm constructed along the west side of the pit in the lowlying farmland area will also serve to limit viewplanes of the pit.</p> <p>A stop sign will be placed at the intersection of Pit No.4 and Little Dyke Road.</p> <p>During discussions regarding this Project, residents requested stop signs also be installed at each exit at the existing Glenholme facility. OSCO agreed to put a stop sign at the exit of Pit No.1 and a yield sign at the exit of Pit No.2 and to request employees stop before crossing from either side.</p>
Traffic/Damage to roads	The Project is not anticipated to alter traffic rates, with the exception of between the property access and the existing Glenholme Wash Plant facility (approximately 700 m of public road). Only one homeowner is located in this area who has not identified a concerned with the traffic. The Project is not intended to increase production at the



Issue/Concern	Response/Proposed Resolution
Historic spill response	<p>Glenholme facility, but will extend the life of the facility. Therefore additional regional traffic is not expected to increase.</p> <p>Concerns were identified in relation to the existing condition of the Little Dyke Road due to truck traffic and no spring weight restrictions. MLA Karen Casey agreed to confirm Transportation and Infrastructure Renewal (TIR) intention regarding maintenance and upgrade of this public road.</p> <p>A vehicle visiting the Glenholme facility in the fall of 2016 spilled hydraulic oil on the public Little Dyke Road. Glenholme Wash Plant personnel put sand on the spill and notified the Area Manager for TIR. A response from TIR is pending and OSCO is following up with them.</p> <p>Though this event is not within the scope of the EA, it demonstrates the Proponent's relationship with the surrounding community, and their environmental protocols.</p>
Groundwater impacts  General concern that gravel pits in the Glenholme area are having a negative effect on wetlands and McCurdy Creek	<p>The proposed Project will not extend into the water table and thus is not anticipated to affect groundwater supplies.</p> <p>OSCO is conducting existing operations and will conduct proposed Pit No.4 operations in compliance with NSE approval requirements which include setbacks from watercourses and setbacks that will apply to wetlands. The existing Glenholme Wash Plant operates as a contained system with water recycled within ponds that do not discharge during operations.</p>
Potential impacts to the Ducks Unlimited pond  Potential impacts to loons nesting at the Ducks Unlimited pond	<p>Ducks Unlimited Canada (DUC) was contacted regarding this Project and OSCO personnel meet with representatives on site to provide an outline of the Project. Ducks Unlimited Canada did not express concern over the Project subject to the normal approvals process. OSCO has committed to work with Ducks Unlimited to complete the Project minimizing potential short term negative effects to waterfowl and other birds at the pond and in the long term to improve waterfowl habitat in the area.</p> <p>It is understood that loons have been regularly nesting in the pond/lake in the area since the late 1990's. Loons typically nest on islands or artificial islands to limit predator access, thus would be interior to the pond, limiting potential for direct nest disturbance. Noise disturbance beyond what typically occurs in the area will be temporary and will be partially mitigated by the proposed buffers, berms and noise mitigation.</p>
Ongoing engagement during Project Operation	<p>Based on public request, OSCO has agreed to hold quarterly meetings with local resident's representatives, if interested, to allow for ongoing opportunity to identify new concerns and keep the community informed throughout the life of the Project.</p>

### 3.3 First Nations Communication

Following recommendations from the Consultation Advisor for the Nova Scotia Office of Aboriginal Affairs (OAA)(pers. comm. D. Mitchell), a letter outlining the Project and providing a contact for comments, concerns or questions was sent on January 6, 2016 to:

- Kwilmu'kw Maw-klusuaqn, Mi'kmaq Rights Initiative (KMKNO)
- Chief Millbrook First Nation
- Chief and Council, Sipeknekatik (Shubenacadie) First Nation

As well, as part of the Heritage Research Permit required for the Archaeological Screening, the archaeological consultant (CRM Group) sent notice to the KMKNO of the Project.

Copies of information provided are included in **Appendix B**. OSCO has heard back from Sipeknekatik First Nation that they have received the letter and will be reviewing the Environmental Assessment.

### 3.4 Future Steps

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OSCO's Glenholme operations manager will continue to be available to discuss and address community concerns with the Project. Quarterly meetings with resident's representatives will be held throughout the life of the Project, if residents are interested, to allow the opportunity to raise any new concerns and share information.

## 4.0 Regulatory Framework

OSCO is committed to adherence with applicable municipal, provincial and federal regulatory requirements. Approvals/permits required will be obtained prior to construction and operation as applicable. Relevant policy guiding legislation such as the Nova Scotia Wetland Conservation Policy will also be followed. **Table 4-1** provides a summary of potential key regulatory requirement and applicability to this Project.

**Table 4-1 Potentially Relevant Environmental Legislative Requirements Applicable to the Project**

Legislation	Requirement	Approval/Permit Anticipated
<b>FEDERAL</b>		
<i>Canadian Environmental Assessment Act (CEAA 2012)</i>	Expansion of an existing stone quarry or sand or gravel pit that would result in an increase in the area of mine operations of 50% or more and a total production capacity of 3 500 000 t/year or more (not triggered by Project)	No
<i>Fisheries Act and Regulations</i>	Protection of fish habitat (no fish habitat in footprint)	No
<i>Species at Risk Act (SARA)</i>	Protection of listed species (impact not identified in footprint)	No
<i>Transportation of Dangerous Goods Act and Regulations</i>	Documented handling, storage, emergency response requirements for transportation of dangerous goods, if to be used on-site, to be met	No
<i>Migratory Birds Convention Act (MCBA) and regulations</i>	Protection of migratory birds, nests, eggs and young	No (assuming clearing outside of nesting season)
<i>Canadian Environmental Protection Act (CEPA)</i>	Pollution prevention requirements, and direction on priority substances and deleterious substances to be met where applicable	No
<b>PROVINCIAL</b>		
<i>Environment Act and Regulations Environmental Assessment Regulation</i>	Project requires Ministerial Approval	<b>Yes</b>
<i>Environment Act and Regulations Activities Designation Regulations</i>	Industrial Approval - a pit that is larger than 2 ha where a ground disturbance or excavation is made for the purpose of removing aggregate without the use of explosives	<b>Yes</b>
	Wetland or Watercourse Alteration (alteration not proposed as part of the Project)	No
<i>Environment Act and Regulations Contaminated Sites Regulations</i>	Requirements for contaminated sites on provincial land (no contaminated sites identified)	No
<i>Environment Act and Regulations Petroleum Management Regulations</i>	Petroleum storage requirements to be met as applicable	No
<i>Environment Act and Regulations</i>	To meet requirements if environmental emergency	No

Legislation	Requirement	Approval/Permit Anticipated
Environmental Emergency Regulations	occurs	
<i>Nova Scotia Endangered Species Act (NSESA)</i>	Protection of listed species (impacts to listed species not identified for Project)	No
<i>Nova Scotia Wildlife Act</i>	Among other wildlife management requirements; prohibits killing of raptors, or disturbance of bird and turtle nests (turtle nests not identified for property, however contingency planning in place)	No (assuming clearing outside of nesting season)
<i>Special Places Protection Act</i>	Heritage Research Permit for purposes of EA	Yes
<i>Crown Lands Act and Regulations</i>	Crown land easements, leases and licences (Project is on private land)	No
<i>Forests Act – Forest Fire Protection Regulations</i>	Requirements for fire suppression equipment for operations in forests to be met	No
<i>Dangerous Goods Transportation Act and Regulations</i>	Requirements for safe transport of dangerous goods to be met if applicable	No
Labour Standards Codes	Labour requirements to be met	No
<i>Nova Scotia Public Highways Act</i>	Any work within the public road (e.g. potential road signage) would require Nova Scotia Department of Transportation and Infrastructure Renewal approvals.	May be required
<i>Occupational Health and Safety Act and Regulations</i>	Workplace health and safety requirements to be met	Activity specific

Key relevant environmental provincial and federal acts and guidelines include; *Migratory Birds Convention Act*; *Nova Scotia Environment Act* and “Species At Risk Acts”; as well as the Nova Scotia Pit and Quarry Guidelines (Nova Scotia Department of Environment and Labour (now NSE) 1999). Provincial regulatory officials have been made aware of the intention to submit an EA Registration Document (EARD) for this undertaking. Provincial regulators have provided assistance in scoping by bringing forth potential issues of concern. No federal environmental assessment triggers have been determined.

## 5.0 Project Description

The proposed Pit No. 4 Project will involve excavation of aggregate material from the reserve within the property. The regional geological mapping for the Pit No. 4 Project property indicates the reserve is in a south flowing glacial outwash system. Known aggregate resources in this system generally consist of clean, coarse-grained aggregate (a mixture of gravel and medium to coarse-grained sand) and localized sand bars. Similarly, an extraction face on the northwest portion of the existing pit at the property consists of medium to coarse grained sand containing 40% to 50% crushable stone (Lafarge 2015). Based on a test pitting program conducted in the fall of 2016, Servant Dunbrack, McKenzie & MacDonald (SDMM) calculated a preliminary potential reserve volume of 1.13 million tonnes (pers. comm. D. Bancroft, OSCO). This volume includes existing stockpiles at the property from previous operations (different proponent). The resource available was evaluated as medium to good quality sand and gravel (Lafarge 2015).

The pit reserve area was determined utilizing the Nova Scotia Pit and Quarry Guidelines separation distances for pit operations, which include:

The active area shall not be located within:

- 30 m\* of the boundary of a public or common highway.
- 30 m of the bank of any watercourse or ordinary high water mark.
- 30 m of the boundary of the pit property.

The excavation working face of the pit shall not be located within:

- 30 m\* of the boundary of a public or common highway.
- 30 m of the bank of any watercourse or ordinary high watermark.
- 90 m\* of the foundation or base of a structure located off-site.
- 15 m of the property boundary when a structure on the abutting property is not involved.

\* Note: buffers may be reduced with written consent from land/structure owner.

The 30 m setback was also applied to wetlands identified within the Project area, as shown in **Figure 2 (Section 2)**. The property survey is pending, so the assessment is focused on the property as identified in Property Online (Service Nova Scotia) based on review by SDMM, and is noted as the “study area”. The potential reserve footprint area (30.41 ha) assumes that wetlands and their buffers are maintained.

The quantity of aggregate excavated within a given year will vary based on market conditions. Annual extraction rates of between 50,000 tonnes and 250,000 tonnes are anticipated. Given the potential variation in annual production rates, the reserve area is anticipated to be removed within a 10 to 20 year timeframe.

Project phases are described further below.

## 5.1 Site Preparation and Construction

Site preparation will not be conducted on the entire site at once. Trees will be removed within one-third of the proposed Project area in phases. No trees will be removed within the buffers as outlined in the Pit and Quarry Guidelines active area separation buffers, or from within wetlands or their buffers (except where authorized by NSE). Grubbing and removal of topsoil will occur in each area in advance of extraction requirements, on a seasonal or annual basis. Preparation activities include creation or upgrade of on-site roads, removal of forest cover and other vegetation, and stockpiling of materials for progressive reclamation.

There is currently a partially paved, partially gravel access road leading from Little Dyke Road to the existing historic pit area located in the north of the site. The gravel portion of this road will be restored/ upgraded to support proposed operations. Road restoration will involve the use of dump trucks and dozers to add clean gravel where required for road stability. Roads upgraded will have equivalent widths to the existing access road. As the pit extends into new area, the gravel road will be extended, and level gravelled staging areas established within the completed area of the pit.

Timber harvest will be contracted to a forestry company for mechanical harvest and will be conducted outside regional nesting bird seasons as defined by Environment and Climate Change Canada (ECCC). Removal of topsoil (average local thickness of 0.3 m) and vegetation will be conducted on an as needed basis with the advancement of the operation to minimize the potential for erosion and sedimentation. As the pit expands, topsoil and ground vegetation will be stripped and stockpiled so the material can be used in the future during rehabilitation. Ground preparation will involve the use of dozers, front end loaders and excavators.

Fueling areas and temporary fuel storage (for equipment on-site) will be located in designated areas at least 30 m from a watercourse or wetland.

## 5.2 Operation and Maintenance

Excavation of the pit will typically be undertaken using front end loaders. The pit floor will be maintained at least 0.5 m above the groundwater table. The material to be excavated will include a mix of medium to coarse-grained sand, gravel, and associated finer material including silt and clay fractions. Based on experience at the Glenholme Wash Plant, OSCO personnel report that the fines component is not easily mobilized in runoff (pers. comm. S. Putnam, OSCO). Blasting will not be undertaken at the site. No permanent fuel storage will be located at the Pit No. 4 site. The pit configuration will generally direct runoff to within the excavated area. Runoff is not anticipated from the pit area to downgradient locations based on experience with aggregate extraction in the area and the permeable nature of the surficial material which facilitates infiltration of rainwater. Pit design will include directing flow towards the interior of the pit from exposed surfaces.

A portable crushing and screening plant will be brought to the site and set up in a staging area on the pit floor. A scale and scale house may also be established. The excavated material will be dumped into the crusher. Crusher output (approximately one inch diameter gravel and finer fractions) will be conveyed to a dry screen. Screened material will go to a stockpile. Stockpiles will typically be for 2 inch minus and 1 inch minus material. Stockpiles will work across the extraction area, and locations will move from year to year as extraction progresses. At a maximum, up to 100,000 tonnes of aggregate material may be stockpiled within the stockpile laydown area. However, stockpile volumes will typically be much less. Crushing, screening and stockpiling areas will be within the active area of the proposed pit.

#### **Extraction Schedule and Rates**

The Pit No. 4 operating schedule will be based on a potential 12 to 14 hour day, 5 to 6 days/week, year-round, with the potential for peak season expansion of operations to 22- 24 hours per day. However, it is anticipated that extraction activities will be limited or halted from January to February. The rate of aggregate extraction from Pit No. 4 is expected to vary from year to year, ranging from 50,000 to 250,000 tonnes of aggregate per year. The resulting pit life is estimated to be between 10 and 20 years.

#### **Transportation Off-site**

It is estimated that up to 25% of the material stockpiled at Pit No. 4 will be sold as is, with the majority trucked to the Glenholme Wash Plant for processing. Whether transport is as a direct point of sale or to OSCO for processing, trucking will generally be large trailer loads (tri-axel or quad). The truck traffic from the existing Glenholme Wash Plant to market will not change from the existing traffic load. The Pit No. 4 aggregate source will replace existing aggregate sources. The only new traffic to the road will occur along the approximately 700 meters of Little Dyke Road from Pit No. 4 to the existing Glenholme Wash Plant. Truck traffic on public roads is generally subject to spring weight load restrictions. Weight restrictions have been variable on Little Dyke Road.

#### **Progressive Reclamation**

Progressive reclamation will occur in stages as aggregate removal is completed from sections of the site. The inactive pit areas will be graded to a stable slope and covered with topsoil/mulch and seeded as needed.

#### **Maintenance Activities**

The only maintenance activity associated with the Project aggregate extraction is occasional grading or addition of gravel to the access road. Road salting is not anticipated in the winter.

### **5.3 Decommissioning and Final Reclamation**

Final reclamation will be completed following applicable provincial and federal regulatory requirements at the time of reclamation. Final decommissioning may require a couple of years following completion of extraction activities to allow the site to stabilize and vegetation to fill in.

## 5.4 Environmental Management

Throughout the Project, OSCO will employ best practices and mitigation measures as applied in the province for pits. Key guidance documents, in addition to regulatory requirements (**Section 4**) include:

- Canadian Council of Ministers of the Environment (CCME) guidance on water quality;
- Pit and Quarry Guidelines (NSE 1999);
- Nova Scotia Wetland Conservation Policy (NSE 2011);
- Beaverdam Removal Code of Practice (Nova Scotia Department of Environment (NSE) and Nova Scotia Department of Natural Resources (NSDNR)); and
- Erosion and Sediment Control Handbook for Construction Sites (NSE 1988).

### **Erosion and Sediment Control (E&SC) and Stormwater Management**

In accordance with best practice as identified by NSE, erosion and sediment control measures will be established prior to disturbance activity and during operations, as required to manage runoff. NSE guidance will be followed such as diversion of clean surface drainage away from disturbed areas, avoidance of disturbance during storm events and direction on the construction of sediment and erosion control measures (NSE 1988). The progressive nature of pit excavation and reclamation minimizes the disturbed area exposed at a given time.

Specific stormwater control infrastructure is not required for the pit, as the pit will be graded to drain internally. Where required, berms and swales will be placed to direct flow back towards the pit. Surface water readily infiltrates into the subsurface due to the high permeability of the sands and gravels. The pit floor will be located above the ground water table. No discharges will occur from the operational activities.

The 30 m undisturbed buffers from natural watercourses and wetlands will be maintained.

### **Dust and Noise Control**

Dust control will be undertaken during dry weather conditions with water from an approved source. Stockpiles/windrows of topsoil and vegetative material may be seeded or covered with mulch to minimize erosion and dust generation.

Forest cover within the property buffers and the northern berm at the existing pit will be maintained. An additional berm is proposed along the west edge of the property within the lowlying farmlands area to address concerns expressed by local residents. It is proposed that the berm be approximately 10 m wide at its base and 2 m in height with 4:1 slopes. Young trees (in the order of 2-3 m height) will be transplanted to the berm from the excavation area.



### **Hazardous Materials Management**

Hazardous materials will not be stored permanently on the Project property. Any fuel/chemicals temporarily on site will be stored in accordance with all provincial regulations, including the provision of Health and Safety information and emergency spill kits on-site at strategic locations.

Mobile equipment may be fuelled on-site by contracted mobile fuel trucks. Refueling will not be conducted within 30 m of a watercourse or wetland. Operators will remain with the equipment at all times during refueling following the requirements of the Petroleum Management Regulations. Preventative maintenance will be performed on site equipment by qualified personnel. Used oil and filters will be disposed of in an approved manner, off-site.

In the event of an accidental release at the Property, immediate action will be undertaken to stop and contain spilled material. All contaminated material will be collected and stored in an appropriate manner prior to transport to an approved disposal facility. In accordance with the Environmental Emergency Regulations, spills will be reported to the 24-hour environmental emergency reporting system. All equipment operators and those responsible for refueling and maintaining equipment will be required to take spill response training, which will be documented.

A contingency plan will be in place to address potential petroleum, oil, lubricant (POL) spills as well as other potential accidental events (**Section 9**). This plan will be available to NSE on their request. The Canadian Standards Association publication *Emergency Planning for the Industry (CAN/CSA-A731-95)* will be consulted in the development of this plan.

## 6.0 Existing Environment

The proposed aggregate pit (No. 4) Project addressed by this assessment is located in a rural area with several existing and historic aggregate developments. **Figure 3** (in **Section 2**) shows the Project setting.

There has been sporadic extraction over the last 30 years from the gravel pit that currently exists on the proposed Project property. This section provides a description of the biophysical environment and social economic features relevant to the EA scope. The purpose is to provide a general understanding of the existing environment within the temporal and spatial boundaries of the proposed Project activities. The information was gathered using a variety of methods, including building on a previous assessment in the general area; literature and database reviews including Atlantic Canada Conservation Data Centre (ACCDC); desktop assessment; contact with regulatory agencies; identification of public concerns; and, review of aerial/satellite imagery and geographic maps. Field studies were also conducted from August to November 2016 by Dillon Consulting Limited (Dillon) to supplement study area specific information and provide baseline data.

### 6.1 Study Boundaries

Environmental components of the Project are described, focusing on the spatial boundaries of the Project including the footprint of the pit area and Project components, but also extend beyond, where appropriate, to describe larger features or features that may be contiguous with the footprint (e.g., watercourses and wetlands). The Project footprint (reserve area), shown previously in **Figure 2**, represents the potential ultimate “disturbed” area. With respect to describing the existing environment, a regional study area applies to the broader water and air-sheds potentially interacting with the proposed Project.

The temporal boundaries or time frame of interest reflects the proposed 2017 construction initiation and excavation and pit operations for 20 years.

### 6.2 Atmospheric Environment

Atmospheric parameters include:

- Ambient air quality – the chemical and physical properties of the air in the atmosphere. The air quality parameters of interest for the Project are particulate emissions and Green House Gases (GHG).
- Ambient Sound Quality (noise quality) – any pressure variation (in air, water or another medium) the human ear can detect. Noise is characterized as any unwanted sound.

For the purpose of this EA, the atmospheric environment is confined to within 5 km of the proposed Project location (except Green House Gases which are considered cumulatively).

### 6.2.1 Air Quality

NSE and ECCC operate a network of ambient air quality monitoring stations within the province to measure ambient concentrations of various air contaminants. Common air pollutants monitored include sulphur dioxide, nitrogen oxide (NO), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), fine particulate matter (PM<sub>2.5</sub>), ground level ozone (O<sub>3</sub>) and other volatile organic components (VOCs). The nearest stations to the Project are over 50 km away – Pictou (National Air Pollution Surveillance Station #030120) and Kentville (National Air Pollution Surveillance Station #031101). The Pictou station is located over 75 km to the northeast within a fairly industrial urban area along the Northumberland Strait, while the Kentville station is located over 70 km to the southeast on the opposite side of the Bay of Fundy within a small town/agricultural setting. The NSE/ECCC data are provided below as reflective of regional ambient air quality.

In 2016, from January to December the air pollutants ranged as follows:

Pictou	Kentville
• 0 to 16 ppb NO <sub>x</sub>	• 0 to 5 ppb NO <sub>x</sub>
• 0 to 6 ppb NO	• 0 to 1 ppb NO
• 0 to 13 ppb NO <sub>2</sub>	• 0 to 5 ppb NO <sub>2</sub>
• 0 to 24.1 ug/m <sup>3</sup> PM <sub>2.5</sub>	• 1.4 to 23.7 ug/m <sup>3</sup> PM <sub>2.5</sub>
• 1.4 to 48.9 ppb O <sub>3</sub>	• 6.9 to 48.1 ppb O <sub>3</sub>

With respect to local conditions, the key air quality parameter of concern would be particulates, i.e. dust. Site personnel (S. Putnam, pers. comm.) identified that occasional past complaints regarding dust that were related to truck traffic at the existing Glenholme Wash Plant were resolved to the satisfaction of the concerned individuals.

### 6.2.2 Noise

The proposed Project extends northwards from Little Dyke Road and the property is surrounded by various resource use and residential properties. Properties immediately adjacent to the proposed Project are either undeveloped or resource use, including operating aggregate pits. There are several residences located to the east, north and southwest areas of the proposed Project area along Little Dyke Road.

The locations of residences within the proposed Project area are presented in **Figure 3 (in Section 2.3)**. The nearest residential properties are: approximately 200 m to the north of the Project; approximately 250 m to the west; approximately 80 m to the south (one residence); and, over 500 m to the east. There are approximately 60 residences within 1,000 m of the proposed Project boundaries.

To characterize the existing sound quality, Dillon completed baseline noise measurements at three representative receptor locations (**Figure 3**) in November 2016 as part of the EA for the proposed Project. These representative receptors are identified in **Table 6-1**.

**Table 6-1 Representative Noise Receptors in the Vicinity of the Proposed Project**

Representative Receptor	Approximate Distance from Proposed Pit No. 4 Project
247 Little Dyke Road (Residence)	200 m
539 Little Dyke Road (Residence)	350 m
885 Little Dyke Road (Residence)	500 m

Approximately 72 hours of continuous sound monitoring was recorded with a data logger. Dillon's baseline noise measurements used NL-22 Type 1 integrating sound level meters to measure one-hour sound pressure levels that were then used to calculate hourly Leq (Equivalent Sound Level) values. For methodology and results of Dillon's baseline noise assessment, refer to **Appendix C**. The monitoring was completed between November 5, 2016 and November 8, 2016. The baseline measurement commenced on a Saturday afternoon and concluded on a Tuesday afternoon to encompass periods of time when background sounds are relatively lower (i.e., weekends).

The NSE has established the following noise guidelines for Nova Scotia (NSDOE/NSE 1989):

- (i) 65 decibel (dBA) from 7 am-7 pm (Days);
- (ii) 60 dBA from 7 pm to 11 pm (Evenings); and
- (iii) 55 dBA from 11 pm to 7 am (Nights).

The A-weighted maximum, minimum and mean hourly sound level equivalents (LeqA) for daytime (7 am – 7 pm), evening (7 pm – 11 pm) and nighttime (11 pm – 7 am) for the three noise monitoring locations (DCL-01 to DCL-03) are presented in **Table 6-2**. Also included in this table are the 90th percentile sound levels (i.e., Lp90). Hourly results of the baseline sound measurements are provided in **Appendix C** for the three receptors. Hourly weather data is also provided in this Appendix.

**Table 6-2 Noise Monitoring Results**

Receptor ID	Receptor Description	Receptor Address	Maximum Hourly Leq (dBA)	Minimum Hourly Leq (dBA)	Geometric Mean LAeq (dBA)	Ave. Lp90 (dBA)
Daytime (7 am – 7 pm)						
DCL-01	Two story residential	885 Little Dyke Road	50	34	43	34
DCL-02	Single story residential	539 Little Dyke Road	53	34	42	34
DCL-03	Single story residential	247 Little Dyke Road	56	30	42	34

Receptor ID	Receptor Description	Receptor Address	Maximum Hourly Leq (dBA)	Minimum Hourly Leq (dBA)	Geometric Mean LAeq (dBA)	Ave. Lp90 (dBA)
Evening (7 pm – 11 pm)						
DCL-01	Two story residential	885 Little Dyke Road	45	33	37	30
DCL-02	Single story residential	539 Little Dyke Road	40	29	35	26
DCL-03	Single story residential	247 Little Dyke Road	43	28	36	28
Nighttime (11 pm – 7 am)						
DCL-01	Two story residential	885 Little Dyke Road	43	25	32	25
DCL-02	Single story residential	539 Little Dyke Road	47	23	31	25
DCL-03	Single story residential	247 Little Dyke Road	49	23	30	23

The three monitoring sites were located at residences along Little Dyke Road, which contributes to the background sound levels at these receptors. Construction of a shed and renovation activities at receptors DCL-01 and DCL-03, respectively, are the likely sources of elevated sound levels at these two receptors during monitoring. Elevated sound levels at receptor DCL-02 were likely due to traffic noise at this site which is located at the intersection of Little Dyke Road and Donkin Drive.

Baseline sound monitoring results indicate that the NSE noise guidelines were not exceeded on an average basis at residential receptors DCL-01, DCL-02, DCL-03. The sound monitoring results are indicative of typical rural/resource areas with some noise during the day.

There are no current documented records of complaints from local residents within the 30 years before this proposed Project regarding offsite noise levels from existing operations (personal communication, S. Putnam). The Glenholme operations manager confirmed in the November 2016 meeting with residents that he is approachable regarding community concerns if they arise. Potential operational mitigation includes adjusting the orientation of equipment to direct noise away from receptors.

Given the setting of the Project, existing sound pressure levels in the vicinity of the Project are expected to be typical of sound pressure levels in a rural/ resource development area.

## 6.3 Setting and Topography

### 6.3.1 Regional Setting

The proposed Project study is located within the Valley and Central Lowlands ecoregion and the Minas Lowlands Ecodistrict which has several major rivers and associated alluvial floodplains passing through it. Major rivers in the vicinity of the Project are the Folly and Debert Rivers. There are very few lakes with the majority of freshwater found in streams and rivers. The ecodistrict forests are primarily composed of softwood species interspersed by a few stands of tolerant hardwood. The majority of the Ecoregion area is close to sea level with the highest elevation being appropriately 40 m above sea level

(asl) (Neily et al. 2005). The regional area is generally coastal with extensive salt marshes. Dykes have been constructed in the general area to claim farmland from tidal waters of the bay.

The confluence of two larger rivers, the Debert and Folly Rivers and their associated river valleys, occurs approximately 1 km to the east of the proposed Project study area. These rivers are tidal within approximately 3 km of the coast and are bordered by salt marsh habitat. The Cobequid Bay within the Bay of Fundy river estuary habitat, which is quite common in this region, is heavily influenced by the Bay of Fundy. Directly to the southwest of the property is a marsh that is managed by Ducks Unlimited Canada (DU/DUC). Further to the west beyond the neighbouring marsh (approximately 350 m from the Project property) is a small lake, Little Dyke Lake.

### 6.3.2 Site Topography

The Project study area is located within a gently sloping area with elevation 10 to 15 m asl. The high point is in the north of the property and the low point near the access road entrance in the south. In general, the central portion of the property slopes very gently towards the southeast, with the eastern borders sloping toward McCurdy Creek, and the western border sloping toward the DU pond.

### 6.3.3 Special Areas in General Area

The ACCDC review of the area within 5 km of the center of the study area identified two managed areas and three biologically significant areas. The managed areas are coastal beaches - the Little Dyke Protected Beach located approximately 900 m to the southwest of the Project, and Lower Debert Protected Beach located over 1.5 km to the south east of the Project. The significant areas are the coastal Sites of Ecological Significance (SES) associated with the managed beaches at Little Dyke and Lower Debert, and the Cobequid Bay Important Bird Area (IBA) which follows the Fundy shoreline and within 1 km inland. This generalized area encroaches on the border of the Project area and is discussed further in **Section 6.9**.

## 6.4 Climate and Weather

The proposed Project site is located in an area with coastal influence from the Bay of Fundy but also south of the Cobequid Hills. Typically, this region experiences warm early spring, hot summers with less precipitation than elsewhere in the province, and a higher frequency of clear skies. Winters are cold with a mean daily temperature of -7°C in January, with mean daily temperatures rising to around freezing in late March. Spring is warm, and by July the mean daily temperature is 19°C. Total annual precipitation is less than 1200 mm. Representative climate normals from the nearest principal weather station (Debert, Nova Scotia located within 10 km to the northeast), are provided in **Table 6-3** below.

**Table 6-3 Representative Climate Normals for Debert**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature Normals, Debert NS (1981 - 2010)													
Daily Average (°C)	-6.7	-6.1	-1.8	4.3	10.2	15.1	18.6	18.2	13.7	8.0	3.0	-3.2	6.1
Daily Maximum (°C)	-1.5	-0.9	3.2	9.2	16.5	21.5	24.8	24.3	19.5	12.9	6.9	1.0	11.4
Daily Minimum (°C)	-11.8	-11.2	-6.8	-0.7	3.9	8.7	12.4	12.1	7.9	3.0	-1.0	-8.2	0.7
Precipitation Normals, Debert NS (1981 - 2010)													
Rainfall (mm)	54.0	44.3	58.7	79.0	106.1	95.9	90.7	89.6	109.1	107.9	101.8	73.9	1010.9
Snowfall (cm)	38.8	35.1	32.2	8.7	0.7	0.0	0.0	0.0	0.0	0.0	10.1	31.9	157.5
Precipitation (mm)	92.8	79.4	90.8	87.7	106.8	95.9	90.7	89.6	109.1	107.9	111.9	105.8	1168.3
Wind Normals for Debert, NS (1981-2010)													
Maximum Hourly Speed (km/h)	93	71	64	61	61	48	48	58	51	64	68	69	Not applicable
Direction of Maximum Hourly Speed	SW	N	SE	E	W	S	SW	W	SE	W	SW	W	Not applicable

Source: Canadian Climate Normals 1981-2010 [http://climate.weather.gc.ca/climate\\_normals](http://climate.weather.gc.ca/climate_normals)

## 6.5 Geology and Soils

Geology (bedrock and surficial) and soils within the study area and general setting are described below and illustrated in **Figures 4** and **5**.

### 6.5.1 Soils

Soils are illustrated in **Figure 4**. Based on the Soils of Colchester County, Nova Scotia (Agriculture Canada 1989), soils within the study area are comprised of the Herbert Association, generally described as 40 to 60 cm of gravelly loamy sand to gravelly loam over loose, very strongly to extremely acidic, glaciofluvial sands and gravels. The sand and gravels are frequently stratified and have moderately rapid to very rapid permeability. The soils are imperfectly drained, slightly stony and non-rocky, and located on a very gentle slope.

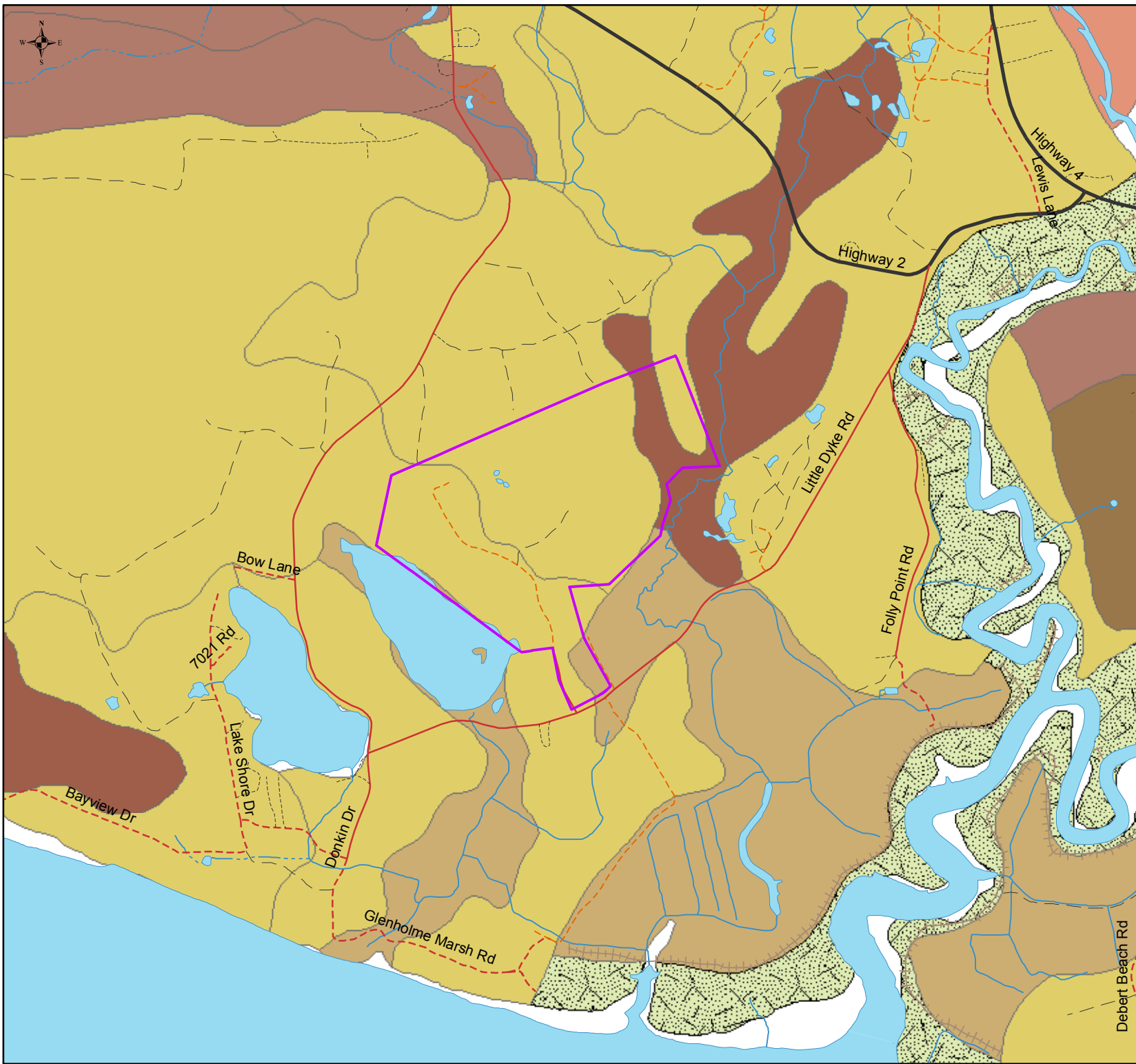
On the eastern side of the study area, close to McCurdy Creek, the soils are comprised of the Castley Association, generally described as 40 to 60 cm of poorly decomposed peat over 50 to 180 cm of moderately decomposed peat of mixed origin over mineral material. These organic materials are extremely, to strongly, acidic. Soils of the Castley Association are very poorly drained, non-stony and non-rocky, and located on a level slope.









Due to the low slopes and poor drainage of both units, the erosion potential would be considered low.



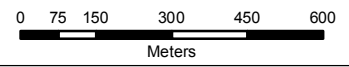
OSCO Aggregates Limited  
 Glenholme Pit No. 4  
 Extraction Project  
 Environmental Assessment

Figure 4  
 Soils



-  Study Area
-  Acadia - ACA
-  Castley - CSY
-  Cumberland - CBR
-  Hebert - HBT
-  Queens - QUE
-  Salt Marsh - ZSM
-  Truro - TUO

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 BY PROPERTY ONLINE  
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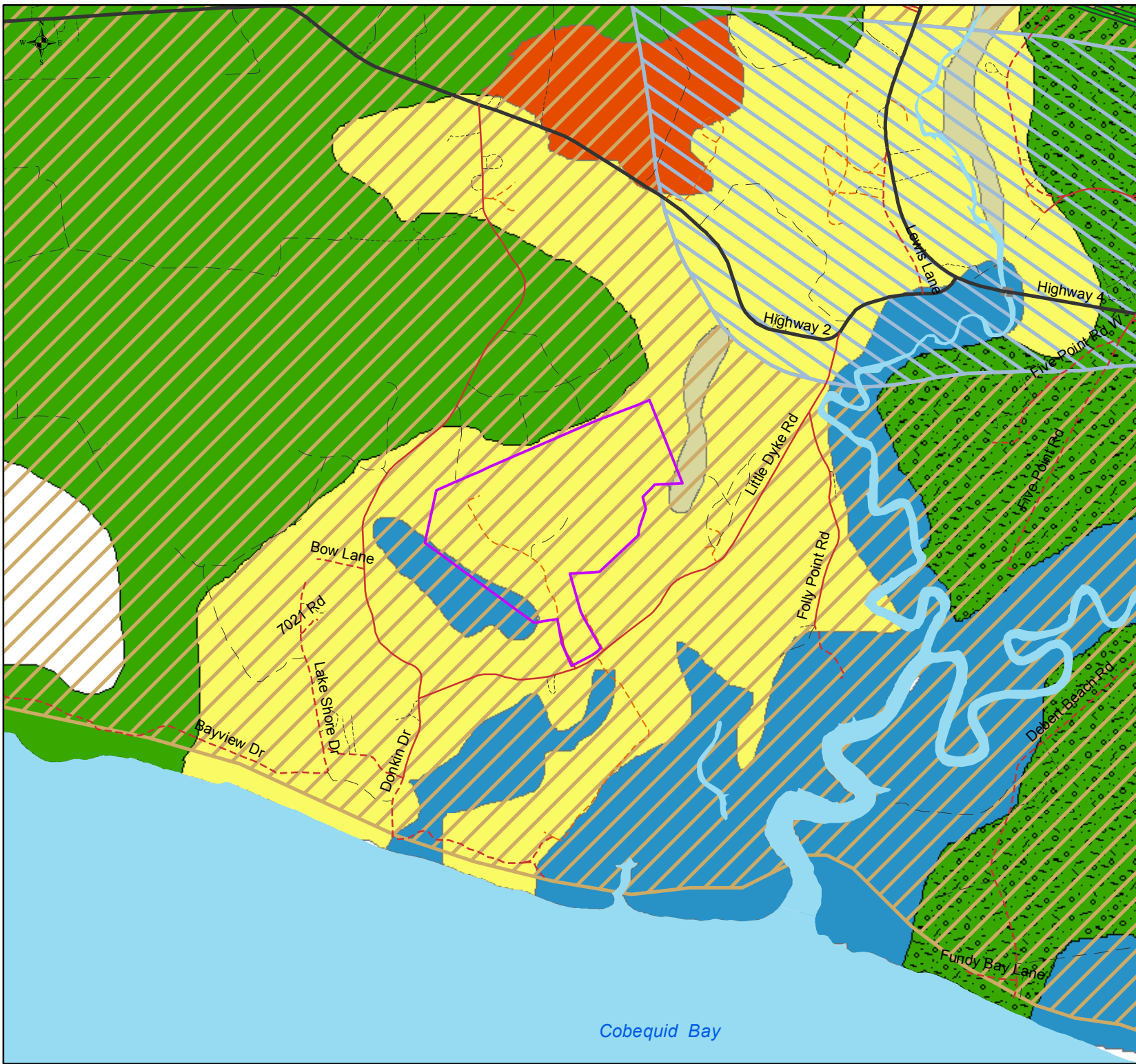
MAP CREATED BY: SCM  
 MAP CHECKED BY: KLM  
 MAP PROJECTION: NAD 1983 CSRS UTM Zone 20N

MAP DRAWING INFORMATION  
 DATA PROVIDED BY NSDNR, GeoNova, OSCO  
 Date: 3/24/2017



OSCO Aggregates Limited  
 Glenholme Pit No. 4  
 Extraction Project  
 Environmental Assessment

Figure 5  
 Bedrock and Surficial Geology



**Study Area**

**Surficial Geology**

**Holocene Non-Glacial Deposits**

- Alluvial Deposits**  
 Gravel, sand, silt, minor clay and organic material; forms floodplains, channel and bank deposits, 2-15 m thick
- Marine Deposits**  
 Fine sand, silt, clay; locally overlain by peat and organics (salt marsh), forms intertidal mud flats.

**Late Wisconsinian Non-Glacial and Glacial Deposits**

- Saints Rest Member**  
 Glaciofluvial gravel, sand and minor silt; massive to horizontally stratified channel sequences common; forms outwash plains and topset parts of Gilbert - type deltas, 3-30m thick
- Apple River Member**  
 Ice contact stratified drift, boulders, gravelly sand, sand and silt; abrupt changes in grain size between beds; faulting common; till may be included locally; forms hummocky and kettled terrain, terraces along valley sides, 4 - 30m thick

**Glacial Environment**

- Eatonville- Hants Till**  
 Reddish - brown silty sand till; moderately compact to compact, fissile and massive, jointed MnO<sub>2</sub> staining along fissility planes. 1 - 15m thick
- Eatonville-Hants Till (Es)**  
 Stony, sandy facies, reddish - brown stony sand till; loose to moderately compact, coarsely fissile, gravelly sand and sand inclusions. 3 - 20m thick

**Bedrock Geology**

- Windsor Group**
- Wolfville Formation**

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 NOV 2016

0 75 150 300 450 600 750  
 Meters

MAP CREATED BY: SCM  
 MAP CHECKED BY: KLM  
 MAP PROJECTION: NAD 1983 CSRS UTM Zone 20N

MAP DRAWING INFORMATION  
 DATA PROVIDED BY NSDNR, GeoNova, OSCO  
 Date: 3/24/2017

Cobequid Bay

### 6.5.2 Surficial Deposits

The surficial geology of the study area and surrounding areas is shown on **Figure 5** (Bedrock and Surficial Geology). The legend describes the various types of deposits in detail. In particular, the majority of the study area is comprised of the Late Wisconsinan-age Saints Rest Member, whose glaciofluvial gravel, sand and minor silt deposits are massive to horizontally stratified, channel sequences common and are up to 30 m thick. On the eastern boundary of the study area, alluvial deposits of gravel, sand, silt and minor clay with organic material form flood plains, channel and bank deposits up to 15 m thick. On the western boundary of the study area, marine deposits of fine sand, silt and clay overlain by peat and organics (salt marsh) form intertidal mud flats. Both of these deposits are non-glacial (Holocene age).

The proposed Project site is blanketed with gravel and sand that is massive to horizontally stratified with coarse to fine gradation within sections and deposits (NSDNR 2006). These glaciofluvial deposits date back to the Quaternary period (Early Wisconsinan to Holocene). Glacial deposits of sand and gravel are the primary sources of aggregate in Nova Scotia (NSDNR, IC ME 24).

According to the memo prepared by Lafarge (2015), “the property is underlain by a south flowing outwash system that is the southern continuation of the one underlying the Lafarge Plains Road and Probert properties to the north. These outwash systems generally contain clean, coarse-grained aggregate with the exception of localized sand bars, confirmed by an examination of the extraction face in the northwestern portion of the property. This face consisted of medium- to coarse-grained sand containing approximately 40 to 50% crushable stone” (Lafarge 2015).

### 6.5.3 Bedrock

Bedrock underlying the study area is the Mid-Late Triassic Wolfville Formation of the Fundy Group (shown in **Figure 5**). The Wolfville Formation consists of fluvial sandstone and conglomerate, aeolian sandstone and minor deltaic-lacustrine deposits (NSDNR, Nova Scotia Geoscience Atlas – web-based interactive map). According to a Department of Mines, Groundwater Section Report (Hydrogeology of the Truro Area, Hennigar 1972), the true thickness of these Triassic sediments is unknown, but there is at least 305 m exposed along the Debert River (located east of the study area).

Northeast of the study area, a small area of older (Early Carboniferous) Windsor Group strata (undivided), is found alongside faults located along the northern and eastern boundaries of this rock type, with the southern boundary representing an unconformity. The Windsor Group (undivided) in this area is described by Donohoe and Wallace (1982) as grey to tan limestone, calcareous siltstone, black to dark grey impure limestone, red siltstone and wacke.

Further north of the study area (beyond the area shown in **Figure 5**) lies the deep crustal Cobequid-Chedabucto Fault System, which strikes East-West and separates the Avalon and Meguma terranes. The Cobequid Fault extends from West Advocate to a point northeast of Truro, a distance of 145 km (Hennigar 1972).

### 6.5.3.1 Acid Rock Drainage Potential

Acid generating rocks are mineralized materials containing various sulphides. If acid generating rock is disturbed and exposed to water, oxygen or iron-reducing bacteria, oxidization of the sulphide minerals in the rock can occur and result in the production of acid. It should be noted that the presence of iron-reducing bacteria is a catalyst for the acid producing reaction and the potential for generation of acid rock drainage (ARD).

Based on available regional maps, there are no known occurrences of acid generating rocks in the Glenholme area (NSDNR 2006b).

## 6.6 Groundwater Resources

According to the NSDNR's Groundwater Atlas (web-based interactive map), the study area is located within the Salmon/Debert Watershed (NSE designation 1DH, sedimentary bedrock) with flow direction generally towards the Bay of Fundy. A search of available well logs (within approximately 1 km of the study area boundaries) was undertaken via the Groundwater Atlas and the query generated 104 well logs. These were in turn exported to Excel for review.

Of the 104 well log records, only some of which contained civic addresses, 12 addresses appeared to be outside the area of interest; however, are assumed to be in relation to cottage properties and were, therefore, included in the following discussion.

The 104 well logs included one dug well (to 4.3 m depth, with a well yield of 45.4 L/min); the remainder were drilled wells. A summary of the 103 drilled well logs is presented in **Table 6-4** below.

**Table 6-4 Summary of Well Logs (NSE)**

Well Depth (m)	Casing Depth (m)	Depth to Bedrock (m)	Static Water (m)	Well Yield (L/min)
Min 6.1	6.1	3.0	0.3	0
Max 283	54	52	16	681
Average	33.6	15.8	12.0	6.4

The well records indicated that the majority of wells were installed for domestic purposes. One well was identified as an irrigation well (which contained the highest well yield of 681 L/min and was installed to 91.4 m depth and cased to bedrock, encountered at 15.8 m depth). Two wells were identified as industrial (both cased into bedrock and terminated at 27 and 68 m depths, with well yields of 45 and 68 L/min, respectively). Ten wells were identified as unknown or not specified.

In relation to potential outliers, it is noted that if the shallowest well and the deepest well were removed, the minimum well depth would be 11.6 m, the maximum would be 97.4 m and the average would be 31.3 m. Also, if the irrigation well (at 681 L/min) and two domestic wells with the highest well

yields (i.e., 363 L/min and 340 L/min) were removed from the data summary, the highest well yield would be 182 L/min and the average well yield would be 47.4 L/min.

Overall, the data review infers that wells in the area are generally shallow, high producing wells drawing water from a sedimentary bedrock aquifer.

Groundwater from wells completed in the Wolfville Formation (sedimentary) bedrock is typically calcium-bicarbonate water and iron is generally not a problem (Hennigar 1972). It is noted that groundwater from wells completed in the Windsor Group are generally of very poor quality, with the evaporite deposits (e.g. limestone) contributing excessive amounts of sulphates, hardness and total dissolved solids (Hennigar 1972).

Groundwater quality can be influenced by many factors, such as, the degree of development around a well (e.g., domestic and industrial), the integrity of the well which can degrade over time without proper maintenance (well heads should be protected and wells should be adequately sealed to avoid surface water infiltration around the well casing), and proximity to potential sources of contamination (e.g., highway runoff, septic fields).

## 6.7 Surface Water Resources

The Project is located within the Salmon River/Debert River primary watershed (NSE designation 1DH) and the Folly River secondary watershed. This primary/secondary watershed drains to the Bay of Fundy in the Glenholme area. The sub-watersheds within the study area are not directly connected to the main Folly/Debert Rivers, but drain directly to the Bay of Fundy at Little Dyke. The majority of the study area drains southward and eastward to McCurdy Creek. McCurdy Creek originates approximately 3 km to the north of the study area, borders the study area for approximately 1 km, and then flows in a southeasterly direction to Cobequid Bay of the Bay of Fundy, approximately 1 km downstream of the study area. The McCurdy Creek watershed is approximately 600 ha (AMEC 2007). The watershed receives runoff from agricultural, other aggregate operations, and woodlots, as well as residential development. The portion of the watershed downstream of Little Dyke Road is predominately farmland created by historical dykes.

A small portion of the western part of the study area drains toward a Ducks Unlimited (DU) pond. The pond borders approximately 500 m of the Project property. The pond's sub-watershed originates within 0.5 km upstream. The land bordering the DU pond is used for agriculture, except the northeastern shore, which is forested. The southern end of the pond has historically been modified to allow DU to manage water levels. Downstream of the DU pond, a watercourse drains southward through the agricultural dyke lands and discharges to Cobequid Bay approximately 1 km downstream of Little Dyke Road.

The only permanent surface water features within the Project study area, are three small (15 m by 25 m) ponds that receive drainage from the existing pit area and were likely man-made. These ponds appear to be present throughout the year, but drainage from them was not observable during the 2016 field visits. Given the aggregate substrate nature and the potential for infiltration, runoff is expected to be limited.

These features are located on **Figure 3**. Additional detail on fish habitat is provided in **Section 6.10** and on wetlands is provided in **Section 6.11**.

### 6.7.1 Surface Water Quality

#### Surface Water Chemistry Assessment Methodology

Surface water quality was assessed in fall of 2016 through in situ metered measurements and water samples at an upstream and downstream location on McCurdy Creek, at the DU pond and from on-site drainage ponds at the pre-existing pit. The unfiltered grab water samples were taken following Dillon sampling protocols. Water chemistry analysis was conducted by Maxxam Analytics (accredited by Standards Council of Canada and Canadian Association for Laboratory Accreditation Inc.) for basic parameters (general chemistry, metals and Total Suspended Solids-TSS).

#### Results

**Appendix D** provides the analytical data. **Table 6-5** provides a summary of key parameters.

**Table 6-5 Summary of Surface Water Chemistry**

W/C ID	Date Sampled	Water Temp. °C*	pH	Cond. (uS/cm)	TSS (mg/L)	DO* (mg/L)	FWAL+ Exceedances
DU Pond	Oct. 15 2016	14.8	7.1	79	1.4	6.8	Iron 340 ug/L
Upstream (McCurdy Brook)	Oct. 15 2016	11.2	7.51	180	<1	8.5	-
Downstream (McCurdy Brook)	Oct. 15 2016	11.3	7.58	190	5.6	8.8	Aluminum 120 ug/L
16SW01 (Existing Pit Pond)	Sept. 26 2016	Not available	6.75	34	Not available Turbidity 1.7 NTU	Not available	Iron 990 ug/L

\* meter data (YSI brand)

+ Canadian Council of Ministers of Environment (CCME) Freshwater Aquatic Life (FWAL) Guideline Exceedances

The water quality of surface waters in the study area is generally good with moderate pH and guideline exceedances expected to be reflective of baseline in the watershed. It is noted that there is Windsor Group bedrock located within 500 m upstream of the study area along McCurdy Creek. This bedrock type can contribute alkalinity to surface waters and likely is a factor in the McCurdy Creek water quality. Slightly elevated aluminum was noted in McCurdy Creek at the downstream location and may be

associated with the slightly elevated solids level (TSS). Iron was elevated slightly in the DU ponds and more so in the existing pit pond.

## 6.8 Habitat Assessment

The methodology for addressing wildlife species and habitat follows the approach outlined in the NSE Guide to Addressing Wildlife Species and Habitats in an EA Registration Document (2009). As noted in this guidance, the focus for EA documents is to be on priority species and habitats. Priority species include those listed in the sources identified in **Table 6-6** below.

**Table 6-6 Priority Species and Habitats that must be Considered**

Lists	Designation
Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and Federal Species-at Risk Act (SARA)	Endangered, Threatened or Vulnerable/Special Concern Species (and SARA Schedule)
Nova Scotia Endangered Species Act (NSESA)	Endangered, Threatened or Vulnerable
Nova Scotia General Status	At risk, May be at risk or Sensitive (Previously red or yellow)

Additionally, species listed by the ACCDC as critically imperiled (S1) to vulnerable (S3) and those with undetermined (UD) status are also considered in the assessment.

An assessment of priority species/habitats is provided in subsequent sections by general categories:

- Fish/Priority Species and Fish Habitat;
- Wetlands;
- Plants – Priority Species/Species at Risk;
- Migratory Birds and Priority/Species at Risk Birds; and,
- Wildlife - Priority Species/Species at Risk.

Priority/species at risk are addressed under each of the categories, except wetlands. Wetland priority/species at risk are noted in one of the other relevant categories (fish, plants, birds or wildlife).

Available background information on potential priority/species at risk for the study area was compiled from the NSDNR's Significant Wildlife Habitat Database, an ACCDC screening, as well as a previous EA in the area (AMEC 2007) which included a Nova Scotia Museum database inquiry. The ACCDC data correspondence is included in **Appendix E-1**. The priority species review focuses on known occurrences within 5 km of the study area but also examines a radius of 100 km for potential priority species for each taxonomic group with elevated potential for occurrence based on habitat present and range/dispersive characteristics of the species in the complete list. **Appendix E-2** presents the potential priority species short-list based on the data review.

Base mapping, provincial interactive maps (<http://novascotia.ca/natr/meb/geoscience-online/maps-interactive.asp>) and aerial photographs/google images were also used to provide a preliminary assessment of forest cover and vegetation type. Habitat types were confirmed in the field through the study area assessment conducted by Dillon in 2016. Field inventories, where possible within the study time frame, were designed to target peak periods of optimal detection of the “short-list” priority species. Details of the field inventory methodologies are provided in the relevant sections below.

### 6.8.1 General Terrestrial/Wetland Habitats Present

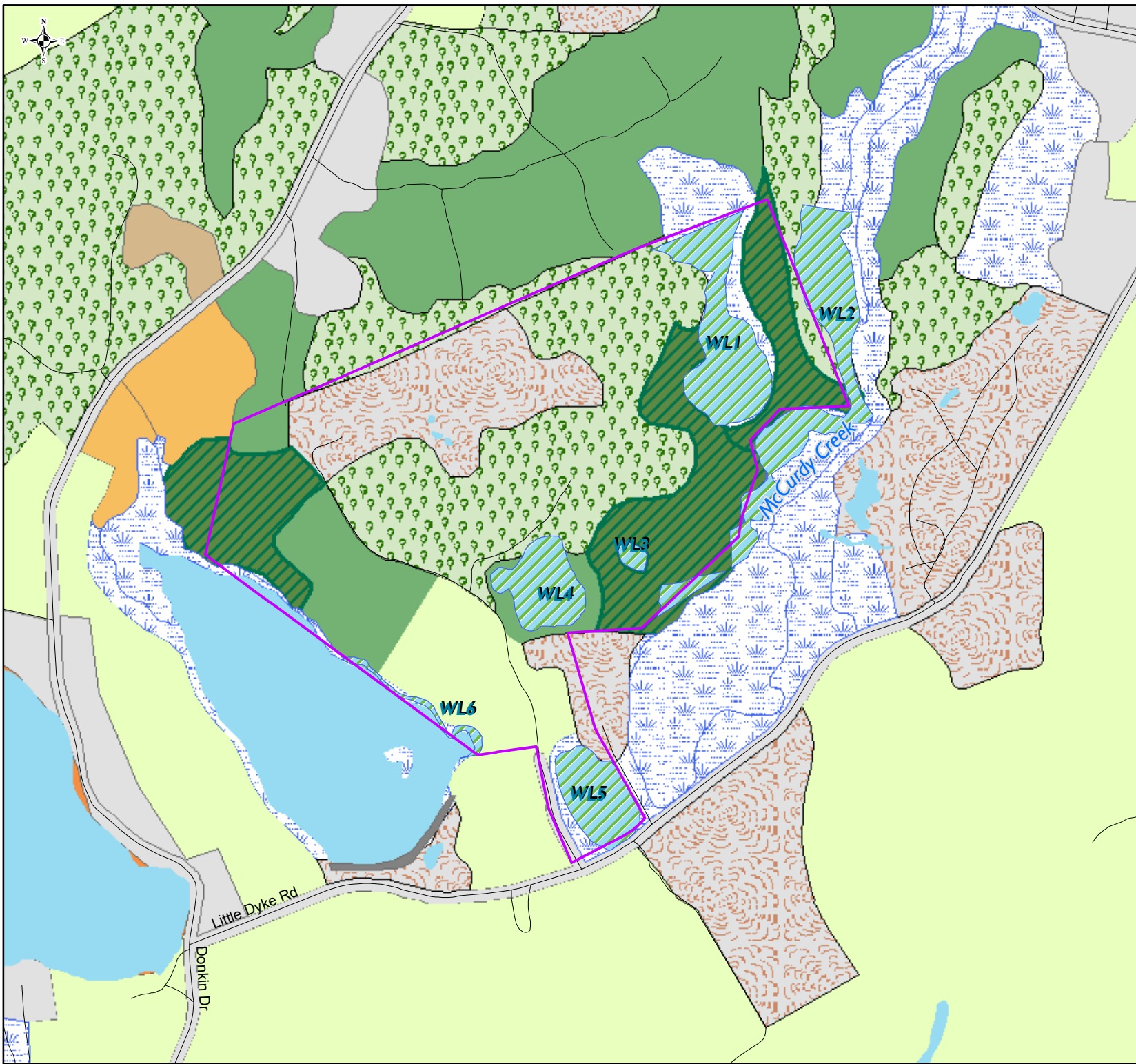
**Figure 6** illustrates the general habitats present in the study area based on NSDNR forest cover and landscape database (<https://nsgi.novascotia.ca/plv/>).

The Nova Scotia provincial landscape EcoSection encompassed by the area is defined as being hummocky with well-drained coarse soil. EcoElements within the study area are spruce, hemlock, pine hummocks and hills within the central area, and grasslands/wetlands at the adjacent the DU pond and bordering McCurdy Creek.

Approximately two-thirds of the study area has forest cover, while the remaining habitats present are wetlands, agricultural fields and disturbed habitats (primarily related to the existing pit development at the northern end of the study area).

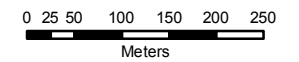
OSCO Aggregates Limited  
 Glenholme Pit No. 4  
 Extraction Project  
 Environmental Assessment

Figure 6  
 Project Area Habitats



- Study Area
- FOREST COVER TYPE**
- Softwood Dominant
- Mixedwood
- Hardwood Dominant
- Open Water
- Wetland ( from NS Topobase)
- Field Identified Wetland
- Past Cut Over/  
Regenerated Forest
- Wind Throw
- Agricultural Land
- Built Area/Road Corridor
- Pit
- Watercourse
- Road

PROPERTY AS PROVIDED  
 BY PROPERTY ONLINE  
 NOV 2016



MAP CREATED BY: SCM  
 MAP CHECKED BY: KLM  
 MAP PROJECTION: NAD 1983 CSRS UTM Zone 20N

MAP DRAWING INFORMATION  
 DATA PROVIDED BY NSDNR, GeoNova, OSCO

Date: 3/24/2017



**Table 6-7** summarizes the general habitat types (note that plants are listed by common name and full scientific name in **Appendix F**). **Photo Plate 1** provides typical habitat photographs (from the fall of 2016).

**Table 6-7 Summary of Study Area Generalized Habitat Types**

Habitat	Character	Key Forest Species	Key Under-story/Ground Cover	Approx. Area within Study Area (ha)
Softwood Forest	Mature forest	Red spruce, white spruce north of agricultural field	Balsam fir, mosses	14.2
Regenerating Forest	Mature and regenerating with extensive blowdown	Red spruce, white pine, red maple, poplar, white birch	Bracken fern, sarsaparilla, bunchberry, ericaceous shrubs	14.3
Wetlands	Variety of wetland types – swamps (treed and shrub), bog (treed and shrub), fen, marsh/open water	Black spruce, tamarack/larch where present	Various – see wetland <b>Section 6.11</b>	7
Agricultural	Agricultural land to the west of the on-site access road was being used for feed corn in 2016. Other crops may be planted at other times.	Not applicable	Not applicable	4.6
Disturbed - Previous Pits/Road	Open disturbed habitat with little or weedy vegetation	Not applicable	Not applicable	7.4

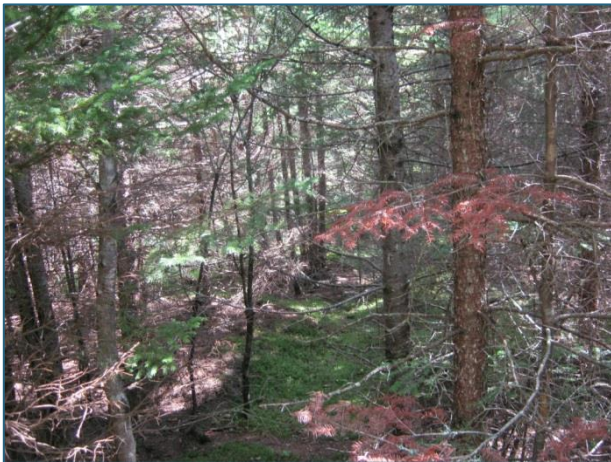
The majority of the forest stands are mature, however extensive blow-down (wind-throw) occurs in stands to the west of McCurdy Creek and at the northern end of the property to the west of the existing pit. The forested areas throughout, and particularly south of the existing pit, have extensive pockets of depressions and alternating raised areas. Large portions of the forest are regenerating from historical cutting (selective cutting in the 1930s and more recently), and from storm events (such as Hurricane Juan – September 2003).

Wetlands occur throughout the low-lying areas of the study area, often associated with watercourses, and are discussed further in **Section 6.11**. Recently disturbed habitat areas occur within the existing pit area at the northern study area border and along the access road, as well as the agricultural field to the west of the access road. Other small anthropogenic areas are associated with woods roads throughout the study area.

Plant species observed during fall 2016 surveys and terrestrial animal species anticipated to use the area are noted in **Appendix F**. **Section 6.13** provides anticipated bird species potentially nesting in the study area.

**Plate 1 General Habitat Photos (September, October 2016)**

**Photo 1 Softwood Forest**



**Photo 2 Historically Cutover area (current blowdown)**



**Photo 3 Treed Bog – Wetlands**



**Photo 4 Agricultural (Corn) Field**



**Photo 5 Existing Pit Area**



**Photo 6 Paved Portion of Access Road**



### *Exotic Species*

Approximately 5 percent of the plant species observed within the study area in late August 2016 are not native to the province of Nova Scotia. Exotic plants identified (Hill and Blaney 2010) as potentially problematic invasive species were not observed. Non-native animal species were not observed. However, it is anticipated that several exotic terrestrial animals and birds use the habitat in the area as noted in **Appendix F**.

## 6.9 Environmentally Sensitive Habitat Areas

Habitats identified by the Nova Scotia Department of Natural Resources (NSDNR) within the study area (see **Figure 3** above) as significant include:

- Mainland moose concentration areas (outside the area shown in Figure 3) – the entire Cobequid Highlands from east of Truro to the Nova Scotia/New Brunswick border is identified as an area of mainland moose habitat. Core moose populations typically occur in the area to the west of Economy, with lower densities between Economy and Truro. The study area may occasionally provide a portion of the larger moose habitat in the area. However, this largely disturbed coastal area is not expected to provide key habitat for moose and moose observations have not been reported near the existing Glenholme facility. The Nova Scotia Endangered Species Act Recovery Plan (NSDNR 2007) does not identify this coastal area, including the Project area as part of core moose habitat.
- Cobequid Bay Important Bird Area (IBA) – an IBA is located within approximately 1 km of the coast, which includes the southern tip of the study area. This IBA is identified as important due to the vast areas of coastal mud and sand flats and salt marshes that provide food supply for migrating shorebirds. A diversity of shorebirds use the IBA as a fall migration staging area, but the largest numbers are of Semipalmated Sandpipers. The peak staging time is in July and early August. Some shorebirds, primarily Black-bellied Plovers also stage in the IBA for spring migrations. These shorebirds are not anticipated to use the Project footprint area.
- Other significant habitat – the eastern third of the study area and the area around the DU pond is identified by NSDNR as other habitat due to various records of Bald Eagle nests from 1993 to 2009 (pers. comm. NSDNR GIS Analyst, 2016). Two nests were identified just north of the property (AMEC 2007), and one was evident within the study area at the time of October 2016 field surveys. However, it is unknown if any of these nests are still active.
- Wetlands – several wetlands are identified in the NSDNR database within the riparian area of McCurdy Creek and associated with the DU pond. Wetlands are further discussed in **Section 6.11**.

## 6.10 Fish/Priority Fish Species and Fish Habitat

No fish habitat was observed within the proposed Project area. The only watercourses within the potential Project footprint are intermittent surface drainage or the isolated ponds associated with the existing pit. **Plate 2** provides fall 2016 photographs of watercourses within or adjacent to the study area.

**Plate 2 Watercourses in the Vicinity of the Study Area (October 2016)**

**Photo 7 McCurdy Creek October 2016**



**Photo 8 McCurdy Creek Vegetation**



**Photo 9 DU Pond Cove**



**Photo 10 DU Pond**



**Photo 11 On-site North Pond**



**Photo 12 On-site south Pond**



### *Fish Habitat Field Assessment Methodology*

Qualitative assessments examined standard habitat characteristics identified by the Department of Fisheries and Oceans Canada (DFO); channel width, depth, substrate composition, riparian and instream cover type, stream bank stability and stream flow character.

### *Results*

McCurdy Creek, located along the border of the study area (outside the proposed Project footprint), was examined qualitatively to assess potential fish habitat in October 2016 for this assessment. McCurdy Creek was also qualitatively assessed in May 2006 as part of an EA of the adjacent pit development on the east side of the watercourse (AMEC 2007).

Adjacent to the east study area border, the stream is predominately slow moving within a streamside riparian wetland (WL2). At the time of the October 14, 2016 survey (following a large rain event – approximately 75 mm on October 9/10), bankfull conditions were present (**Photo 7**). Throughout the reach bordering the study area, the stream has a low gradient and is within a riparian wetland channel. Bluejoint grass dominates the streamside wetland. The stream width is generally in the order of 5 m and depth less than 0.5 m. Stream character is predominately Stillwater, but at higher flows takes on a run characteristic in the central channel area. Aquatic vegetation is present throughout, with submergent grasses within the channel, watercress and a mix of emergents at the channel edge (**Photo 8**). Areas of more extensive cattail development also occur. The substrate is predominately gravel with increasing fines in lower flow velocity areas. Both the water quality and stream character are indicative of moderately good brook trout habitat. Although Atlantic salmon are known for the adjacent Folly and Debert Rivers, they are less likely in the smaller McCurdy Brook, which also has low flow passage restrictions and is ditched within the agricultural lower dyke areas downstream of the study area.

The DU pond adjacent to the west border of the study area is a large pond with a good mix of emergent vegetation and open water consistent with the DU mandate to promote waterfowl habitat. Extensive areas of pond lilies and pickerel-weed occur in the shallows (**Photos 9 and 10**). Wetland shrubs (Spirea, alder, Myrica) border the pond. Downstream of the DU pond, the watercourse is partially ditched within an agricultural area, and fish passage access is unknown. Suitable habitat is present for brook trout and smaller forage fish species, and they may be present in the pond.

The on-site ponds had silt substrate underlain by gravel. All the ponds are shallow with water depth in October 2016 generally less than 30 cm, and it appears that portions of the ponds dry up during summer low flows. The more northerly pond was the deepest with cattail and emergent rushes present (**Photo 11**). The other two ponds were shallower with emergent horsetails dominating the vegetation (**Photo 12**). No defined connections between the ponds or downstream were observed, however storm flow is expected to travel from one pond to the next and extreme flows likely discharge toward the access road ditch. No fish were observed. The lack of passage to a permanent watercourse limits potential fish access, and it is unlikely that these ponds provide habitat.

*Potential Downstream Fisheries*

A variety of fisheries (recreational, commercial, and traditional) depend on fish stocks in the watersheds in the general area. No fisheries occur within the Project study area. Adjacent waterbodies, McCurdy Creek and DU pond, are expected to support minor recreational fishing.

*Potential Downstream Fish Species*

No fish are anticipated to occur within the study area. Fish species anticipated in the permanent watercourses adjacent to the property (McCurdy Creek and the DU pond) are expected to be typical of small streams and ponds in the area, including species such as brook trout (status rank S4, sensitive), American eel (COSEWIC Threatened, status rank S5, secure), and a variety of minnow species. Brook trout use a variety of stream and lake habitats and typically spawn in well-oxygenated areas in the fall (September - November). McCurdy Creek appears to provide adult forage, rearing and potentially spawning habitat for brook trout. If passage is possible, the DU pond may provide adult and potentially juvenile rearing trout habitat. American eel are a species that spawn at sea but spend their adult lives in freshwater in a variety of habitats. American eel are considered threatened by COSEWIC (COSEWIC 2012) primarily within the marine environment. The eel populations within freshwater in the Maritimes are under review by DFO and are currently not considered at risk provincially.

Other priority fish species are unlikely to be present. Gaspereau (status rank S4, sensitive) are species that migrate from marine environment to spawn in freshwater in the early summer. Similarly, Atlantic salmon (inner Bay of Fundy population – iBoF; COSEWIC/SARA Schedule 1 endangered, status rank S2, may at risk) are also fish that enter freshwater to spawn (in the fall). The adjacent Folly and Debert Rivers have salmon runs (COSEWIC 2006) and have been identified as providing draft critical habitat (COSEWIC 2016). Obstructions to passage related to agricultural dykes and roads as well as the DU impoundment structure limit potential for gaspereau or salmon enter the DU pond or McCurdy Creek.

## 6.11 Wetlands

*Wetland Assessment Methodology*

Wetlands were identified based on NSDNR's wetland database, mapping, Google imagery and October 2016 field surveys. Wetlands were determined to be present if vegetative, soil and hydrologic indicators occurred following the provincial process which is based on the US Army Corps of Engineers Wetland Delineation methodology. Wetland classes are based on the Canadian Wetland Classification System (NWWG 1997). For wetlands potentially affected by the Project, additional information was collected on wetland function. Wildlife habitat and potential for Species at Risk is based on background data, the August 2016 vegetation assessment and the October wetland assessments. Assessment of hydrological and surface water function is based on wetland watershed character and field observations.

### *Summary of Wetlands*

Wetland types within the Project study area are summarized below and are located in **Figure 6** above.

**Plate 3** provides photographs of the wetlands. Details of wetlands surveyed are provided in **Appendix G**.

**Table 6-8** provides a summary of key functions in each of the wetlands. Wetlands within the potential footprint of the proposed Project will not be altered.

#### WL1 – Treed Bog

- Tree cover dominated by black spruce.
- Predominately larger mature spruce, with areas of stunted trees. Old man’s beard lichen prevalent on trees.
- Areas with closed canopy, ground vegetation dominated by mosses.
- More open areas with ground vegetation dominated by heath shrubs (Kalmia, Labrador tea) overlying sphagnum.
- Basin surrounded by elevated rock ridges - surface water runoff collecting in outer rim of the wetland.

WL2 – McCurdy Creek Wetland Complex – Fen/graminoid-typha swamp adjacent to the Creek, grading to bog and treed swamp inland from the creek.

- Adjacent to McCurdy Creek- bluejoint meadow and cattail swamp.
- Inland areas of black spruce bog with Kalmia and Labrador tea shrub over sphagnum.
- Further inland grades to treed swamp - tree cover mix of red maple, black spruce, balsam fir with shrubs - winterberry, mountain holly, speckled alder, black huckleberry, and possum-haw viburnum. Ground cover mosses and sedges.

#### WL3 – Small open bog.

- Sparse tree cover.
- Predominately cotton grass

#### WL4 – Treed Swamp.

- Red spruce and balsam fir tree cover - generally fairly dense.
- Ground cover dominated by mosses.

#### WL5 – Cattail/Graminoid Swamp

- Variety of shrubs, forbs, and graminoids including cattail, sedges, goldenrod.
- Sphagnum overlain by cranberry in areas with less standing water. Cattail in areas with ponded water.

WL6 – Marsh - Ducks Unlimited pond – open, shallow water and emergent wetland sub-classes.

- Shallow water aquatics and emergent along edge of pond - dominated by sedges, pickerel weed, rushes.
- Open water areas dominated by pond lilies.
- Shrub cover around edge - leatherleaf and sweet gale.

**Plate 3 Study Area Wetland Photographs (September, October 2016)**

**Photo 13 WL1**



**Photo 14 WL2**



**Photo 15 WL3**



**Photo 16 WL4**



**Photo 17 WL5**



**Photo 18 WL6**





Table 6-8 Key Wetland Functions within Study Area of Adjacent<sup>1</sup>

ID	Dominant Wetland Type	Total Wetland Size (ha)	Area in Project Footprint (ha)	Landscape Position	Landform	Flow Path	Water Regime	Origin	Disturbance	Priority Species Habitat	Surface Water Detention	Stream Flow	Sediment Retention	Shoreline Stabilization	Fish Habitat	Waterfowl Habitat	Other Wildlife Habitat	Community Use	Carbon Sequestration	Nutrient Transformation
WL 1	Bog - Forested	4.5	0	Terrene	Basin	Isolated	Permanently saturated	Natural	Forest harvest to north.		○						○ Cavity Trees	●	○	
WL 2	Fen (Bog / Swamp – Treed)	22	0	Lotic stream - unconfined	Stream -side	Through-flow (perennial – surrounding McCurdy Creek)	Permanently saturated to Seasonally flooded	Natural	Not within study area, but road crossings within 500 m both upstream and downstream. Other pit developments within wetland shed.	GrJa	○	○	●	○	○	○	●	○	●	●
WL 3	Bog	1	0	Terrene	Basin	Isolated	Permanently saturated/Seasonally flooded	Natural	Black spruce dead indicating changing hydrology or age.		○		●						●	○
WL 4	Bog – Treed/Swamp	2	0	Terrene	Basin	Isolated	Permanently saturated	Natural	Trail along north border, access road along west border, historic pit development to south.				○				○	●	●	
WL 5	Swamp/Bog	2	0	Terrene	Basin	Outflow (intermittent)	Permanently saturated/Seasonally flooded	Natural	Historic hydrologic disturbance – berm/road to east affecting connection with McCurdy Creek. Historic pit to north.			○	●				○	○	●	●
WL 6	Marsh	12.5	0	Lentic pond	Basin	Outflow (perennial – controlled – surrounding the DU pond)	Seasonally to Permanently flooded	Enhanced	Managed for waterfowl habitat.		●	●	●	●	○	●	●	●	●	●

Notes: ● High Function ○ Moderate Function Observed Priority Species: GrJa Gray Jay (S3S4 Sensitive)

## 6.12 Plants - Priority Species/Species at Risk

### Priority Plant Assessment Methodology

**Appendix E-2a** lists the potential at-risk plants “short-listed” for the study area, their likely habitat, flowering period, and at risk/priority status. The timing identified for optimal detection of most of the “short-listed” plant species was August. A baseline plant survey was conducted on August 30, 2016. The alignment was surveyed on foot by a qualified plant specialist, visually searching for significant plant habitats and species of interest. Although priority lichen species were not identified in the area; plant surveys included visual lichen searches based on habitat potential for uncommon lichens. Habitats surveyed were identified and located using a handheld GPS.

### Results

No rare plants were observed during field assessments. The full list of plants and habitats observed within the study area is provided in **Appendix F-1**. Based on the August survey and habitats identified, it is unlikely that priority plant species are present within the Project area.

## 6.13 Birds – Potential Migratory, Breeding and Priority Species/Species at Risk

A list of breeding birds known for the general area is provided in **Table 6-9** based on the Maritime Breeding Bird Atlas (<http://www.mba-aom.ca/>). The atlas identifies breeding birds within a 10 km square area based on breeding bird surveys. It does not specifically identify birds within the Project location but provides an indication of birds that may be present in the general area.

Habitat within the study area is identified in **Figure 6** above, as categorized by NSDNR Forest Cover Type Mapping. **Table 6-9** links the habitat requirements for breeding birds identified from the Maritime Breeding Bird Atlas to potential for habitat in the study area. The Ducks Unlimited Canada personnel (R. Fraser) indicated that the managed pond adjacent to the property is highly successful for waterfowl production and it supports a diversity of birds. Common loons are also reported nesting within the pond (pers. comm. S. Putnam). A wide variety of migratory birds may breed in the general area. Actual species within the proposed site footprint will depend on the habitat present within that area.

**Table 6-9 Maritime Breeding Bird Atlas Species within 10 km\* of Study Area, Status Information (as of November 2016) and Nesting Habitat**

Under MBCA	Common Name	Species	ACCDC Rank	NSESA/ COSEWIC/ SARA	10 km Breeding Status	Nesting Habitat	Nest in Project Footprint
Y	Canada Goose	<i>Branta canadensis</i>	SNAB,S4N, Secure	-	Confirmed	Open protected areas.	Unlikely
Y	Wood Duck	<i>Aix sponsa</i>	S4S5B, Secure	-	Possible	Cavities near fertile water.	Unlikely
Y	American Wigeon	<i>Anas americana</i>	S4B, Secure	-	Confirmed	Open areas.	Unlikely
Y	American Black Duck	<i>Anas rubripes</i>	S5 Secure	-	Confirmed	Wetlands - freshwater and saltmarshes.	Possible
Y	Mallard	<i>Anas</i>	S5, Secure	-	Confirmed	Open ponds, wetlands,	Possible

Under MBCA	Common Name	Species	ACCDC Rank	NSESA/ COSEWIC/ SARA	10 km Breeding Status	Nesting Habitat	Nest in Project Footprint
		<i>platyrhynchos</i>				lakes.	
Y	Northern Shoveler	<i>Anas clypeata</i>	<b>S2B, May Be At Risk</b>	-	Possible	Open shallow wetlands.	Unlikely
Y	Green-winged Teal	<i>Anas crecca</i>	S4S5B, Secure	-	Probable	Fertile wetlands.	Unlikely
Y	Ring-necked Duck	<i>Aythya collaris</i>	S5B, Secure	-	Confirmed	Lake, pond.	No
Y	Common Merganser	<i>Mergus merganser</i>	S5, Secure	-	Confirmed	Close to water.	No
	Gray Partridge	<i>Perdix perdix</i>	SNA, Exotic	-	Confirmed	Mixed forests, agricultural areas.	Possible
	Ringed-neck Pheasant	<i>Phasianus colchicus</i>	SNA, Exotic	-	Confirmed	Open areas, mixed forests, agricultural areas.	Possible
	Ruffed Grouse	<i>Bonasa umbellus</i>	S4S5, Secure	-	Probable	Open areas.	Possible
Y	Common Loon	<i>Gavia immer</i>	<b>S3B,S4N, May Be At Risk</b>	-	Confirmed	Islands in lakes.	No
	Pied-billed Grebe	<i>Podilymbus podiceps</i>	<b>S3B, Sensitive</b>	-	Confirmed	Floating vegetation in open wetlands.	Unlikely
Y	American Bittern	<i>Botaurus lentiginosus</i>	<b>S3S4B, Sensitive</b>	-	Probable	Marshes.	No
	Osprey	<i>Pandion haliaetus</i>	S5B, Secure	-	Probable	Coastal areas, near shallow water, near inland lakes, power line structures.	Unlikely
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	S4, Secure	-	Confirmed	Large trees, near open water.	Yes
	Northern Harrier	<i>Circus cyaneus</i>	S5B, Secure	-	Confirmed	Open marshes, meadows.	Unlikely
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	S5, Secure	-	Probable	Woodland trees or cliff.	Possible
Y	Virginia Rail	<i>Rallus limicola</i>	<b>S2B, Undetermined</b>	-	Probable	Marshes with dense emergent vegetation.	Unlikely
Y	Sora	<i>Porzana carolina</i>	S4S5B, Secure	-	Probable	Fertile freshwater marshes, aquatic vegetation.	No
Y	Killdeer	<i>Charadrius vociferus</i>	<b>S3S4B, Sensitive</b>	-	Confirmed	Open areas.	Possible
Y	Spotted Sandpiper	<i>Actitis macularius</i>	<b>S3S4B, Sensitive</b>	-	Confirmed	Open areas.	Possible
Y	Willet	<i>Tringa semipalmata</i>	<b>S2S3B, May Be At Risk</b>	-	Confirmed	Coastal near marsh.	Unlikely
Y	Wilson's Snipe	<i>Gallinago delicata</i>	<b>S3S4B, Sensitive</b>	-	Probable	Shallow marsh, bog.	Possible
	Rock Pigeon	<i>Columba livia</i>	SNA, Exotic	-	Confirmed	Mixed forests, agricultural areas, urban areas and structures.	Probable
Y	Mourning Dove	<i>Zenaidura macroura</i>	S5, Secure	-	Probable	Trees, open-grown conifers (e.g. windbreaks).	Probable
	Great Horned Owl	<i>Bubo virginianus</i>	S5, Secure	-	Possible	Nest in crows nests.	Possible
Y	Common Nighthawk	<i>Chordeiles minor</i>	<b>S3B, At Risk</b>	<b>Threatened, Threatened, Threatened/ Schedule 1</b>	Possible	Open habitats such as recent cutovers, buildings with gravel roofs, gravel roads, open forests, pastures, marshes/bogs. Ground nester.	Possible

Under MBCA	Common Name	Species	ACCDC Rank	NSESA/ COSEWIC/ SARA	10 km Breeding Status	Nesting Habitat	Nest in Project Footprint
Y	Ruby-throated Hummingbird	<i>Archilochus colubris</i>	S5B, Secure	-	Probable	Urban.	Possible
	Belted Kingfisher	<i>Megaceryle alcyon</i>	S5B, Secure	-	Confirmed	Salt and freshwater areas, earth banks, trees along shorelines.	Unlikely
Y	Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	S4S5B, Secure	-	Possible	Live poplar and birches and other trees decaying.	Possible
Y	Downy Woodpecker	<i>Picoides pubescens</i>	S5, Secure	-	Probable	Open woodlands, particularly among deciduous trees and brushy or weedy edges.	Probable
Y	Hairy Woodpecker	<i>Picoides villosus</i>	S5, Secure	-	Confirmed	Mature forests, woodlots, forest edges, open woodlands (particularly oak and pine forests).	Possible
Y	Northern Flicker	<i>Colaptes auratus</i>	S5B, Secure	-	Confirmed	Cavities.	Possible
Y	Pileated Woodpecker	<i>Dryocopus pileatus</i>	S5, Secure	-	Possible	Cavity nester.	Possible
	Merlin	<i>Falco columbarius</i>	S5B, Secure	-	Probable	Trees, old crow nests.	Possible
Y	Olive-sided Flycatcher	<i>Contopus cooperi</i>	<b>S3B, At Risk</b>	<b>Threatened, Threatened, Threatened/ Schedule 1</b>	Probable	Forest edge.	Possible
Y	Alder Flycatcher	<i>Empidonax alnorum</i>	S5B, Secure	-	Confirmed	Wet thickets.	Probable
Y	Eastern Phoebe	<i>Sayornis phoebe</i>	<b>S3S4B, Sensitive</b>	-	Possible	Open woods, farmland, urban near water.	Unlikely
Y	Eastern Kingbird	<i>Tyrannus tyrannus</i>	<b>S3S4B, Sensitive</b>	-	Probable	Open areas - grasslands, wetlands, forest or water edges.	Unlikely
Y	Blue-headed Vireo	<i>Vireo solitarius</i>	S5B, Secure	-	Confirmed	Mixed forests and coniferous dominant edge habitats.	Probable
Y	Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B, Secure	-	Confirmed	Deciduous dominant mature forests, broad-leaved trees.	Unlikely
	Blue Jay	<i>Cyanocitta cristata</i>	S5, Secure	-	Confirmed	Forest edges.	Probable
	American Crow	<i>Corvus brachyrhynchos</i>	S5, Secure	-	Confirmed	Mature trees.	Probable
	Common Raven	<i>Corvus corax</i>	S5, Secure	-	Confirmed	Open areas, developed and disturbed.	Probable
Y	Horned Lark	<i>Eremophila alpestris</i>	S1S2B, S4N, Secure	-	Possible	Farmlands, airfields.	Possible
Y	Tree Swallow	<i>Tachycineta bicolor</i>	S4B, Sensitive	-	Confirmed	Cavities near lakes.	Unlikely
Y	Bank Swallow	<i>Riparia riparia</i>	<b>S3B, May be at Risk</b>	<b>COSEWIC Threatened</b>	Confirmed	Banks, cliffs.	Unlikely
Y	Barn Swallow	<i>Hirundo rustica</i>	<b>S3B, At Risk</b>	<b>NSESA Endangered COSEWIC Threatened</b>	Probable	Buildings and man-made structures.	Unlikely
Y	Black-capped	<i>Poecile atricapilla</i>	S5, Secure	-	Confirmed	Shrubs, nest cavities in	Probable

Under MBCA	Common Name	Species	ACCDC Rank	NSESA/ COSEWIC/ SARA	10 km Breeding Status	Nesting Habitat	Nest in Project Footprint
	Chickadee					rotted tree stumps.	
Y	Red-breasted Nuthatch	<i>Sitta canadensis</i>	S4S5, Secure	-	Possible	Conifer dominant matures forests, and young regen forests - spruce.	Probable
Y	Winter Wren	<i>Troglodytes troglodytes</i>	S5B, Secure	-	Possible	Damp coniferous forest.	Probable
Y	Golden-crowned Kinglet	<i>Regulus satrapa</i>	S4, <b>Sensitive</b>	-	Confirmed	Coniferous forest.	Probable
Y	Ruby-crowned Kinglet	<i>Regulus calendula</i>	S4B, <b>Sensitive</b>	-	Probable	Conifers.	Possible
	Eastern Bluebird	<i>Sialia sialis</i>	<b>S3B, Sensitive</b>	-	Confirmed	Cavities near open fields and treed areas.	Unlikely
Y	Swainson's Thrush	<i>Catharus ustulatus</i>	S4S5B, Secure	-	Confirmed	Shrubs, dense woodlands.	Probable
Y	Hermit Thrush	<i>Catharus guttatus</i>	S5B, Secure	-	Confirmed	Ground.	Probable
Y	American Robin	<i>Turdus migratorius</i>	S5B, Secure	-	Confirmed	Everywhere.	Probable
Y	Gray Catbird	<i>Dumetella carolinensis</i>	<b>S3B, May be at Risk</b>	-	Possible	Shrubbery. Brushy understorey in woods, damp shaded areas.	Possible
	European Starling	<i>Sturnus vulgaris</i>	SNA, Exotic	-	Confirmed	Urban areas and agricultural areas. Cavities, tree holes, urban structures.	Probable
Y	Cedar Waxwing	<i>Bombycilla cedrorum</i>	S5B, Secure	-	Confirmed	Open mixed forests, road edges, forest edges.	Probable
Y	Ovenbird	<i>Seiurus aurocapilla</i>	S5B, Secure	-	Probable	Closed-canopy forests, particularly deciduous and mixed forests.	Possible
Y	Black-and-white Warbler	<i>Mniotilta varia</i>	S4S5B, Secure	-	Confirmed	Open areas/base of shrubs, Ground among tree roots.	Possible
Y	Tennessee Warbler	<i>Vermivora peregrina</i>	<b>S3S4B, Sensitive</b>	-	Possible	Forest.	Possible
Y	Nashville Warbler	<i>Vermivora ruficapilla</i>	S5B, Secure	-	Confirmed	Open woods/shrubs.	Possible
Y	Mourning Warbler	<i>Oporornis philadelphia</i>	S4B, Secure	-	Possible	Shrubbery.	Possible
Y	Common Yellowthroat	<i>Geothlypis trichas</i>	S5B, Secure	-	Possible	Brushy areas.	Possible
Y	American Redstart	<i>Setophaga ruticilla</i>	S5B, Secure	-	Confirmed	Small trees.	Possible
Y	Northern Parula	<i>Parula americana</i>	S5B, Secure	-	Confirmed	Bearded lichen in conifer.	Probable
Y	Magnolia Warbler	<i>Dendroica magnolia</i>	S5B, Secure	-	Confirmed	Coniferous and mixed forests.	Probable
Y	Blackburnian Warbler	<i>Dendroica fusca</i>	S4B, Secure	-	Confirmed	Dense, mixed and coniferous dominant forests.	Possible
Y	Yellow Warbler	<i>Dendroica petechia</i>	S5B, Secure	-	Confirmed	Shrubby thickets and woods, particularly along watercourses and in wetlands.	Probable

Under MBCA	Common Name	Species	ACCDC Rank	NSESA/ COSEWIC/ SARA	10 km Breeding Status	Nesting Habitat	Nest in Project Footprint
Y	Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	S5B, Secure	-	Probable	Low shrubs, raspberry canes, disturbed forest edges.	Possible
Y	Palm Warbler	<i>Dendroica palmarum</i>	S5B, Secure	-	Confirmed	Bogs and wetlands, low coniferous forest and shrub cover.	Possible
Y	Yellow-rumped Warbler	<i>Dendroica coronata</i>	S5B, Secure	-	Confirmed	Forest with conifers.	Probable
Y	Black-throated Green Warbler	<i>Dendroica virens</i>	S4S5B, Secure	-	Confirmed	Mixed or coniferous forest.	Probable
Y	Canada Warbler	<i>Wilsonia canadensis</i>	<b>S3B, At Risk</b>	<b>Endangered Threatened Threatened/Schedule 1</b>	Possible	Broad-leaved trees and shrubs, dense understory habitats, shrub wetlands.	Unlikely
Y	Chipping Sparrow	<i>Spizella passerina</i>	S4S5B, Secure	-	Confirmed	Open woodlands, edge habitats, gardens.	Unlikely
Y	Savannah Sparrow	<i>Passerculus sandwichensis (not princeps)</i>	S4B, Secure	-	Confirmed	Open vegetated areas, ground.	Possible
Y	Nelson's Sparrow	<i>Ammodramus nelsoni</i>	S4B, Secure	-	Confirmed	Open areas.	Possible
Y	Song Sparrow	<i>Melospiza melodia</i>	S5B, Secure	-	Confirmed	Brushy edges and waterside habitats.	Possible
Y	Lincoln's Sparrow	<i>Melospiza lincolni</i>	S4B, Secure	-	Probable	Shrubs and small trees, bogs, fields.	Possible
Y	Swamp Sparrow	<i>Melospiza georgiana</i>	S5B, Secure	-	Confirmed	Wetlands with tall, shrubby vegetation.	Probable
Y	White-throated Sparrow	<i>Zonotrichia albicollis</i>	S5B, Secure	-	Confirmed	Ground at forest edge.	Probable
Y	Dark-eyed Junco	<i>Junco hyemalis</i>	S4S5, Secure	-	Confirmed	Forest edge.	Possible
Y	Indigo Bunting	<i>Passerina cyanea</i>	<b>S1S2B, Undetermined</b>	-	Probable	Weedy/brushy - fields meet forests.	Unlikely
Y	Bobolink	<i>Dolichonyx oryzivorus</i>	<b>S3S4B, Sensitive</b>	<b>NSESA Vulnerable COSEWIC Threatened</b>	Probable	Open areas.	Unlikely
Y	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	S4S5B, Secure	-	Confirmed	Freshwater marshes, cattails, bulrushes, and low shrubs.	Possible
	Common Grackle	<i>Quiscalus quiscula</i>	S5B, Secure	-	Confirmed	Urban areas and agricultural areas, low shrubs, open habitats.	Probable
Y	Brown-headed Cowbird	<i>Molothrus ater</i>	S2S3B, Secure	-	Possible	Parasitic nester.	Possible
Y	Purple Finch	<i>Carpodacus purpureus</i>	S4S5, Secure	-	Confirmed	Conifers.	Probable
Y	White-winged Crossbill	<i>Loxia leucoptera</i>	S4S5, Secure	-	Probable	Conifers.	Possible
Y	Pine Siskin	<i>Carduelis pinus</i>	<b>S3S4B, S5N, Sensitive</b>	-	Probable	Open forests.	Possible
Y	American Goldfinch	<i>Carduelis tristis</i>	S5, Secure	-	Probable	Open.	Probable

Under MBCA	Common Name	Species	ACCDC Rank	NSESA/ COSEWIC/ SARA	10 km Breeding Status	Nesting Habitat	Nest in Project Footprint
Y	House Sparrow	<i>Passer domesticus</i>	SNA, Exotic	-	Confirmed	Urban.	Possible

Note: \* Square 20MR52 – 1986-1990, 2006-2010

#### *Priority Bird Species Observed*

The only priority bird species observed during fall 2016 surveys was the Gray Jay (*Perisoreus canadensis*). The Gray Jay has a provincial S Rank of S3S4 (vulnerable to apparently secure) and a general status of sensitive. A Gray Jay was observed during October 2016 wetland surveys at the western edge of Wetland WL2. Gray Jays inhabit coniferous woods in areas with low trees such as around bogs or clearings. These birds typically nest in mid-April to early July (Tower 1980).

#### *Potential Priority/Species at Risk Birds*

NSESA/COSEWIC/SARA listed bird species with potential to nest in the Project footprint include:

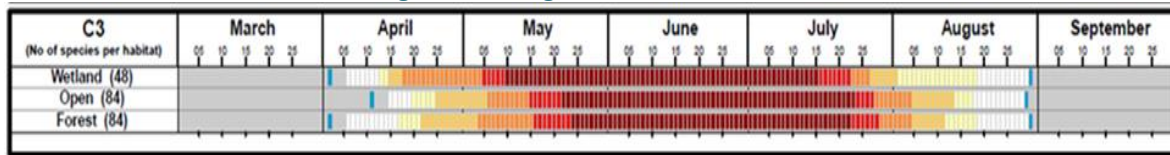
- Common Nighthawk – these birds may nest in open gravel areas including anthropogenic clearings (COSEWIC 2007) in late June to early August. The recovery strategy (ECCC 2016) identifies potential threats to the population including factors affecting insect prey and natural succession reducing open habitats. Critical habitat has not been identified to date.
- Olive-sided Flycatcher– are associated with open areas containing tall trees or snags. Open areas may include forest (typically coniferous or mixed coniferous) openings or edges with natural or man-made openings (COSEWIC 2007b). Nesting occurs in late June to mid-August. The recovery strategy (ECCC 2016b) identifies potential threats as forest harvest, a decline of insect prey and loss of wintering grounds (not in Nova Scotia). Critical habitat has not been identified to date.

Provincial priority bird species with potential to nest within the Project footprint and their nesting periods (Tower 1980) include:

- Killdeer – nests mid-April to early July.
- Spotted Sandpiper – nests mid-April to mid-July.
- Wilson's Snipe – nests early May to early July.
- Golden-crowned Kinglet – nests mid-May to mid-July.
- Ruby-crowned Kinglet – nests mid-June to early July.
- Gray Catbird – nests mid-June to mid-August.
- Tennessee Warbler – nests mid-June to mid-July.
- Pine Siskin – nests late May to early August.

**Table 6-10** provides Environment Canada nesting periods for this region.

Table 6-10 Environment Canada Regional Nesting Periods



Environment Canada Nesting Calendar ([https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#\\_05](https://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#_05))

### 6.13.1 Wildlife – Priority Species/Species at Risk

#### Priority Wildlife Assessment Methodology

The assessment of wildlife, as with plants, focused on potential priority species. **Appendix E-2** lists the potential at-risk animal “short-listed” for the study area, their likely habitat, preferred investigation period, and priority status. Animal data was primarily obtained through existing data compilation (including the AMEC 2007 EA of the adjacent property), assessment of habitat requirements and observations incidental to other field surveys.

#### Results

No priority wildlife were observed during 2016 field assessments. A list of potential animals expected within the study area is provided in **Appendix F-2**.

#### Potential Priority/Species at Risk Wildlife

Although not observed by OSCO personnel in the area and unlikely to occur in the Project footprint, several SAR wildlife have potential to occur in the general area and may occasionally use the study area:

- Monarch butterfly (*Danaus plexippus*), COSEWIC Special Concern, SARA Schedule 1 – may migrate through the area on the way to breeding and wintering grounds (COSEWIC 2010), but the Project area is not expected to provide key habitat. The current management plan for this species (ECCC 2016c) includes future development of guidelines to conserve and enhance breeding and nectaring habitat.
- Mainland moose (*Alces alces americana*), NSESA Endangered – as noted in **Section 6.9** above, mainland moose are known for the Cobequid Highlands. These animals are wide-ranging, but are unlikely to rely on habitat within the Project footprint.
- Bats (*Myotis lucifugus*, *Myotis septentrionalis*, *Pipistrellus subflavus*), NSESA Endangered, SARA Endangered Schedule 1 – three bat species have had severe population declines due to a fungal infection – white-nose syndrome (COSEWIC 2013). Critical habitat is currently being defined by ECCC and includes hibernacula (ECCC 2015). Hibernating areas for bats are not expected in the area. The general area provides suitable summer roosting and foraging habitat for bats. It is possible that small numbers of myotis bats, and possibly tri-colored bats, use the general area occasionally in the summer.
- Snapping turtle (*Chelydra serpentina*), COSEWIC Special Concern, SARA Schedule 1 – are fairly widespread, with a preferred habitat characterized by slow moving water with a soft mud bottom and dense aquatic vegetation. Nesting may occur in soft gravel areas including road shoulders (COSEWIC



2008). Due to the presence of the DU pond and McCurdy Creek at the borders of the study area, potential habitat is present in the general area, but snapping turtles are not known for the Glenholme area, and the potential is low. Best management practices to mitigate threats to the population are under development by ECCC (2016d).

- Wood turtle (*Glyptemys insculpta*), NSESA threatened, COSEWIC Special Concern, SARA Schedule 1 - wood turtles are semi-aquatic and are associated with rivers/streams with sand or gravel bottom, preferring clear meandering streams with moderate current. Nesting habitat consists of sand or gravel beaches or stream banks, but they also use anthropogenic sites such as gravel pits and roads (COSEWIC 2008b). Critical habitat has been partially defined based on known occurrences and habitat suitability (ECCC 2016e). There are not known occurrences within the study area.

In addition, the following priority species were determined to have potential habitat (although this potential is unclear as habitat descriptions and information on occurrences in Nova Scotia are limited) in the study area:

- Milbert's tortoiseshell (*Aglais milberti*) (butterfly), S2, secure – this rare summer resident with secure populations, typically inhabits wet areas near woods, feeding on flower nectar. Larvae nest on plants such as stinging nettles (*Urtica* spp.).
- Northern cloudywing (*Thorybes pylades*) (butterfly), S2S3, sensitive – this rare summer resident typically inhabits partially wooded areas. The flight period is in mid-June to early July (<http://novascotiabutterflies.ca/ss.cgi?s=nocl>). The status of this species in Nova Scotia is not well understood as it is a small and inconspicuous species.

## 6.14 Socio-Cultural Environment

### 6.14.1 Land Use

The proposed Project is located within a rural area with mixed land use. **Figure 7** illustrates land cover within the general area. Residential areas occur along Little Dyke Road and Highway 2. Numerous aggregate operations occur to the north and east of the study area. Extensive agricultural developments (dykelands) occur south of Little Dyke Road. Blueberry and U-pick strawberry fields occur to the north of the Project property (typically over 500 m away). Forest resource lands in various states of harvest occur to the north of the Project property. DU manages the pond bordering the west of the study area for waterfowl. Recreational land use includes hunting, fishing and All-terrain Vehicle (ATV) use in forests in the general area, including waterfowl hunting at the DU pond adjacent to the Project. The DU pond water levels are actively managed to provide suitable habitat for waterfowl. Recreational use of the Project property is unauthorized. Land ownership of the Project property and in the general area is private.

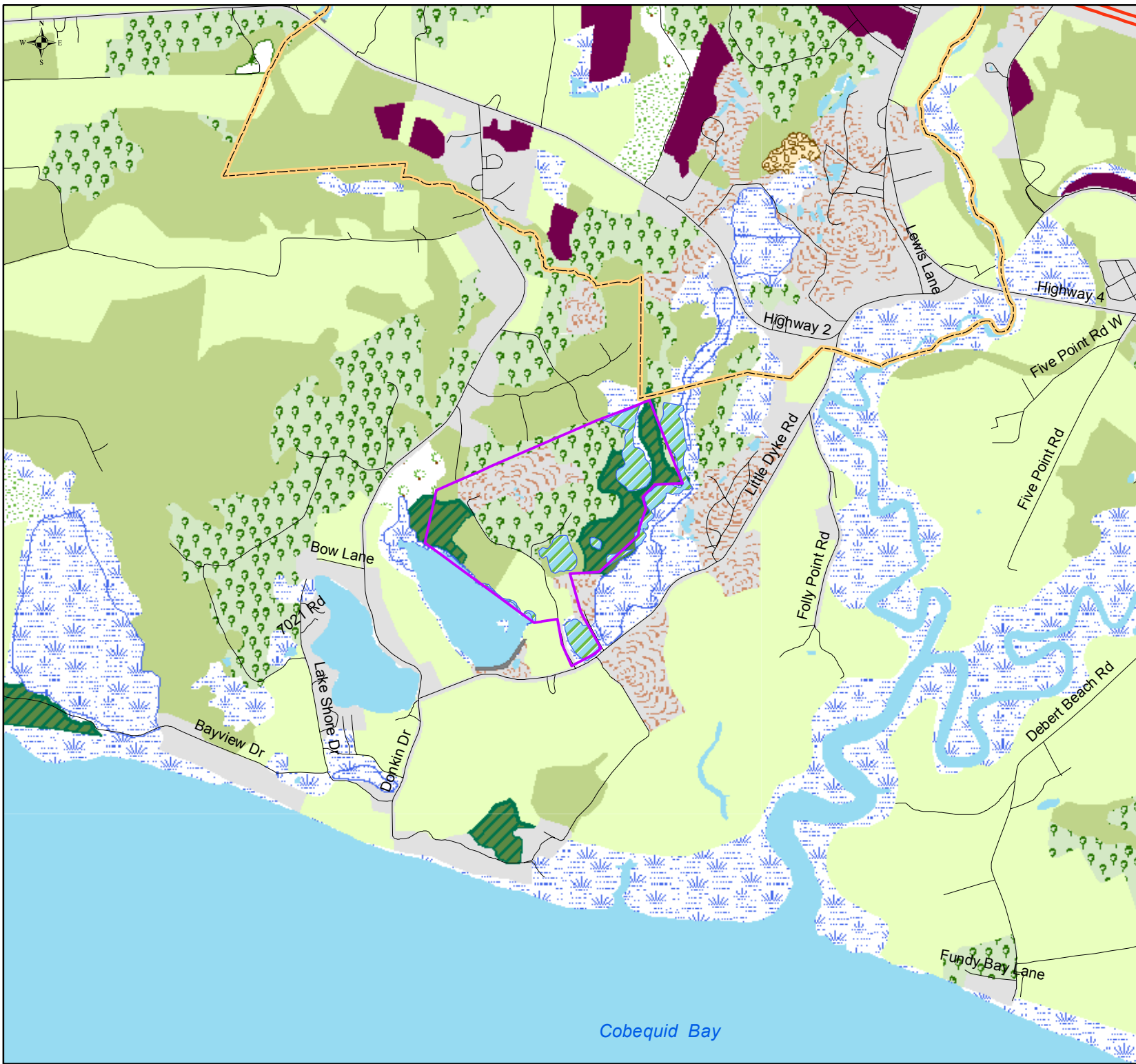
#### 6.14.2 Archaeological, Heritage and Aboriginal Resources and Traditional Land Use

A desktop assessment and field reconnaissance of potential archaeological and heritage resources was undertaken by a professional archaeologist in October 2016. Based on the results, it was recommended that the study area be cleared of any requirement for future archaeological investigation. **Appendix H** provides the Archaeological assessment.

No information on First Nations traditional land use has been forthcoming to date from preliminary information mailouts to nearby First Nations (see **Section 3**).

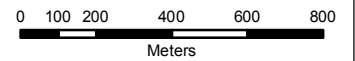
OSCO Aggregates Limited  
 Glenholme Pit No. 4  
 Extraction Project  
 Environmental Assessment

Figure 7  
 Landcover/Landuse



- Study Area
- Glenholme Village Boundary
- Forested
- Past Cut Over/  
Regenerated Forest
- Agricultural Land
- Wetland ( from NS Topobase)
- Field Identified Wetland
- Blueberry Field
- Wind Throw
- Christmas Tree Lot
- Dead Stand (<25%)
- Built Area/Developed
- Pit
- Watercourse
- Road

PROPERTY AS PROVIDED  
 BY PROPERTY ONLINE  
 NOV 2016



MAP CREATED BY: SCM  
 MAP CHECKED BY: KLM  
 MAP PROJECTION: NAD 1983 CSRS UTM Zone 20N

MAP DRAWING INFORMATION  
 DATA PROVIDED BY NSDNR, GeoNova, OSCO

Date: 3/24/2017

Cobequid Bay

## 7.0 Environmental Assessment Methodology

A central component of the EA process is to identify the anticipated impacts on the environmental features resulting from the construction and operation of the proposed Project. The approach taken involves identifying the potential for the Project to interact with the existing environmental components which are present at the Project location. This step is shown in a simple matrix format. Following this identification of potential interactions, the effect of the interaction is evaluated with consideration of the time in which it may occur and the space in which it may occur. Mitigation is identified for each effect, and the significance of each interaction is established. Best management practices have been identified as appropriate mitigative measures.

The significance of the resultant effect was evaluated using the following questions as a guide:

1. Is the effect direct or indirect?
2. Is the effect reversible?
3. What is the magnitude of the effect?
4. What is the duration (short or long term) and frequency of the effect?
5. What is the geographic extent of the effect?
6. What is the ecological or socio-cultural context?

### 7.1 Determination of Valued Environmental Components (VECs)

To focus on valued, vulnerable or representative components of the environment, the assessment will focus on VECs for potential interactions with the Project.

As noted in **Section 2.6**, VECs were chosen based on provincial guidance, the regulatory framework and on the existing condition of the study area determined from publicly available documents related to the area and from data collected by the proponent and consultants (**Section 6**).

### 7.2 Scope of Project

The scope of the project refers to the components of the proposed development that should be considered part of the Project for the purpose of EA. The approach to identifying Project activities, including environmental management and monitoring, is based on knowledge gathered on similar projects. **Table 7-1** outlines the components and related physical activities of the Project. Malfunctions and accidents may occur during any phase of the Project.

**Table 7-1 Project Components and Related Physical Activities**

Project Stage	Project Activity
Site Preparation and Construction	<ul style="list-style-type: none"> <li>• Forest harvest and ground vegetation/topsoil removal and stockpiling (progressive)</li> <li>• Stormwater management (maintaining flow direction internal to pit)</li> <li>• Restoration/extension of access road and establishing base for crushing/screening area</li> </ul>
Operations and Maintenance	<ul style="list-style-type: none"> <li>• Excavation of aggregate</li> <li>• Transportation of aggregate to processing location</li> <li>• Crushing and screening</li> <li>• Onsite aggregate storage</li> <li>• Progressive reclamation</li> <li>• Road maintenance</li> </ul>
Decommissioning and Final Reclamation	To be finalized based on regulatory requirements at the time.

## 8.0 Impact Evaluation/Effects Assessment

The effects assessment is based on the existing environment and on the Project description and mitigation as required to minimize environmental effects from the proposed development of the pit. An analysis of the potential interactions is identified in **Table 8-1**. For each of these effects, proposed mitigation, and predicted residual effects were determined. The predicted residual effect assumes that each of the recommended mitigation measures is implemented. The significance of the residual effect is based upon an evaluation of the effect's magnitude, geographic extent, duration/frequency, irreversibility and ecological context.

Potential malfunctions and accidents are considered separately in **Section 9**.

The VECs were evaluated to determine if potential pathways or linkages exist by which the Project activities or works may affect the VEC. Potential effects are presented for each VEC in the following sections. To complete the assessment, the various components of the atmospheric, aquatic and terrestrial environments were evaluated to determine: the potential for interaction, the potential for effects and the significance of effects, with consideration of feasible mitigation applied.

Additional detail on follow-up requirements is provided in **Section 12**.

Table 8-1 Potential Project – Environmental Interaction Matrix (by VEC)

PROJECT ACTIVITIES	VALUED ENVIRONMENTAL COMPONENTS (VECs) - BIOPHYSICAL										SOCIO-CULTURAL	
	Atmospheric	Groundwater Resources	Surface Water Resources	Fish/Fish Habitat and Priority Fish Species	Significant Habitat (IBA, provincially protected areas)	Other habitat identified by NSDNR (eagle nests)	Wetlands	Priority Flora	Migratory Birds and Priority Birds	Priority Terrestrial Wildlife	Land Use	Cultural /Heritage and Traditional Land Use
<b>Site Preparation and Construction</b>												
Forest harvest and vegetation removal and stockpile (progressive)	✓		✓			✓			✓	✓		
Stormwater management (maintain internal flow, berm creation)			✓	✓			✓					
Restoration/extension of access road and establishing base for crushing/screening area	✓											
<b>Operation and Maintenance</b>												
Excavation	✓		✓			✓	✓			✓	✓	
Transportation of aggregate	✓									✓		
Crushing and screening (dry)	✓											
Onsite aggregate storage	✓								✓			
Progressive reclamation	✓		✓				✓		✓	✓	✓	
Road maintenance	✓		✓				✓			✓		
<b>Malfunctions and Accidents</b>												
Malfunctions and Accidents	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

## 8.1 Atmospheric Resources

Construction related activities have the potential to result in changes in air quality (dust and particulates); noise generation with potential disturbance effects for wildlife and humans; and in GHG emissions with potential climate effects. Aggregate pit extraction operations and maintenance activities have similar potential effects. Operations may contribute with a very limited contribution to GHG emissions. Noise at some locations may be generated at levels at or less than current noise generation at the pre-existing extraction pit. **Table 8-2** provides the effects analysis for atmospheric resources.

Significant residual effects for noise would be identified if there is a prediction of an exceedance of NSE noise guidelines or noticeable increase above existing background levels at a sensitive receptor. Significant effects for air quality relate to the likelihood of exceedance of Nova Scotia or federal ambient air quality standards or significance of contribution over the background.

The following key mitigative factors and mitigation measures were applied to the assessment of this VEC:

- The nearest residential area is approximately 200 m from the proposed Pit, and this residence is already 200 m from the existing historic pit. One resident is within approximately 125 m of the access road for the proposed Project, but the set back to the Pit footprint in this area will result in a distance of approximately 250 m to the actual pit.
- Commitment to no work on Sundays at Pit No. 4 and consideration of conducting crushing for the year at Pit No. 4 within a seasonal window.
- Applicable guidelines and regulations will be followed including the NSE Pit and Quarry Guidelines.
- Progressive reclamation will be undertaken with stabilization and re-vegetation of exposed soils as soon as practical.
- Use of berms where appropriate – OSCO proposes to address resident concerns regarding the west edge of the pit through establishing a berm outside of the proposed wetland buffer adjacent the DU pond, within the low lying farm land.
- Maintenance of existing forested buffers.
- Application of dust suppressants -water when appropriate.
- Instituting and following an anti-idling policy.
- Vehicles and equipment will be maintained in proper working order.
- Use of muffling devices where appropriate.
- Following timing restrictions on noise levels established by NSE.
- GHG emissions from general traffic are not expected to increase significantly from current activity levels.
- Noise is not predicted to exceed guidelines or current baseline where guidelines currently exceeded.



Table 8-2 Effects Related to Atmospheric VEC Components

VEC	Activities	Potential Effects	Residual Effect	Category of Effect
<b>Site Preparation and Construction</b>				
Atmospheric - Air Quality (dust)	<ul style="list-style-type: none"> <li>Forest harvest/vegetation removal</li> <li>Restoration/extension of access road</li> </ul>	Dust and airborne particulate generation and deposition	Negligible with standard mitigation applied. <i>Indirect, Reversible</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent – local to construction area</i> <i>Context – existing and proposed buffers from receptors</i>	Not Significant -Adverse
Atmospheric - Climate (GHG Emissions by vehicles - NOx, SOx, CO, VOC)	Operation of construction machinery in all activities	Contribution to degradation of air quality	Negligible. <i>Indirect, Irreversible</i> <i>Magnitude - negligible</i> <i>Duration – long-term</i> <i>Geographic extent - regional</i> <i>Context - global atmosphere</i>	Not Significant -Adverse
Atmospheric - Ambient Noise	Operation of construction machinery in all activities	Noise at nuisance levels to local residences/businesses	Negligible with mitigation applied. <i>Indirect, Reversible</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - site-specific</i> <i>Context – existing and proposed buffers from receptors</i>	Not Significant -Adverse
<b>Operation/Maintenance</b>				
Atmospheric - Air Quality (dust)	<ul style="list-style-type: none"> <li>Excavation</li> <li>Transportation of aggregate</li> <li>Crushing and screening aggregate</li> <li>Progressive reclamation</li> <li>Road maintenance</li> </ul>	Dust and airborne particulate generation and deposition	Negligible with standard mitigation applied. <i>Indirect, Reversible</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - site-specific</i> <i>Context - within previously disturbed subject property</i>	Not Significant - Adverse
Atmospheric – Climate (GHG Emissions by vehicles - NOx, SOx, CO, VOC)	Operation of construction machinery in all activities and transport vehicles	Contribution to degradation of air quality	Negligible. <i>Indirect, Irreversible</i> <i>Magnitude - negligible</i> <i>Duration – long-term</i> <i>Geographic extent - regional</i> <i>Context - global atmosphere</i>	Not Significant -Adverse
Atmospheric - Sound Quality	Operation of construction machinery in all activities and transport vehicles	Noise that may disturb migratory and nesting birds, and terrestrial wildlife causing changes in behavior and range.	Negligible. <i>Indirect, Reversible</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - site-specific</i> <i>Context - Within previously disturbed subject property</i>	Not Significant -Adverse

Construction noise and dust impacts on residences are expected to be minimal using standard and site specific mitigation as identified. Appropriate mitigative measures will be taken when required to ensure noise limits are met and nuisance dust levels are controlled. It is unlikely that emissions will exceed Nova Scotia or federal air quality standards.

Operational impacts on GHG and emissions are negligible contributions to overall atmospheric quality.

## 8.2 Groundwater Resources

No interactions are anticipated with groundwater resources from construction or operational activities of the Project as the pit floor will be maintained 0.5 m above the groundwater table. Residential wells are generally not downgradient of the Project. The nearest well is located south of the access road and is a drilled well.

Significant residual effects on groundwater resources would be identified if a potable water supply was significantly depleted or the water quality was degraded beyond existing conditions or the Canadian Drinking Water Guidelines.

## 8.3 Surface Water Resources and Fish Habitat/Priority Fish Species

Surface water is considered from the perspective of water quality and quantity in relation to fish habitat. No potable surface water supplies were identified in relation to the Project. No fish habitat is within the Project footprint, so potential impacts to fish habitat relate to surface water quality in Property runoff.

Construction related activities have potential to result in changes in water quality (typically due to sediment generation). Operations and maintenance activities related to road winter maintenance and vegetation removal also have potential to affect surface water quality. Winter operations are limited and road salting would not be undertaken. If needed, sand may be used on roads. **Table 8-3** provides the effects analysis for surface water resources.

Significant residual effects relate to degraded water quality with long-term Project related (above existing background range) exceedance of FWAL guidelines or recreational guidelines or degraded water quantity to the level that fisheries habitat is affected.

The following key mitigative factors and mitigation measures were applied to the assessment of this VEC:

- No watercourse alteration is proposed.
- Surficial material is generally coarse grain size (reducing potential for mobilization of fines).
- Utilization of erosion and sediment control procedures, including:
  - Natural vegetation (especially adjacent to the watercourse) will be preserved as much as possible
  - Exposed soil surfaces will be stabilized and revegetated to limit erosion

- Diversion ditching established in undeveloped areas up gradient of active working locations to reduce the amount of incoming surface runoff
- Installation and maintenance of sediment and erosion control measures
- Regular inspection and maintenance of sedimentation control measures. Prior to heavy rainfall events sediment control measures will be checked to ensure they are continuing to operate properly.
- Regular visual monitoring of surface water conditions and operational observations to ensure that sediment and erosion control measures are working effectively.
- Deleterious substances are not anticipated within the proposed excavation area; however, project work will include stop work contingency if a contaminant is encountered.
- Refueling and equipment maintenance areas will be set back from watercourses at least 30 m and spill response materials will be located on site (as identified in **Section 9**).

**Table 8-3 Effects Related to Surface Water and Fish/Fish Habitat VEC Components**

VEC	Activities	Potential Effects	Residual Effect	Category of Effect
<b>Site Preparation and Construction</b>				
Surface Water and Downstream Fish/Fish Habitat - Water Quality	Storm water management throughout the progression of the pit	Erosion of exposed ground areas resulting in increased amounts of sediment in stormwater runoff entering surface water bodies – water quality degradation	Negligible with standard mitigation applied. <i>Indirect, Reversible</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - local</i> <i>Context – no watercourses within the Project footprint</i>	Not Significant -Adverse
<b>Operation/Maintenance</b>				
Surface Water and Downstream Fish/Fish Habitat - Water Quality	<ul style="list-style-type: none"> <li>• Excavation</li> <li>• Road maintenance</li> </ul>	Erosion of exposed ground areas resulting in increased amounts of sediment or deleterious substance in stormwater runoff entering surface water bodies – water quality degradation	Negligible with standard mitigation applied. <i>Indirect, Reversible</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - local</i> <i>Context – no watercourses within the Project footprint</i>	Not Significant -Adverse

Residual Project impacts on surface water resources and downstream fish habitat are expected to be insignificant. Potential adverse impacts will be mitigated or avoided through adherence to best practices, and meeting approval requirements, and applicable regulations and guidelines. Monitoring as detailed in **Section 12**, will be conducted to confirm water quality at the property boundary remains within approval requirements and applicable limits (CCME freshwater aquatic life and recreation guidelines considering background ranges) protecting downstream watercourses.

## 8.4 Significant Habitat

The only NSDNR significant habitat identified within the study area is the Cobequid Bay Important Bird Area (IBA) (other than wetlands which are addressed in **Section 8.6**). Other significant habitats including dykelands, salt marshes and swimming beaches outside of the area of potential influence of the Project. The IBA area identified includes the more southerly wetland (WL5) which is outside the proposed Project footprint.

## 8.5 Other Habitat Identified by NSDNR

Other habitat identified by NSDNR includes Bald Eagle nests historically in the area. At least one of these nests is located within the Project footprint. **Table 8-4** provides the assessment of this VEC.

The following key mitigative factors and mitigation measures were applied to the assessment of this VEC:

- Pit development timing and extent will reflect NSDNR guidelines for Bald Eagle nests
  - Within 200 m of a nest, avoid activities that result in significant landscape changes; road and trail use shall be closed from February to mid-June.
  - Within 400 m of a nest, activity is permitted except during the most critical period between March and mid-May
- If pit development is planned within 200 m of an active nest, NSDNR will be contacted to develop a management plan which may involve providing an alternate nest location.

**Table 8-4 Effects Related to Other NSDNR Habitat**

VEC	Activities	Potential Effects	Residual Effect	Category of Effect
<b>Site Preparation and Construction</b>				
Other NSDNR Habitat – Bald Eagle nests	Forest harvest and vegetation removal	Loss of Bald Eagle nest	Negligible with standard mitigation applied. <i>Direct, Reversible (alternate site provided)</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - local</i> <i>Context – OSCO will work with NSDNR to relocate nests if required</i>	Not Significant -Adverse

VEC	Activities	Potential Effects	Residual Effect	Category of Effect
<b>Operation/Maintenance</b>				
Other NSDNR Habitat – Bald Eagle nests	<ul style="list-style-type: none"> <li>Excavation</li> <li>Crushing and screening</li> </ul>	Disturbance of nesting eagles	Negligible with standard mitigation applied. <i>Direct, Reversible (alternate site provided)</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - local</i> <i>Context – OSCO will work with NSDNR to relocate nests if required</i>	Not Significant -Adverse

OSCO will work with NSDNR and develop a management approach to avoid residual impacts to Bald Eagle nests.

## 8.6 Wetlands

Construction and operation related activities have potential to result in indirect effects on wetland function related to water quality degradation, vegetation changes or hydrological change.

Significant residual effects would be related to loss of a Wetland of Special Significance or un-mitigable (e.g. if compensation of function not possible) wetland loss. **Table 8-5** provides the assessment of this VEC.

The following key mitigative factors and mitigation measures were applied to the assessment of this VEC:

- An undisturbed wetland buffer of 30 m will be maintained, with the exception of the south end of WL1 and the north side of WL2 adjacent WL1. A road is proposed at this location which at the narrowest point is approximately 55 m. The road will be centered to minimize encroachment on both buffer zones, but will likely encroach approximately 5 m into each side of the buffers. The road will be built-up with clean gravel material and existing hydrology maintained. Appropriate E&SC will be implemented during road construction and operation.
- Erosion and sediment control measures (as identified for surface and groundwater) will be employed to protect wetlands.
- Refueling and equipment maintenance areas will be set back from wetlands 30 m, and spill response materials will be located on site (as identified in **Section 9**).

**Table 8-5 Effects Related to Wetland VEC Components**

VEC	Activities	Potential Effects	Residual Effect	Category of Effect
<b>Site Preparation and Construction</b>				
Wetland water quality	Stormwater management	Sediment or contaminants impacts to water quality or hydrology of wetlands	Negligible with standard mitigation applied. <i>Indirect, Irreversible</i> <i>Magnitude - negligible</i> <i>Duration – long-term</i> <i>Geographic extent - site-specific</i> <i>Context – Appropriate surface water runoff management</i>	Not Significant - Adverse
<b>Operation and Maintenance</b>				
Wetland function	Excavation Progressive reclamation Road maintenance	Wetland function impairment is not predicted	Negligible with standard mitigation applied. <i>Indirect, Irreversible</i> <i>Magnitude - negligible</i> <i>Duration – long-term</i> <i>Geographic extent - site-specific</i> <i>Context – Nova Scotia Wetland Conservation Policy</i>	Not Significant - Adverse

Wetland alteration is not proposed within the Pit No. 4 footprint. If required, work within 30 m of wetlands, will be undertaken within the context of NSE approval requirements. For a potential road proposed within 30 m of a wetland, mitigative design will be developed prior to disturbance following Nova Scotia Wetland Conservation Policy and in consultation with NSE, and restoration when it occurs, will consider wetland function.

Potential adverse impacts will be mitigated or avoided through adherence to best practices, terms and conditions of approvals/authorizations, and applicable regulations and guidelines. Monitoring and follow-up will be required to ensure conditions of approvals are met as outlined in **Section 12**.

## 8.7 Priority Flora

Field and desktop priority plant species assessments have been conducted within the project study area, and no priority species were identified. Additionally, based on the potential species present in habitats identified it is very unlikely that priority plant species are present within the Project study area. It is proposed that a follow-up plant survey be conducted in the early season of 2017 to confirm findings. **Section 12.5** outlines follow-up measures.

## 8.8 Migratory Birds

Potential effects to migratory birds include direct habitat loss or nest disturbance through clearance and maintenance as well as indirect disturbance to their habitat such as noise, changes to the local environment or habitat fragmentation. The attraction of ground nesting birds may occur through unsuitable waste management and unattended/unvegetated stockpiles of material left during the

breeding season. Most migratory bird species construct nests in trees (sometimes in tree cavities) and shrubs, but several species nest at ground level (e.g., Common Nighthawk, Killdeer, sandpipers), in hay fields, pastures or in burrows. Some bird species may nest on cliffs or in stockpiles of overburden material from mines or the banks of quarries. Some migratory birds (including certain waterfowl species) may nest in head ponds created by beaver dams. Some migratory birds (e.g., Barn Swallow, Cliff Swallow, Eastern Phoebe) may build their nests on structures such as bridges, ledges or gutters.

Significant residual effects, if identified, would relate to contravention of SARA or NSESA or MBCA or the Nova Scotia Wildlife Act provisions, or population impacts to non-SARA or non-NSESA listed priority wildlife or bird species. **Table 8-6** provides the assessment of this VEC.

The following key mitigative factors and mitigation measures were applied to the assessment of this VEC:

- Bird nests including priority species are expected throughout the Project footprint.
- No one shall disturb, move or destroy migratory bird nests. If a nest or young birds are encountered, work shall cease work in the immediate area of the nest and NSDNR contacted.
- Clearing activities will occur outside of the nesting season (April 1st to August 15<sup>th</sup>) or as determined by Canadian Wildlife Service.
- If clearing is operationally required during the nesting time frame, OSCO will consult with ECCC for an appropriate protocol, which likely would involve pre-construction nest surveys and the requirement to leave buffers around nests, if identified.
- Onsite materials storage that may attract ground-nesting birds will be examined for bird nests during the nesting season, and disturbance avoided if nests are present until after the nesting season.
- Most wildlife and birds habituate to routine traffic noise.

**Table 8-6 Effects related to Migratory/Priority Bird VECs**

VEC	Activities	Potential Effects	Residual Effect	Category of Effect
<b>Site Preparation and Construction</b>				
Migratory birds - nests	Forest harvest and vegetation removal and stockpiling	Potential for alteration of bird nests	Negligible with standard mitigation applied. <i>Indirect, Reversible Magnitude - negligible Duration – short-term Geographic extent - site-specific Context – previously disturbed Project site</i>	Not Significant - Adverse
<b>Operation and Maintenance</b>				
Migratory	On-site aggregate	Potential for alteration of bird nests	Negligible with standard mitigation applied.	Not Significant -

VEC	Activities	Potential Effects	Residual Effect	Category of Effect
birds - nests	storage Progressive reclamation		<i>Indirect, Reversible Magnitude - negligible Duration – short-term Geographic extent - site-specific Context - previously disturbed Project site</i>	Adverse

It is proposed that a follow-up bird survey be conducted in the early season of 2017 to confirm findings. **Section 12.5** outlines follow-up measures.

## 8.9 Priority Terrestrial Wildlife

Potential effects to priority terrestrial wildlife include direct habitat loss through clearance and maintenance as well as indirect disturbance to their habitat such as noise, changes to the local environment or habitat fragmentation.

Significant residual effects, if identified, would relate to contravention of SARA or NSESA or the Nova Scotia Wildlife Act provisions, or population impacts to non-SARA or non-NSESA listed priority terrestrial wildlife species. **Table 8-7** provides the assessment of this VEC.

The following key mitigative factors and mitigation measures were applied to the assessment of this VEC:

- Minimize the area to be cleared to that required for the Project to restrict the loss of habitat.
- Specify re-vegetation mixes to limit potential for invasive species.
- Re-seed exposed areas as soon as possible to limit the time available for invasive species to take seed.
- Installation and maintenance of sediment and erosion control measures to prevent the degradation of habitat.
- Following standards, applicable guidelines and regulations.
- Reduced speed limits will be implemented on the subject property along the access road.
- All motorized vehicles will be maintained in good working order.
- Similar to sensitivities related to bird nests, OSCO personnel and contractors will be briefed on the requirement not to destroy turtle nests and will report any sightings to the operations manager (and depending on the potential for SAR species, the operations manager will contact ECCC).



**Table 8-7 Effects Related to Priority Wildlife VECs**

VEC	Activities	Potential Effects	Residual Effect	Category of Effect
<b>Site Preparation and Construction</b>				
Priority Terrestrial Wildlife	Forest harvest and vegetation removal and stockpiling  Operation of construction machinery	Loss of turtle nests Traffic collisions with priority wildlife	Negligible with standard mitigation applied. <i>Direct, Irreversible</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - site-specific</i> <i>Context – previously disturbed subject property</i>	Not significant – Adverse
<b>Operation and Maintenance</b>				
Priority Terrestrial Wildlife	Excavation Transportation of aggregate Progressive reclamation Road maintenance	Traffic collisions with priority wildlife Potential impacts to turtle nests	Negligible with standard mitigation applied. <i>Direct, Irreversible</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - site-specific</i> <i>Context – previously disturbed subject property</i>	Not significant - Adverse

No significant adverse effects are anticipated in relation to priority wildlife.

### 8.10 Land Use

Pit development will result in land use change at the property. There is no land use zoning that would preclude aggregate development. The subject property has been operating as an aggregate pit on and off for the past several decades. **Table 8-8** provides the assessment of this VEC.

The following key mitigative factors and mitigation measures were applied to the assessment of this VEC:

- Progressive reclamation will return the land to a land use approved by NSE.

Table 8-8 Effects Related to Land use VECs

VEC	Activities	Potential Effects	Residual Effect	Category of Effect
<b>Operation and Maintenance</b>				
Land use	Excavation Progressive reclamation	Land use will change temporarily until sufficient time for reclamation to be implemented	Negligible with standard mitigation applied. <i>Direct, Reversible</i> <i>Magnitude - negligible</i> <i>Duration – short-term</i> <i>Geographic extent - site-specific</i> <i>Context – previously disturbed subject property</i>	Not significant - Adverse

No significant adverse effects are anticipated from the Project on land use.

### 8.11 Cultural and Heritage Resources and Traditional Land Use

No cultural and heritage resources or traditional land use have been identified for the Project property. A contingency plan will be in place as noted in **Section 9.6**.

## 9.0 Possible Malfunctions or Accidents

Possible malfunctions or accidents that could potentially arise during aggregate extraction projects include pit slope failures, chemical and fuel spills, failure of sediment and erosion control measures/extreme rainfall, vehicle accidents, and fire.

### 9.1 Pit Slope Failure

Pit slope failures are due to two principal reasons: failure of faces due to improper design and operational procedures; and, failure of overburden slopes. Improperly designed and operated open pits can pose a safety hazard to workers during construction and operation.

Mitigating factors include:

- Pit slope angles are established using standard of practice approaches and methodologies combined with the Proponents experience with aggregate removal.
- The pit will be operated in accordance with health and safety based requirements limiting the pit face height and defining established setbacks.
- Pit face inspections will occur daily and an Emergency Response Plan has been prepared.

The risk of pit slope failure resulting from operation of the Project is expected to be low. The risk during operations will be reduced further by preventive measures, monitoring and the utilization of standardized methods in the pit design. With preventive and mitigative measures and the low probability of pit slope failure, the effects of pit slope failure during construction and operation are considered not significant.

### 9.2 Chemical and Fuel Spills

Malfunctions or accidents may result in spills of hydrocarbons or other substances during construction and operation of the Project. Such spills may contaminate soils and groundwater and, through runoff, contaminate watercourses. Contaminants may adversely affect both terrestrial and aquatic habitat and migratory birds. Loss of petroleum hydrocarbons, hazardous materials or other substances that may volatilize and adversely impact the ambient air quality.

Mitigating factors include:

- A Spill Contingency Plan will be developed for various substances anticipated to be on site during the construction and operations activities. Furthermore, fuelling or the changing of oil and lubricants will be conducted at a minimum distance of 30 m from wetlands and surface water bodies. Releases caused by motor vehicle accidents are addressed initially by local emergency response agencies and directed by NSE. Subsequently, site contractors contain the spill and remove contaminated soils and

sediment for disposal. Additionally, all chemicals on site will be stored in accordance with all provincial regulations and emergency spill kits will be available on-site.

- Minor spills can typically be cleaned up effectively with minimal long-term impacts, and major spills are not likely based on quantities of hydrocarbons anticipated to be on site during construction/operation.

The risk of spills resulting during operation of the project is expected to be low. The risk of contamination from spills and leaks during operations will be reduced further by preventive measures, contingency planning and spill response and mitigation. The effects of accidental spills of contaminants during construction and operation are considered not significant.

### 9.3 Extreme Rainfall Events

The discharge of runoff containing sediment to watercourses during storm events or spring runoff could result in the degradation of adjacent surface water bodies, wetlands, and fish/fish habitat.

Mitigating factors include:

- Contingency plans are in place for the extreme rainfall events including: monitoring of surface runoff conditions during heavy rainfall and operational observations to evaluate the need for improvements in surface runoff control; and provision of a stockpile of sediment and erosion control materials.
- Contingency may also include temporary pumping of surface water back into the pit. OSCO personnel note that temporary inflow of water to the pit floor during storm events is not an operational concern and allows for natural infiltration.

The risk of impacts from extreme storm events with appropriate contingency planning and implementation is not significant.

### 9.4 Vehicle Accidents

Vehicle accidents have the possibility to risk human health and safety, as well as migratory birds and terrestrial wildlife through collisions.

Mitigating factors include:

- During the construction phase, the necessary barriers and signage will be displayed to minimize the potential for vehicle accidents.
- During operation, appropriate road design and speed limit postings will be in place to minimize the potential for vehicle accidents.

The risk of impacts from vehicle accidents with appropriate contingency planning and implementation is not significant.

## 9.5 Fires

Accidental fires could potentially be caused during construction or operation/maintenance. Sources of potential for fire include hot exhaust or equipment, discarded cigarettes, or sparks. Wildlife including migratory birds could be killed directly and fire poses a safety risk. Surface water quality can be affected indirectly if runoff from a burned area enters a watercourse. Significant fires may result in smoke which could impact air quality.

Mitigating factors include:

- Compliance with fire bans, as applicable.
- Contingency planning for fires.

The risk of impacts from fires with appropriate contingency planning and implementation is not significant.

## 9.6 Other Unexpected Findings

### 9.6.1 Archaeological and Aboriginal Resources

If an archaeological or Aboriginal resource/artifact or human remains is unearthed or discovered during the construction or operation and maintenance phases of the Project, the following procedure will be followed:

- Work will be stopped and the area will be marked to prevent further disturbance.
- Immediately contact the Special Places Program (Sean Weseloh McKeane: 902-424-6475), to notify of the discovery and establish a mitigation plan.
- No additional work will be permitted at the site until approval has been received from the Special Places Program.
- If human remains are found, work in the area must cease, and the RCMP shall be immediately notified.
- No one shall disturb, move or rebury any uncovered human remains.
- If it is a suspected First Nations burial site, the First Nations should be contacted.

### 9.6.2 Priority Species or Migratory Bird or Turtle Nest

Site personnel will receive a briefing on sensitivities and identification of priority species, bird and turtle nests, contingency actions and contacts if there is potential for interaction.

## 10.0 Effects of the Environment on the Project

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The effects of the environment on the Project includes changes to the Project that may be caused by the environment. The potential effects of the environment on the Project are described below.

### 10.1 Climate Change and Hydrological Design

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Climate change modelling for Atlantic Canada and prediction of short duration high-intensity storm events and future drainage flow requirements within the long term Project life will be considered during the final design of sediment control structures and other hydrologically-based design analysis.

### 10.2 Extreme Weather

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The principal manner in which the environment could influence the Project is through heavy precipitation events. An analysis of climate stations in the Maritimes from 1948 to 1995 found that there is an increasing trend in the number of daily precipitation events above 20 mm, a very slightly increasing trend in the number of daily snowfall events above 15 cm, and an overall precipitation increase of approximately 10% (Lewis 1997).

It is not anticipated that the proposed Project will be impacted by climatic events once in the operational phase as the design of the pit incorporates site water management, and aggregate will be stored appropriately while on site to ensure that it is not impacted by rainfall or high wind conditions.

### 10.3 Summary

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In summary, climate and meteorological conditions, including climate change, are not anticipated to significantly affect the operation of the pit over its proposed lifetime.

## 11.0 Cumulative Effects

The geology of the region in which the Project is located has resulted in a long history of aggregate extraction operations in the area. There are approximately five other aggregate extraction pits within 1 km of the Glenholme area. The Glenholme Pit No. 4 development will be concurrent with the operation of existing Pit operations at the Glenholme Wash Plant. However, the total annual production between these OSCO facilities will remain the same. The Pit No. 4 aggregate source will extend the life of the Wash Plant Operation but will not increase production at this facility as existing aggregate sources are depleted. The other common industry in the region is agriculture. Agricultural lands are quite common and are present in every direction around the subject property. Forest harvest is also anticipated to occur in the general area during the Pit No. 4 development timeframe. The relative disturbance related to the pit development is small in relation to overall land disturbance in the area and temporary in nature. The relative contributions of this Project to noise are anticipated to be within regulatory criteria and local in extent.

As noted previously, the only change to road traffic will be from the Pit 4 access road and the 700 m of the public road before the existing Glenholme Wash Plant. Traffic from the Wash Plant will not change from current levels due to the acquisition of Pit No. 4. No significant change is predicted to traffic or greenhouse gas emissions.

In following the Nova Scotia Pit and Quarry Guidelines, combined with the mitigative measures outlined within the assessment above, no significant cumulative effects are anticipated as a result of this Project in combination with other anticipated activity in the area.

## 12.0 Follow-up and Monitoring Summary

This section outlines key follow-up programs proposed by the proponent.

### 12.1 Particulate Monitoring

Monitoring of airborne particulate emissions (dust) will be conducted at the request of NSE and in accordance with the Nova Scotia Pit and Quarry Guidelines. It is anticipated that the following particulate emissions limits will be included in the Industrial Approval and airborne particulates will be monitored to confirm levels below the following limits at the property boundaries:

- Annual Geometric Mean 70 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ).
- Daily Average (24 hours) 120  $\mu\text{g}/\text{m}^3$ .

### 12.2 Ground Water Monitoring

The ground water table will be confirmed using monitoring wells prior to Project initiation. OSCO will meet NSE Industrial Approval monitoring requirements to confirm excavation does not extend to within 0.5 m of the water table.

### 12.3 Surface Water Quality

Due to the design of the Project and the location of surface water bodies in regards to the Project site, significant changes to the surface water quality is not anticipated as a result of components of the proposed Project. Surface water in the vicinity of the Project will be monitored according to terms and conditions identified in the future Industrial Approval and the Nova Scotia Pit and Quarry Guidelines.

Visual monitoring for pathways to surface water bodies, including wetlands, will be conducted throughout all Project phases, especially during periods of heavy rainfall or snowmelt. If pathways to surface water bodies are identified or suspected, TSS sampling will be conducted for major precipitation and snowmelt events to ensure there are no impacts to the surface water quality and that additional mitigative measures are not needed.

### 12.4 Sediment and Erosion Control

Where sediment and erosion control measures are employed, they will be visually monitored throughout the implementation to ensure that they are working effectively, especially during times of heavy precipitation and snowmelt events. If a malfunction of sediment and erosion control measures is observed, then stockpiled sediment and erosion control materials on site will be used to remedy the area of concern.



## 12.5 Priority Species and Migratory Breeding Birds

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An additional priority flora survey and breeding bird survey will be conducted early in 2017 to confirm that there are no priority flora or sensitive birds located on the proposed Project site during activities that may result in an impact. If priority flora or sensitive birds are located within the proposed Project footprint and would potentially be impacted during the construction phase, a management plan will be created in discussion with NSE and if possible, such species would be avoided. As noted previously, clearing activities will not be conducted during the bird nesting season.

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