APPENDIX A
Registry of Joint Stocks and Industrial Approval

Profile

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PROFILE - LAFARGE CANADA INC. - as of: 2012-03-02 12:01 PM

Business/Organization Name:	LAFARGE CANADA INC.
Registry ID:	3260610
Type:	Extra-Provincial Corporation
Nature of Business:	MANUFACTURE & SALE OF CEMENT,CONSTRUCTION MATERIALS & GYPSUM PRODUCTS
Status:	Active
Jurisdiction:	Canada
Registered Office:	6509 AIRPORT ROAD MISSISSAUGA ON Canada L4V1S7
Mailing Address:	6509 AIRPORT ROAD MISSISSAUGA ON Canada L4V1S7

PEOPLE

Name	Position	Civic Address	Mailing Address
RENE THIBAULT	Director	64 DISCOVERY RIDGE CIRCLE SW CALGARY AB T3H5T8	
KENNETH CATHCART	Director	139 CARTER ROAD GUELPH ON N1H6H8	
ALAIN FREDETTE	Director	1954 LAIRD BLVD. MONT-ROYAL QC H3P2V2	
THOMAS ROBERT CARTMEL	Director	4652 W. ABERDDEN ROAD LITTLETON COLORADO 80123	
KENNETH CATHCART	VP, GENERAL COUNSEL & SECRETARY	139 CARTER ROAD GUELPH ON N1H6H8	
THOMAS ROBERT CARTMEL	PRESIDENT & CEO, EASTERN CANADA	4652 W. ABERDDEN ROAD LITTLETON COLORADO 80123	

Français

RENE THIBAULT	PRESIDENT & CEO WESTERN CANADA	64 DISCOVERY RIDGE CIRCLE SW CALGARY AB T3H5T8	
SCARTH MACDONNELL	Recognized Agent	87 CEMENT PLANT ROAD BROOKFIELD NS B0N1C0	PO BOX 5, 87 CEMENT PLANT ROAD BROOKFIELD NS B0N1C0

ACTIVITIES

Activity	**Date**
Date of Filing Amalgamation	2012-01-27
Amalgamated in other Jurisdiction	2012-01-01

RELATED REGISTRATIONS

This Company ...	
LAFARGE CANADA INC.	Amalgamated From
YARMOUTH CONCRETE & GRAVEL	Registered
CEMENT CARTAGE	Registered
STANDARD AGGREGATES	Registered
STANDARD PAVING MARITIME	Registered
ALBANY CARTAGE	Registered
PERMANENT LAFARGE	Registered
LAFARGE CONSTRUCTION MATERIALS	Registered

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(22)

NOVA SCOTIA
Department of Environment and Labour

13 First St.
Yarmouth, NS B5A 1S9

Tel: (902) 742-8985
Fax: (902) 742-7796

Our File Number: 92100-30

March 29, 2005

Mr. Gary Rudolph
Lafarge Canada Inc.
209 Kearney Lake Rd
PO Box 2106
Halifax, NS
B3J 3B7

Dear Mr. Rudolph:

RE: Approval to Construct and Operate - Quarry
Approval No. 2005-044731, PID # 90138991, 90139023

Enclosed please find Approval # 2005-044731 to construct and operate the Quarry at Brooklyn, Yarmouth County, Nova Scotia.

Strict adherence to the attached terms and conditions is imperative in order to validate this approval.

Despite the issuance of this Approval, the Approval Holder is still responsible for obtaining any other authorization which may be required to carry out the activity, including those which may be necessary under provincial, federal or municipal law.

Should you have any questions, please contact Bruce Arthur, Western Region, Yarmouth Office at (902) 742-8985.

Yours Truly

Bob Petrie
District Manager

cc Bruce Arthur
Christine Attard

Eimas #: 2005-044731

NOVA SCOTIA
Department of Environment and Labour

APPROVAL

Province of Nova Scotia
Environment Act, **S.N.S. 1994-95, c.1**

APPROVAL HOLDER: Lafarge Canada Inc.

APPROVAL NO: 2005-044731

EFFECTIVE DATE: March 29, 2005

EXPIRY DATE: March 29, 2015

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Construction and operation of a Quarry, and associated works, at or near Brooklyn, Yarmouth County in the Province of Nova Scotia.

Administrator
Date Signed March 27/05

TERMS AND CONDITIONS OF APPROVAL

Nova Scotia Department of Environment and Labour

Project:	Lafarge Canada Inc. Quarry Brooklyn, Yarmouth County
Approval No:	2005-044731
File No:	92100-30
Map Series:	20 O/16
Grid Reference:	E255750 N4864750
PID # :	90138991, 90139023

Reference Documents:

- Application dated February 14, 2005 and attachments.

1. **Definitions**

a) "Abandonment" means cessation of production of aggregate for a period of twelve (12) months.

b) "Act" means the *Environment Act* S.N.S. 1994-1995, c.1 and includes all regulations made pursuant to the Act.

c) "Active Area" means the area required to operate a quarry and includes the working face and associated works.

d) "Associated works" means any building, structure, processing facility, pollution abatement system or stockpiles of aggregate.

e) "Department" means the Western Region, Yarmouth Office, of the Nova Scotia Department of Environment and Labour located at the following address:

Nova Scotia Department of Environment and Labour
Environmental Monitoring and Compliance Division
Western Region, Yarmouth Office
13 First St.
Yarmouth, NS B5A 1S9

Phone: (902) 742-8985
Fax: (902) 742-7796

f) "Disturbed Area" means any area on a quarry site that has been stripped of vegetation and is susceptible to erosion.

g) "Facility" means the Quarry and associated works.

h) "Minister" means the Minister of the Nova Scotia Department of Environment and Labour.

i) "Rehabilitation" means restorative work performed or to be performed in accordance with the rehabilitation plan.

j) "Structure" includes but is not limited to a private home, a cottage, an apartment building, a school, a church, a commercial building or a treatment facility associated with the treatment of municipal sewage, industrial or landfill effluent, an industrial building, infrastructure or construction, a hospital, and a nursing home, etc.

2. Scope of Approval

a) This Approval (the "Approval") relates to the Approval Holder and their application and supporting documentation, as listed in the reference documents above, to construct and operate the Facility, situated at or near Brooklyn, Yarmouth County (the "Site").

b) The Facility shall be constructed and operated as outlined in the application for industrial approval dated February 14, 2005 and supporting documentation.

c) The Site shall not exceed the area as outlined in the application and supporting documentation.

d) Should the work authorized by this Approval not be commenced within a year, this Approval shall automatically be null and void, unless extended in writing by an Administrator.

3. **General Terms and Conditions**

a) The Approval Holder shall construct, operate and reclaim its Facility in accordance with provisions of the:

i) *Environment Act* S.N.S. 1994-1995, c.1;
ii) Regulations pursuant to the above Act;
iii) Any future amendments to the Act and regulations

b) No authority is granted by this Approval to enable the Approval Holder to construct the Facility on lands which are not in the control or ownership of the Approval Holder. It is the responsibility of the Approval Holder to ensure that such a contravention does not occur. The Approval Holder shall provide, to the Department, proof of such control or ownership upon expiry of any relevant lease or agreement. Failure to retain said authorization will result in this Approval being null and void.

c) If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.

d) The Minister or Administrator may modify, amend or add conditions to this Approval at anytime pursuant to Section 58 of the Act.

e) This Approval is not transferable without the consent of the Minister or Administrator.

f) (i) If the Minister or Administrator determines that there has been non-compliance with any or all of the terms and conditions contained in this Approval, the Minister or Administrator may cancel or suspend the Approval pursuant to subsections 58(2)(b) and 58(4) of the Act, until such time as the Minister or Administrator is satisfied that all terms and conditions have been met.

(ii) Despite a cancellation or suspension of this Approval, the Approval Holder remains subject to the penalty provisions of the Act and regulations.

g) The Approval Holder shall notify the Department prior to any proposed extensions or modifications of the Facility, including the active area, process changes or waste disposal practices which are not granted under this Approval. An amendment to this Approval will be required before implementing any change. Extensions or modifications to the Facility may be subject to the Environmental Assessment Regulations.

h) Pursuant to Section 60 of the *Act*, the Approval Holder shall submit to the Administrator any new and relevant information respecting any adverse effect that actually results, or may potentially result, from any activity to which the Approval relates and that comes to the attention of the Approval Holder after the issuance of the Approval.

i) The Approval Holder shall immediately notify the Department of any incidents of non-compliance with this Approval.

j) The Approval Holder shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.

k) Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures.

l) All samples required by this Approval shall be analysed by a laboratory that is:

   i) Accredited by the Standards Council of Canada; or

   ii) Accredited by another agency recognized by the Nova Scotia Department of Environment and Labour to be equivalent to the Standards Council of Canada; or

   iii) Maintaining an acceptable standard in a proficiency testing program conducted by the Canadian Association for Environmental Analytical Laboratories for all parameters being reported; or

   iv) Maintaining an acceptable standard in a proficiency or performance testing in another program considered acceptable to the Nova Scotia Department of Environment and Labour for all parameters being reported

m) The Approval Holder shall submit any monitoring results or reports required by this Approval to the Department. Unless specified otherwise in this Approval, All monitoring results shall be submitted within 30 days following the month of monitoring.

n) The Approval Holder shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel directly involved in the Facility operation are made fully aware of the terms and conditions which pertain to this Approval.

o) The Approval Holder will be required to register their project under Part IV of the *Environment Act* should the Facility and associated works including access roads exceed an area of four (4) hectares.

4. Construction of Facility

a. All erosion and sedimentation controls are to be in place prior to construction at this Facility. The Nova Scotia Department of the Environment "Erosion and Sedimentation Control Handbook For Construction Sites" shall serve as the reference document for all erosion control measures. These measures are minimum requirements and additional controls shall be implemented if Site runoff exceeds the discharge limits contained herein.

b. All erosion and sedimentation controls are to be maintained and remain in place until the disturbed areas are stabilized.

c. All water leaving the Site during the construction phase shall be in compliance with total suspended solids limits of 50 mg/l grab or 25 mg/l monthly arithmetic mean.

d. Appropriate signage including the hours of operation, emergency telephone numbers and contacts are to be posted at the entrance to the Facility.

e. The generation of dust from the Site shall be suppressed by the application of water sprays, or the application of other suitable approved dust suppressants as required.

5. Particulate Emissions (Dust)

a) Particulate emissions shall not exceed the following limits at or beyond the Site property boundaries:

Annual Geometric Mean	70 $\mu g/m^3$
Daily Average (24 hr.)	120 $\mu g/m^3$

b) The generation of fugitive dust from the Site will be suppressed by the application of water sprays, or the application of other suitable dust suppressants approved by the Department.

c) Site access road(s) shall be maintained to minimize dust generation. The use of used oil is <u>not</u> permitted.

d) Monitoring of particulate emissions shall be conducted at the request of the Department. The location of the monitoring station(s) for particulate will be established by the Administrator and may include point(s) beyond the property boundary of the quarry.

e) When requested, suspended particulate matter shall be measured by the high volume method as described in report No. E.P.S. 1-AP-73-2.

6. **Sound Levels**

a) Sound levels measured at the Site property boundaries shall not exceed the following equivalent sound levels (Leq):

Leq 65 dBA 0700-1900 hours (Days)
60 dBA 1900-2300 hours (Evenings)
55 dBA 2300-0700 hours (Nights)

b) Monitoring of sound levels shall be conducted at the request of the Department. The location of the monitoring station(s) for sound will be established by the Administrator and may include point(s) beyond the property boundary of the quarry.

7. **Surface Water**

a) The Site shall be developed and maintained to prevent siltation of the surface water which is discharged from the property boundaries into the nearest watercourse or beyond the property boundary. The Nova Scotia Department of the Environment "Erosion and Sedimentation Control Handbook For Construction Sites" shall serve as the reference document for all erosion control measures. These measures are minimum requirements and additional controls shall be implemented if Site runoff exceeds the discharge limits contained herein.

b) No authority is granted by this Approval to enable the Approval Holder to discharge surface water beyond the property boundary and onto adjoining lands without the authorization of the affected landowner(s). It is the responsibility of the Approval Holder to ensure that the authorization of said landowner(s) is current and valid. Failure to retain said authorization will result in this Approval being null and void. The Approval Holder shall provide, to the Department, proof of the continued authorization of the adjoining landowner(s) when the current agreement has expired.

c) All erosion and sedimentation control devices shall be installed prior to any excavation of material.

d) The Approval Holder shall ensure the liquid effluent levels in Table 1 are met and that the effluent is monitoring at the frequency and locations indicated.

Table 1

Final Effluent Discharge Limits

Parameters	Maximum in a Grab Sample	Monthly Arithmetic Mean	Monitoring Frequency	Monitoring Station
Total Suspended Solids	50 mg/l	25 mg/l	At NSEL request	Discharge from site
pH	5 - 9	5 - 9	At NSEL request	Discharge from site

e) If it becomes necessary to drain the Site, the wastewater shall be drained to settling ponds for appropriate treatment to meet the suspended solids limits outlined in Table 1.

f) All wash water systems shall be arranged in closed circuit.

g) Additional monitoring stations for liquid effluent may be specified as required by the Department.

h) A monthly summary of results of monitoring shall be submitted to the Department.

8. **Groundwater**

a) The Approval Holder shall replace at their expense any water supply which has been lost or damaged as a result of extracting aggregate.

b) The Approval Holder shall secure from the Administrator an approval amendment prior to excavating below the watertable.

9. **Separation Distances**

a) The Approval Holder shall not locate the Active Area of the quarry within:

i) 30 m of the boundary of a public or common highway.

ii) 30 m of the bank of any watercourse or ordinary high water mark.

iii) 30 m of the boundary of the quarry property.

b) The Approval Holder shall not blast within:

i) 30 m of the boundary of a public or common highway.

ii) 30 m of the bank of any watercourse or ordinary high water mark.

iii) 800 m of the foundation or base of a structure located off site.

iv) 30 m of the property boundary when a structure on the abutting property is not involved.

10. **Blasting**

a) The Approval Holder shall have a technical blast design prepared by a qualified person which ensures the ground vibration and air concussion limits in this Approval can be achieved.

b) The Approval Holder shall conduct a pre-blast survey including a water quality analysis of all structures within 800 metres of the Facility. The survey shall be conducted in accordance with the Department's 'Procedure For Conducting a Pre-Blast Survey" and **the results of this survey sent to the Department prior to any blasting on the Site**. Water quality parameters will be determined by NSDEL staff.

c) The Approval Holder shall call the nearest weather office, to assess the climatic conditions prior to conducting any blasting. No blasting will be permitted if a thermal inversion is anticipated at the time of the proposed blast.

d) No blasting shall occur on Sunday, on a statutory holiday prescribed by the Province, or on any day between 1800 and 0800 hours.

d) The Approval Holder shall ensure that all blasts are monitored for concussion and ground vibration to ensure that the limits in Table 2 are not exceeded:

Table 2			
Blasting Limits			
Parameters	**Maximum**	**Monitoring Frequency**	**Monitoring Station**
Concussion (Air Blast)	128 dBL	Every Blast	Within 7 m of the nearest structure not located on the Site
Ground Vibration	0.5 in/sec (12.5 mm/s)	Every Blast	Below grade or less than 1 m above grade in any part of the nearest structure not located on the Site

e) The monitoring station for blasting shall be as indicated in Table 2. Additional monitoring stations for blasting may be specified as required by the Department.

f) A monthly summary of results of monitoring shall be submitted to the Department.

g) Blasts during the first year shall be restricted to a maximum of 30,000 tonnes for any blast providing that all blasting limits are met.

11. **Rehabilitation**

a) The Approval Holder shall post an interim security in a form acceptable to the Department in the amount of $2,500.00 an acre of disturbed area on or before **May 27, 2005** and before any earth moving or blasting occurs at the Site.

b) The interim security shall not exceed one (1) year unless otherwise agreed in writing by the Administrator.

c) The Approval Holder shall submit a rehabilitation plan to the Department for review by **August 26, 2005**. The rehabilitation plan shall be revised and updated every three years thereafter and submitted to the Department for review. The rehabilitation plan shall include the estimated total cost for labour, equipment, supplies and services of a third party contractor to undertake the following activities:

i) surface contouring
ii) establishing proper drainage
iii) revegetation work
iv) any work necessary to reclaim the quarry

d) Before the expiry of the interim security, the Approval Holder shall post a final security which shall be calculated using the rehabilitation plan and factors in item c) above. The final security shall be revised every three years in accordance with the revised rehabilitation plan.

e) The Approval Holder shall rehabilitate the Site within twelve (12) months of abandonment and in accordance with the rehabilitation plan submitted by the Approval Holder in 11 (c) or other terms as specified by the Department,

f) The Nova Scotia Department of Environment and Labour shall release the security to the Approval Holder after final rehabilitation of the Site has been completed to the satisfaction of the Minister or Administrator. The Approval Holder shall notify the Department when rehabilitation has been completed.

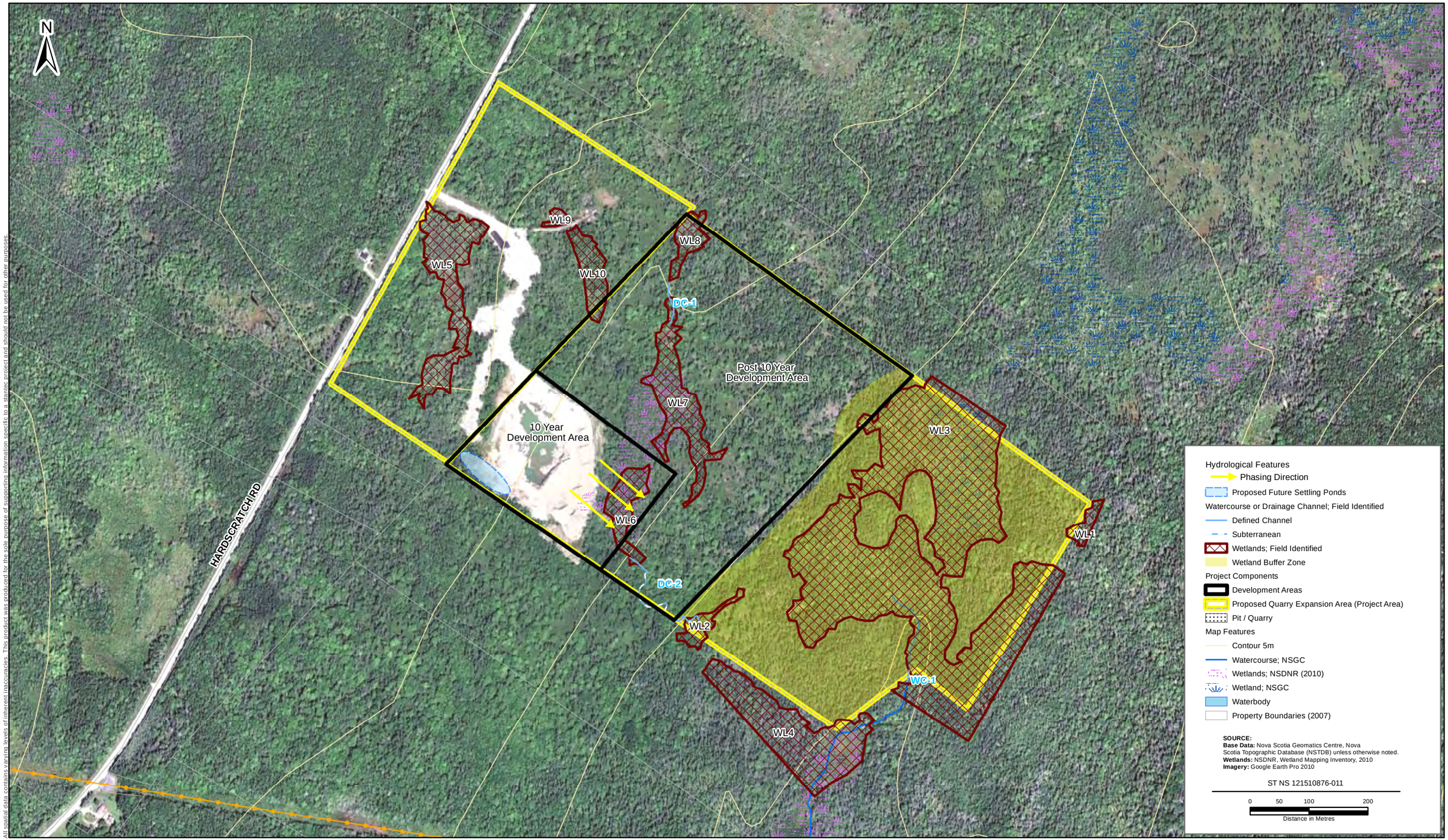
g) The Approval Holder shall ensure that any security posted for rehabilitation be kept valid for the term of the Approval.

12. **Site Specific Conditions**

a) The boundaries of the Site will be cut out and kept reasonably clear of new growth and the corner boundaries shall be clearly marked with permanent markers no less than four feet high.

b) The Approval Holder shall submit scaled engineering drawings of the quarry area, processes and activities including but not limited to: crushing and screening; wash plant and settling pond(s); and stockpiles. These drawings shall be submitted on or before **May 27, 2005** and before any earth moving or blasting occurs at the Site.

APPENDIX B
Proposed Quarry Development Plan



PREPARED BY: R Sutcliffe	LAFARGE HARDSCRATCH QUARRY	FIGURE NO.: 1
REVIEWED BY: K. Fraser	**Quarry Development Plan**	DATE: Jul 17, 2013
LAFARGE		Stantec

Path: \\CD1213-F02\Profit_Centers\1215\active\121510xxx\121510876_ea_lafarge\geomatics\mapping\mxd\report\ST NS-121510876-011_hydro_features_20120217.mxd

APPENDIX C
Lafarge Quarry Extension Hydrology Study

Hydrologic Assessment - Lafarge Quarry Expansion, Yarmouth, NS

Prepared for:

Lafarge Canada Inc.

Prepared by:

Stantec Consulting Limited
102-40 Highfield Park Drive
Dartmouth, NS, B3A 0A3

Project No. 121510876
August 29, 2012

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Lafarge Canada Inc. (Lafarge) to conduct a hydrologic assessment of the existing Lafarge Hardscratch quarry and proposed quarry expansion. This hydrologic assessment is part of the Environmental Assessment Registration document for the proposed quarry expansion project.

The main objectives, data sources, methodology, and results of this hydrologic assessment are included herein.

1.1 OBJECTIVES

The main objectives of this hydrologic assessment are based on Section 6.1.2 of the "Guide for preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia" (NSE, 2008) and are included below:

1. Provide a general description of the hydrologic conditions and flow regimes for all surface water in the vicinity of the existing and proposed quarry development area;

2. Discuss and quantify the potential effects that the quarry activity may have on existing surface water bodies, both on-site and downstream of the quarry area;

3. Estimate the total change in surface water runoff amounts for the existing and full quarry development conditions;

4. Estimate the total required capacity of the detention/siltation facilities (i.e. detention ponds) for the existing and proposed conditions (i.e. full quarry expansion) in order to fulfill acceptable liquid effluent discharge amounts as defined in the "Pit and Quarry Guidelines" (NSE, 1999), and;

5. Assess any potential impacts of the proposed quarry expansion on downstream surface water components with respect to water quantity and quality and propose mitigation measures to minimize any potential effects.

1.2 SITE DESCRIPTION AND BACKGROUND

The Lafarge Hardscratch Quarry is located along Hardscratch Road, near Yarmouth, Nova Scotia. The property has an approximate area of 68 Ha of which approximately 24.3 Ha have been proposed by Lafarge for full quarry development, which has been planned to progress gradually within the next 50+ years.

The current quarry area is approximately 4 Ha and is located near the southwest corner of the property. The property is rectangular in shape with its longest dimension aligned from NW to

SE. Existing site topography slopes to the SE and therefore surface runoff originating from the property drains to the Chebogue River and ultimately to the Atlantic Ocean. It is assumed that as the quarry footprint expands until full development is achieved, all runoff generated off-site and from the undisturbed portions of the Lafarge property will be bypassed around the quarry floor and conveyed to the wetland buffer area and other features that drain directly to the Chebogue River, and therefore the surface runoff volumes that will require treatment will be originated at the quarry floor only.

Based on available stream and contour mapping (5 m resolution) the site was divided into one catchment area. A total of ten wetlands were identified within the quarry property. Out of these, four wetlands will be protected by a proposed buffer area in the eastern end of the property which is the closest to the receiving environment and includes the Chebogue Meadows Provincial Park and the Chebogue River.

Currently the undisturbed sections of the quarry property are comprised mainly of a mixture of forest and wetland areas. Other site features also include a detention pond, one watercourse and two drainage channels, private access roads, and disturbed areas which surround and contain the various activities related to present quarry operations. The quarry operations include blasting, crushing, and stockpiling of material to supply granite and sand to local markets.

This hydrologic assessment was based on a full development scenario from the existing condition (i.e., over the next 50+ years until complete extraction of the material is achieved). . A 30 m buffer zone around each side of all streams, wetlands and property boundaries was included in the hydrologic assessment in recognition of regulated buffers and/or best practices. Future reduction of these buffers could require additional permit applications..

2.0 DATA SOURCES AND METHODOLOGY

In order to conduct this hydrologic assessment, a hydrologic model was constructed to simulate a series of storm events with different magnitudes based on the available Intensity-Duration-Frequency curves for the area. The hydrologic model requires the input of site parameters including but not limited to catchment area, imperviousness, vegetation types, surface geology, topography, soil information and watershed-specific parameters including the time of concentration, soil infiltration and average slope.

The data required for calculations were obtained from several sources. GIS layers containing soil types, elevation contours, watercourses, lakes, wetlands, vegetation and aerial geo-referenced photographs were obtained from the Nova Scotia Department of Natural Resources.

The surface slope, catchment areas, and other physical parameters were estimated using GIS tools and available mapping. The time of concentration was estimated using the Upland Method

included in the National Engineering Handbook, Section 4, Natural Resources Conservation Service (NRCS, 1993).

Rainfall Intensity-Duration-Frequency curves were obtained from Station 8206500 (Yarmouth Airport), operated by Environment Canada. Station 8206500 is located approximately 10 km to the southwest from the site.

Peak flow rates and their associated volumes were calculated for the existing and proposed quarry development conditions using a range of synthetic precipitation events (1:2, 1:5, 1:25, 1:50, and 1:100 year storms) with the hydrologic model HEC-HMS version 3.5.

HEC-HMS is a hydrologic software package developed by the U.S. Army Corp of Engineers and is widely accepted as a tool to conduct hydrologic modeling in rural watersheds. All rainfall events were assumed to have a 24 hour duration and distributed using the alternating block method to generate the corresponding rainfall hyetograph. The peak for all storms was assumed to be located at 50% of the storm duration (USACE, 2000).

3.0 SITE CONDITIONS

3.1 CLIMATE NORMALS

Climate data (total monthly precipitation and average monthly temperatures) were obtained from Climate Normals included in the Environment Canada National Climate Data and Information Archive online (2012). According to the station index, the meteorological station at Yarmouth Airport (Sta.8206500) is the closest to the study area with available temperature and precipitation data. Station 8206500 is located approximately 10 km to the southwest from the Lafarge quarry. Climate Normals, which are calculated by averaging 30 years of climatic data (1971-2000) were used to represent the average conditions present at the Lafarge Quarry property.

Table 1 provides a summary of relevant climate data as well as monthly total precipitation and monthly average temperature that were used to estimate the annual water balance amounts.

According to Webb and Marshall (1999), Yarmouth is located within the Tusket River Ecosystem, which is characterized by early mild springs, cool summers and mild winters due to the influence of the Atlantic Ocean. The monthly average temperature for the Yarmouth area varies from -3 ºC in January and February to 16.9 ºC in August with an annual average temperature of 7 ºC. The extreme maximum and minimum temperatures over the 30 year period were 30.3 ºC and -23.6 ºC recorded on August 1993 and February 1993, respectively.

Table 1 Summary of Canadian Climate Normals for Sta. 8206500, Yarmouth Airport, NS (1971-2000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature (°C)													
Daily Average	-3	-3	0.3	4.9	9.7	13.7	16.5	16.9	13.8	9.1	4.8	-0.2	7
Daily Maximum	1	0.8	4.1	8.7	13.8	17.9	20.6	21	17.8	13.1	8.3	3.6	10.9
Daily Minimum	-7	-6.8	-3.4	1.1	5.4	9.4	12.4	12.7	9.6	5.1	1.3	-4.1	3
Extreme Maximum	14	12.8	17.1	22.4	24.9	28.3	30	30.3	29.4	25	18.8	16.1	-
Date of Occurrence (yyyy/dd)	1995/16	1976/02	1999/28	1990/28	1989/18	1957/17	1968/17+	1993/27	1969/02	1970/09	1977/04	1950/11	-
Extreme Minimum	-21.3	-23.6	-17.6	-10.8	-2.2	1.7	1.7	0	-2.3	-3.9	-9.3	-20	-
Date of Occurrence (yyyy/dd)	1994/27	1993/07	1989/07	1995/05	1972/10+	1945/03	1996/11	1991/23	1980/29	1974/22	1993/25	1942/20	-
Precipitation													
Rainfall (mm)	84.2	65.2	84.1	89.6	97.7	94.2	84.5	74.4	99.1	107.9	123.2	98.7	1102.8
Snowfall (cm)	65.2	44.2	30	9.5	0.8	0	0	0	0	1.6	7.3	42.9	201.4
Precipitation (mm)	136.1	100.8	113.5	98.9	98.5	94.2	84.5	74.4	99.1	109.6	129.9	134.7	1274.1
Extreme Daily Precipitation (mm)	69.6	61.4	96	72.4	72.4	79	92.5	101.1	127.4	172.5	111.3	110.7	-
Date of Occurrence (yyyy/dd)	1956/05	1979/26	1953/25	1973/28	1945/04	1990/11	1967/17	1952/17	1996/02	1959/01	1950/27	1967/04	-

The annual average total precipitation for the area is 1274.1 mm of which 1102.8 mm is in the form of rain and 201.4 cm as a snow equivalent amount.

The annual average wind speed measured at the Yarmouth Airport was 18.1 km/hr; the prevailing wind direction, on an annual basis, is from the NW. The maximum monthly average wind speeds occurred in January with average speeds of 21.7 km/h and the minimum monthly average speeds occurred in August with an average of 13.6 km/h. The average monthly wind speeds are generally higher in the winter than in the summer. Maximum monthly wind gusts measured over the 30-year period ranged from 163 km/h to 80 km/h.

3.2 EVAPOTRANSPIRATION

Annual evapotranspiration amounts were calculated with the Thornwaite equation which required monthly average temperatures to estimate the amount of available energy that can produce evapotranspiration. The monthly average temperature was obtained from the Climate Normals for Station 8206500. The estimated evapotranspiration amount on a yearly basis is 559.1 mm.

3.3 INFILTRATION AMOUNTS

Estimated infiltration amounts for the Yarmouth area were obtained from Kennedy et al. (2010) which indicate that annual infiltration amounts for the Yarmouth area ranges between 260 to 300 mm per year.

3.4 ANNUAL WATER BALANCE

A hydrologic water balance assessment on a yearly basis was conducted with the calculated parameters for evapotranspiration and infiltration. The general equation that describes the long term water balance estimation is:

$$P = ET + R + I$$

Where: P = precipitation

ET = evapotranspiration

R = surface runoff

I = infiltration and storage

The annual water balance results for the area surrounding the quarry indicate that for a total annual precipitation of 1274.1 mm, 44 percent (559.1 mm) is lost to evapotranspiration, 24 percent to infiltration and storage (300 mm) and 32 percent (415 mm) leaves the watershed as surface runoff.

3.5 MEAN ANNUAL SITE RUNOFF ESTIMATION

The change in the mean annual runoff volume for the existing and proposed conditions was calculated by developing a mean annual water balance for the property. The data required to calculate the mean annual water balance is included in the Climate Normals for the area, which were obtained from the Environment Canada database.

As the quarry expands its footprint, it is assumed that both the vegetative cover and topsoil layers will be removed gradually from the site, which will cause an increase in site runoff due to a decrease in evapotranspiration and infiltration. Ultimately the proposed portion of the property will be developed as a quarry with the exception of the required buffer and other undeveloped areas. This scenario also assumes that ultimately the quarry floor will have a very flat surface (assumed to be in the order of 0.2%). Further details regarding mean annual runoff estimations for the existing and proposed conditions are provided in Section 5.1.

4.0 MODEL PARAMETERS

4.1 CATCHMENT AREA

Both the existing and proposed conditions were analyzed under the main assumption that surface water runoff from external areas of the quarry floor will be diverted around the quarry and conveyed directed to downstream receptors. It is also assumed that the surface runoff from external sources will not be in contact with the quarry area and therefore will not require treatment at the quarry. For the modeled scenarios an area of 4 Ha was used for the existing condition and an area of 24.3 Ha for the proposed condition (i.e. full quarry development) which will progress gradually as material is extracted from the quarry.

4.2 RAINFALL EVENTS

Selected rainfall events were included in the hydrologic model (1:2, 1:5, 1:25, 1:50 and 1:100 year frequency storms). These are based on the Intensity-Duration-Frequency (IDF) curves from Station 8206500 (Yarmouth Airport, NS). The IDF curves for Station 8206500 are included in Table 2 for the selected precipitation events included in the model. To generate each storm hyetograph, the model requires a series of storm depths for different intervals which for this case include all values with durations between 5 minutes to 24 hours.

Table 2 Intensity-Duration-Frequency (IDF) data for Station 8206500, Yarmouth Airport (mm)

Storm Duration		Storm Return Period (yrs)				
		2	5	25	50	100
5	min	6.2	7.7	10.1	11.1	12
10	min	9.5	12.3	16.4	18.1	19.8
15	min	11.9	16	22.1	24.6	27.1
30	min	17.4	23.1	31.6	35.1	38.6
1	h	23.1	31.5	44	49.2	54.3
2	h	30.4	39.3	52.8	58.3	63.9
3	h	36	45	59	65	71
6	h	49.1	58.6	72.9	78.8	84.6
12	h	60.7	71.1	86.7	93.2	99.6
24	h	66.3	80.9	102.9	112	121.1

4.3 IMPERVIOUSNESS

The imperviousness (as a percentage) was estimated for the quarry area assuming that the topsoil layer will be removed, therefore increasing imperviousness within the quarry floor. The imperviousness for the quarry floor was therefore estimated to be in the order of 70%.

4.4 TIME OF CONCENTRATION

The time of concentration (Tc) was estimated using the Upland Method included in NRCS, (1993). The Tc for both the existing and proposed quarry areas was estimated based on the length of path for overland runoff, average slope and surface type. The parameters used for the calculation of Tc are included in Table 3.

Table 3 Parameters for the determination of time of concentration (Tc)

Scenario	Area (Ha)	Flow Path Length (m)	Slope (m/m)	Tc (min)
Existing	4	300	0.002	6
Proposed	24.3	650	0.002	12

5.0 RESULTS

5.1 MEAN ANNUAL SITE RUNOFF ESTIMATION

Based on Climate Normals (1971-2000) from station 8206500 (Yarmouth Airport), the average annual precipitation at the site is in the order of 1274.1 mm. This includes rainfall and snowfall amounts.

Total annual potential evapotranspiration in the area has been estimated using the Thornthwaite Equation. Annual evapotranspiration is therefore in the order of 559.1 mm and the annual infiltration in the order of 300 mm.

The remaining 415 mm can contribute to surface runoff and corresponds to 32% of the average annual precipitation. It has been estimated that surface runoff from the site will increase by 20% as a result of the quarry expansion; this takes into account an equivalent decrease in evapotranspiration and infiltration and an increase in runoff amounts.

Although it is difficult to accurately determine the effects of climate change within the next century, there is general agreement that the magnitude of precipitation events will likely increase. Since the site will be developed over a long period of time (>50 years) it is advisable to account for climate change effects, and therefore an extra 20% increase in mean annual precipitation was assumed as a conservative approach. Therefore, the annual effective precipitation at the site after full development is assumed to be 597.6 mm.

The existing and post development yearly surface runoff volumes were estimated by multiplying the estimated annual precipitation by its corresponding catchment area. The results are presented on Table 4.

Table 4 Existing and post development surface runoff volume estimations

Scenario	Area (Ha)	Effective Annual Runoff (mm)	Runoff Volume (m^3)	Average Annual Flow Rate (L/s)
Existing condition	4	415	16,600	0.53
Full Development	24.3	597.6	145,216	4.60

Therefore, the average annual site runoff volume due to the proposed full quarry expansion has been estimated to increase from 16,600 m^3 to 145,216.8 m^3 after full quarry development.

5.2 PEAK FLOWS AND VOLUMES

Flow hydrographs developed with the hydrologic model for all considered precipitation events and both the existing and proposed quarry development conditions are shown in Figure 1 and Figure 2, respectively.

Figure 1 Flow hydrographs for all considered precipitation events – Existing condition

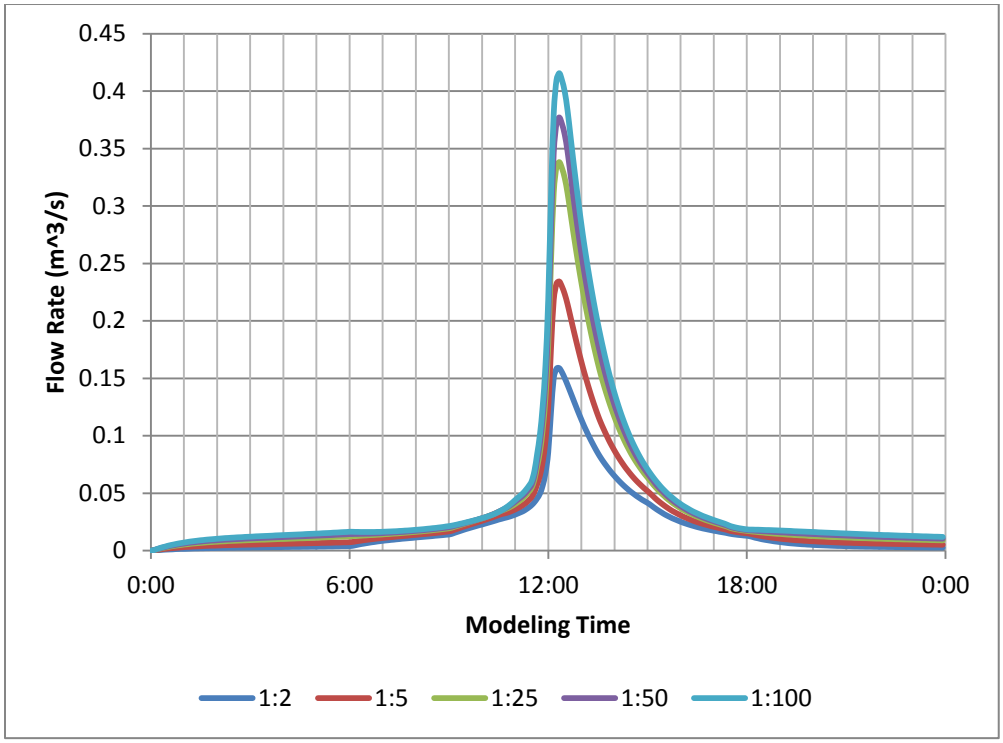
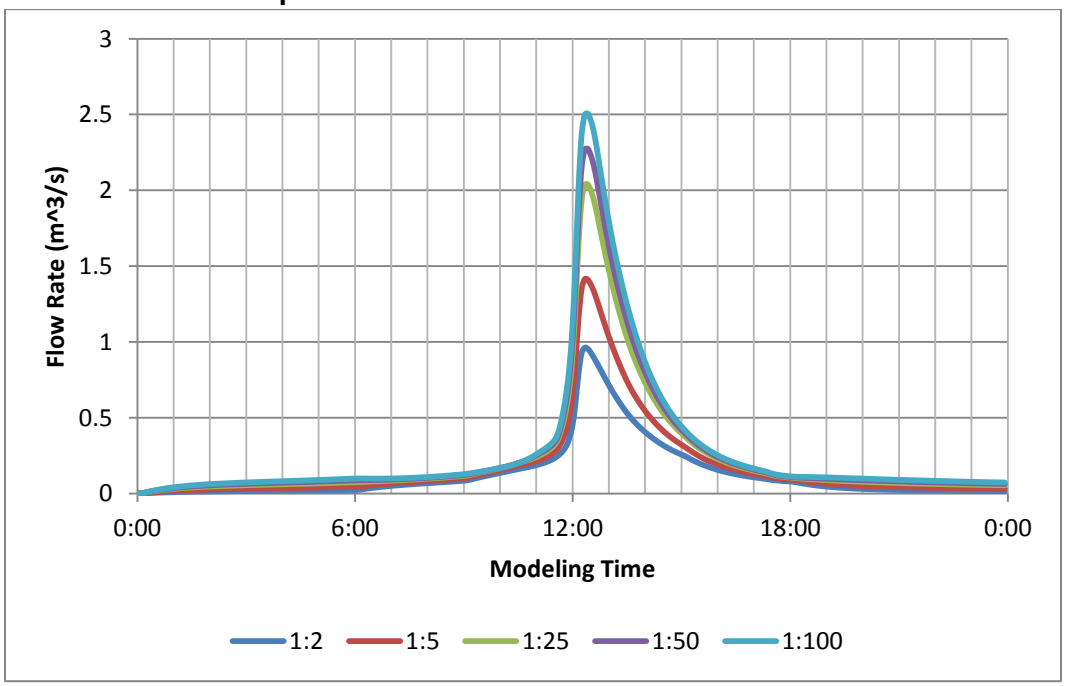


Figure 2 Flow hydrographs for all considered precipitation events – Proposed condition



A summary of storm peak flows and volumes for both scenarios are included in Table 5.

Table 5 Summary of Results from the hydrologic model

Existing Condition		
Return Period	**Peak Flow (m^3/s)**	**Volume (m^3)**
1:2	0.16	1,820
1:5	0.23	2,490
1:25	0.34	3,380
1:50	0.38	3,700
1:100	0.42	4,020
Proposed Condition		
Return Period	**Peak Flow (m^3/s)**	**Volume (m^3)**
1:2	0.96	11,090
1:5	1.41	15,150
1:25	2.04	20,500
1:50	2.27	22,480
1:100	2.5	24,420

These values will be used to size the detention and siltation treatment facilities as well as the required hydraulic structures that are required to maintain the minimum recommended drawdown period to optimize water quality objectives.

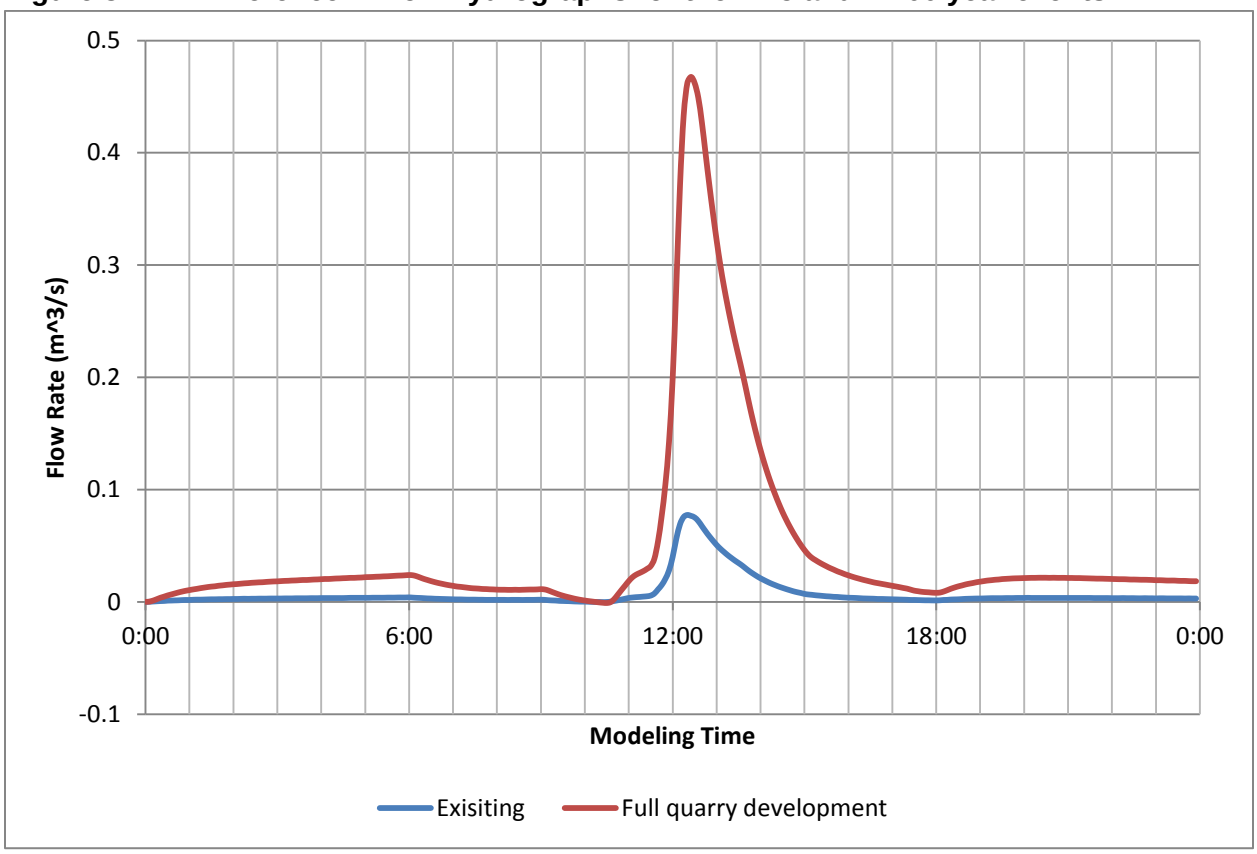
5.3 FLOW DETENTION AND SILTATION TREATMENT FACILITIES

It is recommended to size the flow detention pond to detain the volume from the 24 hour 1:25 year rainfall event, assuming that the excess volumes for any storm with a larger magnitude than the 1:25 year event will be released without treatment. Based on the hydrologic model results, once full quarry development is achieved the detention pond should be sized to store 20,500 m^3 of surface water runoff as active volume. Since this volume is required only after full expansion; the volume of the pond should be increased gradually over time as the quarry footprint is expanded. This capacity does not include any extra volume required for sedimentation purposes or integrates the depth of the water table which could affect active storage, especially during large precipitation events when the water table is likely to rise.

Based on the simulations completed for the 24 hour 1:100 year event, the peak flows for the existing and proposed conditions are estimated to be in the order of 0.42 m^3/s and 2.5 m^3/s, respectively. The discharge structures at the exit of the detention pond should be designed to accommodate as a minimum the excess discharge between the 1:25 and the 1:100 year rainfall events.

The difference in flow hydrographs between the 1:25 and 1:100 year rainfall events for the existing and proposed conditions are shown on Figure 3. As indicated, after full quarry development the weir structure should be sized to accommodate a minimum of 0.5 m^3/s.

Figure 3 Difference in flow hydrographs for the 1:25 and 1:100 year events



Drawdown of water levels from the 1:25 year rainfall event to the permanent pool detention level should be estimated based on a detention time that will improve water quality. A recommended drawdown period of 24 hours is expected to decrease suspended sediment concentrations by as much as 80%. Based on the low flow threshold of 24 hour discharge for runoff events equal or smaller that the 1:25 year rainfall event, the mean discharge capacity should be 0.24 m^3/s. As a result, an appropriately designed weir or orifice is recommended as the most suitable discharge structure which is expected to control peak discharge volumes reducing the risk of downstream erosion and extending the discharge time to downstream hydrologic features.

The Nova Scotia Department of Environment Pit and Quarry Guidelines (1999) define maximum concentrations of suspended solids from storm runoff and liquid effluents that are generated at the site. The guidelines indicate that the maximum suspended solid concentration in any grab sample shall not exceed 50 mg/L and that the maximum arithmetic monthly average suspended solid concentration shall not exceed 25 mg/L. A properly designed monitoring program should be established to ensure that these guidelines are met at all times.

Maintenance of the detention structures may be warranted over time as sediment particles deposit at the bottom reducing active storage. The sediment must be collected and disposed of following all applicable regulations.

6.0 CONCLUSIONS

The following conclusions are offered based on the desktop hydrology study for the proposed Lafarge Hardscratch quarry expansion project:

- The existing mean annual runoff volume within the quarry is estimated to be in the order of 16,600 m^3;
- The total increase in the mean annual runoff for the site resulting from the proposed expansion (full quarry development) is in the order of 145,216 m^3;
- The flow detention structures for the full quarry expansion should be able to accommodate a volume of 20,500 m^3, which corresponds to the 24 hour 1:25 year rainfall event. The dimensions of the proposed detention ponds will depend on site characteristics; for example, a single detention pond able to accommodate this volume should have approximate dimensions of 80 m x 80 m x 3.2 m;
- Ultimately, the outlet structures for each detention pond should be able to accommodate a total discharge of approximately 0.5 m^3/s which corresponds to the difference in flows between the 1:25 and the 1:100 year rainfall events for full quarry development;
- Based on a recommended detention time of 24 hours for any precipitation event equal or smaller than the 1:25 year event, the required weir(s) should be designed to conform to a discharge capacity of 0.24 m^3/s. The maximum discharge capacity should be maintained to remove accumulated sediment;
- Flow detention structures should be placed immediately downstream of the quarry facilities to capture all surface runoff before it is conveyed towards the receiving environment. This will also help to attenuate peak flows, reduce the slope of the recession limb and to some extent maintain pre-development conditions;
- Drainage features should be constructed with appropriate erosion and sediment control measures to direct and convey site surface runoff to their corresponding flow detention and sediment control structures; and
- The surface water runoff from the site should comply with the applicable guidelines for the protection of the aquatic environment, this is especially important given the presence of the Chebogue Meadows Provincial Park which is situated just downstream of the proposed wetland buffer area.

7.0 CLOSURE

This report has been prepared for the sole benefit of Lafarge Canada Inc. The report may not be used by any other person or entity without the express written consent of Stantec Consulting Ltd. and Lafarge Canada Inc.

Any uses that a third party makes of this report, or any reliance on decisions made based on it, are the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken, based on this report.

The information and conclusions contained in this report are based upon work undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. Conclusions and recommendations presented in this report should not be construed as legal advice.

The conclusions presented in this report represent the best technical judgment of Stantec Consulting Ltd. based on the data obtained from the work. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

This report was prepared by Andres Rodriguez, M.Sc.E., P.Eng. (NB) and reviewed by Robert Federico.

Respectfully submitted,

STANTEC CONSULTING LTD.

Originally signed by

Andres Rodriguez, M.Sc.E., P.Eng.(NB)
Water Resources Engineer
Andres.Rodriguez@stantec.com

8.0 REFERENCES

Kennedy et al. 2010. Estimation of Regional Groundwater Budgets in Nova Scotia. Nova Scotia Department of Natural Resources. Open File Illustration ME-2010-2. Halifax, Nova Scotia.

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Webb K.T. and Marshall I.B., 1999. Ecoregions and Ecodistricts of Nova Scotia. Agriculture and Agri-Food Canada and Environment Canada. 39 pp and 1 map.

APPENDIX D
Project Information Bulletin and Letters

Lafarge Canada Inc.
Lafarge Hardscratch Quarry Extension Project
Project Information Sheet

Project Overview

Lafarge Canada Inc. proposes to extend its quarry activities at the existing facility in Yarmouth, Nova Scotia (refer to Figure 1 on reverse). The current operation is approximately 3.9 hectares in area. The proposed extension will incorporate land north west of the existing quarry to increase the total size of the operation to approximately 46 hectares. The quarry is an important local source of high quality stone that is primarily used for local construction projects. Depending on market demand, the proposed activities will take place over an extended period of time until the material is exhausted.

Proposed project activities will be consistent with current quarry operations. These activities were approved by Nova Scotia Environment (NSE) (in 2005) and in accordance with the *Nova Scotia Pit and Quarry Guidelines* (NSE 1999). Blasting, crushing, washing and stockpiling of aggregate is proposed to take place at the extension site. Aggregate production begins with drilling and blasting, which will be conducted by a licensed blasting contractor. After blasting, portable crushing equipment will be brought to the site periodically to process the blasted rock. Various products (*i.e.*, various aggregate sizes) will be stockpiled at the quarry site until they are transported to local markets via tandem trucks or tractor trailer trucks via existing haul routes. It is anticipated that production and trucking activity will be similar to current conditions and may vary with market demand for the aggregates. The proposed operating schedule is consistent with the current operating schedule.

Environmental Assessment Process

Lafarge Canada Inc. is required to register this project as a Class I Undertaking pursuant to the Nova Scotia *Environment Act* and *Environmental Assessment Regulations*. The environmental assessment registration is currently being prepared by environmental consultants Stantec, on behalf of Lafarge Canada Inc., to fulfill these regulatory requirements. Other relevant provincial regulations include *the Activities Designation Regulations*, which requires an Industrial Approval from Nova Scotia Environment for the quarry operation, and the *General Blasting Regulations* made pursuant to the Nova Scotia *Occupational Health and Safety Act* (1996). Provincial guidelines to be adhered to include the Nova Scotia *Pit and Quarry Guidelines* (NSE 1999).

The environmental assessment registration will evaluate potential environmental effects of the project and identify appropriate mitigation and monitoring where necessary to minimize these effects. The environmental assessment registration document will be available for public review and comment once it is filed with NSE.

Environmental Document Components

The environmental registration document focuses on those aspects of the environment that are considered to be of most concern. Components to be evaluated include:

- rare and sensitive flora;
- wildlife;
- surface water resources
- groundwater resources;
- wetlands;
- archaeological and heritage resources;
- atmospheric environment (includes dust and noise); and
- socio-economic environment.

Potential effects of quarry activities on these components will be addressed in the registration document.

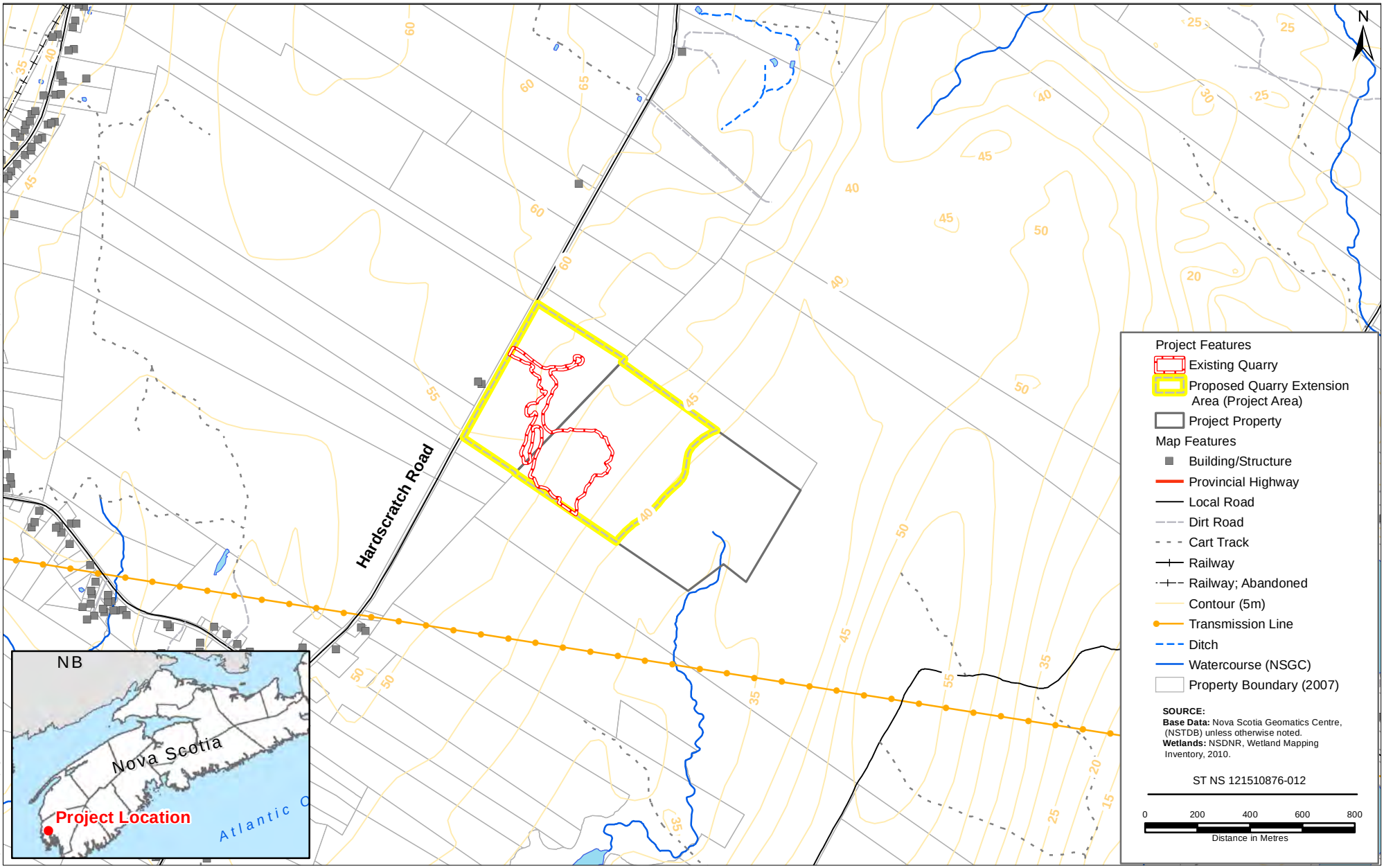
The proposed extension will result in the conservation of several wetlands in a buffer area (approximately 23 hectares). Extraction will be phased to minimize disturbance and the quarry will be progressively rehabilitated. No federally or provincially-listed species or other sensitive features have been identified on-site to date. Based on the proposed mitigative measures, government guidelines and approvals, there are no significant adverse environmental or socio-economic effects anticipated.

Contacts

If you have any questions or concerns about this project please contact:

Lafarge Canada Inc.
George Purdy, Yarmouth Plant Manager
28 Industry Avenue, Yarmouth, NS B5A 4B2
(902) 742-7273

Stantec Consulting Ltd.
Kelley Fraser, MES, Project Manager
Robert Federico, MPA, Senior Advisor
102-40 Highfield Park Dr., Dartmouth, NS B3A 0A3
Tel: (902) 468-7777
E-mail:kelley.fraser@stantec.com
robert.federico@stantec.com



PREPARED BY: R. Sutcliffe	Lafarge Hardscratch Quarry	FIGURE NO.: 1
REVIEWED BY: K. Fraser	**Project Base Map**	DATE: Jul 17, 2013
CLIENT: LAFARGE		Stantec

File Path: \\CD1213-F02\Profit_Centers\1215\active\121510xxx\121510876_ea_lafarge\geomatics\mapping\mxd\report\ST NS-121510876-012_ProjectBaseMap_20120228.mxd

Stantec Consulting Ltd.
102 - 40 Highfield Park Drive
Dartmouth NS B3A 0A3
Tel: (902) 468-7777
Fax: (902) 468-9009

March 19, 2012
File: 121510876

Native Council
324 Abenaki Road
PO Box 1320
Truro, NS B2N 5N2

Attention: Mrs. Grace Conrad

Dear Mrs. Conrad:

Reference: Lafarge Hardscratch Quarry Extension Project

This letter is to inform you of a proposed Project near Yarmouth, Yarmouth County, Nova Scotia.

The Project consists of an extension of quarry activities at an existing facility on Hardscratch Road near Yarmouth, Yarmouth County, Nova Scotia. The developer, Lafarge Canada Inc., is proposing to extend the area of the existing Lafarge Hardscratch Quarry while maintaining approximately the same level of production which is used primarily for supplying granite to local gravel and concrete markets as well as aggregate for asphalt. Lafarge Canada Inc. is currently preparing the documentation required to register this Project under the Environmental Assessment Regulations pursuant to the Nova Scotia *Environment Act.*

Please find enclosed the Project Information Sheet and corresponding Figure, which provide further details regarding the Project and the site location.

Please contact the undersigned or the contacts listed on the Project Information Sheet with any comments, concerns, or questions you may have regarding the project.

Sincerely,

STANTEC CONSULTING LTD.

Kelley Fraser, MES
Project Manager
Tel: (902) 468-7777
Fax: (902) 468-9009
Kelley.fraser@stantec.com

Attachment

Stantec Consulting Ltd.
102 - 40 Highfield Park Drive
Dartmouth NS B3A 0A3
Tel: (902) 468-7777
Fax: (902) 468-9009

March 19, 2012
File: 121510876

Kwilmu'kw Maw-klusuaqn
Mi'kmaq Rights Initiative
851 Willow Street, Truro, NS
B2N 6N8

Attention: Ms. Twila Gaudet

Dear Ms. Gaudet:

Reference: Lafarge Hardscratch Quarry Extension Project

This letter is to inform you of a proposed Project near Yarmouth, Yarmouth County, Nova Scotia.

The Project consists of an extension of quarry activities at an existing facility on Hardscratch Road near Yarmouth, Yarmouth County, Nova Scotia. The developer, Lafarge Canada Inc., is proposing to extend the area of the existing Lafarge Hardscratch Quarry while maintaining approximately the same level of production which is used primarily for supplying granite to local gravel and concrete markets as well as aggregate for asphalt. Lafarge Canada Inc. is currently preparing the documentation required to register this Project under the Environmental Assessment Regulations pursuant to the Nova Scotia *Environment Act.*

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Sincerely,

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Kelley Fraser, MES
Project Manager
Tel: (902) 468-7777
Fax: (902) 468-9009
Kelley.fraser@stantec.com

Attachment

Stantec Consulting Ltd.
102 - 40 Highfield Park Drive
Dartmouth NS B3A 0A3
Tel: (902) 468-7777
Fax: (902) 468-9009

March 19, 2012
File: 121510876

Confederacy of Mainland Mi'kmaq
57 Martin Crescent
P.O. Box 1590
Truro, NS, B2N 5V3

Attention: Mr. Donald M. Julien

Dear Mr. Julien:

Reference: Lafarge Hardscratch Quarry Extension Project

This letter is to inform you of a proposed Project near Yarmouth, Yarmouth County, Nova Scotia.

The Project consists of an extension of quarry activities at an existing facility on Hardscratch Road near Yarmouth, Yarmouth County, Nova Scotia. The developer, Lafarge Canada Inc., is proposing to extend the area of the existing Lafarge Hardscratch Quarry while maintaining approximately the same level of production which is used primarily for supplying granite to local gravel and concrete markets as well as aggregate for asphalt. Lafarge Canada Inc. is currently preparing the documentation required to register this Project under the Environmental Assessment Regulations pursuant to the Nova Scotia *Environment Act.*

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Sincerely,

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Kelley Fraser, MES
Project Manager
Tel: (902) 468-7777
Fax: (902) 468-9009
Kelley.fraser@stantec.com

Attachment

Stantec Consulting Ltd.
102 - 40 Highfield Park Drive
Dartmouth NS B3A 0A3
Tel: (902) 468-7777
Fax: (902) 468-9009

March 19, 2012
File: 121510876

Union of Nova Scotia Indians
47 Maillard Street
Membertou, NS B1S 2P5

Attention: Mr. Joe B. Marshall

Dear Mr. Marshall:

Reference: Lafarge Hardscratch Quarry Extension Project

This letter is to inform you of a proposed Project near Yarmouth, Yarmouth County, Nova Scotia.

The Project consists of an extension of quarry activities at an existing facility on Hardscratch Road near Yarmouth, Yarmouth County, Nova Scotia. The developer, Lafarge Canada Inc., is proposing to extend the area of the existing Lafarge Hardscratch Quarry while maintaining approximately the same level of production which is used primarily for supplying granite to local gravel and concrete markets as well as aggregate for asphalt. Lafarge Canada Inc. is currently preparing the documentation required to register this Project under the Environmental Assessment Regulations pursuant to the Nova Scotia *Environment Act.*

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Sincerely,

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Kelley Fraser, MES
Project Manager
Tel: (902) 468-7777
Fax: (902) 468-9009
Kelley.fraser@stantec.com

Attachment

Stantec Consulting Ltd.
102 - 40 Highfield Park Drive
Dartmouth NS B3A 0A3
Tel: (902) 468-7777
Fax: (902) 468-9009

March 19, 2012
File: 121510876

Chief and Council
Acadia First Nation
10526 Highway #3
Yarmouth, N.S.
B5A 4A8

Attention: Chief Deborah Robinson and Council

Reference: Lafarge Hardscratch Quarry Extension Project

This letter is to inform you of a proposed Project near Yarmouth, Yarmouth County, Nova Scotia.

The Project consists of an extension of quarry activities at an existing facility on Hardscratch Road near Yarmouth, Yarmouth County, Nova Scotia. The developer, Lafarge Canada Inc., is proposing to extend the area of the existing Lafarge Hardscratch Quarry while maintaining approximately the same level of production which is used primarily for supplying granite to local gravel and concrete markets as well as aggregate for asphalt. Lafarge Canada Inc. is currently preparing the documentation required to register this Project under the Environmental Assessment Regulations pursuant to the Nova Scotia *Environment Act.*

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Kelley Fraser, MES
Project Manager
Tel: (902) 468-7777
Fax: (902) 468-9009
Kelley.fraser@stantec.com

Attachment

APPENDIX E
Fish Habitat Survey

Watercourse 1 (WC-1) Downstream of WL3

Looking upstream towards Project Area

Looking downstream

Substrate example

Streambank vegetation

Drainage Channel 1 (DC-1)

Looking downstream towards WL2

Substrate example

Drainage Channel 2 (DC-2)

Looking Downstream towards WL7

Substrate example

APPENDIX F
Rare and Sensitive Plants Identified during Modelling Exercise as being Potentially Present in Project Area

Table F-1 Plant Species of Conservation Concern Recorded as Being Potentially Present Within 100 km of the Project Area and Information on their Preferred Habitat, Phenology, and Population Status

Scientific Name	Common Name	Habitat	Flowering Season	Likely our Unlikely to Occur on Site?	ACCDC Rank	NSDNR Rank (New)	COSEWIC	NS ESA Rank	Distance Recorded from Site
Pseudevernia cladonia	Ghost Antler Lichen	Occurs on twigs of conifers in cool montane and coastal spruce-fir forests in eastern North America. It is very patchily distributed in New Brunswick and Nova Scotia, probably owing to dispersal limitations.	-	Unlikely	S2S3	3 Sensitive	Special Concern	-	25 ±10
Erioderma pedicellatum (Atlantic pop.)	Boreal Felt Lichen (Atlantic pop.)	Generally, most habitats are found on northerly exposed slopes where cool and moist habitat conditions prevail, throughout much of the year.	-	Unlikely	S1S2	1 At Risk	Endangered	Endangered	71 ±0.1
Toxicodendron vernix	Poison Sumac	Swampy lakeshores, marsy areas.	May to July	Unlikely	S1	2 May Be At Risk	-	-	92 ±0.1
Conioselinum chinense	Chinese Hemlock-parsley	Swamps, mossy coniferous woods or swales, and seepy slopes near the coast.	August to October	Possible	S2	3 Sensitive	-	-	48 ±0.5
Hydrocotyle umbellata	Water Pennywort	Wet, sandy and gravelly lake margins	Not given for NS.	Unlikely	S1	1 At Risk	Threatened	Endangered	13 ±0
Lilaeopsis chinensis	Eastern Lilaeopsis	Muddy and rocky tidal banks, in estuaries.	July and August	Unlikely	S2	3 Sensitive	Special Concern	Vulnerable	6 ±0
Asclepias incarnata ssp. pulchra	Swamp Milkweed	Swamps, thickets and on shores.	Flowers in early August	Unlikely	S2S3	5 Undetermined	-	-	23 ±0
Baccharis halimifolia	Eastern Baccharis	By woodland streams or in calcareous woods.	Not given for NS.	Unlikely	S1	2 May Be At Risk	-	-	10 ±10
Coreopsis rosea	Pink Tickseed	Cobbly, sandy beaches and the peaty margins of lakes, rivers, and boggy savannahs.	August	Unlikely	S1	1 At Risk	Endangered	Endangered	3 ±0
Erigeron philadelphicus	Philadelphia Fleabane	Old fields, meadows, and springy slopes.	Flowers June to August	Possible	S2	3 Sensitive	-	-	22 ±1
Eupatorium dubium	Coastal Plain Joe-pye-weed	Rocky shores, swamps and damp thickets.	August and September, can be identified when not in flower.	Possible	S2	2 May Be At Risk	-	-	4 ±1
Hieracium kalmii	Kalm's Hawkweed	Roadsides, rough ground, clearings and thickets.	Flowers July and August	Possible	S2?	5 Undetermined	-	-	50 ±0.5
Hieracium kalmii var. fasciculatum	Kalm's Hawkweed	Roadsides, rough ground, clearings and thickets.	July to October	Possible	S2?	5 Undetermined	-	-	98 ±0.5
Hieracium robinsonii	Robinson's Hawkweed	Rock crevices and cliffs, cobble shores, and along streams.	Flowers July and August	Unlikely	S2	3 Sensitive	-	-	27 ±1
Iva frutescens ssp. oraria	Big-leaved Marsh-elder	Roadside embankments and salt marshes, always near the seashore.	August to September	Unlikely	S2	3 Sensitive	-	-	12 ±1
Lactuca hirsuta var. sanguinea	Hairy Lettuce	Dry open woods and cut-over areas.	July to September	Possible	S2	3 Sensitive	-	-	4 ±0
Megalodonta beckii	Water Beggarticks	Shallow, quiet waters, slow-moving streams, and ponds.	August and September	Unlikely	S3	3 Sensitive	-	-	51 ±0.5
Prenanthes racemosa	Glaucous Rattlesnakeroot	Cliff edges and exposed wetlands.	August and September	Unlikely	S1	2 May Be At Risk	-	-	61 ±0.1
Senecio pseudoarnica	Seabeach Ragwort	Gravelly to somewhat sandy sea beaches.	Late July to August	Unlikely	S2	3 Sensitive	-	-	12 ±0.1
Solidago hispida	Hairy Goldenrod	Woods and forest edges.	Summer and fall	Possible	S1?	2 May Be At Risk	-	-	27 ±5
Symphyotrichum boreale	Boreal Aster	Gravelly soil of lake beaches, along streams and the edges of bogs.	August and September	Possible	S2?	3 Sensitive	-	-	3 ±0
Symphyotrichum undulatum	Wavy-leaved Aster	Old fields and the edges of thickets.	August and September	Unlikely	S2	3 Sensitive	-	-	53 ±10
Symphyotrichum ciliolatum	Fringed Blue Aster	Open fields, lawns and the edges of woods.	August and September	Unlikely	S2S3	3 Sensitive	-	-	78 ±0
Alnus serrulata	Smooth Alder	Lakeshores.	February to May, throughout its range.	Unlikely	S3	3 Sensitive	-	-	100 ±0
Betula pumila	Bog Birch	Bogs and bog meadows, often mixed with alders matching the 1-3m height of the birches.	May and June. Can be identified without flowers.	Possible	S2S3	3 Sensitive	-	-	96 ±0.5

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Scientific Name	Common Name	Habitat	Flowering Season	Likely our Unlikely to Occur on Site?	ACCDC Rank	NSDNR Rank (New)	COSEWIC	NS ESA Rank	Distance Recorded from Site
Betula michauxii	Newfoundland Dwarf Birch	Peat and sphagnous bogs.	June and July, can be identified when not in flower.	Possible	S2	3 Sensitive	-	-	45 ±5
Cardamine parviflora var. arenicola	Small-flowered Bittercress	Dry woods, shaded or exposed ledges, and in sandy soils.	April to August	Unlikely	S2	3 Sensitive	-	-	48 ±5
Minuartia groenlandica	Greenland Stitchwort	Granitic ledges and gravel, on coasts at higher elevations.	June to August	Unlikely	S2	3 Sensitive	-	-	60 ±10
Sagina nodosa	Knotted Pearlwort	Sea cliffs, sand flats and dune slopes.	Not given for NS	Unlikely	S2S3	4 Secure	-	-	50 ±0.1
Sagina nodosa ssp. borealis	Knotted Pearlwort	Sea cliffs, sand flats and dune slopes.	Not given for NS	Unlikely	S2S3	4 Secure	-	-	48 ±5
Chenopodium rubrum	Red Pigweed	Salt marshes, seashores, and saline soils.	August to November	Unlikely	S1?		-	-	84 ±0
Suaeda maritima ssp. richii	White Sea-blite	Salt marshes, muddy saline shores, along running dykes and in low-lying areas on marshes and dykelands, also around salt ponds or springs.	August and early September	Unlikely	S1	5 Undetermined	-	-	35 ±0.1
Suaeda calceoliformis	Horned Sea-blite	Saline or alkaline flats and marshes.	Not given for NS	Unlikely	S2S3	4 Secure	-	-	10 ±10
Hudsonia ericoides	Pinebarren Golden Heather	Dry, rocky, and sandy barrens. Recently disturbed areas or on open sandy soils	Late May to early July	Possible	S2	3 Sensitive	-	-	39 ±1
Clethra alnifolia	Coastal Sweet Pepperbush	The shores of lake headwaters, swamps, damp thickets, and sandy woods.	Late September to October	Unlikely	S1	3 Sensitive	Special Concern	Vulnerable	19 ±10
Hypericum dissimulatum	Disguised St John's-wort	On shores and damp open areas.	Not provided	Unlikely	S2S3	3 Sensitive	-	-	52 ±0.5
Hypericum majus	Large St. John's-wort	Wet or dry open soil.	July to September	Unlikely	S1	2 May Be At Risk	-	-	76 ±1
Cornus suecica	Swedish Bunchberry	Sphagnous depressions in barrens, gravelly shores, and dry exposed headlands.	Late June	Unlikely	S1S2	3 Sensitive	-	-	96 ±0.1
Crassula aquatica	Water Pygmyweed	Brackish, muddy shores and sandy flats. The borders of muddy ponds near the coast.	July to September	Unlikely	S2	3 Sensitive	-	-	61 ±0.1
Cuscuta cephalanthi	Buttonbush Dodder	Low-lying ground near seashore, often parasitic on Asters.	August and September	Unlikely	S1	2 May Be At Risk	-	-	84 ±0
Drosera filiformis	Thread-leaved Sundew	Nutrient-poor (ombotrophic) peat bogs, peaty depressions with immediate moisture, and where there is little competition from shrubs.	Mid-July to late August.	Unlikely	S1	1 At Risk	Endangered	Endangered	56 ±10
Vaccinium uliginosum	Alpine Bilberry	Cool coastal bogs and on subalpine summits. Dry or wet organic and inorganic soils, tolerant of high copper concentrations.	Not given for NS. Likely identifiable from early summer to October	Unlikely	S2	3 Sensitive	-	-	45 ±5
Desmodium canadense	Canada Tick-trefoil	Typically around river banks and exposed adjacent flood plain area including open woods and thickets.	Late July(August) to early September, can be identified when not in flower.	Unlikely	S1	2 May Be At Risk	-	-	58 ±10
Desmodium glutinosum	Large Tick-Trefoil	Rich deciduous woods or intervales.	June and July	Unlikely	S1	2 May Be At Risk	-	-	86 ±0.1
Sabatia kennedyana	Plymouth Gentian	Cobbly, sandy beaches and the peaty margins of lakes, rivers and boggy savannahs.	Not given for NS	Unlikely	S1	1 At Risk	Threatened	Endangered	4 ±0
Myriophyllum farwellii	Farwell's Water Milfoil	Ponds and slow-moving streams.	Flowers June to September	Possible	S2	3 Sensitive	-	-	20 ±10
Proserpinaca palustris var. palustris	Marsh Mermaidweed	Boggy swales, savannas, wet marshes and the edges of streams.	Not given for NS.	Possible	S1?	2 May Be At Risk	-	-	9 ±0
Hedeoma pulegioides	American False Pennyroyal	Stony till and upland pastures, throughout northern part of NS. Near seashores occasionally.	August	Unlikely	S2S3	3 Sensitive	-	-	12 ±5

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Teucrium canadense	Canada Germander	Gravelly seashores, generally at crest of beach, above direct tidal influence.	Flowers July to September when easiest to identify but identifiable from June to October	Unlikely	S3	3 Sensitive	-	-	9 ±5
Utricularia gibba	Humped Bladderwort	Shallow lake margins, small pools and small ponds in quagmires or peaty situations.	Late June to September. Can be identified without flowers, but is very cryptic.	Unlikely	S3S4	4 Secure	-	-	100 ±0
Utricularia resupinata	Inverted Bladderwort	Ponds, lakes and river shores.	Flowers July to September, likely little noticable or identifiable out of flower	Unlikely	S1S2	2 May Be At Risk	-	-	30 ±10
Decodon verticillatus	Swamp Loosestrife	Quaking margins, edges of ponds or lakes.	July and August	Unlikely	S3	3 Sensitive	-	-	15 ±0.1
Fraxinus nigra	Black Ash	Low ground, damp woods and swamps.	May and June. Can be identified without flowers.	Unlikely	S2S3	3 Sensitive	-	-	45 ±10
Fraxinus pennsylvanica	Red Ash	Near lakes or ponds, or in other low-lying areas.	Flowers in May	Unlikely	S1	2 May Be At Risk	-	-	92 ±10
Epilobium coloratum	Purple-veined Willowherb	Low-lying ground, springy slopes and similar locations.	July and October. Seeds required for identification.	Unlikely	S2?	3 Sensitive	-	-	56 ±1
Epilobium strictum	Downy Willowherb	Wet meadows, boggy swales and marshes.	July to September	Unlikely	S3	3 Sensitive	-	-	97 ±1
Oenothera fruticosa	Narrow-leaved Evening Primrose	Old fields, the edges of thickets, and roadsides. In dry,open, sandy soil.	Flowers June to August	Possible	S2	5 Undetermined	-	-	78 ±0
Oenothera fruticosa ssp. glauca	Narrow-leaved Evening Primrose	Old fields, the edges of thickets, and roadsides. In dry,open, sandy soil.	Flowers June to August	Possible	S2	5 Undetermined	-	-	10 ±10
Conopholis americana	American Cancer-root	Associated with oaks and other decidous trees.	April to July	Possible	S1S2	2 May Be At Risk	-	-	82 ±5
Polygala polygama	Racemed Milkwort	Sandy woods and clearings.	June to August	Unlikely	S1	5 Undetermined	-	-	73 ±0.1
Polygonum buxiforme	Small's Knotweed	Sandy soils, not necessarily maritime.	Flowers July to September	Unlikely	S2S3	5 Undetermined	-	-	45 ±10
Polygonum scandens	Climbing False Buckwheat	Low alluvial thickets along river intervales.	Flowers late August to October. Lacks ocrea without ring of bristles like P. convolvulus, fruit best for ID	Unlikely	S2	3 Sensitive	-	-	60 ±10
Polygonum raii	Sharp-fruited Knotweed	Coastal damp sands and gravels.	Not given, likely July to September	Unlikely	S2S3	5 Undetermined	-	-	47 ±1
Montia fontana	Water Blinks	Springy or seepy slopes, wet shores and brackish spots, coastal.	Flowers June to September when most noticable	Unlikely	S1	2 May Be At Risk	-	-	50 ±0.1
Samolus valerandi ssp. parviflorus	Seaside Brookweed	Brackish meadows, tidal banks and the edge of salt marshes.	July to September.	Unlikely	S2	3 Sensitive	-	-	5 ±0
Pyrola minor	Lesser Pyrola	Characteristic of mature coniferous woods in northern Cape Breton	Flowers in July and August	Unlikely	S2	3 Sensitive	-	-	80 ±0.1
Hepatica nobilis var. obtusa	Round-lobed Hepatica	Dry, usually mixed deciduous forest.	Early May	Unlikely	S1S2	2 May Be At Risk	-	-	90 ±0.5
Ranunculus flammula var. flammula	Lesser Spearwort	Semi-aquatic, in bogs and cold streams.	July to September.	Possible	S2	3 Sensitive	-	-	7 ±0.1
Ranunculus sceleratus	Cursed Buttercup	Marshes, ditches, swampy meadows.	Not given for NS	Unlikely	S1S2	2 May Be At Risk	-	-	84 ±0

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Rhamnus alnifolia	Alder-leaved Buckthorn	Calcareous bogs , swamps, swampy woods and meadows, marl bogs in rich aluvial soils.	Flowers mid -May to June. Identifiable from May to October and potentially year round	Unlikely	S3	3 Sensitive	-	-	79 ±0
Amelanchier fernaldii	Fernald's Serviceberry	Bogs and barrens, mainly in calcareous areas.	Early June to August	Unlikely	S2?	5 Undetermined	-	-	66 ±1
Amelanchier nantucketensis	Nantucket Serviceberry	Pine barrens, pond margins, fields, edges, and thickets. Old fields /roadsides.	May	Unlikely	S1	2 May Be At Risk	-	-	69 ±0.1
Geum peckii	Eastern Mountain Avens	Boggy areas and sphagnous hummocks.	June	Unlikely	S1	1 At Risk	Endangered	Endangered	47 ±0.1
Cephalanthus occidentalis	Common Buttonbush	Granite boulders, rocky shores, about lakes.	July 15 to August 15	Unlikely	S3	3 Sensitive	-	-	100 ±0
Galium boreale	Northern Bedstraw	The edges of woods and in grassy places, such as pastures.	Flowers June to August	Unlikely	S2	2 May Be At Risk	-	-	91 ±0.5
Galium obtusum	Blunt-leaved Bedstraw	Boggy swales and wet thickets.	May to July	Possible	S1S2	2 May Be At Risk	-	-	6 ±0
Salix pedicellaris	Bog Willow	Acid bogs and sphagnous lake shores.	May to July.	Unlikely	S2	3 Sensitive	-	-	99 ±0.1
Salix sericea	Silky Willow	Low thickets and stream banks.	Late March to early May	Unlikely	S2	2 May Be At Risk	-	-	17 ±0
Agalinis maritima	Saltmarsh Agalinis	Salt marshes along the coast	Mid-July to September	Unlikely	S1S2	2 May Be At Risk	-	-	11 ±0
Limosella australis	Southern Mudwort	Low areas by ponds, gravel lakeshores, the muddy edges of ponds behind barrier beaches and muddy river margins.	Late June to October.	Unlikely	S3	3 Sensitive	-	-	6 ±0
Viola nephrophylla	Northern Bog Violet	Cool mossy bogs, the borders of streams, and damp woods.	May to July.	Possible	S2	3 Sensitive	-	-	76 ±1
Thuja occidentalis	Eastern White Cedar	Lakesides and swamps or old pastures.	Can be identified throughout the year	Unlikely	S1S2	1 At Risk	-	Vulnerable	14 ±0
Carex adusta	Lesser Brown Sedge	Dry, open places. Rocky coastal, nonforested, upland.	June to September	Possible	S2S3	3 Sensitive	-	-	72 ±10
Carex atlantica ssp. capillacea	Atlantic Sedge	Swamps, bogs, and peaty barrens.	Flowers May to early August	Possible	S2	5 Undetermined	-	-	4 ±0.1
Carex digitalis	Slender Wood Sedge	Dry, sandy woodlands.	Not given for NS	Unlikely	S1	2 May Be At Risk	-	-	85 ±0.5
Carex houghtoniana	Houghton's Sedge	Sandy soils and roadside banks.	Seeds (perigynia) required for identification. Can be identified from May through September.	Unlikely	S2?	3 Sensitive	-	-	85 ±0.5
Carex laxiflora	Loose-Flowered Sedge	Damp clearings and open rocky woods.	Not given for NS	Possible	S1	2 May Be At Risk	-	-	79 ±10
Carex longii	Long's Sedge	Costal swamps, bogs or peaty soils.	Summer		S1?	2 May Be At Risk	-	-	8 ±1
Carex prairea	Prairie Sedge	Typha swamp	Not given for NS	Unlikely	S1	2 May Be At Risk	-	-	72 ±5
Carex swanii	Swan's Sedge	Boggy pastures, dry peaty barrens, forests, clearings and the edges of woods.	Early summer	Possible	S2S3	3 Sensitive	-	-	9 ±10
Carex viridula var. saxilittoralis	Greenish Sedge	Sphagnous swales, gravelly and rocky shores and low pastures near the sea. Often at the borders of brackish ponds.	June to September	Unlikely	S1	5 Undetermined	-	-	45 ±5
Carex wiegandii	Wiegand's Sedge	Boggy and peaty soils, conifer and alder swamps.	Matures in summer	Possible	S1	2 May Be At Risk	-	-	62 ±1
Carex vacillans	Estuarine Sedge	Saline, brackish shores, swales, salt and intertidal marshes. Tidal wetland (non-forested wetland).	June through August	Unlikely	S1S3	5 Undetermined	-	-	96 ±0.5
Cyperus diandrus	Low Flatsedge	Above waterline on lakeshores.	Not given for NS	Unlikely	S1	5 Undetermined	-	-	5 ±0

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Eleocharis olivacea	Yellow Spikerush	Peaty muck of bogs, wet sandy shores, and swales.	June to October. Mature achenes required for identification.	Possible	S2	3 Sensitive	-	-	17 ±0.5
Eleocharis quinqueflora	Few-flowered Spikerush	Damp calcareous shores, ledges and swamps.	July to September	Unlikely	S2	2 May Be At Risk	-	-	67 ±0.5
Eleocharis rostellata	Beaked Spikerush	Confined to salt marshes and swales.	July to October	Unlikely	S3	3 Sensitive	-	-	6 ±0
Eleocharis tuberculosa	Cone-cupped Spikerush	Sandy and boggy lake margins, coastal plain areas.	June to September.	Unlikely	S2	1 At Risk	Special Concern	Threatened	33 ±0
Eleocharis ovata	Ovate Spikerush	Muddy shores and ditches.	Flowers/Fruit May to October	Possible	S2?	3 Sensitive	-	-	17 ±0
Eriophorum gracile	Slender Cottongrass	Wet peat and inundated shores.	Flowers and fruits early summer	Unlikely	S2	3 Sensitive	-	-	95 ±1
Schoenoplectus americanus	Olney's Bulrush	Alkaline bogs, also wet calcareous ledges in NB.	Not given for Nova Scotia	Unlikely	S3	3 Sensitive	-	-	6 ±0
Scirpus longii	Long's Bulrush	Peaty and mucky shoresof some lakes in the southwest, stillwater meadows, and fens.	June and early July	Unlikely	S2S3	3 Sensitive	Special Concern	Vulnerable	9 ±10
Scirpus pedicellatus	Stalked Bulrush	Lowland marshes in stream valleys, edges of bogs, boggy meadows, and wet sandy shorelines.	Mid or late July	Unlikely	S1	5 Undetermined	-	-	57 ±5
Schoenoplectus robustus	Sturdy Bulrush	Saltmarsh.	Not given for NS	Unlikely	S1?	5 Undetermined	-	-	1 ±10
Lachnanthes caroliana	Carolina Redroot	Peaty shores and lakeside marshes.	July to September	Unlikely	S2	1 At Risk	Special	Threatened	98 ±10
Sisyrinchium fuscatum	Coastal Plain Blue-eyed-grass	Sandy plains or banks.	May to early July	Unlikely	S1	2 May Be At Risk	-	-	16 ±0.1
Triglochin gaspensis	Gaspé Arrowgrass	Nothing is known about this taxon in NS at present.	Not given for NS	Unlikely	S1?	5 Undetermined	-	-	11 ±0
Juncus acuminatus	Sharp-fruited Rush	Sandy and muddy flats, wet clay soils, sterile meadows and ditches.	Late May to August	Possible	S3S4	3 Sensitive	-	-	3 ±0
Juncus brachycephalus	Short-headed Rush	Calcareous meadows and snady shores.	July to September	Unlikely	S1	2 May Be At Risk	-	-	54 ±1
Juncus greenei	Greene's Rush	Coastal sandy soils and dune hollows.	June to September	Unlikely	S1S2	2 May Be At Risk	-	-	57 ±0
Juncus marginatus	Grass-leaved Rush	Clayey roadsides, damp fields, and brooksides	June to September.	Unlikely	S3	3 Sensitive	-	-	17 ±1
Juncus secundus	One-sided Rush	Usually in sterile, sandy or clay soil.	Not given for NS	Unlikely	S1	2 May Be At Risk	-	-	87 ±5
Juncus subcaudatus	Woodland Rush	Wet boggy woods and openings in spruce swamps.	Flowers July to October	Possible	S3	3 Sensitive	-	-	1 ±10
Allium schoenoprasum var. sibiricum	Wild Chives	Wet lowlands near the sea.	Flowers late June and July	Unlikely	S2	2 May Be At Risk	-	-	49 ±0.5
Allium tricoccum	Wild Leek	Rich deciduous forests and intervales.	Late July	Unlikely	S1	2 May Be At Risk	-	-	85 ±10
Lophiola aurea	Golden Crest	Lakeshores, wet savannas and sphagnous swales.	Not given for NS	Unlikely	S2	1 At Risk	Threatened	Threatened	47 ±1
Najas gracillima	Thread-Like Naiad	Muddy , peaty, or sandy ponds, pools, and shores.	Flowers July to October	Unlikely	S1S2	2 May Be At Risk	-	-	86 ±10
Cypripedium parviflorum var. pubescens	Yellow Lady's-slipper	Rich calcareous woodlands, also in drier sections of seepage fed wetlands or old beaver pond woodland.	Flowers in June. Plant identifiable from late May to October	Unlikely	S2	3 Sensitive	-	-	95 ±1
Goodyera pubescens	Downy Rattlesnake-Plantain	Woodland and thickets. Usually found in dry or moist coniferous or mixed woods, often in a sandy substrate with oak or white pine.	July and August	Unlikely	S2	2 May Be At Risk	-	-	72 ±1
Goodyera repens	Lesser Rattlesnake-plantain	Under conifers, growing with very few other plants.	Flowers July and August	Unlikely	S3	3 Sensitive	-	-	22 ±0.1

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Listera australis	Southern Twayblade	Among the shaded sphagnum moss of bogs or damp woods.	June. Quickly senesces after flowering.	Possible	S2	2 May Be At Risk	-	-	42 ±0
Platanthera flava var. flava	Tubercled Orchid	Sand or gravelly beaches, wet peat, and lake or river margins. Bogs, swamps, and meadows.	May to August.	Possible	S2	3 Sensitive	-	-	4 ±1
Platanthera macrophylla	Large Round-Leaved Orchid	Rich old deciduous or mixed woods.	August	Unlikely	S2	3 Sensitive	-	-	21 ±1
Spiranthes casei	Case's Ladies'-Tresses	Acid, sandy soils, roadsides and open barrens.	September	Possible	S2	3 Sensitive	-	-	54 ±0
Spiranthes casei var. casei	Case's Ladies'-Tresses	Acid, sandy soils, roadsides and open barrens.	September	Possible	S1	2 May Be At Risk	-	-	45 ±5
Spiranthes casei var. novaescotiae	Case's Ladies'-Tresses	Acid, sandy soils, roadsides and open barrens.	September	Possible	S2	3 Sensitive	-	-	11 ±1
Spiranthes lucida	Shining Ladies'-Tresses	Alluvial soils and rocky shores. Thickets and meadows.	Flowers early July	Unlikely	S2	2 May Be At Risk	-	-	44 ±10
Spiranthes ochroleuca	Yellow Ladies'-tresses	Characteristic of the driest sand barrens in southwestern counties. Also near rivers and in dry habitats such as roadsides and fields.	September to October	Possible	S2S3	3 Sensitive	-	-	3 ±0
Calamagrostis stricta ssp. stricta	Slim-stemmed Reed Grass	Around lakes and bogs, wet cliff faces, and landward edges of saltmarshes.	Flowering time not given, summer	Unlikely	S1S2	3 Sensitive	-	-	14 ±0.5
Dichanthelium acuminatum var. lindheimeri	Woolly Panic Grass	Wet, sphagnous swale at border of lakes.	Not given for NS	Unlikely	S1?	5 Undetermined	-	-	14 ±0.5
Piptatherum canadense	Canada Rice Grass	Dry sandy soils.	Not provided	Unlikely	S2	3 Sensitive	-	-	21 ±0.5
Panicum dichotomiflorum var. puritanorum	Fall Panic Grass	Sandy and gravelly shores of lakes and savannas.	July to October.	Unlikely	S1?	2 May Be At Risk	-	-	9 ±10
Panicum tuckermanii	Tuckerman's Panic Grass	Floodplains, sandy shores (further west), cranberry bogs.	June to October	Unlikely	S2S3	3 Sensitive	-	-	4 ±0
Panicum rigidulum var. pubescens	Redtop Panic Grass	Sandy and peaty beaches, gravelly lake margins.	July onwards. Matures late in the season, and the panicle branches are slow in spreading	Unlikely	S3	3 Sensitive	-	-	4 ±0
Stuckenia filiformis ssp. Alpina or Pttamogeton filiformis var. borealis	Thread-leaved Pondweed	Cold waters in lakes or ponds or in brackish ponds, on a substrate of sand or gravel.	Submerged leaves only	Unlikely	S2S3	5 Undetermined	-	-	94 ±10
Adiantum pedatum	Northern Maidenhair Fern	In fertile or quite alkaline soils. Under oak-birch-sugar maple-elm trees on intervales.	Summer	Unlikely	S1	2 May Be At Risk	-	-	6 ±0.5
Asplenium trichomanes	Maidenhair Spleenwort	Damp shaded cliffs, and talus slopes. Acidic rock such as granite, basalt and sandstone.	Can be identified without sprangia.	Unlikely	S2	3 Sensitive	-	-	81 ±0.1
Woodwardia areolata	Netted Chain Fern	Swamps, bog margins, and particulary along streams.	July to October.	Possible	S2S3	3 Sensitive	-	-	8 ±1
Isoetes acadiensis	Acadian Quillwort	Water up to 1 m deep, bordering lakes or ponds, and occassionally along rivers	Megaspores required for identification.	Unlikely	S3	3 Sensitive	-	-	12 ±0.5
Isoetes prototypus	Prototype Quillwort	Deep water in nutrient poor, acidic lakes.	Summer. Megaspores required for identification.	Unlikely	S2	3 Sensitive	Special Concern	Vulnerable	65 ±0.1
Huperzia selago	Northern Firmoss	Rock crevices on stream cliffs, and moist ravines.	Not given for NS	Unlikely	S1S3	5 Undetermined	-	-	45 ±5

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Ophioglossum pusillum	Northern Adder's-tongue	Sterile meadows, grassy swamps, and damp, sandy, or cobbly beaches of lakes.	Late May to August. Can beidentified until early October if stipe and sporangia are present.	Unlikely	S2S3	3 Sensitive	-	-	6 ±1
Selaginella rupestris	Rock Spikemoss	Dry, exposed rocks and sandy soils.	July to October	Unlikely	S1	2 May Be At Risk	-	-	67 ±0.1
Selaginella selaginoides	Low Spikemoss	Moist areas borderingbog tussocks, peat bogs, and stream margins.	Produces spores in July and August. Likely identifiable when not snow covered but very easily overlooked	Unlikely	S2	2 May Be At Risk	-	-	48 ±5

Table F-2 Mammal, Bird, Fish and Herpertile Species of Conservation Concern Recorded as Being Potentially Present Within 100 km of the Project Area and Information on their Preferred Habitat, Phenology, and Population Status

Scientific Name	Common Name	Habitat	Likely our Unlikely to Occur on Site?	ACCDC Rank	NSDNR Rank	COSEWIC	NS ESA Rank	Distance Recorded from Site
Toxostoma rufum	Brown Thrasher	Breeds in brushy open country, thickets, shelter belts, riparian areas, and suburbs.	Unlikely	S1?B	5 Undetermined	-	-	95 ±1
Vireo gilvus	Warbling Vireo	Riparian woodlands.	Unlikely	S1?B	5 Undetermined	-	-	18 ±0.5
Nycticorax nycticorax	Black-crowned Night-heron	Various wetland habitats, including salt, brackish, and freshwater marshes, swamps, streams, lakes, and agricultural fields.	Unlikely	S1B	2 May Be At Risk	-	-	35 ±5
Sterna dougallii	Roseate Tern	Few islands off the Atlantic coast of Nova Scotia. Found in colonies.	Unlikely	S1B	1 At Risk	Endangered	Endangered	25 ±1
Hylocichla mustelina	Wood Thrush	Interior as well as the edges of deciduous and mixed forests, often near water.	Unlikely	S1B	5 Undetermined	-	-	3 ±5
Sturnella magna	Eastern Meadowlark	Grasslands, pastures, and hayfields, as well as croplands, golf courses, and other open habitat.	Unlikely	S1B	3 Sensitive	Threatened	-	89 ±5
Alca torda	Razorbill	Coastal cliffs.	Unlikely	S1B,S4N	3 Sensitive	-	-	20 ±5
Fratercula arctica	Atlantic Puffin	During the summer, reside on rocky cliffs of the North Atlantic and northern Europe. They winter far at sea on deep, icy water and are seldom seen within sight of land until March.	Unlikely	S1B,S4S5N	3 Sensitive	-	-	20 ±5
Calidris minutilla	Least Sandpiper	Breeds in mossy or wet grassy tundra, occasionally in drier areas with scattered scrubby bushes. Migrates and winters in wet meadows, mudflats, flooded fields, shores of pools and lakes, and, less frequently, sandy beaches.	Unlikely	S1B,S5M	4 Secure	-	-	14 ±0.1
Bucephala islandica (Eastern	Barrow's Goldeneye (Eastern pop.)	Breeds along lakes in parkland, especially alkaline lakes. Winters along rocky coasts.	Unlikely	S1N	1 At Risk	Special Concern	-	96 ±0.1
Asio flammeus	Short-eared Owl	Nests on the ground in open country. An open hayfield is often chosen as a nest site.	Unlikely	S1S2	2 May Be At Risk	Special Concern	-	67 ±10
Catharus bicknelli	Bicknell's Thrush	Breeds in montane fir and spruce forests, usually associated with recently disturbed areas.	Unlikely	S1S2B	1 At Risk	Threatened	Vulnerable	95 ±5

Table F-2 Mammal, Bird, Fish and Herpertile Species of Conservation Concern Recorded as Being Potentially Present Within 100 km of the Project Area and Information on their Preferred Habitat, Phenology, and Population Status

Scientific Name	Common Name	Habitat	Likely our Unlikely to Occur on Site?	ACCDC Rank	NSDNR Rank	COSEWIC	NS ESA Rank	Distance Recorded from Site
Passerina cyanea	Indigo Bunting	Breeds in brushy and weedy areas along edges of cultivated land, woods, roads, power line rights-of-way, and in open deciduous woods and old fields. Winters in weedy fields, citrus orchards, and weedy cropland.	Unlikely	S1S2B	5 Undetermined	-	-	46 ±5
Eremophila alpestris	Horned Lark	Open, barren country. Prefers bare ground to short grasses.	Unlikely	S1S2B,S4N	4 Secure	-	-	95 ±1
Charadrius semipalmatus	Semipalmated Plover	Frequents sandy beaches and mudflats.	Unlikely	S1S2B,S5M	4 Secure	-	-	11 ±0.1
Asio otus	Long-eared Owl	Various woodland habitats as well as open habitats.	Possible	S2	2 May Be At Risk	-	-	39 ±5
Vireo philadelphicus	Philadelphia Vireo	Young deciduous woods.	Unlikely	S2?B	5 Undetermined	-	-	63 ±5
Anas acuta	Northern Pintail	Salt and freshwater marshes, occasionally on Sable Island and most frequently in the Amherst region.	Unlikely	S2B	2 May Be At Risk	-	-	14 ±5
Anas clypeata	Northern Shoveler	Breeds in open, shallow wetlands. In winter, inhabits both freshwater and saline marshes.	Unlikely	S2B	2 May Be At Risk	-	-	50 ±5
Anas strepera	Gadwall	Marsh	Unlikely	S2B	2 May Be At Risk	-	-	46 ±0.1
Rallus limicola	Virginia Rail	Freshwater marshes; occasionally inhabits salt marshes. Lives in dense emergent vegetation.	Unlikely	S2B	5 Undetermined	-	-	95 ±5
Empidonax traillii	Willow Flycatcher	Breeds in moist, shrubby areas, often with standing or running water. Winters in shrubby clearings and early successional growth.	Unlikely	S2B	3 Sensitive	-	-	39 ±0.5
Myiarchus crinitus	Great Crested Flycatcher	Found in open deciduous forest.	Unlikely	S2B	2 May Be At Risk	-	-	14 ±5
Piranga olivacea	Scarlet Tanager	Common in deciduous or mixed forests.	Unlikely	S2B	5 Undetermined	-	-	14 ±5
Bucephala clangula	Common Goldeneye	Clear water lakes and ponds without submergent and emergent vegetation. Forested habitat with mature trees (deciduous or coniferous) suitable nesting cavities.	Unlikely	S2B,S5N	4 Secure	-	-	100 ±5
Histrionicus histrionicus pop.	Harlequin Duck - Eastern pop.	Mountain streams and rivers, usually in forested regions; in winter, primarily turbulent coastal waters, especially in rocky regions.	Unlikely	S2N	1 At Risk	Special Concern	Endangered	36 ±5

Table F-2 Mammal, Bird, Fish and Herpertile Species of Conservation Concern Recorded as Being Potentially Present Within 100 km of the Project Area and Information on their Preferred Habitat, Phenology, and Population Status

Scientific Name	Common Name	Habitat	Likely our Unlikely to Occur on Site?	ACCDC Rank	NSDNR Rank	COSEWIC	NS ESA Rank	Distance Recorded from Site
Euphagus carolinus	Rusty Blackbird	Boreal forest; forest wetlands, such as slowmoving streams, peat bogs, sedge meadows, marshes, swamps, beaver ponds and pasture edges.	Possible	S2S3B	2 May Be At Risk	Special Concern	-	14 ±5
Icterus galbula	Baltimore Oriole	Edges of deciduous and mixed wood forests.	Unlikely	S2S3B	2 May Be At Risk	-	-	10 ±5
Calidris canutus rufa	Red Knot rufa ssp	Breeds in drier tundra areas, such as sparsely vegetated hillsides. Outside of breeding season, it is found primarily in intertidal, marine habitats, especially near coastal inlets, estuaries, and bays.	Unlikely	S2S3M	1 At Risk	Endangered	Endangered	10 ±0.5
Phalaropus lobatus	Red-necked Phalarope	Along edges of major ocean currents.	Unlikely	S2S3M	3 Sensitive	-	-	45 ±10
Sterna hirundo	Common Tern	Coastal and freshwater islands, coastal beaches and salt marshes.	Unlikely	S3B	3 Sensitive	Not at Risk	-	10 ±5
Sterna paradisaea	Arctic Tern	Coastal islands, beaches and salt marshes. May occasionally nest on islands in lakes.	Unlikely	S3B	2 May Be At Risk	-	-	100 ±5
Sialia sialis	Eastern Bluebird	Open woodlands, clearings, farmlands, parks, orchards, gardens, fields, along roadsides on utility wires and fences.	Unlikely	S3B	3 Sensitive	Not at Risk	-	14 ±5
Limosa haemastica	Hudsonian Godwit	Breeds near treeline, where tundra, open woods, and ponds come together. Typically found on marshy lakes, wet pastures, and mudflats around ponds.	Unlikely	S3M	3 Sensitive	-	-	14 ±0.5
Calidris maritima	Purple Sandpiper	Breeds along low tundra near shorelines, as well as gravel beaches along rivers. Winters along rocky coastlines and man-made jetties.	Unlikely	S3N	3 Sensitive	-	-	46 ±0.5
Accipiter gentilis	Northern Goshawk	Various forest types, especially mature forest	Unlikely	S3S4B	4 Secure	Not at Risk	-	28 ±5
Dolichonyx oryzivorus	Bobolink	Fields with dense grass cover, particularly hay fields.	Unlikely	S3S4B	3 Sensitive	Threatened	-	3 ±5
Coregonus huntsmani	Atlantic Whitefish	Limited to certain areas in Southwestern Nova Scotia.	Unlikely	S1	-	Endangered	Endangered	1 ±10
Morone saxatilis	Striped Bass	Estuaries and coastal waters.	Unlikely	S1	-	Threatened	-	10 ±10
Salmo salar pop. 1	Atlantic Salmon - inner Bay of Fundy pops	Anadromous fish that spawn in fresh water, but spends much of its life at sea (Bay of Fundy).	Unlikely	S2	-	Endangered	-	76 ±10

Table F-2 Mammal, Bird, Fish and Herpertile Species of Conservation Concern Recorded as Being Potentially Present Within 100 km of the Project Area and Information on their Preferred Habitat, Phenology, and Population Status

Scientific Name	Common Name	Habitat	Likely our Unlikely to Occur on Site?	ACCDC Rank	NSDNR Rank	COSEWIC	NS ESA Rank	Distance Recorded from Site
Martes americana	American Marten	Prefer old growth coniferous or mixed woods forest, although they may seek food in some open areas.	Unlikely	S1	-	-	Endangered	22 ±10
Lynx canadensis	Canada Lynx	Live deep in coniferous forests near rocky areas, bogs and swamps.	Unlikely	S1	-	Not at Risk	Endangered	63 ±1
Alces americanus	Moose	Woodlands providing both mature softwood cover and young hardwood browse. Also swamps, bogs and lakeshores, generally remote from human habitation.	Unlikely	S1	7 Exotic	-	Endangered	22 ±10
Perimyotis subflavus	Eastern Pipistrelle	They are not often found in buildings or in deep woods, seeming to prefer edge habitats near areas of mixed agricultural use.	Unlikely	S1?	-	-	-	83 ±0
Lasiurus cinereus	Hoary Bat	Hoary bats are thought to prefer trees at the edge of clearings, but have been found in trees in heavy forests, open wooded glades, and shade trees along urban streets and in city parks.	Possible	S2?	-	-	-	98 ±1
Glaucomys volans	Southern Flying Squirrel	Pine and hardwood trees provide suitable foraging and nesting habitat, and dead trees are also important nest sites.	Unlikely	S2S3	-	Not at Risk	-	72 ±10
Emydoidea blandingii	Blanding's Turtle (Nova Scotia pop.)	Lakes, ponds, fens, marshes, low fields, ditches, creeks, river sloughs, and bogs. Within these habitats, they tend to frequent shallow water containing submergent or emergent vegetation, often with deep, organic sediments.	Unlikely	S1	-	Endangered	Endangered	50 ±0
Thamnophis sauritus pop. 3	Eastern Ribbon Snake (Atlantic pop.)	Wetlands and the edges of ponds and streams.	Unlikely	S2S3	-	Threatened	Threatened	100 ±0.1
Glyptemys insculpta	Wood Turtle	Found along streams and wetlands. Gravel bars, tall shrub swamps, deep pools in wetlands.	Unlikely	S3	-	Threatened	Vulnerable	63 ±10

APPENDIX G
Population Status of Vascular Plants Recorded in Project Area

Table G1 Vascular Plant Species Found in the Study Area

Scientific Name	Common Name	ACCDC General Status Ranks	NSDNR General Status Ranks
Abies balsamea	Balsam Fir	S5	Secure
Acer rubrum	Red Maple	S5	Secure
Achillea millefolium	Common Yarrow	S5	Secure
Agalinis neoscotica	Nova Scotia Agalinis	S3	Secure
Agrostis perennans	Upland Bent Grass	S4S5	Secure
Agrostis scabra	Rough Bent Grass	S5	Secure
Alnus incana	Speckled Alder	S5	Secure
Alnus viridis	Green Alder	S5	Secure
Amelanchier sp.	a Serviceberry	na	na
Anaphalis margaritacea	Pearly Everlasting	S5	Secure
Anthoxanthum odoratum	Large Sweet Vernal Grass	SNA	Exotic
Aralia hispida	Bristly Sarsaparilla	S5	Secure
Aralia nudicaulis	Wild Sarsaparilla	S5	Secure
Aster sp.	an Aster	na	na
Bartonia paniculata	Branched Bartonia	S4S5	Secure
Bartonia virginica	Yellow Bartonia	S3	Secure
Betula papyrifera	Paper Birch	S5	Secure
Betula papyrifera var. cordifolia	Heart-leaved Birch	S5	Secure
Betula populifolia	Gray Birch	S5	Secure
Calamagrostis canadensis	Bluejoint Reed Grass	S5	Secure
Carex atlantica	Atlantic Sedge	S4	Secure
Carex atlantica ssp. atlantica	Atlantic Sedge	S4	Secure
Carex brunnescens	Brownish Sedge	S5	Secure
Carex canescens	Silvery Sedge	S5	Secure
Carex cumulata	Dense Sedge	S4S5	Secure
Carex debilis	White-edged Sedge	S5	Secure
Carex echinata	Star Sedge	S5	Secure
Carex folliculata	Northern Long Sedge	S5	Secure
Carex gracillima	Graceful Sedge	S4S5	Secure
Carex gynandra	Nodding Sedge	S5	Secure
Carex intumescens	Bladder Sedge	S5	Secure
Carex lurida	Sallow Sedge	S5	Secure
Carex magellanica	Boreal Bog Sedge	S5	Secure
Carex novae-angliae	New England Sedge	S5	Secure
Carex ovalis	Oval Sedge	SNA	Exotic
Carex scoparia	Broom Sedge	S5	Secure
Carex stricta	Tussock Sedge	S5	Secure
Carex tonsa var. tonsa	Deep Green Sedge	S5	Secure
Carex trisperma	Three-seeded Sedge	S5	Secure
Carex umbellata	Umbellate Sedge	S4	Secure
Centaurea nigra	Black Knapweed	SNA	Exotic
Cerastium arvense	Mouse-Ear Chickweed	SNR	Undetermined
Chamaedaphne calyculata	Leatherleaf	S5	Secure
Chenopodium album	Common Lamb's Quarters	SNA	Exotic
Cinna latifolia	Drooping Wood Reed Grass	S5	Secure
Clintonia borealis	Yellow Bluebead Lily	S5	Secure
Comptonia peregrina	Sweet-fern	S5	Secure
Conyza canadensis	Canada Horseweed	S5	Secure
Coptis trifolia	Goldthread	S5	Secure
Cornus canadensis	Bunchberry	S5	Secure
Cypripedium acaule	Pink Lady's-Slipper	S5	Secure
Dalibarda repens	Dewdrop	S5	Secure
Danthonia compressa	Flattened Oat Grass	S5	Secure
Danthonia spicata	Poverty Oat Grass	S5	Secure
Daucus carota	Queen Anne's Lace	SNA	Exotic
Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5	Secure
Deschampsia flexuosa	Wavy Hair Grass	S5	Secure
Dichanthelium acuminatum	Woolly Panic Grass	S5	Secure
Dichanthelium acuminatum var. fasciculatum	Woolly Panic Grass	S5	Secure
Dichanthelium boreale	Northern Panic Grass	S5	Secure
Doellingeria umbellata	Hairy Flat-top White Aster	S5	Secure
Drosera intermedia	Spoon-Leaved Sundew	S5	Secure
Drosera rotundifolia	Round-leaved Sundew	S5	Secure
Dryopteris campyloptera	Mountain Wood Fern	S5	Secure
Dryopteris carthusiana	Spinulose Wood Fern	S5	Secure
Dryopteris cristata	Crested Wood Fern	S5	Secure
Dryopteris intermedia	Evergreen Wood Fern	S5	Secure
Dryopteris x triploidea	a Hybrid Wood-fern	SNA	Not Assessed
Eleocharis acicularis	Needle Spikerush	S5	Secure
Eleocharis nitida	Quill Spikerush	S3	Secure
Eleocharis palustris	Common Spikerush	S5	Secure
Eleocharis sp.	a Spikerush	na	na
Eleocharis tenuis	Slender Spikerush	S5	Secure
Epigaea repens	Trailing Arbutus	S5	Secure
Epilobium ciliatum	Northern Willowherb	S5	Secure
Equisetum arvense	Field Horsetail	S5	Secure
Equisetum fluviatile	Water Horsetail	S5	Secure
Equisetum sylvaticum	Woodland Horsetail	S5	Secure
Erechtites hieraciifolia	Eastern Burnweed	S5	Secure
Eriophorum virginicum	Tawny Cottongrass	S5	Secure
Eupatorium perfoliatum	Common Boneset	S5	Secure
Eurybia radula	Low Rough Aster	S5	Secure
Euthamia graminifolia	Grass-leaved Goldenrod	S5	Secure
Galeopsis tetrahit	Common Hemp-nettle	SNA	Exotic
Galium sp.	a Bedstraw	na	na
Galium trifidum	Three-petaled Bedstraw	S5	Secure
Gaultheria hispidula	Creeping Snowberry	S5	Secure
Gaultheria procumbens	Eastern Teaberry	S5	Secure
Gaylussacia baccata	Black Huckleberry	S5	Secure
Glyceria grandis	Common Tall Manna Grass	S4S5	Secure
Glyceria laxa	Northern Mannagrass	S4?	Secure
Glyceria obtusa	Atlantic Manna Grass	S4	Secure
Glyceria sp.	a Manna-grass	na	na
Gnaphalium uliginosum	Marsh Cudweed	SNA	Exotic

Table G1 Vascular Plant Species Found in the Study Area

Scientific Name	Common Name	ACCDC General Status Ranks	NSDNR General Status Ranks
Hamamelis virginiana	American Witch-Hazel	S5	Secure
Hieracium canadense	Canada Hawkweed	S4S5	Secure
Hieracium murorum	Wall Hawkweed	SNA	Exotic
Hieracium scabrum	Rough Hawkweed	S5	Secure
Hieracium x flagellare	Whiplash Hawkweed	SNA	Exotic
Holcus lanatus	Common Velvet Grass	SNA	Exotic
Hypericum canadense	Canada St. John's-wort	S5	Secure
Hypericum perforatum	Common St. John's-wort	SNA	Exotic
Hypochaeris radicata	Hairy Cat's-ear	SNA	Exotic
Ilex glabra	Inkberry	S5	Secure
Ilex verticillata	Common Winterberry	S5	Secure
Iris versicolor	Harlequin Blue Flag	S5	Secure
Juncus acuminatus	Sharp-fruited Rush	S3S4	Sensitive
Juncus brevicaudatus	Short-tailed Rush	S5	Secure
Juncus bufonius	Toad Rush	S5	Secure
Juncus effusus	Soft Rush	S5	Secure
Juncus pelocarpus	Brown-Fruited Rush	S5	Secure
Juncus sp.	a Rush	na	na
Juncus subcaudatus	Woodland Rush	S3	Sensitive
Juncus tenuis	Path Rush	S5	Secure
Kalmia angustifolia	Sheep Laurel	S5	Secure
Larix laricina	Tamarack	S5	Secure
Lechea intermedia	Large-pod Pinweed	S4	Secure
Ledum groenlandicum	Common Labrador Tea	S5	Secure
Leontodon autumnalis	Fall Dandelion	SNA	Exotic
Leucanthemum vulgare	Oxeye Daisy	SNA	Exotic
Linnaea borealis	Twinflower	S5	Secure
Listera australis	Southern Twayblade	S2	May Be At Risk
Lupinus polyphyllus	Large-Leaved Lupine	SNA	Exotic
Luzula acuminata	Hairy Woodrush	S5	Secure
Luzula multiflora	Common Woodrush	S5	Secure
Lycopodiella inundata	Northern Bog Clubmoss	S5	Secure
Lycopodium annotinum	Stiff Clubmoss	S5	Secure
Lycopus uniflorus	Northern Water Horehound	S5	Secure
Lysimachia terrestris	Swamp Yellow Loosestrife	S5	Secure
Maianthemum canadense	Wild Lily-of-The-Valley	S5	Secure
Maianthemum trifolium	Three-leaved False Soloman's Seal	S5	Secure
Mitchella repens	Partridgeberry	S5	Secure
Monotropa hypopithys	Pinesap	S4	Secure
Monotropa uniflora	Indian Pipe	S5	Secure
Morella pensylvanica	Northern Bayberry	S5	Secure
Muhlenbergia uniflora	Bog Muhly	S5	Secure
Nemopanthus mucronatus	Mountain Holly	S5	Secure
Oclemena acuminata	Whorled Wood Aster	S5	Secure
Oclemena nemoralis	Bog Aster	S5	Secure
Oclemena x blakei	a hybrid White Panicled American-Aster	S4S5	Secure
Oenothera biennis	Common Evening Primrose	S5	Secure
Onoclea sensibilis	Sensitive Fern	S5	Secure
Osmunda cinnamomea	Cinnamon Fern	S5	Secure
Osmunda claytoniana	Interrupted Fern	S5	Secure
Osmunda regalis	Royal Fern	S5	Secure
Oxalis montana	Common Wood Sorrel	S5	Secure
Phalaris arundinacea	Reed Canary Grass	S5	Secure
Photinia floribunda	Purple Chokeberry	S5	Secure
Photinia melanocarpa	Black Chokeberry	S5	Secure
Photinia pyrifolia	Red Chokeberry	S4?	Secure
Picea glauca	White Spruce	S5	Secure
Picea mariana	Black Spruce	S5	Secure
Picea rubens	Red Spruce	S5	Secure
Plantago major	Common Plantain	SNA	Exotic
Poa pratensis	Kentucky Blue Grass	S5	Secure
Polygonum cilinode	Fringed Black Bindweed	S5	Secure
Polygonum cuspidatum	Japanese Knotweed	SNA	Exotic
Polygonum hydropiperoides	False Waterpepper	S5	Secure
Polygonum persicaria	Spotted Lady's-thumb	SNA	Exotic
Polygonum punctatum	Dotted Smartweed	S5	Secure
Polypodium virginianum	Rock Polypody	S5	Secure
Populus grandidentata	Large-toothed Aspen	S5	Secure
Potamogeton epihydrus	Ribbon-leaved Pondweed	S5	Secure
Potentilla simplex	Old Field Cinquefoil	S5	Secure
Prenanthes trifoliolata	Three-leaved Rattlesnakeroot	S5	Secure
Prunella vulgaris	Common Self-heal	S5	Secure
Prunus pensylvanica	Pin Cherry	S5	Secure
Prunus virginiana	Chokecherry	S5	Secure
Pteridium aquilinum	Bracken Fern	S5	Secure
Radiola linoides	Tiny Allseed	SNA	Exotic
Ranunculus repens	Creeping Buttercup	SNA	Exotic
Rhododendron canadense	Rhodora	S5	Secure
Ribes rubrum	European Red Currant	SNA	Exotic
Rosa multiflora	Multiflora Rose	SNA	Exotic
Rosa nitida	Shining Rose	S4	Secure
Rubus adenocaulis	Glandulose Dewberry	SNR	Undetermined
Rubus allegheniensis	Allegheny Blackberry	S5	Secure
Rubus canadensis	Smooth Blackberry	S5	Secure
Rubus elegantulus	Showy Blackberry	SNR	Undetermined
Rubus hispidus	Bristly Dewberry	S5	Secure
Rubus idaeus	Red Raspberry	S5	Secure
Rubus semisetosus	Swamp Blackberry	SNR	Undetermined
Rubus sp.	a Blackberry	na	na
Rumex acetosella	Sheep Sorrel	SNA	Exotic
Rumex crispus	Curled Dock	SNA	Exotic
Rumex orbiculatus	Greater Water Dock	S5	Secure
Sagina procumbens	Procumbent Pearlwort	S5	Exotic
Salix bebbiana	Bebb's Willow	S5	Secure

Table G1 Vascular Plant Species Found in the Study Area

Scientific Name	Common Name	ACCDC General Status Ranks	NSDNR General Status Ranks
Salix discolor	Pussy Willow	S5	Secure
Salix sp.	a Willow	na	na
Sarracenia purpurea	Northern Pitcher Plant	S5	Secure
Scirpus cyperinus	Common Woolly Bulrush	S5	Secure
Scirpus hattorianus	Mosquito Bulrush	S5	Secure
Senecio jacobaea	Tansy Ragwort	SNA	Exotic
Senecio viscosus	Sticky Ragwort	SNA	Exotic
Sisyrinchium atlanticum	Eastern Blue-Eyed-Grass	S3S4	Secure
Solidago puberula	Downy Goldenrod	S5	Secure
Solidago rugosa	Rough-stemmed Goldenrod	S5	Secure
Solidago uliginosa	Northern Bog Goldenrod	S5	Secure
Sorbus americana	American Mountain Ash	S5	Secure
Sparganium americanum	American Burreed	S5	Secure
Sparganium emersum	Green-fruited Burreed	S5	Secure
Sparganium eurycarpum	Broad-fruited Burreed	S4	Secure
Sparganium sp.	a Bur-reed	na	na
Spiraea alba	White Meadowsweet	S5	Secure
Spiraea tomentosa	Steeplebush	S5	Secure
Spiranthes cernua	Nodding Ladies'-Tresses	S5	Secure
Spiranthes ochroleuca	Yellow Ladies'-tresses	S2S3	Sensitive
Spiranthes sp.	Ladies'-Tresses	na	na
Stellaria graminea	Little Starwort	SNA	Exotic
Symphyotrichum lateriflorum	Calico Aster	S5	Secure
Symphyotrichum novi-belgii	New York Aster	S5	Secure
Taraxacum officinale	Common Dandelion	SNA	Exotic
Thalictrum pubescens	Tall Meadow-Rue	S5	Secure
Thelypteris noveboracensis	New York Fern	S5	Secure
Thelypteris palustris	Eastern Marsh Fern	S5	Secure
Thelypteris simulata	Bog Fern	S4S5	Secure
Toxicodendron radicans	Poison Ivy	S4	Secure
Triadenum fraseri	Fraser's Marsh St. John's-wort	S5	Secure
Triadenum sp.	a Marsh St. John's Wort	na	na
Trientalis borealis	Northern Starflower	S5	Secure
Trifolium pratense	Red Clover	SNA	Exotic
Trillium undulatum	Painted Trillium	S5	Secure
Tussilago farfara	Coltsfoot	SNA	Exotic
Typha latifolia	Broad-leaved Cattail	S5	Secure
Utricularia geminiscapa	Twin-stemmed Bladderwort	S4	Secure
Vaccinium angustifolium	Late Lowbush Blueberry	S5	Secure
Vaccinium corymbosum	Highbush Blueberry	S3	Secure
Vaccinium myrtilloides	Velvet-leaved Blueberry	S5	Secure
Vaccinium oxycoccos	Small Cranberry	S5	Secure
Veronica officinalis	Common Speedwell	S5	Exotic
Viburnum nudum	Northern Wild Raisin	S5	Secure
Vicia cracca	Tufted Vetch	SNA	Exotic
Viola cucullata	Marsh Blue Violet	S5	Secure
Viola lanceolata	Lance-leaved Violet	S5	Secure
Viola sp.	a Violet	na	na
Viola tricolor	Johnny-jump-up	SNA	Exotic
Woodwardia virginica	Virginia Chain Fern	S4	Secure

APPENDIX H
Breeding and Population Status of Birds Recorded in the Project Area and the Breeding Bird Atlas Squares

Table H1 Bird Species Recorded in Maritime Breeding Bird Atlas Square 19GJ36 and Birds Observed during the Field Surveys

Common Name	Binomial	Breeding Status in Atlas Square	Likely to be present in Project Area	Recorded in Project Area during 2011 Field Survey	Observed Breeding Status (2013)	SARA / COSEWIC Designation	NS ESA Designation	NSDNR Rank	ACCDC Rank
Alder Flycatcher	*Empidonax alnorum*	Possible Breeder	Possible	No	Possible			Secure	S5B
American Black Duck	*Anas rubripes*	Confirmed Breeder	Unlikely	No	No			Secure	S5
American Crow	*Corvus brachyrhynchos*	Possible Breeder	Possible	No	Possible			Secure	S5
American Goldfinch	*Carduelis tristis*	Possible Breeder	Possible	Yes	Possible			Secure	S5
American Redstart	*Setophaga ruticilla*	Possible Breeder	Possible	Yes	No			Secure	S5B
American Robin	*Turdus migratorius*	Confirmed Breeder	Possible	Yes	Possible			Secure	S5B
Barn Swallow	*Hirundo rustica*	Possible Breeder	Unlikely	No	No	Endangered		Sensitive	S3B
Black-and-white Warbler	*Mniotilta varia*	Possible Breeder	Possible	No	Possible			Secure	S4S5B
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Possible Breeder	Unlikely	No	No			May Be At Risk	S3?B
Blackburnian Warbler	*Dendroica fusca*	Possible Breeder	Possible	No	No			Secure	S4B
Black-capped Chickadee	*Poecile atricapillus*	Confirmed Breeder	Possible	Yes	Probable			Secure	S5
Black-throated Blue Warbler	*Dendroica caerulescens*	Not Recorded	Possible	Yes	No			Secure	S5B
Black-throated Green Warbler	*Dendroica virens*	Probable Breeder	Possible	Yes	Possible			Secure	S4S5B
Blue Jay	*Cyanocitta cristata*	Confirmed Breeder	Possible	Yes	Possible			Secure	S5
Blue-headed Vireo	*Vieo solitarius*	Possible Breeder	Possible	No	Possible			Secure	S5B
Bobolink	*Dolychonyx oryzivorus*	Probable Breeder	Unlikely	No	No	Threatened	Vulnerable	Sensitive	S3S4B
Boreal Chickadee	*Poecile hudsonicus*	Possible Breeder	Possible	Yes	Probable			Sensitive	S3
Brown Creeper	*Certhia americana*	Possible Breeder	Possible	Yes	Possible			Secure	S5
Brown-headed Cowbird	*Molothrus ater*	Confirmed Breeder	Unlikely	No	No			May Be At Risk	S2S3B
Canada Goose	*Branta canadensis*	Confirmed Breeder	Unlikely	No	No			Secure	SNAB,S4N
Canada Warbler	*Wilsonia canadensis*	Possible Breeder	Possible	No	Possible	Threatened	Endangered	At Risk	S3B
Cedar Waxwing	*Bombycilla cedrorum*	Possible Breeder	Possible	Yes	Possible			Secure	S5B
Chestnut-sided Warbler	*Dendroica pensylvanica*	Possible Breeder	Possible	No	Possible			Secure	S5B
Chipping Sparrow	*Spizella passerina*	Possible Breeder	Unlikely	No	No			Secure	S4S5B
Common Grackle	*Quiscalus quiscula*	Confirmed Breeder	Possible	Yes	No			Secure	S5B
Common Loon	*Gavia immer*	Possible Breeder	Unlikely	No	No	Not At Risk		May Be At Risk	S3B,S4N
Common Nighthawk	*Chordeiles minor*	na	Possible	No	Observed, but no indication	Threatened	Theatened	At Risk	S3B
Common Raven	*Corvus corax*	Possible Breeder	Possible	Yes	No			Secure	S5
Common Yellowthroat	*Geothlypis trichas*	Probable Breeder	Possible	Yes	Possible			Secure	S5B
Dark-eyed Junco	*Junco hyemalis*	Probable Breeder	Possible	No	Possible			Secure	S4S5
Double-crested Cormorant	*Phalacrocorax auritus*	No Evidence of Nesting	Unlikely	No	No	Not At Risk		Secure	S5B
Eastern Phoebe	*Sayornis phoebe*	Possible Breeder	Unlikely	No	No			Sensitive	S3S4B
Eastern Wood-Pewee	*Contopus virens*	Possible Breeder	Possible	Yes	No	Special Concern	Vulnerable	Sensitive	S3S4B
European Starling	*Sturnus vulgaris*	Confirmed Breeder	Unlikely	No	No			Exotic	SNA
Evening Grosbeak	*Coccothraustes vespertinus*	Confirmed Breeder	Possible	No	No			Secure	S4B,S5N
Golden-crowned Kinglet	*Regulus satrapa*	Possible Breeder	Possible	No	Possible			Sensitive	S4
Gray Catbird	*Dumetella carolinensis*	Probable Breeder	Unlikely	No	No			May Be At Risk	S3B
Gray Jay	*Perisoreus canadensis*	Possible Breeder	Possible	Yes	No			Sensitive	S3S4
Great Black-backed Gull	*Larus marinus*	No Evidence of Nesting	Unlikely	No	No			Secure	S4
Great Blue Heron	*Ardea herodias*	Not Recorded	Unlikely	Yes	No			Secure	S4B
Hairy Woodpecker	*Picoides villosus*	Possible Breeder	Possible	Yes	Possible			Secure	S5
Hermit Thrush	*Catharus guttatus*	Confirmed Breeder	Possible	Yes	Possible			Secure	S5B
Herring Gull	*Larus argentatus*	No Evidence of Nesting	Unlikely	No	No			Secure	S4S5
House Sparrow	*Passer domesticus*	Confirmed Breeder	Unlikely	No	No			Exotic	SNA
Killdeer	*Charadrius vociferus*	na	na	No	Possible			Sensitive	S3S4B
Least Flycatcher	*Empidonax minimus*	na	na	No	Possible			Secure	S4B
Magnolia Warbler	*Dendroica magnolia*	Probable Breeder	Possible	Yes	Possible			Secure	S5B
Mallard	*Anas platyrhynchos*	Confirmed Breeder	Unlikely	No	No			Secure	S5
Mourning Dove	*Zenaida macroura*	Possible Breeder	Possible	No	Possible			Secure	S5
Nashville Warbler	*Vermivora ruficapilla*	Possible Breeder	Possible	No	No			Secure	S5B
Nelson's Sharp-tailed Sparrow	*Ammodramus caudacutus*	Probable Breeder	Unlikely	No	No	Not At Risk		Secure	S4B
Northern Cardinal	*Cardinalis cardinalis*	Probable Breeder	Unlikely	No	No			Secure	S3S4
Northern Flicker	*Colaptes auratus*	Probable Breeder	Possible	No	No			Secure	S5B
Northern Mockingbird	*Mimus polyglottos*	No Evidence of Nesting	Unlikely	No	No			Secure	S3B
Northern Parula	*Parula americana*	Probable Breeder	Possible	No	Possible			Secure	S5B
Osprey	*Pandion haliaetus*	Not Recorded	Unlikely	Yes	No			Secure	S5B
Ovenbird	*Seiurus aurocapillus*	Probable Breeder	Possible	No	Possible			Secure	S5B
Palm Warbler	*Dendroica palmarum*	Confirmed Breeder	Possible	Yes	Probable			Secure	S5B
Pileated Woodpecker	*Dryocopus pileatus*	Not Recorded	Possible	Yes	Possible			Secure	S5
Pine Siskin	*Carduelis pinus*	Confirmed Breeder	Possible	No	No			Sensitive	S3S4B,S5N
Purple Finch	*Carpodacus purpureus*	Possible Breeder	Possible	No	No			Secure	S4S5
Red-breasted Nuthatch	*Sitta canadensis*	Possible Breeder	Possible	No	No			Secure	S4S5
Red-eyed Vireo	*Vireo olivaceus*	Possible Breeder	Possible	No	Possible			Secure	S5B
Red-tailed Hawk	*Buteo jamaicensis*	Possible Breeder	Possible	No	No	Not At Risk		Secure	S5
Red-winged Blackbird	*Agelaius phoeniceus*	Confirmed Breeder	Unlikely	No	No			Secure	S4S5B
Ring-necked Pheasant	*Phasianaus colchicus*	Confirmed Breeder	Unlikely	No	No			Exotic	SNA
Rock Pigeon	*Columba livia*	Possible Breeder	Possible	No	No			Exotic	SNA
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Possible Breeder	Unlikely	No	No			Sensitive	S3S4B
Ruby-crowned Kinglet	*Regulus calendula*	Possible Breeder	Possible	No	No			Sensitive	S4B
Ruby-throated Hummingbird	*Archilochus colubris*	Possible Breeder	Possible	No	No			Secure	S5B
Ruffed Grouse	*Bonasa umbellus*	Confirmed Breeder	Possible	No	Possible			Secure	S4S5
Savannah Sparrow	*Passerculus sandwichensis*	Possible Breeder	Unlikely	No	No			Secure	S4B
Song Sparrow	*Melospiza melodia*	Confirmed Breeder	Possible	No	No			Secure	S5B
Spotted Sandpiper	*Actitis macularia*	Probable Breeder	Unlikely	No	No			Sensitive	S3S4B
Swainson's Thrush	*Catharus ustulatus*	Probable Breeder	Possible	No	No			Secure	S4S5B
Swamp Sparrow	*Melospiza georgiana*	Possible Breeder	Possible	No	Possible			Secure	S5B
Tree Swallow	*Tachycineta bicolor*	Probable Breeder	Possible	No	No			Sensitive	S4B
Turkey Vulture	*Cathartes aura*	na	na	No	Observed, but no indication			Sensitive	S2S3B
Veery	*Catharus fuscescens*	Possible Breeder	Unlikely	No	No			Secure	S4B
White-throated Sparrow	*Zonotrichia albicollis*	Probable Breeder	Possible	Yes	Probable			Secure	S5B
White-winged Crossbill	*Loxia leucoptera*	Probable Breeder	Possible	Yes	No			Secure	S4S5
Winter Wren	*Troglodytes troglodytes*	Possible Breeder	Possible	No	No			Secure	S5B
Wood Thrush	*Hylocichla mustelina*	Possible Breeder	Unlikely	No	No			Undetermined	S1B
Yellow Warbler	*Dendroica petechia*	Confirmed Breeder	Possible	No	No			Secure	S5B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	na	na	No	Possible			Sensitive	S3S4B
Yellow-rumped Warbler	*Dendroica coronata*	Confirmed Breeder	Possible	Yes	Probable			Secure	S5B

APPENDIX I
Government Disposition Table

Disposition Table of Government Comments Regarding Draft EA Registration for Lafarge Hardscratch Quarry Extension Project

Comment No.	Reviewing Agency	Date	Comment	Response
1	Canadian Environmental Assessment Agency (Joseph Vigder)	March 8, 2013	After reviewing the draft EA Document for the above noted project, the Canadian Environmental Assessment Agency has determined that the proposed project is not subject to any requirements under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). The Agency has no further comments to submit at this time.	Comment noted.
2	Nova Scotia Environment, Wetlands Branch (John Brazner)	March 20, 2013	The proponent has emphasized throughout the document that of the total 65 ha area included within the proposed quarry extension boundary, approximately 42 ha will support quarrying activities. They state that the remaining 23 ha (i.e., the eastern third of the extension area) will be set aside as a buffer area in which no quarrying or development will occur. This will protect some of the most important wetlands on the site (particularly Wetland 3) as well as a watercourse that is hydrologically connected to fish-bearing waters in Chebogue Meadows Provincial Park downstream of the site.	Comment noted.
3	NSE-WL	March 20, 2013	Protecting Wetland 3 is significant because of its headwaters position, large size and support for some rare/uncommon plant species. However, it looks as though the plan is to alter about 3.5 ha of wetland (all swamp) during the life of the quarry. A full functional analysis should be completed for the final EA for these wetlands so that we can get a better idea about the potential significance of removing them from the landscape.	The Proponent is not seeking approval for specific wetland alterations at this point and that has not typically been required for quarry EAs. Approval will be sought through an application for Wetland Alteration Approval, including provision of functional assessments, in advance of specific proposed wetland alterations. Associated detailed compensation planning will accompany the applications.
4	NSE-WL	March 20, 2013	The proponent has suggested they will apply for an approval to alter wetlands at least 6 months in advance of any alteration. This may not be acceptable with the local EMC Office (Yarmouth) that will be handling the Wetland Alteration Approvals for this project. Those details will have to be worked out as part of the application process. The proponent should not be surprised if they are required to compensate for alterations anticipated more than 6 months in advance. It is possible that the Yarmouth EMC Office might want all alterations compensated for upfront before an approval is granted. I don't expect this will be the case, but raise the issue so that the proponent is aware that it is a possibility and may be something they want to work out with the Yarmouth Office in advance of decisions to move forward.	Section 5.5.2 of the EA Registration has been revised to include the following statement: "The regional NSE Compliance Environmental Monitoring and Compliance (EMC) office in Yarmouth will be consulted regarding their application timing requirements."
5	NSE-WL	March 20, 2013	Compensation will mostly be expected in the form of restoration of wetland habitat ideally in the southwestern part of the province and will be at a 2:1 ratio if it is in fact in the form of restoration. This means that about 7 ha of restoration will be required, depending on the final design details and which wetlands will actually be lost to the operation. Expansion of the nearby Ducks Unlimited projects might work to fulfill compensation, but we will definitely want to have discussions with the proponent's consultants about the details of what might work and what would be the best option(s) for compensation before any final decisions are made.	Comment noted.
6	NSE-WL	March 20, 2013	Inside the quarry area, buffers (a minimum of 20 m) should be maintained from all wetlands that will not be altered as well as from watercourses.	Section 5.2.2 of the EA Registration has been revised to state the following: "In addition to encompassing wetlands WL1 to WL4, the Wetland Buffer Zone protects the riparian zone within 200 m of the watercourse and likely includes the majority, if not all, of the drainage basin which supports watercourse WC-1. This 200 m buffer zone more than meets the separation distance requirements specified in the Nova Scotia Pit and Quarry Guidelines (NSE 1999), which state that no works associated with an active quarry are to be located within 30 m of the bank of any watercourse without prior government approval. As noted in Section 5.2.1, DC-1 and DC-2 do not constitute watercourses under the Environment Act; therefore, the 30 m separation distance requirement under the Pit and Quarry Guidelines is not applicable for these drainage channels. Outside of the Wetland Buffer Zone (i.e., in the portion of the Project Area that will be subject to development and operation of the extended quarry), 30 m buffers will be maintained from all wetlands that will not be altered." Section 5.5.2 of the EA Registration has been revised to include the following statement: "Outside of the Wetland Buffer Zone (i.e., in the portion of the Project Area that will be subject to development and operation of the extended quarry), 30 m buffers will be maintained from all wetlands that will not be altered."
7	NSE-WL	March 20, 2013	When building roads through wetlands, drainage should be maintained under the road so wetlands that remain on either side do not become flooded. It sounds like this has not been done in the past and has resulted in the alteration of several wetlands on the existing project site. Flooding is considered an alteration by NSE, so the proponent should be aware that they could be held responsible for altering a wetland in this manner and required to compensate for this alteration if best management practices to maintain hydrology are not employed.	It is acknowledged in Section 5.5.2 of the EA Registration that, "if NSE grants approval to infill or alter the hydrology of any wetland in the Project Area, it will be necessary to develop a compensation plan to replace the wetland functions lost as a result of damage to or loss of the wetland." In addition, Section 5.5.2 of the final EA Registration includes the following paragraph: "Existing

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Comment No.	Reviewing Agency	Date	Comment	Response
				wetlands could also be indirectly influenced by the Project through changes in hydrology, nutrients, or sediment input. However, mitigative measures will be taken during Project activities to maintain existing flows into the wetlands and to prevent inputs of nutrients, or sediments. This will be accomplished through the application of best management practices to maintain hydrology and control erosion and sedimentation, including the use of flow retention structures and energy dissipation measures."
8	NSE-WL	March 20, 2013	The final EA document should contain a complete assessment of wetland area and function that will be lost as the result of the project construction, including a table of all wetlands that will be altered, a description of the type of each wetland and an assessment functions that will be affected. This will provide part of what will be needed for the Wetland Alteration Approval process as well.	This will require additional field work and, in our experience, is typically conducted as part of the post-EA permitting process (i.e., in support of application for Wetland Alteration Approval). Also see responses to Comment No. 3 and Comment No. 29.
9	NSE-WL	March 20, 2013	Given the large number of wetlands that have been surveyed, the proponent should be asked to provide GPS boundary coordinates of all wetlands they delineate for the project (preferably in a GIS ready shape file). These data will be incorporated into the provincial wetland inventory to improve inventory accuracy.	GIS shapefiles for surveyed wetlands can be provided to NSE-WL.
10	NS Transportation & Infrastructure Renewal (Angela Swaine)	March 22, 2013	NSTIR staff have reviewed the Draft Environmental Assessment Document for the proposed Lafarge Hardscratch Quarry Extension Project. There are essentially no planned changes to current operations from a transportation perspective and we believe the existing road infrastructure is adequate to support the quarry operations. We have no comments or concerns at this time.	Comment noted.
11	NS Office of Aboriginal Affairs (Beata Dera)	March 22, 2013	Proponent indicated that a letter of information was provided to CMM, Native Council, KMKNO and Acadia First Nation. A more detailed account of information and correspondence, including follow-up by the proponent, should be included in the final registration document.	No comments have been received in response to the information letters that were sent to the CMM, NCNS, KMKNO, UNSI, and Acadia First Nation. The Proponent will follow up with additional communication and engagement around any expressed issues of concern (if applicable).
12	NS OAA	March 22, 2013	It is unclear whether the archaeological investigation for the project site was performed under a heritage research permit from the Department of Communities, Culture and Heritage. It also appears that no visual on-site assessment was undertaken to assess the archaeological potential. The Tusket River area, located approximately 4-5 km from the project site, is rich in known pre-contact archaeological resources. Given the extensive size and scope of the proposed activity, the project would benefit from an on-site visual archaeological assessment by a professional archaeologist.	Archival research and archaeological potential modeling was undertaken by a professional archaeologist in accordance with Heritage Research Permit A2011NS105. A pedestrian survey was subsequently undertaken by a professional archaeologist in July 2013 in accordance with Heritage Research Permit A2013NS053. The findings of this survey were incorporated into Section 5.7.1 of the final EA Registration. Refer also to Comment No. 31.
13	NS OAA	March 22, 2013	The Proponent indicated that "While the watercourse in the Project Area is not expected to bear fish, the water contained in the watercourse has direct connection downstream to Chebogue River. As such, appropriate mitigation must be undertaken to prevent downstream effects on fish and fish habitat…". The project site is located approximately 7 km north of Acadia First Nation. It is recommended that the Proponent gain a better understanding of any fishing activity by the Mi'kmaq community in the area which may be affected by the project.	As noted in the EA Registration, offsite effects on fish and fish habitat are not expected to occur with application of the prescribed mitigation measures; therefore, it was not considered necessary to contact recreational or traditional fishers with respect to offsite fishing activities.
14	Nova Scotia Environment, Water & Wastewater (NSE-WW) Branch (Krista Hilchey)	March 25, 2013	Although Larfarge should be commended for their decision to limit the project footprint to outside of a 23 ha "wetland conservation area/buffer zone", it is important to clarify that this area will not provide compensation for any wetlands altered within the remaining 42 ha. It is also misleading to call this area a "conservation area" because in section 5.2.2, the following is stated "should Lafarge *ever wish to quarry within the buffer zone in the future*, approval to alter a watercourse must be granted under the NSADR. However, it is currently anticipated that alteration of the watercourse will not be required during the life of the quarry extension."	Comment noted. Wording in the final EA Registration has been modified to "Wetland Buffer Zone".
15	NSE-WW	March 25, 2013	Maps showing wetlands should be revised to show Chebogue Meadows Provincial Park borders. Because Wetlands 1, 3 and 4 are partially included within Chebogue Meadows Provincial Park, these wetlands are designated as "Wetlands of Special Significance" according to the Nova Scotia Wetland Conservation Policy. Thus this wetland complex will NOT be eligible for alteration, unless the activity that causes the alteration is deemed a "necessary public function". Therefore, "preservation" of this wetland is already ensured by government policy.	Figure 5.2 was revised to show the correct boundaries for Chebogue Meadows Provincial Park, which does not overlap with any of the wetlands in the Project Area. NSE-WW's comment was based on a previous version of Figure 5.2 that was submitted as part of the draft EA Registration document and incorrectly identified provincial Crown land surrounding Chebogue Meadows Provincial Park as part of the park. When this error in the previous version of the map was brought to their attention, NSE-WW confirmed that none of the wetlands in the Project Area are entirely or partially located within the boundaries of Chebogue

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Comment No.	Reviewing Agency	Date	Comment	Response
				Meadows Provincial Park, and that the Project Area does not contain any Wetlands of Special Significance (K. Hilchey, email communication, August 14, 2013).
16	NSE-WW	March 25, 2013	It must be noted that wetland compensation will occur only if approval is granted to alter the wetland, and must be provided at a minimum 2:1 ratio (restored area: altered area) when compensation method is *restoration* of degraded wetland habitat. If alternative methods of compensation are approved (i.e. creation of replacement wetlands or enhancement of existing wetlands), higher ratios of compensation will likely be required.	Comment noted.
17	NS Department of Natural Resources (Lois Blackburn)	March 26, 2013	Minerals Branch: Submitted by Patrick Whiteway, Manager Minerals Development & Policy Page 2.3 – Figure 2.1, a minor detail, but their property lines do not match those indicated on Property on line (POL). Specifically, POL indicates the northern boundary of PID 9038991, should be 100 metres further north. These same property lines are indicated on Figures 2.2, 5.1, 5.2, 5.3, 5.4 and 5.5 as well as Figure 1 in Appendix B and D. Two things may have happened, either Stantec is using an outdated property boundary or the property has been surveyed and their boundary lines are more accurate than those on POL	The property boundaries shown on the report figures were sourced from a 2007 provincial dataset. Stantec compared the property boundaries on the report figures against provincial property data from 2011 and found that the boundaries for PID 90138991 have not changed. According to POL, the property was last registered in 2004. It is therefore assumed that the 2007 dataset that was used to create the figures is more up to date than the POL information.
18	NSDNR	March 26, 2013	Page 5.13 – Figure 5.3, perhaps not worthy of comment, but you would think they would have enlarged the aerial photo to incorporate the entire proposed quarry buffer. That goes for Figure 5.4, on page 5.29, as well.	Figures 5.3 and 5.4 were revised to show aerial photography for the entire proposed quarry buffer area.
19	NSDNR	March 26, 2013	Page 5.25 – first paragraph, 7th line, '*the provincial mineral resource land-use map indicates that the closest abandoned underground mine openings are approximately 12 km away'*. This is not correct, there is believed to be an old shaft on, or very near, the property of interest, see Geological Survey of Canada (GSC) Memoir 349, Map 1186A. Stantec's description is from the original draft for the Aberdeen Paving Quarry to the North (Page 5.21). That draft was edited to identify the shaft on, or near, this property, and the shaft is mentioned later on in this draft (Page 5.55, see below), however, its location is incorrectly referenced relative to the Aberdeen Quarry, indicating at least some of the Aberdeen EA was incorporated into this document	The information in Section 5.9.1 of the EA Registration document has been corrected.
20	NSDNR	March 26, 2013	Page 5.40 – Bedrock Geology – There is a new Open File Map, 2012-091, which should be referenced as opposed to a Provincial Scale Map, i.e. Keppie	Figure 5.5 and Section 5.6.1 of the final EA Registration document were revised to include reference to Open File Map, 2012-091.
21	NSDNR	March 26, 2013	Page 5.55 – Mining – 6th line, '*the Abandoned mine openings database indicates a shaft located approximately 2 km south of the proposed quarry boundary'*. This location is taken from the original draft of the Aberdeen Paving EA; the entire paragraph does not match what is indicated on page 5.25 (see above). Utilizing GSC Map 1186A, and a historical aerial photography from 1945, we have revised the location of the shaft and it is believed to be either on, or in very close proximity to, the property of interest, but still well South of the Aberdeen Paving site (which I believe Stantec is referencing). GSC Memoir 349 indicates the opening is partially in-filled, thus it likely poses little hazard. However, its existence within the area of interest needs to be identified.	Text in Section 5.9.1 of the EA Registration document was revised to include this information.
22	NSDNR	March 26, 2013	Wildlife division: Submitted by Duncan Bayne, Regional Biologist Site development should ensure no overflow of water or sediments into the large wetland buffer zone / conservation area under any circumstances.	The EA Registration outlines commitments related to the control of surface runoff/overflow and erosion/sedimentation (e.g., Section 2.6 – Effluents and Emissions). Text was revised to explicitly state that these controls will be implemented so as to prevent runoff and sediments from entering into the Wetland Buffer Zone.
23	NSDNR	March 26, 2013	Section 2.6. "In the unlikely event that overflow, in the event of a significant rain fall, exceeds final effluent discharge limits as determined through monitoring, contingency measures may include pumping of sediment water to vegetated areas (away from watercourses) or through filter bags for additional filtration and/or use of additional filtration devices or structures." The applicant should establish exactly where pumping would take place as part of the EA.	Pumping locations will be determined during detailed design of the settling pond and presented in the application for Industrial Approval. Text in Section 2.6 of the final EA Registration has been modified accordingly.
24	NSDNR	March 26, 2013	Section 2.7. Only native species should be used in reclamation to prevent further introduction of non-native species.	Text was revised in Section 2.7 of the final EA Registration to specify seed mixes free of invasive species.
25	NSDNR	March 26, 2013	Section 3.3. No net loss of wetlands policy should be applied and permanent safeguard of the large wetland complex should be strongly considered as a part of this. The large wetland buffer zone / conservation area should be protected in perpetuity to safeguard the headwaters of the Chebogue	The Proponent will consider this proposal by NSDNR with respect to long term wetland compensation. Section 5.5.2 of the final EA Registration notes this.

Disposition Table of Government Comments Regarding Draft EA Registration for Lafarge Hardscratch Quarry Extension Project

Comment No.	Reviewing Agency	Date	Comment	Response
			River system and the Chebogue River Meadows wetland complex – it is requested that these lands be transferred to DNR as part of the mitigation / compensation for loss of wetlands in other parts of the site or to Ducks Unlimited due to their involvement in management of the Chebogue River Meadows wetland complex.	
26	NSDNR	March 26, 2013	The buffer zone for the large wetland buffer zone / conservation area should be expanded to include the whole drainage system for the Chebogue River headwaters.	As indicated in Section 5.5 of the EA Registration, the Proponent will establish a Wetland Buffer Zone occupying approximately one third of the entire property under their ownership. As shown on Figure 5.1, the Wetland Buffer Zone encompasses WL1, WL2, WL3, WL4, and WC-1. WL3, WL4, and possibly WL1 are part of a much larger wetland complex that, through a hydrological connection with WC-1, forms the headwaters for the Chebogue River, which flows through Chebogue Meadows Provincial Park. It is not considered feasible to add additional buffer on lands within Lafarge's property boundaries.
27	NSDNR	March 26, 2013	Section 5.3 The three species found on the site that are considered sensitive by NSDNR woods-rush (*Juncus subcaudatus*), sharp-fruited rush (*Juncus acuminatus*) and yellow ladies'-tresses (*Spiranthes ochroleuca*) should be safeguarded by symbolic fencing off from development or, only where this is not possible, be transplanted to appropriate habitat on site.	Comment noted. As stated in Section 5.3.2 with respect to woods-rush, sharp-fruited rush, and yellow ladies'-tresses, care will be taken to minimize the likelihood of disturbing existing populations (*e.g.*, through staking/flagging and avoidance) and "symbolic fencing can be used to mark the locations of the known populations of these species." The text was revised slightly in Section 5.3.2 of the final EA Registration to state that symbolic fencing *will* be used.
28	NSDNR	March 26, 2013	Three species of potential concern could not be identified due to the late summer survey: northern bog violet (Viola nephrophylla), southern twayblade (Listera australis), and tubercled orchid (Plantanthera flava var. flava). A June survey should be undertaken to identify locations for these species. Southern twayblade is of particular concern as it is anticipated that this species will be added to the Nova Scotia Endangered Species Act	Follow-up vegetation surveys were carried out in June 2013. An overview of the survey findings is provided in Section 5.3 of the final EA Registration.
29	NSDNR	March 26, 2013	The wetland infill and loss and the associated compensation plan should be completed and approved as part of the EA and not "progressively as the quarrying area expands" as indicated in the draft EA.	The Proponent is not seeking approval for specific wetland alterations at this point and that has not typically been required for quarry EAs. That approval will be sought through an application for Wetland Alteration Approval, including provision of functional assessments, in advance of specific proposed wetland alterations. Associated detailed compensation planning will accompany the applications. Also see responses to Comment No. 3 and Comment No. 8.
30	NSDNR	March 26, 2013	Additional comments from the wildlife division will be provided on the final report.	Comment noted.
31	NS Communities, Culture and Heritage (Laura Bennett)	March 27, 2013	I do have some concerns regarding the archaeology conducted for this project. Since the work was conducted in 2009, our department has changed its policy regarding the validity of desktop studies for the purpose of clearing land for development, and now requires that an archaeologist visit the study area to ground-truth the results of their desktop study. As such, it is our recommendation that the proponent have an archaeological resource impact assessment conducted which consists of a pedestrian survey of the development area.	Archival research and archaeological potential modeling was undertaken by a professional archaeologist in accordance with Heritage Research Permit A2011NS105. A pedestrian survey was subsequently undertaken by a professional archaeologist in July 2013 in accordance with Heritage Research Permit A2013NS053. The findings of this survey were incorporated into Section 5.7.1 of the final EA Registration. Refer also to Comment No. 12.
32	Environment Canada (Stephen Zwicker)	April 2, 2013	Under Section 6 of the *Migratory Birds Regulations* (MBR), it is forbidden to disturb, destroy or take a nest or egg of a migratory bird; or to be in possession of a live migratory bird, or its carcass, skin, nest or egg, except under authority of a permit. It is important to note that under the current MBR, no permits can be issued for the incidental take of migratory birds caused by development projects or other economic activities. Furthermore, Section 5.1 of the MBCA describes prohibitions related to deposit of substances harmful to migratory birds: "5.1 (1) No person or vessel shall deposit a substance that is harmful to migratory birds, or permit such a substance to be deposited, in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area. (2) No person or vessel shall deposit a substance or permit a substance to be deposited in any place if the substance, in combination with one or more substances, results in a substance — in waters or an area frequented by migratory birds or in a place from which it may enter such waters or such an area — that is harmful to migratory birds." It is the responsibility of the proponent to ensure that activities are managed so as to ensure compliance with the MBCA and regulations.	Comment noted.
33	EC	April 2, 2013	In fulfilling its responsibility for MBCA compliance, the proponent should take the following points into	This information has been incorporated into Section 5.4.2 of the final EA Registration.

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			consideration: • The breeding season for most birds within the Project area occurs between May 1st and August 31st; however some species protected under the MBCA nest outside this timeframe. • While most bird species construct nests in trees and shrubs, a number of species of birds nest at ground level (e.g. Common Nighthawk, Killdeer), and some species may nest in burrows in stockpiles of soil or the banks of pits (e.g. Bank Swallows).	
34	EC	April 2, 2013	Environment Canada provides the following recommendations: 1. Avoid engaging in potentially destructive activities during key periods in order to reduce the risk of nest destruction, i.e. avoid land clearing activities between the most critical period, May 1 and August 31, to accommodate the breeding season for most migratory birds within the Project area. 2. Risk of impacting active nests or birds caring for pre-fledged chicks, discovered during project activities outside the May 1st to August 31st window, can be minimized by measures such as the establishment of vegetated buffer zones around nests, and minimization of activities in the immediate area until nesting is complete and chicks have naturally migrated from the area. It is incumbent on the proponent to identify the best approach, based on the circumstances, to complying with the MBCA.	As noted in Section 5.4.2 of the EA Registration, "Migratory birds are protected under the *Migratory Birds Convention Act* (MBCA). As such, it is illegal to kill migratory bird species not listed as game birds or destroy their eggs or young. Other bird species not protected under the federal Act, such as raptors, are protected under the provincial Wildlife Act. In order to avoid contravening these regulations, clearing, grubbing and stripping of areas to be used for the Project will be preferentially conducted outside of the breeding season of most bird species (May 1 to August 31) so that the eggs and flightless young of birds are not inadvertently destroyed. It is anticipated that proper quarry planning will allow the Proponent to conduct clearing well outside the bird breeding period, which should provide adequate protection for migratory birds. However, in the unlikely case that this is not possible, the Proponent will review the best practical mitigation measures with the Canadian Wildlife Service (CWS). At a minimum, if complete avoidance of these activities during the specified timeframe is not feasible, nest surveys will be undertaken by a qualified biologist and avoidance buffers will be established around active nests."
35	EC	April 2, 2013	When referring to the MBCA and provincial wildlife legislation, the proponent states that "In order to avoid contravening these regulations, clearing, grubbing and stripping of areas to be used for the Project will be preferentially conducted outside of the breeding season of most bird species (May 1 to August 31) so that the eggs and flightless young of birds are not inadvertently destroyed. If complete avoidance of these activities during the specified timeframe is not feasible, nest surveys will be undertaken by a qualified biologist and avoidance buffers will be established around active nests." We recommend that the proponent clarify how it proposes to comply with the MBCA and associated regulations considering the following: • It is difficult to locate most nests. Nest sites are cryptic and adult birds avoid approaching their nests in a manner that would attract predators to their eggs or chicks. The amount of habitat to be searched also often limits the success of surveys intended to locate active nests. Therefore, except in circumstances where nests are known to be easy to locate (i.e. open areas, isolated trees, man-made structures), active nest searches are not recommended because of the inability to locate most nests and because of the disturbance to nesting birds they are likely to cause. • To determine what birds are nesting in an area, non-intrusive searching methods are generally recommended in order to prevent disturbing migratory birds while they are nesting. For example point counts early in the breeding season may provide a good indication of the presence of song bird nests in an area. • If nests containing eggs or young of migratory birds are located or discovered (i.e. such as in previously cleared, open areas), or suspected based on results of non-intrusive searching methods (i.e. in vegetated areas), setbacks should be established in consultation with CWS. Nests should not be marked using flagging tape or other similar material as these increase the risk of nest predation. • Compliance with the MBCA is expected for all project-related activities and during all project phases.	It is anticipated that proper quarry planning will allow the Proponent to conduct clearing well outside the bird breeding period, which should provide adequate protection for migratory birds. In the unlikely case that this is not possible, the Proponent will review the best practical mitigation measures with the Canadian Wildlife Service (CWS). Text was modified to reflect this in Section 5.4.2 of the final EA Registration.

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			• Certain species of migratory birds (e.g. Bank Swallows) may nest in large piles of soil left unattended/unvegetated during the breeding season. To discourage this, the proponent may want to consider measures such as covering these large piles of unattended soil during the breeding season. If however migratory birds take up occupancy of these piles, any industrial activities (including hydroseeding) will cause disturbance to these migratory birds and inadvertently cause the illegal destruction of nests and eggs. Alternate measures will then need to be taken to reduce potential for erosion, and to ensure that nests are protected until chicks have fledged and left the area. For a species such as Bank Swallows, the period when the nests would be considered active would include not only the time when birds are incubating eggs or taking care of flightless chicks, but also a period of time after chicks have learned to fly since swallows return to their colony to roost. • Some species of migratory birds, including the threatened Common Nighthawk, may be attracted to cleared areas for nesting. The proponent should clarify how it would respond should migratory birds nest in previously cleared areas of the quarry.	
36	EC	April 2, 2013	We agree with the statement on page 5.17 that "Given the timing of the field survey it was not possible to collect good evidence of breeding activity." Site visits on August 30-31 2011 (page 5.1) were too late in the season to obtain information on the use of the area by breeding birds. Surveys to determine the use of an area by breeding birds are generally not conducted past the third week of July.	Follow-up breeding bird surveys were carried out in June 2013. An overview of the survey findings is provided in Section 5.4 of the final EA Registration.
37	EC	April 2, 2013	The Eastern Wood-Pewee has been assigned the status of Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and should be considered as such in the EA.	The status of this species has been updated in the final EA Registration.
38	Fisheries and Oceans (Edward Parker)	April 4, 2013	Provided that the plans are implemented as described, DFO has concluded that the proposal is not likely to result in impacts to fish and fish habitat. The proponent will not need to obtain a formal approval from DFO in order to proceed with the proposal.	Comment noted. No action required.
39	DFO	April 4, 2013	The proponent should notify this office at least 10 days before starting the work. A copy of this letter should be kept on site while the work is in progress. PO Box 1035 Dartmouth NS B2Y 4T3	The Proponent will notify DFO as required.
40	DFO	April 4, 2013	If the plans have changed or if the description of the proposal is incomplete the proponent should contact this office to determine if the advice in this letter still applies.	The Proponent will notify DFO if there are any substantive changes to Project description.
41	DFO	April 4, 2013	Please be advised that any impacts to fish and fish habitat which result from a failure to implement this proposal as described could lead to corrective action such as enforcement.	Comment noted.
42	Nova Scotia Environment, EA Branch (Julia Kun)	April 8, 2013	The review of the draft proposal represents only a preliminary examination of the proposed undertaking and does not preclude further examination and commentary during the final review of the undertaking once it is officially registered under Part IV of the *Environment Act* and regulations made pursuant to Part IV.	Comment noted.
43	NSE-EA	April 8, 2013	Please ensure minimum requirements are met when submitting your Registration Document. Section 9 of the Environmental Assessment Regulations provides a complete list of minimum Requirements that must be met. The minimum requirements are available for your reference online at: http://www.gov.ns.ca/just/regulations/REGS/envassmt.htm. In particular, please ensure at least one document provides the name and signature of the Chief Executive Officer or a person with signing authority, if the proponent is a corporation.	Comment noted.
44	NSE-EA	April 8, 2013	You are reminded that the proponent is responsible for the publishing of the environmental assessment notice in two papers, one having local distribution and one having province-wide distribution. A Notice template will be provided for you to complete and submit for review. Prior to registration, please contact me regarding the requirements for these public notices and the number of copies of the document required. You are also required to place copies of the official Environmental Assessment Registration Document in two public locations in the area of the proposed undertaking. Please advise me of these locations prior to registration.	Comment noted.
45	NSE-EA	April 8, 2013	Electronic copies of the public notice and the registration document including all appendices,	Comment noted.

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Comment No.	Reviewing Agency	Date	Comment	Response
			drawings and maps must be provided for publication on the Department's website. Please refer to the Information Bulletin on *Requirements for Submitting Electronic Copies of Environmental Assessment Documents* (http://www.gov.ns.ca/nse/ea/pubs.asp) or contact the EA Branch for details regarding electronic versions.	
46	NSE-EA	April 8, 2013	The proposed undertaking is a Category I Environmental Assessment. In accordance with the Fee Schedule Regulations a registration fee ($10,821.75) is required at the time of the submission of your registration document. A cheque should be made payable to the Minister of Finance.	Comment noted.