

APPENDIX A

Registry of Joint Stocks and Industrial Approval





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PROFILE - GALLANT AGGREGATES LIMITED - as of 2007-01-29 10p.m.

Company/Society Name:	GALLANT AGGREGATES LIMITED
Registry ID:	2501176
Type:	N.S. Limited Company
Nature Of Business:	
Status:	Active
Jurisdiction:	Nova Scotia
Registered Office:	100 BEDROCK LANE ELMSDALE NS B2S 2B1
Mailing Address:	PO BOX 10 ENFIELD NS B2T 1C6
Previous Name:	2501176 NOVA SCOTIA LIMITED

PEOPLE

Name	Position	Civic Address	Mailing Address
FRED BENERE	Director	8 LOCKS ROAD PO BOX 351 ENFIELD NS B2T 1C8	
FRED BENERE	PRESIDENT	8 LOCKS ROAD PO BOX 351 ENFIELD NS B2T1C8	
ALAN G. HAYMAN	Recognized Agent	1800 - 1801 HOLLIS STREET HALIFAX NS B3J 3N4	1800 - 1801 HOLLIS STREET HALIFAX NS B3J 3N4
FLORENCE BENERE	SECRETARY	8 LOCKS ROAD PO BOX 351 ENFIELD NS B2T1C8	

ACTIVITIES

Activity	Date
Registered	1995-10-23
Incorporated	1995-10-23
Change of Directors	1995-10-23
Agent Filed	1995-10-23
Name Change	1996-01-10
Registered Office Change	1996-01-25
Special Resolution	1996-02-05
Special Resolution	1996-10-10
Special Resolution	1996-10-10
Annual Statement Filed	1996-10-18
Annual Renewal	1996-10-18
Filed Document	1997-01-29
Special Resolution	1997-01-29
Annual Renewal	1997-10-10
Annual Statement Filed	1997-11-04
Special Resolution	1998-08-04
Annual Renewal	1998-09-14
Annual Renewal	1999-09-24
Address Change	1999-10-18
Annual Statement Filed	1999-10-18
Filed Document	2000-08-17
Annual Renewal	2000-10-02
Annual Statement Filed	2000-10-02
Annual Renewal	2001-10-11
Annual Statement Filed	2001-10-11

Annual Renewal	2002-10-03
Annual Statement Filed	2002-10-08
Special Resolution	2002-10-28
Filed Document	2002-10-28
Special Resolution	2002-10-28
Filed Document	2003-01-29
Special Resolution	2003-06-16
Annual Renewal	2003-10-02
Annual Statement Filed	2003-10-02
Change of Directors	2004-01-29
Filed Document	2004-01-29
Special Resolution	2004-07-09
Annual Renewal	2004-10-07
Annual Statement Filed	2004-10-07
Special Resolution	2005-07-18
Annual Statement Filed	2005-09-27
Annual Renewal	2005-09-28
Filed Document	2006-02-13
Filed Document	2006-07-24
Special Resolution	2006-07-24
Filed Document	2006-07-24
Annual Renewal	2006-10-03
Annual Statement Filed	2006-10-03

RELATED REGISTRATIONS

There are no related registrations on file for this company.



APPROVAL

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

APPROVAL HOLDER: Gallant Aggregates Limited

APPROVAL NO: 2006-050247-R01 (Renewal)

EFFECTIVE DATE: January 30, 2006

EXPIRY DATE: January 30, 2016

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, operation and reclamation of a Quarry, and associated works, at or near 100 Bedrock Lane, Elmsdale, Halifax Regional Municipality in the Province of Nova Scotia.

Administrator
Date Signed

Stephen Westhaver
February 10, 2006

TERMS AND CONDITIONS OF APPROVAL

Nova Scotia Department of Environment and Labour

Project: Gallant Aggregates Limited
Quarry
100 Bedrock Lane,
Eimsdale, Halifax Regional Municipality

Approval No: 2006-050247-R01 (Renewal)
(Formerly Industrial Approval 84-173 Amendment #1)

File No: 92100-30-/BED-050247

Map Series: 11 D/14

Grid Reference: E 463 000 N 4 979 000

PID # : 00524934

Reference Documents:

- Application dated December 20, 2005 and attachments.
- Original Application for Approval associated with Industrial Approval # 84-173 Issued to L&M Gallant Contracting Trucking Limited file 11-85-0258.

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 Central Region, Bedford Office, of the Nova Scotia Department of Environment and Labour located at the following address:

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Nova Scotia Department of Environment and Labour
Environmental Monitoring and Compliance Division
Central Region, Bedford Office,
Suite 224, 1595 Bedford Highway,
Bedford, Nova Scotia, B4A 3Y4.

Phone: (902) 424-7773

Fax: (902) 424-0597

- 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, operate and reclaim the Facility, situated at or near 100 Bedrock Lane, Elmsdale, Halifax Regional Municipality (the "Site").
- b) The Facility shall be constructed, operated and reclaimed as outlined in the original application for industrial approval and the application for renewal dated December 20, 2005 and supporting documentation unless otherwise indicated by terms and conditions of the Approval.
- c) The Site shall not exceed the area as outlined in the application and supporting documentation.

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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.

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- 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.

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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 $\mu\text{g}/\text{m}^3$
Daily Average (24 hr.)	120 $\mu\text{g}/\text{m}^3$
- 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 not 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.

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- 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.

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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	weekly	Quarry Discharge into unnamed watercourse
pH	5 - 9	6 - 9	weekly	Quarry Discharge into unnamed watercourse

- 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) The Approval shall also establish a surface water monitoring station identified as "Pond" in the unnamed watercourse upstream of the on-site pond and upstream of the culvert crossing the Site access Road. This station shall be monitored at the same frequency as the quarry discharge station.
- 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) 15 m of the property boundary with the exception of that area of the Site with a pre-existing disturbance on the adjacent property, owned by Martell Construction (1995) Ltd. PID # 40705568, in the location of the existing asphalt plant and concrete ready mix plant.
- 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) 15 m of the property boundary.

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 made available to the Department upon request.
- 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:

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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.

11. Rehabilitation

- a) The Approval Holder shall post an interim financial security in a form acceptable to the Department in the amount of \$2,500.00 an acre of disturbed area.
- b) The Approval Holder shall submit a rehabilitation plan to the Department for review by May 30, 2006. The rehabilitation plan shall be revised and updated every three years thereafter and submitted 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

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- c) Prior to expiry of the interim security the Approval Holder shall post financial security which shall be calculated using the rehabilitation plan and factors in item b) above. The value of the final security shall be approved by the Department and updated every three years in accordance with the revised rehabilitation plan.
- d) 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 (b) or other terms as specified by the Department,
- e) 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.
- f) 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.

APPENDIX B

Gallant Aggregates Quarry Hydrology



INTRODUCTION

General

As part of this assessment, a hydrology study of the proposed Elmsdale Quarry expansion project has been completed. The purpose of the study is to determine the hydrologic effects of the proposed expansion both to the proposed site and to downstream hydrologic features.

Objectives

The objectives of the hydrology study are as follows:

- estimate the change in the quantity of runoff from the expansion area as a result of the ultimate level of proposed quarry expansion;
- estimate the required capacity of flow retention and/or siltation treatment structures required for the ultimate level of proposed quarry expansion; and,
- assess the potential impacts of the proposed quarry expansion on downstream flow and water quality for the ultimate level of proposed quarry expansion.

Site Description and Background

The proposed quarry expansion lands are located in Elmsdale, Halifax Regional Municipality, Nova Scotia, just south of the existing Gallant Aggregates Limited quarry. The existing quarry has been operating for the past 20 years, and the granular material produced is used primarily for the local construction market.

The proposed expansion lands (referred to as the “site”) are also owned by Gallant Aggregates Limited, and it is intended that the site be developed in various phases over the next 50 years. The ultimate level of development is approximately 64 ha (refer to the attached Figure 1), with a proposed production rate of 400,000 to 500,000 tonnes per year. Operation of the proposed quarry expansion will remain the same as the existing quarry, which includes blasting, crushing and stockpiling of material on site.

Existing topography on the site generally slopes downward from the southeast and northeast site boundaries and from the northwest side of the site, towards the south. A hydrologic divide is present on the northwest side of the site (refer to the attached Figure 1). Surface drainage from the south side of the site is anticipated to drain to the south, towards a series of wetlands and tributaries which form the headwaters of Beaver Brook, which discharges to the Shubenacadie River approximately 1.5 km east of the site.

METHODOLOGY

Mean Annual Site Runoff Estimation

The mean annual site runoff for the ultimate level of proposed quarry expansion was estimated by comparing mean annual site water balances for both the pre- and post-development cases. The post-development case assumes that all vegetative cover and topsoil will be removed from the surface of the site, which will cause a reduction in both evapotranspiration and infiltration, resulting in an increase in runoff volumes from the site.

Flow Retention and Siltation Treatment Sizing

The discharge capacity and sizing of the required flow retention and siltation treatment structures for the ultimate level of quarry expansion was estimated using the post- and pre-development physiographic parameters for the site and the HydroCAD™ 8.00

hydrological modeling software package, and the SCS TR-20 method (SCS Unit Hydrograph procedure).

Required physiographic input parameter for the TR-20 method include the flow path length (L), the slope along flow path (S), an estimate of the time of concentration (t_c ; defined as the time required for a water molecule to reach the discharge from the most distant point in the subcatchment). Information used to estimate the parameters was obtained from the available project mapping and aerial photography. Time of concentration was calculated using the NEH Upland Method for both the pre- and post-development scenarios.

The minimum flow retention and siltation treatment volumes are based on rainfall amounts derived from the 6-hour duration event for the 25-year return period storm. The maximum required discharge capacities for the north and south subcatchments are based on peak design flows resulting from rainfall amounts derived from the 6-hour duration, 100-year return period storm event. The Indy-Huff design storm distribution was used for the simulations completed.

RESULTS

Mean Annual Site Runoff Estimation

Based on historical climactic normals at the Halifax International Airport Climate station, located approximately 10 km south of the site, for the period of 1971 to 2002, the average annual precipitation at the site is 1452.2 mm.

Estimated total annual evapotranspiration in the Truro area has been estimated to be on the order of 480 mm, or 33% of average annual precipitation for this site (Reference: *Regional Water Resources, Pictou County, Nova Scotia*, prepared by John E. Gibb and Karen A. McMullin, Nova Scotia Department of the Environment, Halifax 1980).

Infiltration is assumed to be on the order 12% of the average annual precipitation based on the hydrologic soil group, vegetation cover and average topographic slope (REFERENCE: *Stormwater Management Planning and Design Manual*. Ministry of the Environment, Queen's Printer for Ontario, Toronto, Ontario, 2003) which results in an estimate of annual infiltration for the site of approximately 175 mm.

The remaining 55% of the average annual precipitation for the site, or 797.2 mm, contributes to the runoff from the site. This compares to a provincial watershed runoff average of approximately 65% of total incipient precipitation estimated by MacLaren et al (1980; REFERENCE: *Regional Flood Frequency Analysis for Mainland Nova Scotia Streams*. MacLaren Atlantic Limited, 1980). Consequently, the estimated annual volume of pre-development runoff is 506,222 m³.

It is estimated that runoff from the site will be increased by a factor approximately 20% as a result of development of the site, accounting for an equivalent decrease in evapotranspiration and infiltration. The resulting post-development annual volume of runoff is estimated to be 607,466 m³, and the total change in anticipated site runoff resulting from the ultimate level of proposed quarry development, when compared to the existing site conditions is 101,244 m³.

Flow Retention and Siltation Treatment Sizing

Physiographic input parameters for the runoff modeling are provided in Table 1 for the pre-development case. Table 2 provides the physiographic input parameters for the post-development case (i.e. the ultimate proposed level of quarry expansion).

Table 1 - Physiographic Input Parameters (Pre-development)

Subcatchment	Area (ha)	Flow Path Length, L (m)	Land Slope along Flow Path, S (m/m)	Time of Concentration, t_c (min)	Curve Number, CN
North	18.7	420	0.024	30	80
South	44.8	670	0.017	62	77

Table 2 - Physiographic Input Parameters (Post-development)

Subcatchment	Area (ha)	Flow Path Length, L (m)	Land Slope along Flow Path, S (m/m)	Time of Concentration, t_c (min)	Curve Number, CN
North	18.7	420	0.024	30	91
South	44.8	670	0.017	62	91

It should be noted that it is assumed that all surface runoff upstream of the proposed expansion area will be diverted around the site, and that off-site area will not contribute to runoff on the site.

Pre- and post-development hydrographs developed for the 25-year and 100-year return period storm simulations are shown in Figures 2 to 5, below.

Figure 2 – Comparison of Pre- and Post-development Runoff Rates for North Subcatchment (6-hour, 25-year Return Period Storm Event)

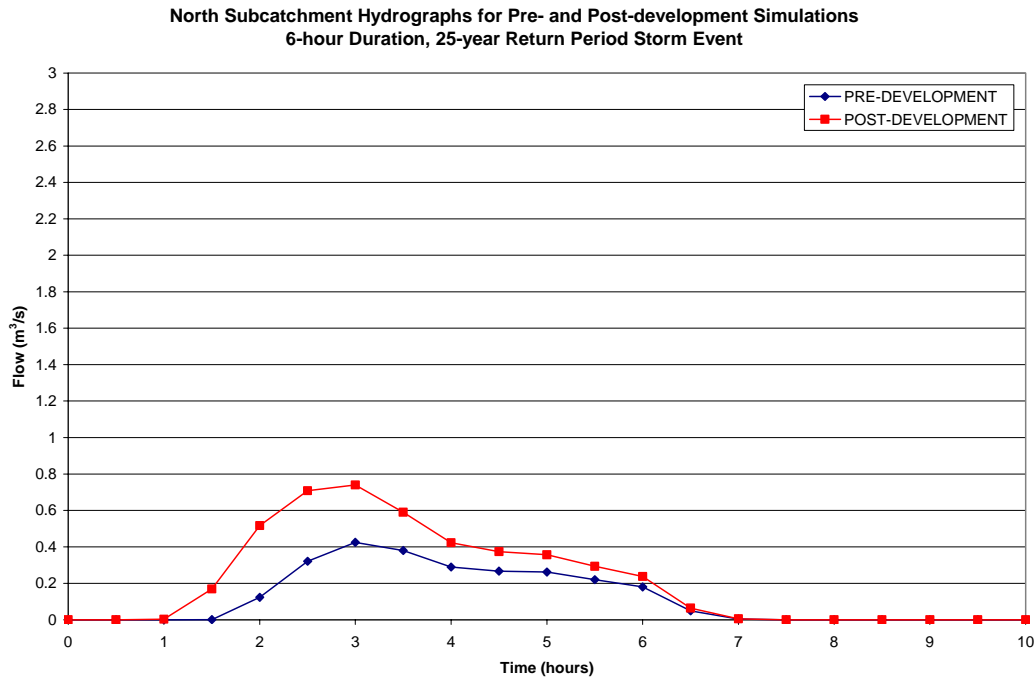


Figure 3 – Comparison of Pre- and Post-development Runoff Rates for South Subcatchment (6-hour, 25-year Return Period Storm Event)

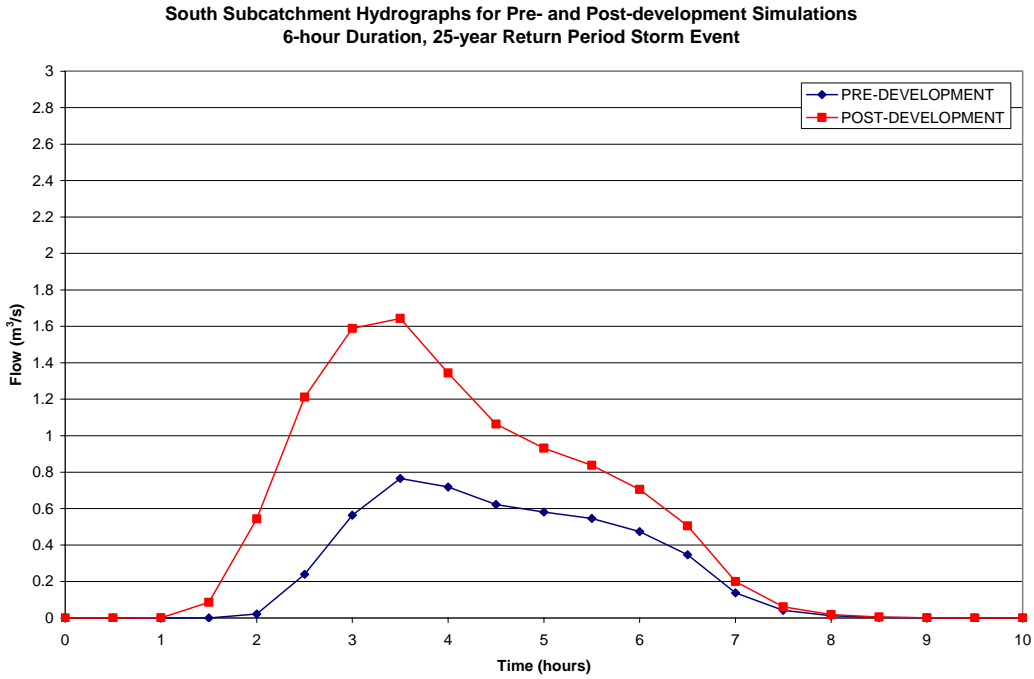


Figure 4 – Comparison of Pre- and Post-development Runoff Rates for the North Subcatchment (6-hour, 100-year Return Period Storm Event)

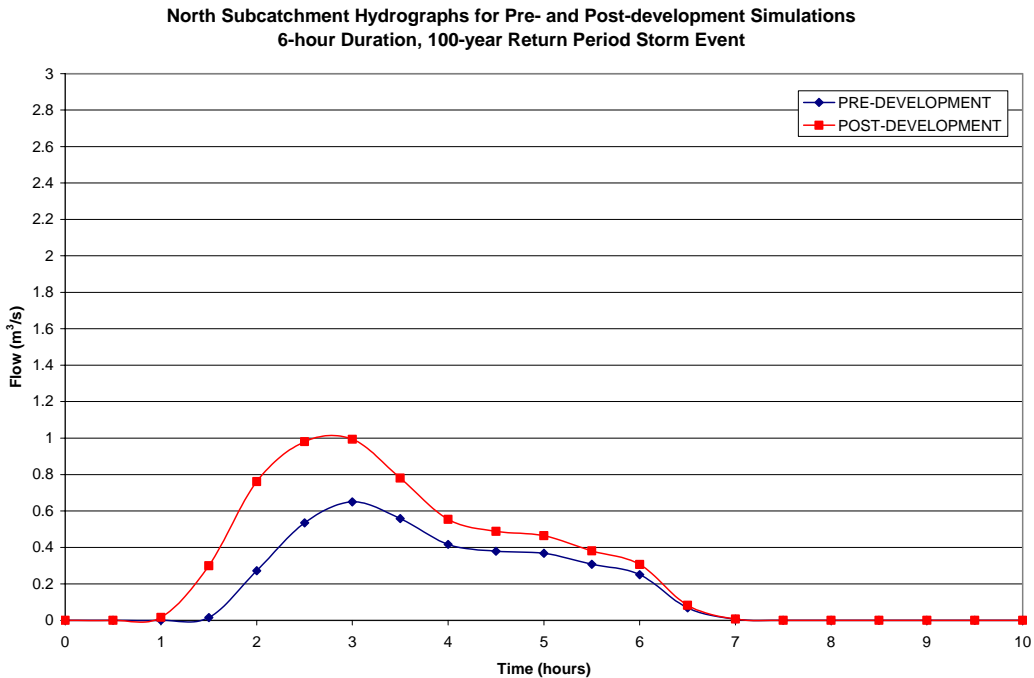
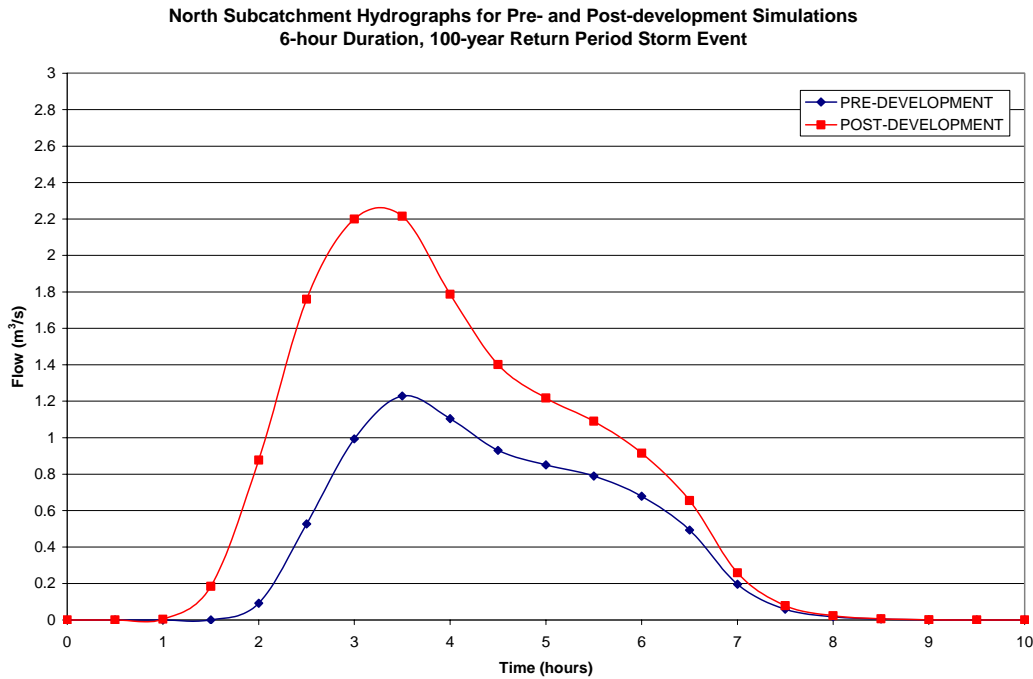


Figure 5 – Comparison of Pre- and Post-development Runoff Rates for South Subcatchment (6-hour, 100-year Return Period Storm Event)



Based on the simulations completed for the 6-hour duration, 25-year return period storm (refer to Figure 2 and Figure 3), the total change in runoff volumes as a result of the ultimate level of proposed quarry expansion are set out in Table 3.

Table 3 - Runoff Volumes for the 6-hour Duration, 25-year Return Period Storm Event

Subcatchment	Pre-development Runoff Volume (m ³)	Post-development Runoff Volume (m ³)	Change in Runoff Volume (m ³)
25-year Return Period Storm Event			
North	4,548	8,075	3,527
South	9,134	19,347	10,213
Total for site	13,682	27,422	13,740

It is recommended that flow retention structures be designed to retain the flow for the 25-year return period storm event. Consequently, the north subcatchment flow retention structure should be sized to accommodate 8,075 m³ of runoff, and the flow retention structure for the south subcatchment should be sized to accommodate 19,347 m³ of runoff. The total volume of flow retention required for the site for the ultimate level of proposed quarry expansion is 27,422 m³. It should be noted that area of the quarry may provide flow retention and siltation treatment capacity, provided these areas meet the runoff volume retention standards.

Based on the simulations completed for the 100-year return period storm event, the peak flows for the post-development case are estimated to be 1.0 m³/s for the north subcatchment and 2.2 m³/s for the south subcatchment. The installation of stormwater storage facilities to capture the 25 year runoff event are expected to have a peak attenuation or “shaving” effect on the discharge from the 100 year event. The

hydrographs developed by taking the difference between the 25-year and 100-year return period storm event simulation for the post-development scenarios in the north and south subcatchments are expected to represent excess discharge from flow retention structures designed to meet the flows of the 6-hour duration, 100-year storm event. These hydrographs are shown in Figures 6 and 7. Discharge outlets for the flow retention structures should be designed to accommodate the difference between the 25-year and 100-year storm event discharges. Therefore, the flow retention structure outlets for the north and south subcatchments should be designed to handle flows of approximately 0.3 m³/s and 0.6 m³/s, respectively as high flow thresholds.

Drawdown of water levels from the 25-year return period storm event detention storage level to the permanent pool retention level should be determined based on detention time estimated to adequately improve water quality. A recommended drawdown period of 24 hours is anticipated to improve water quality by removing as much as 80% or more of suspended solids concentrations. Based on the low flow threshold of 24-hour discharge of runoff events equal to and less than the 25-year storm event, the mean discharge capacity should be 93.5 l/s and 224 l/s for the north and south subcatchments respectively. As a result, it is anticipated that an appropriately designed compound weir may provide the most suitable discharge structure. Such a discharge control structure is expected to mitigate peak discharge volumes to at or below pre-development discharge conditions, reducing the threat of downstream erosion and extending baseflows to downstream hydrologic features.

Figure 6 – Post-Development Runoff and Pond Discharge for the North Subcatchment

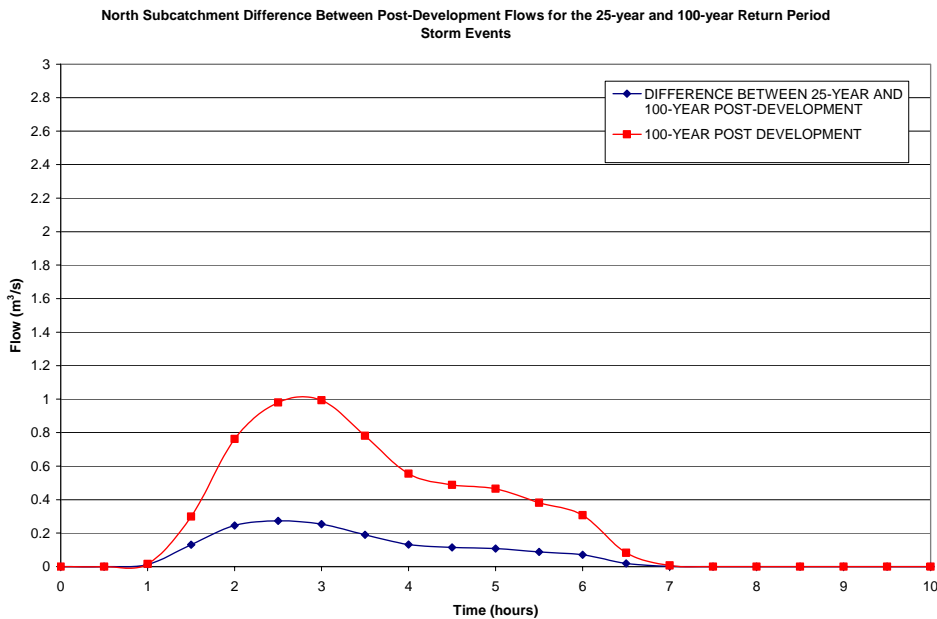
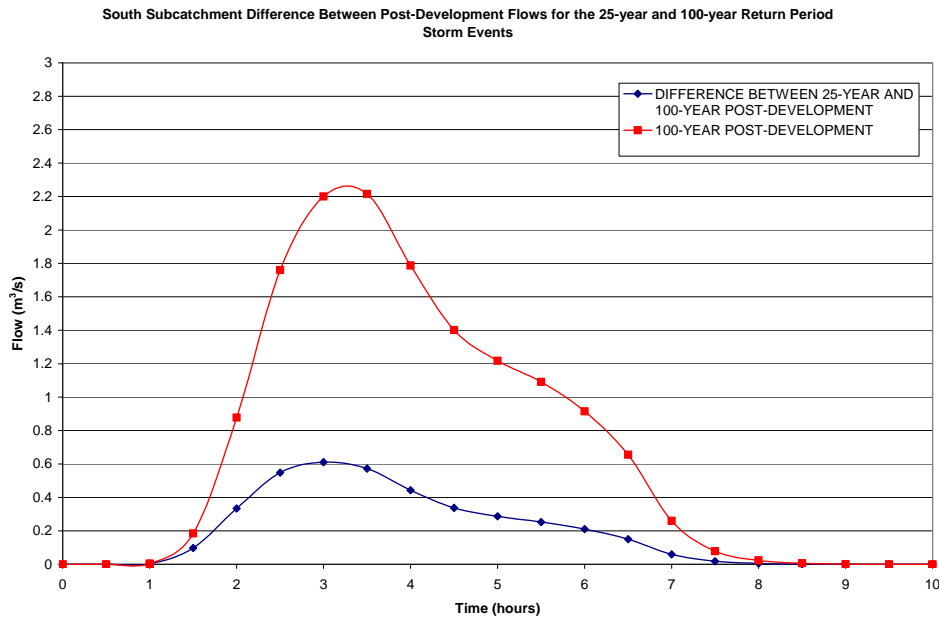


Figure 7 – Post-Development Runoff and Pond Discharge for the North Subcatchment



Effects on Downstream Flows and Water Quality

The ultimate level of proposed quarry expansion is anticipated to increase the total mean annual runoff from the site by 101,244 m³. Of the total change in mean annual site runoff, it is anticipated that an additional 29,815 m³ will be generated in the north subcatchment and 71,429 m³ will be generated in the south subcatchment. It is assumed that the ultimate level of proposed quarry development will result in the removal of the field identified wetlands from the site (refer to the attached Figure 1), and that controls must be implemented to minimize impacts to the downstream wetlands (refer to Figure 1) located immediately south and east of the site.

It is estimated that 70% of the mean annual site runoff generated on the north subcatchment will be directed towards Wetland A. Total annual mean runoff associated with Wetland A (including the site and applicable surrounding area) is estimated to be on the order of 596,156 m³. The additional 20,870 m³ of additional mean annual runoff associated with site development which will discharge to this wetland, represents an increase in the mean annual runoff entering the wetland of 4%.

Wetlands B, C and D form part of a string of interconnected wetlands associated with Beaver Brook. Only Wetlands B and C receive runoff discharge directly from the site. The annual mean runoff associated with the Beaver Brook watershed, upstream of these three wetlands is estimated to be on the order of 3,900,000 m³. As a result, the additional 71,429 m³ of additional mean annual runoff generated by the ultimate level of proposed quarry expansion on the site represents a 2% increase in the mean annual runoff at the discharge point of Wetland B.

Overall, when compared to the pre-development runoff entering Wetlands A, B and C the increases in runoff to Wetlands A, B and C is not considered to be significant. However, it is anticipated that the site development can potentially result in discharge hydrographs with higher peaks and steeper recession limbs. In order to minimize the impacts to the downstream wetlands, it is recommended that the flow retention structures be placed upstream of the wetlands and the outlets be designed to reduce the

slope of the recession limb, and decrease the magnitude of peak flow, thereby mimicking pre-development conditions.

It is anticipated that the largest potential downstream water quality impacts associated with the ultimate level of proposed quarry development will include:

- increase in sediment load; and,
- increase erosion.

Sediment load can be controlled through the installation of check dams along runoff collection ditches, and through the design of flow retention structures which are appropriately configured to provide sufficient sediment removal capacity, and through the placement of free draining cover materials over disturbed areas of the site. These measures are anticipated to negate the potential impacts of increased sediment generation on the site.

Erosion of future constructed drainage channels on the site can be reduced by the installation of riprap for stabilization along channels, and ensuring slopes in any constructed channels do not exceed a slope ratio of 3:1. Check dams, recommended for sediment control, are also anticipated to provide some erosion control capability by providing energy dissipation.

CONCLUSIONS AND RECOMMENDATIONS

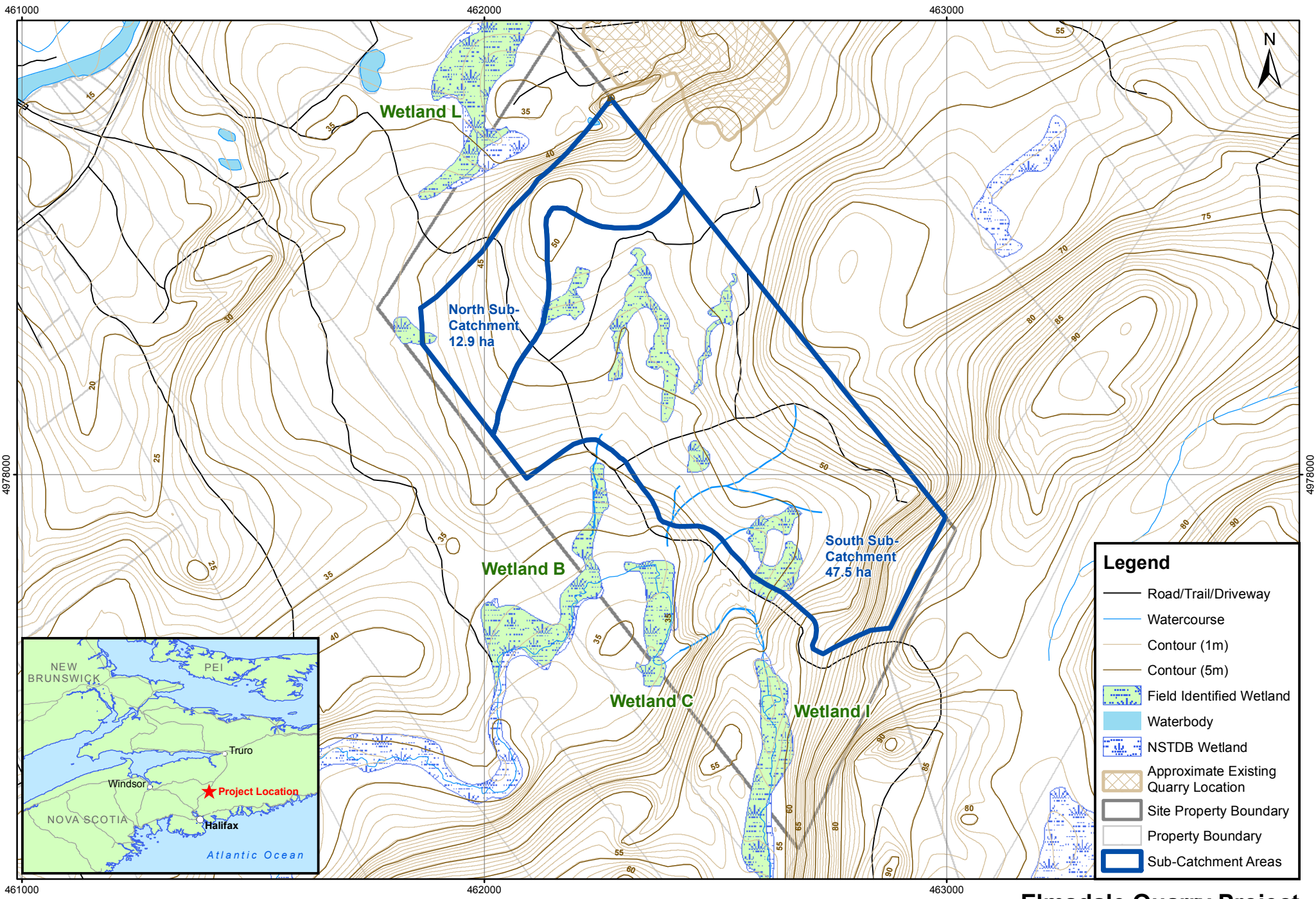
The following conclusions are made based on the results of the desktop hydrology study completed for the ultimate level of proposed quarry development.

- The pre-development mean annual site runoff for the site is estimated to be 506,222 m³.
- The total change in the mean annual site runoff for the site resulting from the ultimate level of proposed quarry development is estimated to be 101,244 m³.
- An estimated increase in the mean annual runoff of 29,815 m³ is anticipated to be generated by the north subcatchment, and an estimated increase in the mean annual runoff of 71,429 m³ is anticipated to be generated by the south subcatchment.
- As a result of the ultimate level of proposed quarry expansion, total mean annual runoff entering Wetland A will increase by approximately 4%. The total mean annual runoff discharging from the Wetland B/C complex will increase by 2%.
- The flow retention and sediment treatment structures for the north and south subcatchments should be designed to accommodate 8,075 m³ and 19,347 m³, respectively of site generated runoff.
- The outlets of the north and south subcatchment flow retention structures should be designed to accommodate discharge rates of 0.3 m³/s and 0.6 m³/s, respectively for high flows between the 25- and 100-year storm events. Based on a 24-hour drawdown period from 25-year storm event to permanent pool levels, discharge capacities are estimated at 93.5 and 224 l/s, for the north and south stormwater retention facilities, respectively.
- An appropriately designed compound weir outlet structure is anticipated to accommodate both high and low flow discharge thresholds.
- Flow retention structures should be designed to provide sufficient sediment removal capacity.

- Flow retention structures should be placed upstream of the wetlands and the outlets be designed to reduce the slope of the recession limb, and decrease the magnitude of peak flow, thereby mimicking pre-development conditions.
- Drainage channel should be constructed, with appropriate erosion and sediment control measures, to direct site drainage to the flow retention and sediment control structures.

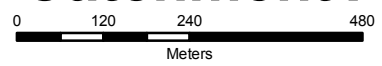
CLOSURE

This report has been prepared on behalf of and for the exclusive use of Gallant Aggregates Limited and its representatives for this project. The assessment only represents the conditions at the subject property at the time of the assessment. The conclusions presented herein represent the best judgment of the assessor based on current environmental standards. Jacques Whitford attests that to the best of our knowledge, the information presented in this report is accurate.



Map Parameters
 Projection: UTM-NAD83-Z20
 Scale 1:10,500
 Date: May 1st, 2007
 Project No: 1013296

Figure 1
Sub-Catchment Areas



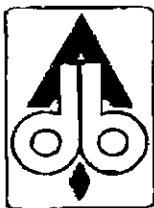
Elmsdale Quarry Project



APPENDIX C

Blast Design for Gallant's Quarry





Archibald Drilling & Blasting (1986) Ltd.

86 Parkway Drive, Truro Heights
Nova Scotia B2N 5A9

Telephone: (902) 897-2673

Fax: (902) 897-2677

February 12, 2007

Gallant's Aggregate
P.O. Box 10
Enfield, NS
B2T 1C6

Attn: Mr. Fred Benere
Re: Blast Design For Gallant's Quarry

Dear Mr. Benere;

As per your discussions with Mr. Rod Dean, the following is the typical blast design for blasting operations at your quarry in Elmsdale :

# of Holes	180
Hole Diameter	5.5 in.
Hole Depth	45 ft. (Avg)
Burden	12 ft.
Spacing	12 ft.
Collar	7 ft
Max Kgs/Delay	682 kg
Type of Explosive	Magnafrac 1161
Total Wt of Explosives	86,850 Kgs
Primer	Pentex 12
Detonator	Handidet 25/500
Quantity of Rock	78,720 t

Please note that we reserve the right to adjust this blast design based upon monitoring results, quality of blasted rock being produced, and changes to site conditions.

We trust that this meets with your approval. If you require additional information, please contact Rod Dean, David Logan or myself. Our office number is (902) 897-2673.

Sincerely,

Mike Mason
Safety Officer/Technician

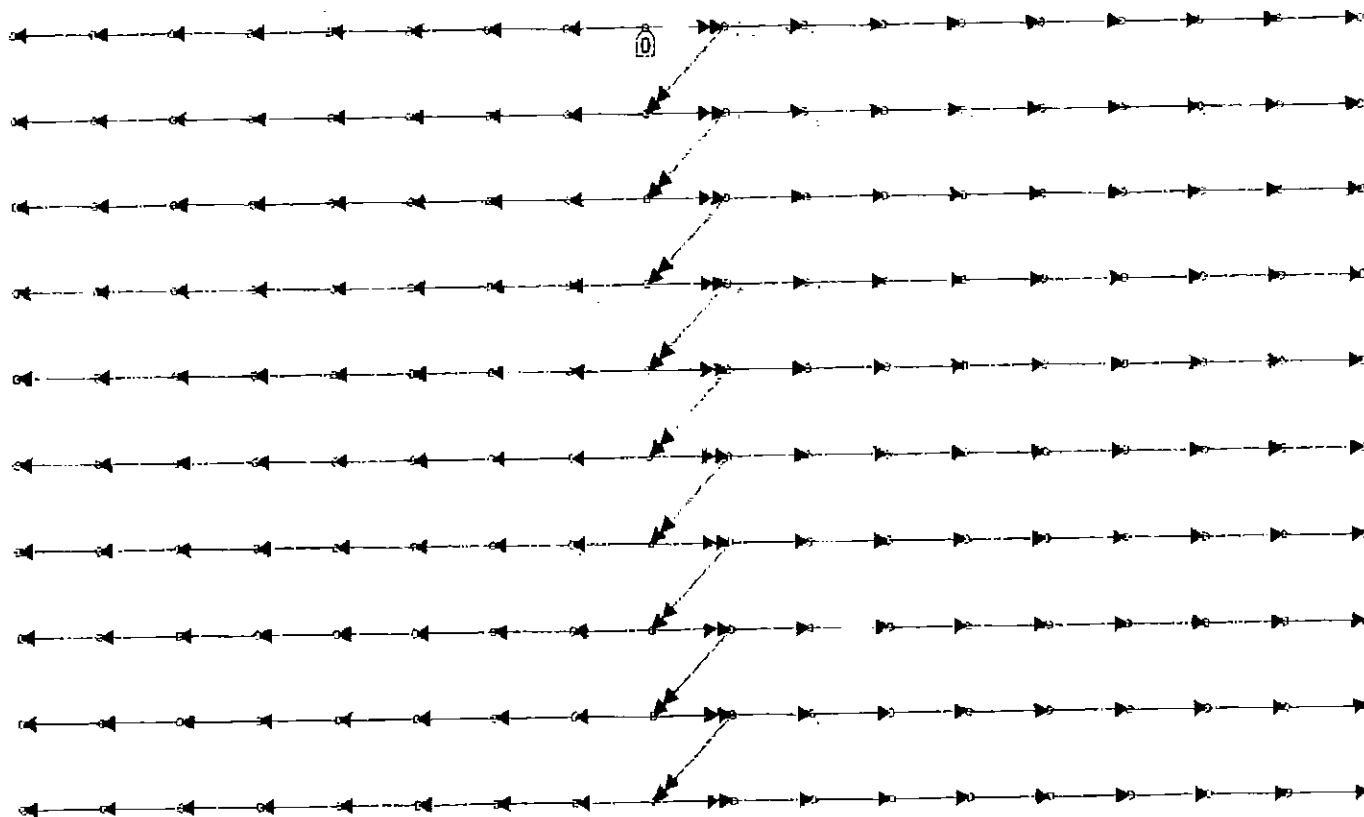
Gallant's Quarry, Elmsdale, NS

Pattern - 12' x 12' Drill Depth - 45' Avg.

Subdrill - 4' Collar - 7' to 12'

Quantity - 78720 t

- ← HANDIDET #25/500 (2)
- ←← EXEL HTD #5 (42)
- ←←← EXEL HTD #1 (8)
- ←+ EXEL HTD #2 (17)
- ←+ EXEL HTD #4 (33)
- ←←← EXEL HTD #6 (65)



Decks...

Gallant's Quarry, Elmsdale, NS

Pattern - 12' x 12' Drill Depth - 45' Avg.

Subdrill - 4' Collar - 7' to 12'

Quantity - 78720 t



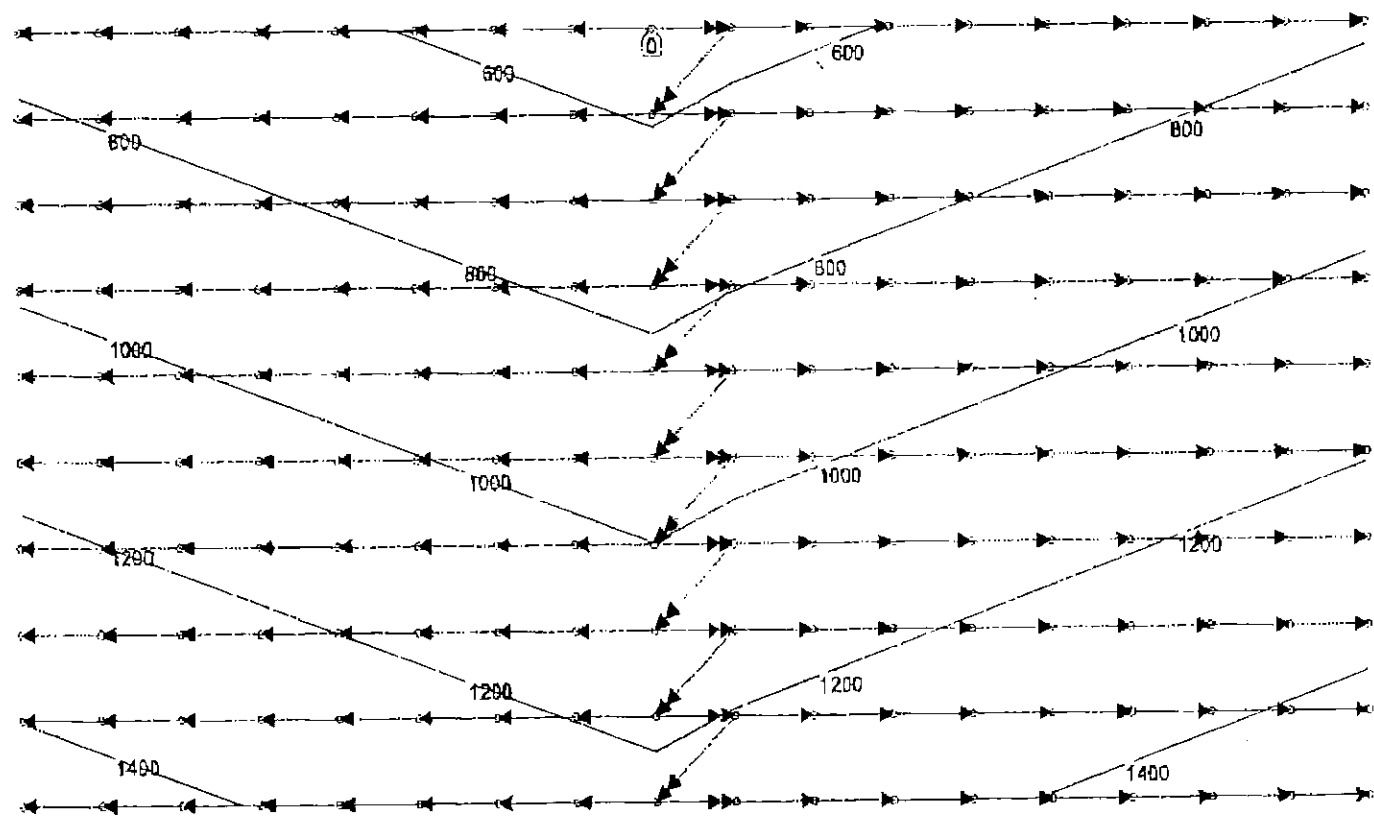
Gallant's Quarry, Elmsdale, NS

Pattern - 12' x 12' Drill Depth - 45' Avg.

Subdrill - 4' Collar - 7' to 12'

Quantity - 78720 t

ARCHIBALD DRILLING



19028972677

02/13/07 12:27
02/12/2007 10:22



Gallant's Quarry, Elmsdale, NS

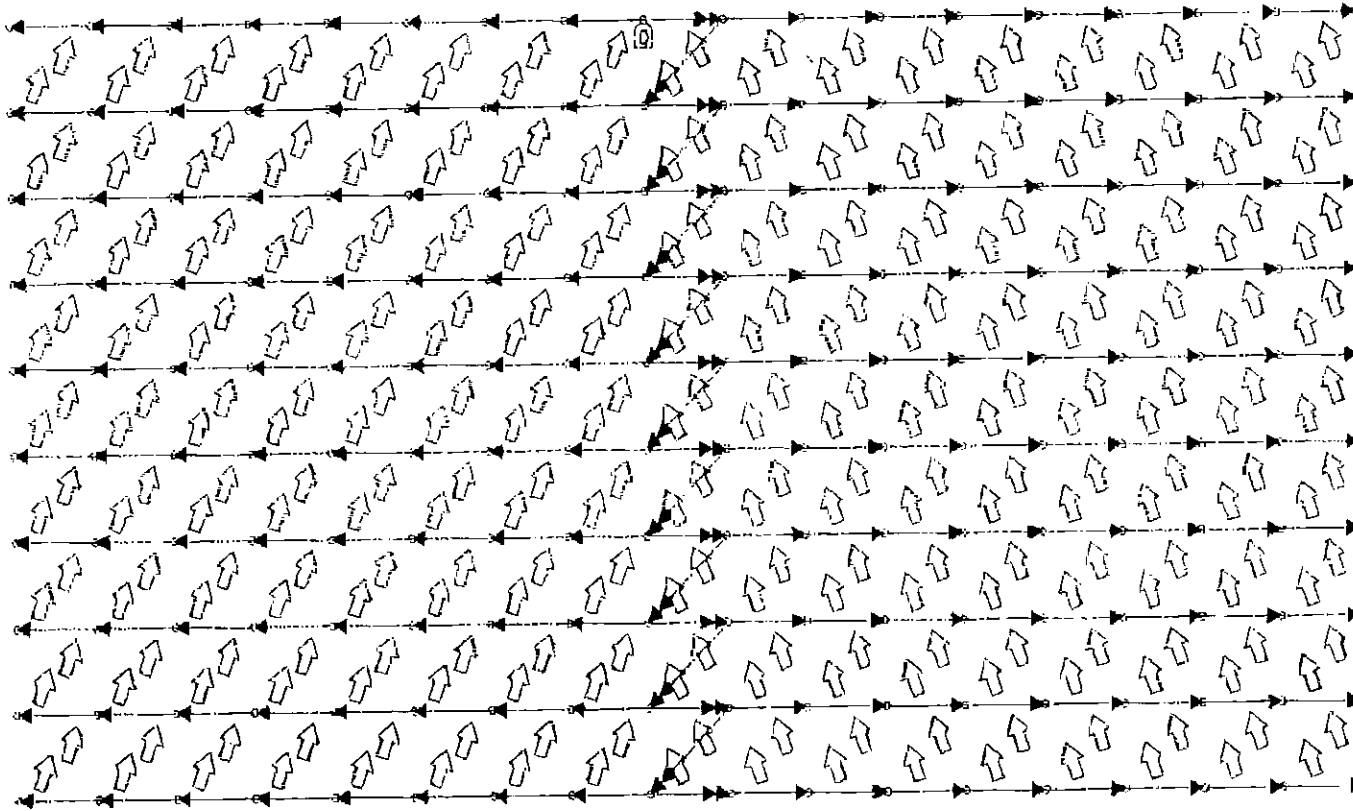
- ← HANDIDET #25/500 (2)
- ← EXEL HTD #5 (42)
- ← EXEL HTD #1 (9)
- ← EXEL HTD #2 (17)
- ← EXEL HTD #4 (33)
- ← EXEL HTD #6 (55)

Pattern - 12' x 12' Drill Depth - 45' Avg.

Subdrill - 4' Collar - 7' to 12'

Quantity - 78720 t

ARCHIBALD DRILLING

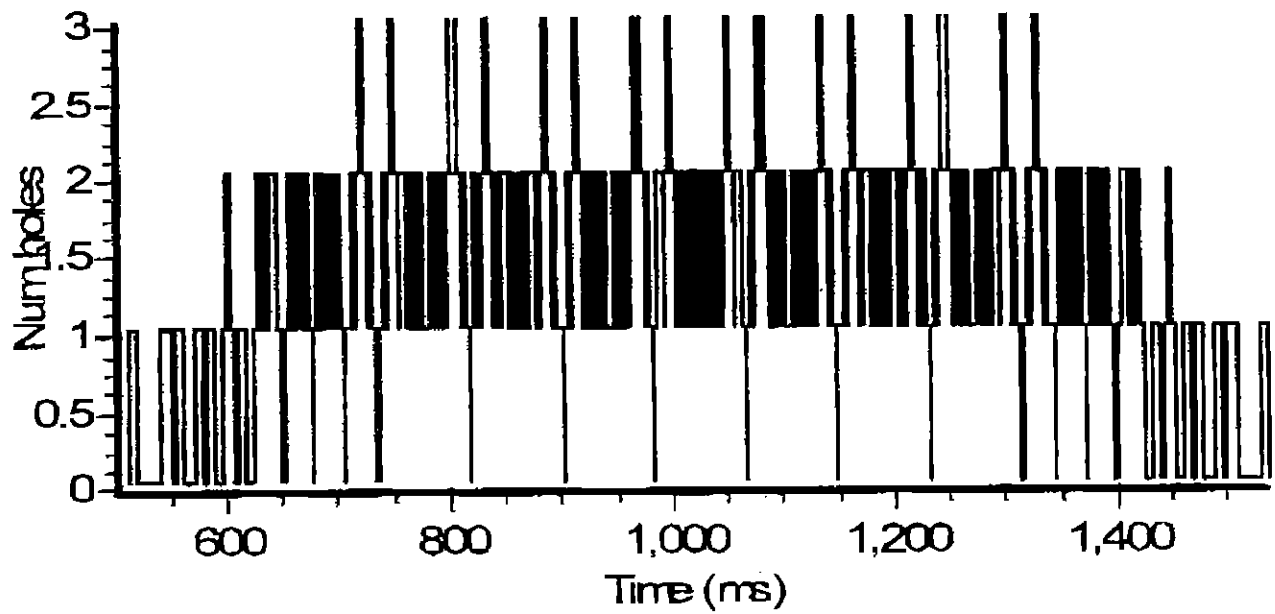


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02/13/07 12:27
02/12/2007 10:22



Time envelope using window of 8.0 ms
Max number of decks firing in calculation window



Potential Environmental Blast Impact

hole diam. (in) **5.50**
 Hole diam. ~~1.9970~~

 Hole Depth (ft.) **46.00**
 Hole Depth (m) ~~13.72~~ Charge Wt. (kg) ~~12.45~~
 Collar (ft) **5.00**
 Collar (m) ~~1.52~~ Charge Wt. (lbs) ~~27.34~~
 Ft. of load ~~89.00~~
 Product diameter (in.) **5.50**
 Product diameter (mm) ~~139.70~~ Distance to seismo (m) **1030.00**
 Product Density (g/cc) **1.25** Distance to seismo (ft) **3376.40**
 Cartridge wt. ft. (lbs) ~~12.85~~
 Weight per hole (lbs) ~~501.39~~
 # of holes/delay **3.00**
 Total Kgs./delay ~~682.90~~
 Total lbs./delay **1504.18** **SCALED DISTANCE**
 K= Constant = ~~1140.00~~ $D=(R/Q)^{1/2}$
 B= Constant = ~~1.50~~ $D=$ ~~35.43~~
 R= Dist. from blast (m) Imperial Scale Distance ~~87.13~~
 Q= Charge/delay (kg) VIBRATION (mm/sec)
 $V=K'(R/Q)^{1/2} -b$ ~~3.10~~

COMPANY Archibald Drilling & Blasting (1986) Limited

LOCATION Gellan's Quarry
Elmsdale, Nova Scotia

BLAST # Typical Blast Design

DATE 12-Feb-07

TIME

BLASTER David Logan



AIRBLAST OVERPRESSURE (kPa) ~~0.0109~~
AIRBLAST NOISE conversion dBL ~~110.55~~

NOTE: (FILL IN BLACK BOLD NUMBERS ONLY)

ARCHIBALD DRILLING

02/12/2007 10:22 19026972677

02/13/07 12:28

APPENDIX D

Project Information Bulletin and First Nations Letter



**Proposed Amendment to
Gallant Aggregates Limited
Elmsdale Quarry Project
Project Information Sheet**

Project Overview

Gallant Aggregates Limited has been operating a quarry for over twenty years at its facility at Elmsdale, Halifax Regional Municipality (HRM), Nova Scotia. The Nova Scotia Department of Environment and Labour (NSEL) granted approval for this quarry which is currently operated in accordance with the Nova Scotia Pit and Quarry Guideline (NSEL 1999).

Gallant owns land adjacent to its existing quarry site and is in the process of applying to NSEL to amend its existing permit to allow the company to blast, crush, and stockpile aggregate on this adjoining parcel of land.

The quarried material is primarily used for local construction such as road building. The primary markets for the products are within Hants County, Colchester County, and Halifax Regional Municipality. The proposed activities on this adjacent property will be developed in various phases over the next 50 years depending on market demand. Approximately 64 hectares (157 acres) of land will be developed over that time.

Proposed project activities will be consistent with current quarry operations on the adjacent site. Aggregate production begins with drilling and blasting, which will be conducted by a licensed blasting contractor. Blasting will take place approximately six times per year. After blasting, portable crushing equipment will be brought to the site 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 the existing truck route. The average number of trucks hauling aggregates from the quarry is expected to remain unchanged and is currently in the range of 85 per day.

The anticipated average production rate will remain the same unless there is a significant contract awarded to the company. Production is now at the rate of approximately 500,000 tons per year. The normal operating schedule will be based on 15 hrs./day, 7 days/week, weather permitting, although peak demand may require operations to continue for 24 hrs./day, 7 days per week, weather permitting. The proposed schedule is consistent with the current operating schedule.

Environmental Assessment Process

Gallant Aggregates Limited 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 Jacques Whitford Limited, on behalf of

Gallant Aggregates Limited, to fulfill these regulatory requirements. Other relevant provincial regulations include *the Activities Designation Regulations*, which requires an Industrial Approval from the Nova Scotia Department of Environment and Labour 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* (NSEL 1999).

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

Environmental Document Components

The environmental registration document focuses on those aspects of the environment 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.

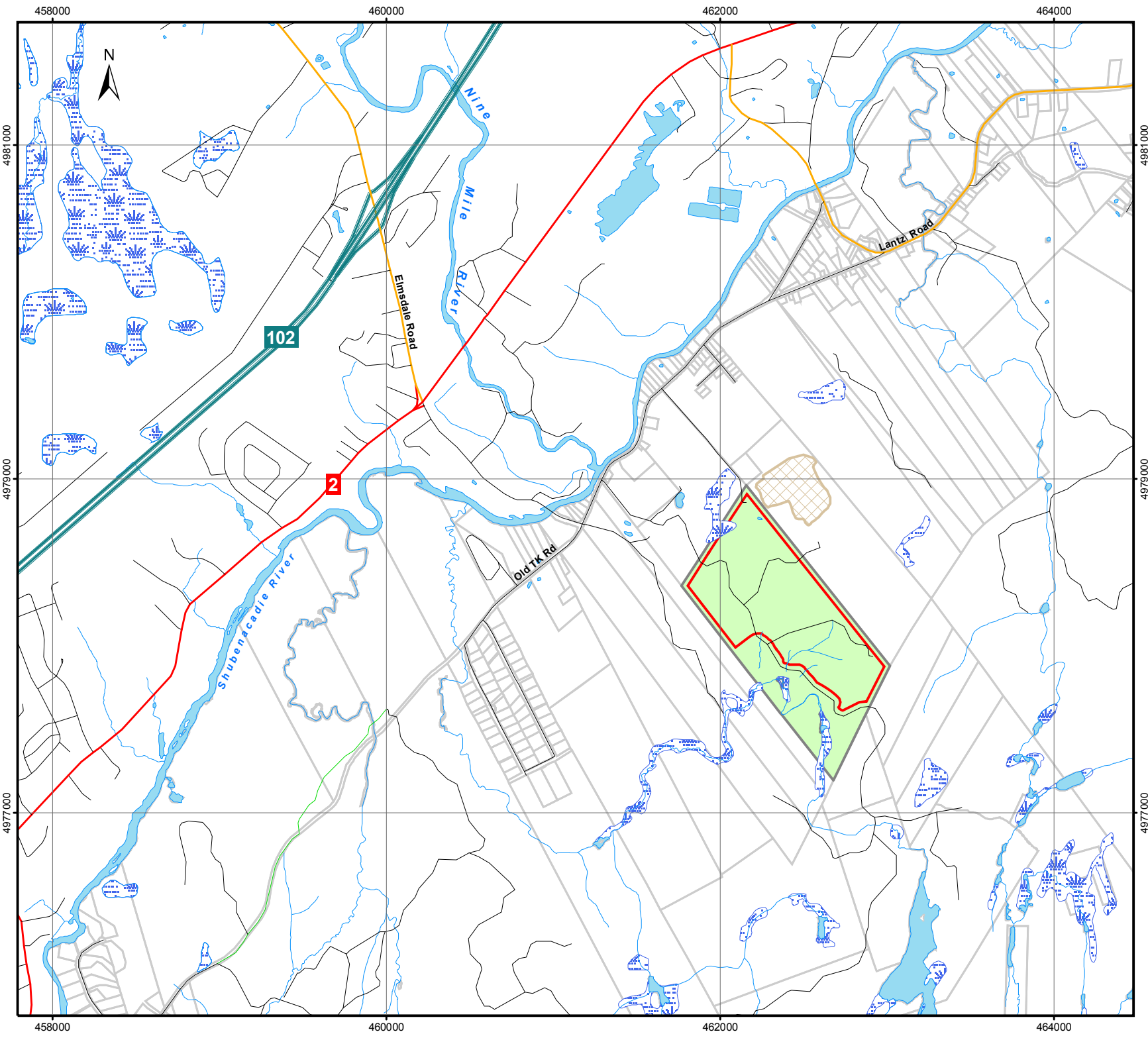
Potential effects of quarry activities on these components will be addressed in the registration document. Preliminary results of an environmental evaluation identified wetlands and small streams on the property. Assuming the implementation of standard mitigative measures and government guidelines and approvals, no significant adverse environmental or socio-economic effects are considered likely.

Contacts

If you have any questions or concerns please contact:

Mr. Fred Benere
Gallant Aggregates Limited
P.O. Box 10
Enfield, NS B2T 1C6
(902) 883-3020 (tel.): (902) 883-8881 (fax)















Ms. Angela Swaine, Project Manager
Jacques Whitford Limited
3 Spectacle Lake Drive Dartmouth, NS B3B 1W8
(902) 468-7777 ext. 210 (tel.): (902) 468-9009 (fax)

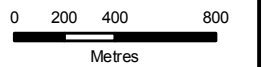


**Gallant
Aggregates Ltd.**

**Elmsdale Quarry
Site Location**

Map Features

- Roads**
-  Expressway
 -  Principal Highway
 -  Secondary Highway
 -  Major Road
 -  Local road
 -  Trail
 -  Ferry Route/Ice Road
 -  Watercourse
 -  Property Boundary
 -  Existing Quarry
 -  Proposed Expansion Area
 -  Site Property Boundary
 -  Waterbody
 -  NSTDB Wetland



Map Parameters
 Projection: UTM-NAD83-Z20
 Scale: 1:30 000
 Date: January 8, 2007
 Project No.: 1013296





**Jacques
Whitford**

**Engineering,
Scientific,
Planning and
Management
Consultants**

3 Spectacle Lake Drive
Suite 100
Dartmouth Nova Scotia
Canada B3B 1W8

Bus 902 468 7777
Fax 902 468 9009

www.jacqueswhitford.com

Project No. 1013296

January 11, 2007

Mr. Donald M. Julien
The Confederacy of Mainland Mi'kmaq
P.O. Box 1590
57 Martin Cres.
Truro, NS B2N 5V3

Dear Mr. Julien:

Re: Gallant Aggregates Quarry Expansion Project

This letter is to inform you of a project that may be located close to your area of interest.

The project consists of an expansion of quarry activities at the existing facility in Elmsdale, Halifax Regional Municipality, Nova Scotia. The developer, Gallant Aggregates Limited, is proposing to expand the area of the existing quarry while maintaining approximately the same level of production. Gallant Aggregates Limited 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 the corresponding Figure, which provide more 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.

Yours truly,

JACQUES WHITFORD LIMITED

Angela Swaine
Project Manager

AS/tw

Enclosure

P:\EnvSci\101xxx\1013296 - Elmsdale quarry EA\LetterToFirstNations.doc



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APPENDIX E

Aquatic Habitat Photos



Appendix E – Elmsdale Quarry Stream Photographs, July 2006



Photograph 1 Stream A - The NE section of the stream near where the source originates



Photograph 2 Stream A – Braided section approximately 45 metres SW downstream



Photograph 3 Stream A – Wetland approximately 120 metres SW downstream



Photograph 4 Stream B – Flats and runs located upstream



Photograph 5 Stream B – Small cascade upstream of the road



Photograph 6 Stream B – Beaver flooding south of the road.



Photograph 7 Stream C – Showing fast flowing riffles and CWD



Photograph 8 Stream D – Beaver flooding and wetland immediately upstream of the beaver dam



Photograph 9 Stream D – Beaver dam at wetland outlet



Photograph 10 Stream D – Showing fast flowing water over cobble/boulder substrate

APPENDIX F

Vascular Plants Recorded in Study Area



TABLE F1 Vascular Plants found in the Study Area.

Common Name	Binomial	ACCDC Population Status (Nova Scotia)	
Balsam Fir	<i>Abies balsamea</i>	S5	Green
Striped Maple	<i>Acer pensylvanicum</i>	S5	Green
Red Maple	<i>Acer rubrum</i>	S5	Green
Sugar Maple	<i>Acer saccharum</i>	S5	Green
Rough Bentgrass	<i>Agrostis hyemalis</i>	S5	Green
Perennial Bentgrass	<i>Agrostis perennans</i>	S4S5	Green
Speckled Alder	<i>Alnus incana</i>	S5	Green
Green Alder	<i>Alnus viridis</i>	S5	Green
Allegheny Service-Berry	<i>Amelanchier laevis</i>	S5	Green
A Serviceberry	<i>Amelanchier Sp.</i>	Not Applicable	Not Applicable
Running Serviceberry	<i>Amelanchier x intermedia</i>	HYB	Not Applicable
Pearly Everlasting	<i>Anaphalis margaritacea</i>	S5	Green
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>	SE	Introduced
Bristly Sarsaparilla	<i>Aralia hispida</i>	S5	Green
Wild Sarsaparilla	<i>Aralia nudicaulis</i>	S5	Green
Red Chokeberry	<i>Aronia arbutifolia</i>	S4S5	Green
Black Chokeberry	<i>Aronia melanocarpa</i>	S5	Green
Whorled Aster	<i>Aster acuminatus</i>	S5	Green
Farewell-Summer	<i>Aster lateriflorus</i>	S5	Green
Large-Leaf Wood-Aster	<i>Aster macrophyllus</i>	S5	Green
New Belgium American-Aster	<i>Aster novi-belgii</i>	S5	Green
Swamp Aster	<i>Aster puniceus</i>	S5	Green
Rough-Leaved Aster	<i>Aster radula</i>	S5	Green
Parasol White-Top	<i>Aster umbellatus</i>	S5	Green
a hybrid White Panicked American-Aster	<i>Aster X blakei</i>	HYB	Green
Lady-Fern	<i>Athyrium filix-femina</i>	S5	Green
Yellow Birch	<i>Betula alleghaniensis</i>	S5	Green
Heart-Leaved Paper Birch	<i>Betula cordifolia</i>	S5	Green
Paper Birch	<i>Betula papyrifera</i>	S5	Green
Gray Birch	<i>Betula populifolia</i>	S5	Green
Bearded Short-Husk	<i>Brachyelytrum erectum</i>	S4S5	Green
Blue-Joint Reedgrass	<i>Calamagrostis canadensis</i>	S5	Green
Wild Calla	<i>Calla palustris</i>	S4	Green
Black Sedge	<i>Carex arctata</i>	S5	Green
Brownish Sedge	<i>Carex brunnescens</i>	S5	Green
Fibrous-Root Sedge	<i>Carex communis</i>	S5	Green
Fringed Sedge	<i>Carex crinita</i>	S4S5	Green
Clustered Sedge	<i>Carex cumulata</i>	S4S5	Green
White-Edge Sedge	<i>Carex debilis</i>	S5	Green
Little Prickly Sedge	<i>Carex echinata</i>	S5	Green
Long Sedge	<i>Carex folliculata</i>	S5	Green
Graceful Sedge	<i>Carex gracillima</i>	S4S5	Green
A Sedge	<i>Carex gynandra</i>	S5	Green
Bladder Sedge	<i>Carex intumescens</i>	S5	Green
Bristly-Stalk Sedge	<i>Carex leptalea</i>	S5	Green
Shallow Sedge	<i>Carex lurida</i>	S5	Green
Michaux Sedge	<i>Carex michauxiana</i>	S4	Green

TABLE F1 Vascular Plants found in the Study Area.

Common Name	Binomial	ACCDC Population Status (Nova Scotia)	
A Sedge	<i>Carex paupercula</i> var. <i>irrigua</i>	S5	Green
Cyperus-Like Sedge	<i>Carex pseudocyperus</i>	S4S5	Green
Stalk-Grain Sedge	<i>Carex stipata</i>	S5	Green
Tussock Sedge	<i>Carex stricta</i>	S5	Green
Three-Seed Sedge	<i>Carex trisperma</i>	S5	Green
Black Starthistle	<i>Centaurea nigra</i>	SE	Green
Leatherleaf	<i>Chamaedaphne calyculata</i>	S5	Green
White Turtlehead	<i>Chelone glabra</i>	S5	Green
Oxeye Daisy	<i>Chrysanthemum leucanthemum</i>	SE	Green
American Golden-Saxifrage	<i>Chrysosplenium americanum</i>	S5	Green
Small Enchanter's Nightshade	<i>Circaea alpina</i>	S5	Green
Swamp Thistle	<i>Cirsium muticum</i>	S5	Green
Clinton Lily	<i>Clintonia borealis</i>	S5	Green
Sweet Fern	<i>Comptonia peregrina</i>	S5	Green
Goldthread	<i>Coptis trifolia</i>	S5	Green
Dwarf Dogwood	<i>Cornus canadensis</i>	S5	Green
Beaked Hazelnut	<i>Corylus cornuta</i>	S5	Green
Fineberry Hawthorn	<i>Crataegus chrysoarpa</i>	S4S5	Green
Pink Lady's-Slipper	<i>Cypripedium acaule</i>	S5	Green
Robin Runaway	<i>Dalibarda repens</i>	S5	Green
Flattened Oatgrass	<i>Danthonia compressa</i>	S4	Green
Poverty Oat-Grass	<i>Danthonia spicata</i>	S5	Green
Wild Carrot	<i>Daucus carota</i>	SE	Green
Northern Bush-Honeysuckle	<i>Diervilla lonicera</i>	S5	Green
Roundleaf Sundew	<i>Drosera rotundifolia</i>	S5	Green
Spinulose Shield Fern	<i>Dryopteris carthusiana</i>	S5	Green
Crested Shield-Fern	<i>Dryopteris cristata</i>	S5	Green
Evergreen Woodfern	<i>Dryopteris intermedia</i>	S5	Green
Trailing Arbutus	<i>Epigaea repens</i>	S5	Green
Fireweed	<i>Epilobium angustifolium</i>	S5	Green
Hairy Willow-Herb	<i>Epilobium ciliatum</i>	S5	Green
Linear-Leaved Willow-Herb	<i>Epilobium leptophyllum</i>	S5	Green
Field Horsetail	<i>Equisetum arvense</i>	S5	Green
Woodland Horsetail	<i>Equisetum sylvaticum</i>	S5	Green
Fireweed	<i>Erechtites hieraciifolia</i>	S5	Green
Daisy Fleabane	<i>Erigeron strigosus</i>	S5	Green
Rough Cotton-Grass	<i>Eriophorum tenellum</i>	S4S5	Green
Tawny Cotton-Grass	<i>Eriophorum virginicum</i>	S5	Green
Spotted Joe-Pye Weed	<i>Eupatorium maculatum</i>	S5	Green
Common Boneset	<i>Eupatorium perfoliatum</i>	S5	Green
Drug Eyebright	<i>Euphrasia officinalis</i>	SE	Green
Flat-Top Fragrant-Golden-Rod	<i>Euthamia graminifolia</i>	S5	Green
American Beech	<i>Fagus grandifolia</i>	S5	Green
Hair Fescue	<i>Festuca filiformis</i>	SE	Green
Virginia Strawberry	<i>Fragaria virginiana</i>	S5	Green
White Ash	<i>Fraxinus americana</i>	S5	Green
Rough Bedstraw	<i>Galium asprellum</i>	S5	Green

TABLE F1 Vascular Plants found in the Study Area.

Common Name	Binomial	ACCDC Population Status (Nova Scotia)	
Marsh Bedstraw	<i>Galium palustre</i>	S5	Green
Stiff Marsh Bedstraw	<i>Galium tinctorium</i>	S5	Green
Sweet-Scent Bedstraw	<i>Galium triflorum</i>	S5	Green
Creeping Snowberry	<i>Gaultheria hispidula</i>	S5	Green
Teaberry	<i>Gaultheria procumbens</i>	S5	Green
Black Huckleberry	<i>Gaylussacia baccata</i>	S5	Green
Bicknell Northern Crane's-Bill	<i>Geranium bicknellii</i>	S3	Green
Purple Avens	<i>Geum rivale</i>	S5	Green
Canada Manna-Grass	<i>Glyceria canadensis</i>	S5	Green
American Mannagrass	<i>Glyceria grandis</i>	S4S5	Green
Fowl Manna-Grass	<i>Glyceria striata</i>	S5	Green
Low Cudweed	<i>Gnaphalium uliginosum</i>	SE	Green
Northern Oak Fern	<i>Gymnocarpium dryopteris</i>	S5	Green
American Witch-Hazel	<i>Hamamelis virginiana</i>	S5	Green
Meadow Hawkweed	<i>Hieracium caespitosum</i>	SE	Green
Whiplash Hawkweed	<i>Hieracium x flagellare</i>	SE	Green
Shining Fir-Clubmoss	<i>Huperzia lucidula</i>	S5	Green
American Water-Pennywort	<i>Hydrocotyle americana</i>	S5	Green
Canadian St. John's-Wort	<i>Hypericum canadense</i>	S5	Green
A St. John's-Wort	<i>Hypericum perforatum</i>	SE	Green
A St. John's-Wort	<i>Hypericum sp.</i>	Not Applicable	Green
Black Holly	<i>Ilex verticillata</i>	S5	Green
Spotted Jewel-Weed	<i>Impatiens capensis</i>	S5	Green
Blueflag	<i>Iris versicolor</i>	S5	Green
Jointed Rush	<i>Juncus articulatus</i>	S5	Green
Narrow-Panicled Rush	<i>Juncus brevicaudatus</i>	S5	Green
Canada Rush	<i>Juncus canadensis</i>	S5	Green
Soft Rush	<i>Juncus effusus</i>	S5	Green
Slender Rush	<i>Juncus tenuis</i>	S5	Green
Sheep-Laurel	<i>Kalmia angustifolia</i>	S5	Green
American Larch	<i>Larix laricina</i>	S5	Green
Common Labrador Tea	<i>Ledum groenlandicum</i>	S5	Green
Autumn Hawkbit	<i>Leontodon autumnalis</i>	SE	Green
Indian-Tobacco	<i>Lobelia inflata</i>	S5	Green
Mountain Fly-Honeysuckle	<i>Lonicera caerulea</i>	S4S4	Green
Marsh Seedbox	<i>Ludwigia palustris</i>	S5	Green
Common Woodrush	<i>Luzula multiflora</i>	S5	Green
Stiff Clubmoss	<i>Lycopodium annotinum</i>	S5	Green
Running Pine	<i>Lycopodium clavatum</i>	S5	Green
Tree Clubmoss	<i>Lycopodium obscurum</i>	S5	Green
American Bugleweed	<i>Lycopus americanus</i>	S5	Green
Northern Bugleweed	<i>Lycopus uniflorus</i>	S5	Green
Swamp Loosestrife	<i>Lysimachia terrestris</i>	S5	Green
Wild Lily-of-The-Valley	<i>Maianthemum canadense</i>	S5	Green
Indian Cucumber-Root	<i>Medeola virginiana</i>	S5	Green
American Cow-Wheat	<i>Melampyrum lineare</i>	S5	Green
Corn Mint	<i>Mentha arvensis</i>	S5	Green

TABLE F1 Vascular Plants found in the Study Area.

Common Name	Binomial	ACCDC Population Status (Nova Scotia)	
Partridge-Berry	<i>Mitchella repens</i>	S5	Green
One-Flower Wintergreen	<i>Moneses uniflora</i>	S5	Green
Indian-Pipe	<i>Monotropa uniflora</i>	S5	Green
Sweet Bayberry	<i>Myrica gale</i>	S5	Green
Mountain Holly	<i>Nemopanthus mucronata</i>	S5	Green
Small Sundrops	<i>Oenothera perennis</i>	S5	Green
Sensitive Fern	<i>Onoclea sensibilis</i>	S5	Green
White-Grained Mountain-Ricegrass	<i>Oryzopsis asperifolia</i>	S5	Green
Cinnamon Fern	<i>Osmunda cinnamomea</i>	S5	Green
Interrupted Fern	<i>Osmunda claytoniana</i>	S5	Green
Royal Fern	<i>Osmunda regalis</i>	S5	Green
White Wood-Sorrel	<i>Oxalis acetosella</i>	S5	Green
Upright Yellow Wood-Sorrel	<i>Oxalis stricta</i>	S5	Green
Panic Grass	<i>Panicum villosissium</i>	S5	Green
Arctic Butter-Bur	<i>Petasites frigidus</i>	S4S5	Green
Reed Canary Grass	<i>Phalaris arundinacea</i>	S5	Green
Northern Beech Fern	<i>Phegopteris connectilis</i>	S5	Green
Meadow Timothy	<i>Phleum pratense</i>	SE	Green
White Spruce	<i>Picea glauca</i>	S5	Green
Black Spruce	<i>Picea mariana</i>	S5	Green
Red Spruce	<i>Picea rubens</i>	S5	Green
Jack Pine	<i>Pinus banksiana</i>	S4	Green
Red Pine	<i>Pinus resinosa</i>	S4S5	Green
Eastern White Pine	<i>Pinus strobus</i>	S5	Green
Nipple-Seed Plantain	<i>Plantago major</i>	SE	Green
White-Fringe Orchis	<i>Platanthera blephariglottis</i>	S4	Green
Small Green Woodland Orchid	<i>Platanthera clavellata</i>	S5	Green
Large Purple-Fringe Orchis	<i>Platanthera grandiflora</i>	S3	Green
Green-Fringe Orchis	<i>Platanthera lacera</i>	S4S5	Green
Small Northern Bog-Orchid	<i>Platanthera obtusata</i>	S4S5	Green
An Orchid	<i>Platanthera sp.</i>	Not Applicable	Green
Canada Bluegrass	<i>Poa compressa</i>	SE	Green
Downy Solomon's-Seal	<i>Polygonatum pubescens</i>	S4S5	Green
Appalachian Polypody	<i>Polypodium appalachianum</i>	S3?	Green
Christmas Fern	<i>Polystichum acrostichoides</i>	S5	Green
Large-Tooth Aspen	<i>Populus grandidentata</i>	S5	Green
Quaking Aspen	<i>Populus tremuloides</i>	S5	Green
Old-Field Cinquefoil	<i>Potentilla simplex</i>	S5	Green
Tall Rattlesnake-root	<i>Prenanthes altissima</i>	S4S5	Green
Three-Leaved Rattlesnake-root	<i>Prenanthes trifoliolata</i>	S5	Green
Self-Heal	<i>Prunella vulgaris</i>	S5	Green
Fire Cherry	<i>Prunus pensylvanica</i>	S5	Green
Bracken Fern	<i>Pteridium aquilinum</i>	S5	Green
American Wintergreen	<i>Pyrola rotundifolia var. americana americana</i>	S5	Green
Northern Red Oak	<i>Quercus rubra</i>	S5	Green
Alderleaf Buckthorn	<i>Rhamnus alnifolia</i>	S3	Yellow
Rhodora	<i>Rhododendron canadense</i>	S5	Green

TABLE F1 Vascular Plants found in the Study Area.

Common Name	Binomial	ACCDC Population Status (Nova Scotia)	
Bristly Black Currant	<i>Ribes lacustre</i>	S5	Green
Watercress	<i>Rorippa nasturtium-aquaticum</i>	SE	Green
Shining Rose	<i>Rosa nitida</i>	S4	Green
Swamp Rose	<i>Rosa palustris</i>	S3	Green
Allegheny Blackberry	<i>Rubus allegheniensis</i>	S5	Green
Smooth Blackberry	<i>Rubus canadensis</i>	S5	Green
Bristly Dewberry	<i>Rubus hispidus</i>	S5	Green
Red Raspberry	<i>Rubus idaeus</i>	S5	Green
Dwarf Red Raspberry	<i>Rubus pubescens</i>	S5	Green
Small Bristleberry	<i>Rubus setosus</i>	S4?	Green
Pussy Willow	<i>Salix discolor</i>	S5	Green
Prairie Willow	<i>Salix humilis</i>	S5	Green
Balsam Willow	<i>Salix pyrifolia</i>	S5	Green
Georgia Bulrush	<i>Scirpus atrovirens</i>	S4	Green
Cottongrass Bulrush	<i>Scirpus cyperinus</i>	S5	Green
Mad Dog Skullcap	<i>Scutellaria lateriflora</i>	S5	Green
Tansy Ragwort	<i>Senecio jacobaea</i>	SE	Green
Robbins Squaw-Weed	<i>Senecio robbinsii</i>	S4S5	Green
Hemlock Water-Parsnip	<i>Sium suave</i>	S5	Green
Solomon's-Plume	<i>Smilacina racemosa</i>	S4S5	Green
Three-Leaf Solomon's-Plume	<i>Smilacina trifolia</i>	S4S5	Green
Canada Goldenrod	<i>Solidago canadensis</i>	S5	Green
Broad-Leaved Goldenrod	<i>Solidago flexicaulis</i>	S5	Green
Smooth Goldenrod	<i>Solidago gigantea</i>	S5	Green
Downy Goldenrod	<i>Solidago puberula</i>	S5	Green
Rough-Leaf Goldenrod	<i>Solidago rugosa</i>	S5	Green
Bog Goldenrod	<i>Solidago uliginosa</i>	S5	Green
American Mountain-Ash	<i>Sorbus americana</i>	S5	Green
American Bur-Reed	<i>Sparganium americanum</i>	S5	Green
A Bur-reed	<i>Sparganium sp.</i>	Not Applicable	Green
Narrow-Leaved Meadow-Sweet	<i>Spiraea alba</i>	S5	Green
Hardhack Spiraea	<i>Spiraea tomentosa</i>	S5	Green
Rosy Twistedstalk	<i>Streptopus roseus</i>	S5	Green
Canadian Yew	<i>Taxus canadensis</i>	S5	Green
Tall Meadow-Rue	<i>Thalictrum pubescens</i>	S5	Green
New York Fern	<i>Thelypteris noveboracensis</i>	S5	Green
Marsh Fern	<i>Thelypteris palustris</i>	S5	Green
Northern Poison Oak	<i>Toxicodendron rydbergii</i>	S5	Green
Marsh St. John's Wort	<i>Triadenum virginicum</i>	S4S5	Green
Northern Starflower	<i>Trientalis borealis</i>	S5	Green
Low Hop Clover	<i>Trifolium campestre</i>	SE	Green
White Clover	<i>Trifolium repens</i>	SE	Green
Painted Trillium	<i>Trillium undulatum</i>	S5	Green
Eastern Hemlock	<i>Tsuga canadensis</i>	S4S5	Green
Colt's Foot	<i>Tussilago farfara</i>	SE	Green
Broad-Leaf Cattail	<i>Typha latifolia</i>	S5	Green
Flatleaf Bladderwort	<i>Utricularia intermedia</i>	S5	Green

TABLE F1 Vascular Plants found in the Study Area.

Common Name	Binomial	ACCDC Population Status (Nova Scotia)	
Late Lowbush Blueberry	<i>Vaccinium angustifolium</i>	S5	Green
Velvetleaf Blueberry	<i>Vaccinium myrtilloides</i>	S5	Green
Small Cranberry	<i>Vaccinium oxycoccos</i>	S5	Green
Poosum-Haw Viburnum	<i>Viburnum nudum</i>	S5	Green
Marsh Blue Violet	<i>Viola cucullata</i>	S5	Green
Smooth White Violet	<i>Viola macloskeyi</i>	S5	Green
Great-Spurred Violet	<i>Viola selkirkii</i>	S4	Green

APPENDIX G

Bird Species Recorded in Study Area

TABLE G1 Observations of Birds in Each Habitat Type

Bird	CC - Clear-cut	DA - Disturbed Area	FO - Flew Over	HU - Habitat Unknown	IH - Immature Hardwood	IM - Immature Mixedwood	LS - Low Shrub Swamp	MM - Mature Mixedwood	MTS - Mixedwood Treed Swamp	TS - Tall Shrub Swamp	Grand Total
Alder Flycatcher					1						1
American Black Duck				1							1
American Crow	2		1								3
American Goldfinch	1	3	2						1		7
American Redstart					1						1
American Robin	1	4			3	1		1	3		13
Black-and-white Warbler					6	3		1	2		12
Black-capped Chickadee					1				8		9
Black-throated Green Warbler						4		2			6
Blue Jay						2					2
Canada Warbler								1	2		3
Cedar Waxwing			1						3		4
Common Nighthawk			1								1
Common Raven			1								1
Common Yellowthroat						1			5	1	7
Dark-eyed Junco	2				4	1			2		9
Downy Woodpecker				1							1
Eastern Wood Pewee					1						1
Golden-crowned Kinglet						1					1
Hairy Woodpecker			1			1		1			3
Hermit Thrush	1				2	2		2	3		10
Killdeer		2									2
Lincoln's Sparrow	2										2
Magnolia Warbler					4	6		2	5		17
Mourning Dove						1					1

TABLE G1 Observations of Birds in Each Habitat Type

Bird	CC - Clear-cut	DA - Disturbed Area	FO - Flew Over	HU - Habitat Unknown	IH - Immature Hardwood	IM - Immature Mixedwood	LS - Low Shrub Swamp	MM - Mature Mixedwood	MTS - Mixedwood Treed Swamp	TS - Tall Shrub Swamp	Grand Total
Nashville Warbler	1				4	3		2	2		12
Northern Flicker	1										1
Osprey			1								1
Ovenbird					2	3			1		6
Palm Warbler	3				2	5			1		11
Parula Warbler								1			1
Purple Finch								1	1		2
Red-eyed Vireo					2	2		3			7
Rock Pigeon			1								1
Ruby-crowned Kinglet					1						1
Ruffed Grouse					1						1
Sharp-shinned Hawk									1		1
Blue-headed Vireo								1			1
Song Sparrow	3	3								1	7
Spotted Sandpiper		1									1
Swamp sparrow							3		7		10
White-throated Sparrow	2				4	2			7		15
Winter Wren						1					1
Yellow-bellied Flycatcher						1		3			4
Yellow-rumped Warbler						6					6
Grand Total	19	13	9	2	39	46	3	21	54	2	208

TABLE G2 Breeding Status and Population Status of Birds Recorded in the Study Area and the Breeding Bird Atlas Square within which the Study Area is Located.

Common Name	Scientific Name	Breeding Status (BBA Data)	Breeding Status (Field Survey)	NSDNR Rank	ACCDC Rank
American Black Duck	<i>Anas rubripes</i>	Probable	Possible	Green	S5B
Common Merganser	<i>Mergus merganser</i>	Confirmed	Not Observed	Green	S5B
Osprey	<i>Pandion haliaetus</i>	Confirmed	Non-breeder	Green	S5B
Northern Harrier	<i>Circus cyaneus</i>	Possible	Not Observed	Green	S5B
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Not Observed	Non-breeder	Green	S4B
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Possible	Not Observed	Green	S5B
American Kestrel	<i>Falco sparverius</i>	Probable	Not Observed	Green	S5B
Ruffed Grouse	<i>Bonasa umbellus</i>	Possible	Possible	Green	S5
Killdeer	<i>Charadrius vociferus</i>	Probable	Probable	Green	S5B
Spotted Sandpiper	<i>Actitis macularia</i>	Probable	Possible	Green	S5B
Common Snipe	<i>Gallinago gallinago</i>	Probable	Not Observed	Green	S5B
American Woodcock	<i>Scolopax minor</i>	Probable	Not Observed	Green	S4S5B
Mourning Dove	<i>Zenaidura macroura</i>	Not Observed	Possible	Green	S5
Rock Dove	<i>Columba livia</i>	Confirmed	Non-breeder	Introduced	SEB
Barred Owl	<i>Strix varia</i>	Probable	Not Observed	Green	S5
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Probable	Not Observed	Green	S4B
Common Nighthawk	<i>Chordeiles minor</i>	Not Observed	Non-breeder	Yellow	S4B
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Probable	Not Observed	Green	S5B
Downy Woodpecker	<i>Picoides pubescens</i>	Probable	Possible	Green	S5
Hairy Woodpecker	<i>Picoides villosus</i>	Confirmed	Confirmed	Green	S5
Northern Flicker	<i>Colaptes auratus</i>	Probable	Possible	Green	S5B
Eastern Wood-Pewee	<i>Contopus virens</i>	Probable	Possible	Green	S5B
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	Probable	Possible	Green	S5B
Alder Flycatcher	<i>Empidonax alnorum</i>	Probable	Possible	Green	S5B
Horned Lark	<i>Eremophila alpestris</i>	Probable	Not Observed	Green	S2B
Tree Swallow	<i>Tachycineta bicolor</i>	Confirmed	Not Observed	Green	S5B
Barn Swallow	<i>Hirundo rustica</i>	Confirmed	Not Observed	Yellow	S5B
Blue Jay	<i>Cyanocitta cristata</i>	Confirmed	Probable	Green	S5
American Crow	<i>Corvus brachyrhynchos</i>	Confirmed	Probable	Green	S5
Common Raven	<i>Corvus corax</i>	Possible	Non-breeder	Green	S5
Black-capped Chickadee	<i>Parus atricapillus</i>	Possible	Confirmed	Green	S5
Boreal Chickadee	<i>Parus hudsonicus</i>	Confirmed	Not Observed	Yellow	S3S4
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Confirmed	Not Observed	Green	S5
Brown Creeper	<i>Certhia americana</i>	Possible	Not Observed	Green	S5B
Winter Wren	<i>Troglodytes troglodytes</i>	Probable	Possible	Green	S2B
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Probable	Possible	Green	S5B
Ruby-crowned Kinglet	<i>Regulus calendula</i>	Probable	Possible	Green	S5B
Swainson's Thrush	<i>Catharus ustulatus</i>	Probable	Not Observed	Green	S5B
Hermit Thrush	<i>Catharus guttatus</i>	Probable	Confirmed	Green	S5B
American Robin	<i>Turdus migratorius</i>	Confirmed	Confirmed	Green	S5B
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Not Observed	Possible	Green	S5B
European Starling	<i>Sturnus vulgaris</i>	Confirmed	Not Observed	Introduced	SE
Blue-headed Vireo	<i>Vireo solitarius</i>	Probable	Possible	Green	S5B

TABLE G2 Breeding Status and Population Status of Birds Recorded in the Study Area and the Breeding Bird Atlas Square within which the Study Area is Located.

Common Name	Scientific Name	Breeding Status (BBA Data)	Breeding Status (Field Survey)	NSDNR Rank	ACCDC Rank
Red-eyed Vireo	<i>Vireo olivaceus</i>	Probable	Possible	Green	S5B
Nashville Warbler	<i>Vermivora ruficapilla</i>	Probable	Probable	Green	S5B
Northern Parula Warbler	<i>Parula americana</i>	Probable	Possible	Green	S5B
Magnolia Warbler	<i>Dendroica magnolia</i>	Probable	Confirmed	Green	S5B
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	Probable	Not Observed	Green	S5B
Yellow-rumped Warbler	<i>Dendroica coronata</i>	Confirmed	Probable	Green	S5B
Black-throated Green Warbler	<i>Dendroica virens</i>	Probable	Possible	Green	S5B
Palm Warbler	<i>Dendroica palmarum</i>	Probable	Probable	Green	S5B
Bay-breasted Warbler	<i>Dendroica castanea</i>	Probable	Not Observed	Green	S5B
Black-and-white Warbler	<i>Mniotilta varia</i>	Probable	Possible	Green	S5B
American Redstart	<i>Setophaga ruticilla</i>	Probable	Possible	Green	S5B
Ovenbird	<i>Seiurus aurocapillus</i>	Probable	Probable	Green	S5B
Common Yellowthroat	<i>Geothlypis trichas</i>	Probable	Confirmed	Green	S5B
Canada Warbler	<i>Wilsonia canadensis</i>	Not Observed	Possible	Yellow	S5B
Chipping Sparrow	<i>Spizella passerina</i>	Probable	Not Observed	Green	S5B
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	Not Observed	Possible	Green	S5B
Song Sparrow	<i>Melospiza melodia</i>	Probable	Possible	Green	S5B
Swamp Sparrow	<i>Melospiza georgiana</i>	Probable	Confirmed	Green	S5B
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Confirmed	Confirmed	Green	S5B,SZN
Dark-eyed Junco	<i>Junco hyemalis</i>	Confirmed	Confirmed	Green	S5
Rusty Blackbird	<i>Euphagus carolinus</i>	Probable	Not Observed	Yellow	S3S4B
Common Grackle	<i>Quiscalus quiscula</i>	Possible	Not Observed	Green	S5B
Pine Grosbeak	<i>Pinicola enucleator</i>	Probable	Not Observed	Green	S5
Purple Finch	<i>Carpodacus purpureus</i>	Possible	Probable	Green	S5B
Pine Siskin	<i>Carduelis pinus</i>	Probable	Not Observed	Green	S5
American Goldfinch	<i>Carduelis tristis</i>	Possible	Possible	Green	S5
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Possible	Not Observed	Green	S5
House Sparrow	<i>Passer domesticus</i>	Confirmed	Not Observed	Introduced	SE

TABLE G3 Bird Species Recorded in the Breeding Bird Atlas Square within which the Study Area is Located

Common Name	Binomial	NSDNR Status	ACCDC Status (Breeding Season)	Breeding Status of Birds found in Atlas Square (10,000 ha)	Species Expected to Nest in Study Area
American Black Duck	<i>Anas rubripes</i>	Green	S5	Probable Nester	X
Common Merganser	<i>Mergus merganser</i>	Green	S5	Confirmed Nester	X
Osprey	<i>Pandion haliaetus</i>	Green	S5	Confirmed Nester	
Northern Harrier	<i>Circus cyaneus</i>	Green	S5	Probable Nester	
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Green	S5	Possible Nester	X
American Kestrel	<i>Falco sparverius</i>	Green	S5	Probable Nester	X
Ruffed Grouse	<i>Bonasa umbellus</i>	Green	S5	Possible Nester	X
Killdeer	<i>Charadrius vociferus</i>	Green	S5	Probable Nester	X
Spotted Sandpiper	<i>Actitis macularia</i>	Green	S5	Probable Nester	X
Common Snipe	<i>Gallinago gallinago</i>	Green	S5	Probable Nester	X
American Woodcock	<i>Scolopax minor</i>	Green	S4S5	Probable Nester	X
Rock Dove	<i>Columba livia</i>	Introduced	SE	Confirmed Nester	
Barred Owl	<i>Strix varia</i>	Green	S5	Confirmed Nester	X
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Green	S4	Probable Nester	X
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	Green	S5	Probable Nester	X
Downy Woodpecker	<i>Picoides pubescens</i>	Green	S5	Probable Nester	X
Hairy Woodpecker	<i>Picoides villosus</i>	Green	S5	Confirmed Nester	X
Northern Flicker	<i>Colaptes aureus</i>	Green	S5	Probable Nester	X
Eastern Wood Pewee	<i>Contopus virens</i>	Green	S5	Probable Nester	
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	Green	S5	Probable Nester	X
Alder Flycatcher	<i>Empidonax alnorum</i>	Green	S5	Probable Nester	X
Least Flycatcher	<i>Empidonax minimus</i>	Green	S5	Probable Nester	
Horned Lark	<i>Eremophila alpestris</i>	Green	S2	Probable Nester	
Tree Swallow	<i>Tachycineta bicolor</i>	Green	S5	Confirmed Nester	X
Barn Swallow	<i>Hirundo rustica</i>	Green	S5	Possible Nester	
Blue Jay	<i>Cyanocitta cristata</i>	Green	S5	Confirmed Nester	X
American Crow	<i>Corvus brachyrhynchos</i>	Green	S5	Confirmed Nester	X
Common Raven	<i>Corvus corax</i>	Green	S5	Possible Nester	X
Black-capped Chickadee	<i>Parus atricapillus</i>	Green	S5	Possible Nester	X
Boreal Chickadee	<i>Parus hudsonicus</i>	Green	S3S4	Confirmed Nester	X
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Green	S5	Confirmed Nester	X
Brown Creeper	<i>Certhia americana</i>	Green	S5	Probable Nester	X
Winter Wren	<i>Troglodytes troglodytes</i>	Green		Probable Nester	X
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Green	S5	Probable Nester	X
Ruby-crowned Kinglet	<i>Regulus calendula</i>	Green	S5	Probable Nester	X
Swainson's Thrush	<i>Catharus ustulatus</i>	Green	S5	Probable Nester	X
Hermit Thrush	<i>Catharus guttatus</i>	Green	S5	Probable Nester	X
American Robin	<i>Turdus migratorius</i>	Green	S5	Confirmed Nester	X
European Starling	<i>Sturnus vulgaris</i>	Introduced	SE	Confirmed Nester	

TABLE G3 Bird Species Recorded in the Breeding Bird Atlas Square within which the Study Area is Located

Common Name	Binomial	NSDNR Status	ACCDC Status (Breeding Season)	Breeding Status of Birds found in Atlas Square (10,000 ha)	Species Expected to Nest in Study Area
Blue-headed Vireo	<i>Vireo solitarius</i>	Green	S5	Probable Nester	X
Red-eyed Vireo	<i>Vireo olivaceus</i>	Green	S5	Probable Nester	X
Nashville Warbler	<i>Vermivora ruficapilla</i>	Green	S5	Probable Nester	X
Northern Parula	<i>Parula americana</i>	Green	S5	Probable Nester	X
Magnolia Warbler	<i>Dendroica magnolia</i>	Green	S5	Probable Nester	X
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	Green	S5	Probable Nester	
Yellow-rumped Warbler	<i>Dendroica coronata</i>	Green	S5	Confirmed Nester	X
Black-throated Green Warbler	<i>Dendroica virens</i>	Green	S5	Probable Nester	X
Palm Warbler	<i>Dendroica palmarum</i>	Green	S5	Probable Nester	
Bay-breasted Warbler	<i>Dendroica castanea</i>	Green	S5	Probable Nester	X
Black-and-white Warbler	<i>Mniotilta varia</i>	Green	S5	Probable Nester	X
American Redstart	<i>Setophaga ruticilla</i>	Green	S5	Probable Nester	
Ovenbird	<i>Seiurus aurocapillus</i>	Green	S5	Probable Nester	X
Common Yellowthroat	<i>Geothlypis trichas</i>	Green	S5	Probable Nester	X
Canada Warbler	<i>Wilsonia canadensis</i>	Green	S5	Probable Nester	X
Chipping Sparrow	<i>Spizella arborea</i>	Green	S5	Probable Nester	
Song Sparrow	<i>Melospiza melodia</i>	Green	S5	Probable Nester	X
Swamp Sparrow	<i>Melospiza georgiana</i>	Green	S5	Probable Nester	X
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Green	S5	Confirmed Nester	X
Dark-eyed Junco	<i>Junco hyemalis</i>	Green	S5	Confirmed Nester	X
Rusty Blackbird	<i>Euphagus carolinus</i>	Green	S3S4	Probable Nester	
Common Grackle	<i>Quiscalus quiscula</i>	Green	S5	Possible Nester	
Pine Grosbeak	<i>Pinicola enucleator</i>	Green	S5	Probable Nester	
Purple Finch	<i>Carpodacus purpureus</i>	Green	S5	Possible Nester	X
Red Crossbill	<i>Loxia curvirostra</i>	Green	S3S4	Confirmed Nester	X
Pine Siskin	<i>Carduelis pinus</i>	Green	S5	Probable Nester	X
American Goldfinch	<i>Carduelis tristis</i>	Green	S5	Possible Nester	X
Evening Grosbeak	<i>Coccothraustes vespertina</i>	Green	S5	Possible Nester	X
House Sparrow	<i>Passer domesticus</i>	Introduced	SE	Confirmed Nester	

Source: Erskine 1992 and M. Crowell pers. comm. 2007