SCOTIA AGGREGATES LTD.

P.O. BOX 371, BRIDGETOWN, NS

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on

PROPOSED MARSHALL ROAD SAND PIT EXPANSION

Environmental Assessment Registration

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May 2, 2006

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Executive Summary

Scotia Aggregates Limited (the proponent & a locally owned company) is proposing to expand existing sand pit operations on their Marshall Road property north of the Village Kingston, Nova Scotia. Currently, the proponent and its sister company VJ Rice Concrete Limited hold two industrial approvals from the Nova Scotia Department of Environment and Labour (NSEL) (Approval No. 98-IAW-022; dated, 17th December 1998 and Approval No. 2002-031347; dated, 30th January 2003) to construct and/or operate an aggregate or sand pit on the Marshall Road property (see Appendix 1). The proposed project expansion is within the 60.7 hectares of land currently owned and used by the Proponent. This environment assessment registration identifies potential environmental effects of the proposed undertaking, as well as the appropriate mitigation and follow-up monitoring measures.

It is anticipated that the proposed expansion will commence soon after the proposed undertaking/project receives approval from NSEL. It is anticipated that the undertaking will be sustainable for at least ten years, with the final reclamation occurring within one year of project shutdown. The proposed operating schedule for the undertaking will be based on 14 hr/days, 6 day/weeks—Monday to Saturday—year-round, environmental conditions permitting. Consistent with company policy, the site will be closed on Sundays and statutory holidays. All activities associated with the proposed project will be in accordance with *Nova Scotia Pit and Quarry Guidelines* (1999).

Scotia Aggregates Limited anticipates that production at the site will be approximately 75,000 tonnes of sand per year. At that rate, it is expected that the project footprint will advance one (1) or two (2) hectares per year. The purpose of the proposed pit expansion is to extract sand for ready-mixed concrete. The primary market for this product is found in the Annapolis Valley. Fine aggregates will also be sold to established customers located in Halifax Regional Municipality, throughout the Annapolis Valley, the Southshore and Yarmouth areas. The extracted sand will be stockpiled within the pit footprint before being transported by tractor-trailer trucks for concrete production or to the various markets. No physical facilities currently exist at the site, nor will any be required to accommodate the proposed undertaking. What will be required is a portable concrete containment pad for refuelling equipment and minor maintenance designed to prevent spillage and containment of groundwater and water wells.

The environmental assessment registration focuses on those features of the environment that have been identified as being of significant concern including:

- effluents and emissions
- rare and sensitive flora
- rare and sensitive fauna
- freshwater fish and fish habitat
- ground water and surface water resources
- geology
- archaeological and heritage resources
- air quality
- socio-economic environment
- visual/aesthetic environment

The environmental assessment registration describes the following monitoring and mitigation measures to address significant environmental and public concerns:

Issue/Concern	**Monitoring and mitigation measures**
Habitat degradation	• Reclamation and decommissioning plan • Removal of plants from area being excavated and transplanting to those already excavated • Retain topsoil for reclamation • Site restoration with pine, spruce and native vegetation
Rare/sensitive plants	• Limitations on site development • Removal and transplant to inactive portion of property • Retention of 30cm of topsoil – saved for reclamation • Use of nested islands for transplanted plants • Establishment of conservation and buffer areas
Wood turtles	• Limitations on site development • Barrier fence • Reclamation plans • 100 metre buffer between Walker Brook and any project activities • Maintain of all vegetative species within 100 metre buffer zone
Vesper sparrow	• Limitations on site development • Reclamation plans
Properties/structures (including archaeological sites)	• Maintenance of existing natural barriers • 90m setback of overburden stockpiles • Adherence to separation distances • 25 m setback from existing archaeological sites of concern

Soil erosion	• Adherence to NSEL *Erosion and Sedimentation Control Handbook for Construction Sites, Best Management Practices for Aggregate Extraction,* and *Best Management Practices for Reclaiming Surface Mines*
Dust	• Maintenance of road surface quality • Application of water when necessary • Adherence to *Guidelines for Pits and Quarries* • Maintenance of existing natural barriers
Noise	• Maintenance of existing natural barriers • Maintenance of road surface quality • Equipment maintenance and inspection • Adherence to *Guidelines for Pits and Quarries* • Discourage use of engine breaks by drivers
GHG	• Equipment maintenance and inspection
Solid waste	• Proper disposal of any waste
Hazardous materials	• 160m setback from watercourse when refilling equipment with oil • Removable concrete pad to prevent site and watercourse contamination from accidental spillages • Contingency plans
Groundwater & surface water	• 3 monitoring wells using Waterra sampling devices • Sand extraction kept to within 1 m of watertable
Traffic	• Encourage drivers to keep to speed limits

The environmental assessment registration identifies three plant species of conservation concern were found on the property - Rockrose (Canada Frostweed); Hudsonia, Golden-heather; Arrow-leaved Violet—and two (2) species of wildlife—Vesper sparrows and Wood turtles. The environmental assessment study found that the proposed project will have an adverse environmental effect, on the heathland and terrestrial habitat, within the proposed footprint of the sand pit. It is expected that the long-term, adverse environmental effects of the proposed project will not be significant, provided that the development of the undertaking and the reclamation and mitigation measures described in this document are adhered to. Furthermore, it is anticipated the proposed mitigation measures will appreciably enhance the survival and growth of the local Wood Turtle population. The development of the undertaking will provide significant economic benefits in terms of local employment and on-going business opportunities.

1.0 PROPONENT AND PROJECT IDENTIFICATION

1.1 Proponent Information

Name of Proponent: Scotia Aggregates Limited
Postal Address: P.O. Box 371, Bridgetown, NS, Canada B0S 1C0

Tel: (902) 665-4843
Fax: (902) 668-4019

Chief Executive Officer: Tom Rice

1.2 Project Information

Name of Undertaking: Marshall Road Sand Pit Expansion
Location: Marshall Road, Kings County, Nova Scotia

Document Preparation: Hendricus Van Wilgenburg BA (Hons), MA, MES
Address: 1396 Sherman Belcher Rd., R.R. 2 Centreville
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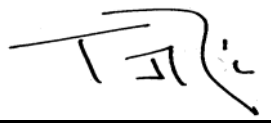

Tom Rice
Signature of President
Date: May 2, 2006

2.0 SCOPE

As it is the intent of SAL to develop an aggregate pit in excess of four (4) hectares, SAL is required to register this project as a Class I Undertaking according to Part IV of the *Environment Act* and the *Environmental Assessment Regulations* for the Province of Nova Scotia before commencing work on the project. This document fulfills that primary requirement for project registration under that legislation. The project falls under the authority of the Province of Nova Scotia and no municipal regulations apply to this project or to any connected activities.

2.1 Scope of the Undertaking

The proposed project, as described in Section 2, consists of the development of a sand pit on the Marshall Road property. The development will involve an expansion beyond the two distinct areas of the property for which SAL and VJ Rice Limited hold active Industrial Approvals. The proposed scope of the project will involve an area of approximately 60.7 hectares of land, with the *final footprint* of the proposed undertaking expected to be about thirty-nine (39) hectares. Activities of the proposed undertaking will include excavation, stockpiling, and screening of sand on—and transportation of sand from—the Marshall Road property.

All screening, mixing, and stockpiling of the excavated sand will take place within the active area of the pit. SAL anticipates that the rate of sand extraction will be in the range of 75,000 tonnes per year, at an advancement rate of roughly 1 to 2 hectares per year. SAL proposes to advance the sand pit in stages, as required. Although excavation may occur at more than one location, it is anticipated that the exposed/open area will be in the range of approximately eight (8) hectares. Excavated sand will be stockpiled within the pit footprint. Stockpiles will be in the range of 30,000 - 60,000 tonnes, in preparation for the winter season.

The proposed extraction operations will begin in the western and central portions of the property. As one open pit area nears depletion, another roughly equal area of land will be prepared for excavation. As each new section is opened up, the former exhausted pit area will be reclaimed to a state similar to existing conditions. In all areas of the property, a 30 metre buffer will be maintained between any active area of the proposed sand pit and the nearest well, foundation, or property boundary, subject to the option of reducing any setback with the permission of the adjacent landowner.

2.1.1 Purpose and Need for the Undertaking

Policy objective

The principal policy objective for SAL is to secure a stable supply of aggregate / sand and of the quality necessary to meet current and expected production and market requirements.

Rationale

There are severe limitations on reaching that policy objective. SAL and its sister company VJ Rice Ltd. need sand of the quality with which to meet the basic requirements of ready-mix production. However, finding quality sand is becoming increasingly difficult in Nova Scotia. Provincially, the Annapolis Valley, particularly from Kentville through to Kingston, has been the chief source of sand for ready-mix concrete. Prime sites for sand or fine aggregates are being developed for other purposes such as industrial and residential development or farming. Often tracts of land are too small or cannot meet setback requirements.

Undertaking context

The Marshall Road property includes five distinct tracts of land purchased from the following: Malcolm Keddy, January 26, 1984; Her Majesty the Queen, January 30, 1987; Edwin Banks, June 9, 1988; Gloria Rutledge, January 21, 1991; and lastly, Trueman Hatt, January 22, 1991. Sand extraction began on the Keddy property at least two years before SAL began negotiations to acquire the property. With the purchase of the Keddy property, SAL (the Rice family) set about acquiring the adjacent properties listed above. With the additional properties, now called the Marshall Road property, the proponent could envision meeting their policy objective.

Purpose of the proposed project

The purpose of the proposed project is to extract sand for use in ready-mixed concrete and concrete products. The sand found on the Marshall Road property is important to SAL because it is a unique material, ideally suited for ready-mixed concrete production. The sand is, for all intents and purposes, ready for immediate use in its present form. This avoids any use of water or the need for water holding-ponds often necessary for removing fine clay particles and other undesired materials. The sand will be transported to local

markets via tandem- and tri-axle trailer trucks, at the rate of approximately 10 - 20 loads per day.

The market for the sand extracted from this site is within the province of Nova Scotia, primarily in the Annapolis Valley, South shore, and Yarmouth areas. This sand will be used to help meet the requirements for fine materials of SAL's sister company V.J. Rice Concrete Limited, which has ready-mixed concrete plants in both Kentville and Bridgetown. Sand from the Marshall Road property is essential to the economic viability of V.J. Rice Concrete Limited, both in the short and long-term. Furthermore, these fine aggregates are required so that SAL can meet its obligations to established customers located in the Halifax Regional Municipality, throughout the Annapolis Valley, and in the Yarmouth area.

2.1.2 Consideration of Alternatives

A review of project alternatives was carried out with regard to the following:

(1) No sand extraction;
(2) Outsourcing sand;
(3) Access routes to and from the site; and
(4) Location of the screening, mixing, and stockpiling area.

Abandoning the proposed project (i.e., no sand extraction on the Marshall Road property) is not a viable option economically for the proponent. The proponent must be able to acquire sand in the amount and quality to sustain its current and future commitments. SAL is continually searching for other properties to source the resources required to fulfill its obligations and as part of its long-term economic strategy. Prior to purchasing the Marshall Road property, a number of sites were considered. Those properties were rejected because of various reasons, including material quality, location and size of the land tract, and setback requirements.

Outsourcing was considered, but doing so is also not viable economically for SAL or for V.J. Rice Concrete Limited. The ready-mix concrete business is a very competitive market. Purchasing sand from competitors would make the SAL and its sister companies uncompetitive or unable to respond to changes in the ready-mix concrete market, which is the foundation of their business. Scotia Aggregates Limited and V.J. Rice Concrete Limited are linked economically; therefore, what affects one company affects the other.

While the property, specifically the sand thereon, has been recognized by the *Atlantic Canada Conservation Data Centre* as supporting a unique ecosystem, other areas in the Kingston and Greenwood areas, which contain comparable sand and support comparable unique ecosystems, have been and are being developed for industrial and residential purposes.[1] For example, there are two abutting properties—one approximately 142 hectares in size and the other 38 hectares—in the Auburn area (8 kms from the study area). Those properties at this time have not been developed, but under existing municipal and provincial legislation they can be exploited for industrial and residential development. Industrial and residential development competes directly with proponents like SAL for available land and indirectly for the sand resource thereon. The key difference between these activities is that industrial and residential developments remove those unique ecosystems permanently, because the sand is covered over by roads, parking lots, and buildings; whereas, sand extraction only disrupts those ecosystems temporarily, provided that the proposed undertaking is properly planned and the excavated areas properly reclaimed and vegetative components restored.

While the protection of heathlands is considered by some to be very important, it does not appear at this time that provincial governments are prepared to compensate landowners for their investment—and for the return on that investment—in properties that support unique ecosystems. Over the past twenty plus years, SAL has examined tens of properties in the Kingston to Berwick area of the Annapolis Valley, looking for suitable fine aggregate sources for ready-mixed concrete. The majority of the properties of interest were not purchased for one or more of the following reasons: the sand is not clean enough for concrete production, the gradation is not suitable, access to the property is difficult, the property is too small to develop, the property is too isolated for normal transportation economies, and/or the asking price for the property is too high.

Two such cases in which properties were actively pursued and considered, but ultimately not purchased were the following: In October of 1991, SAL was approached by Albert Smith of Brickton with the aim of selling an aggregate pit that was located in South Williamston Annapolis County. In this instance, SAL determined that the sand /material is too fine for ready-mix concrete requirements. Furthermore, the material is very close to the water table

[1] There are other lands in the Kingston and Greenwood area that are or were original sand barrens. Planning staff with the County of Kings claim that the County has and continues to approve residential development on these sand barrens. In fact, the study area currently is zoned for residential development.

and the property itself can only be accessed through a subdivision. Hence, the Smith property was deemed to be unsuitable for SAL's requirements.

In March of 2005 SAL spoke to Bowater Mersey Limited regarding property on PIDs # 05180195 and # 05218920. This property was adjoined to property owned by Lafarge Construction Materials and also by Ivan Trimper. SAL met with a Bowater representative at the site to examine the deposit. After some consideration SAL decided not to tender a bid for the Bowater property for the following reasons: the material, while suitable for various uses, is not ideal for ready-mixed concrete requirements; a right-of-way would be required to access the property; and access to SAL's markets would be considerably less than ideal. This property has since been purchased by Curscotts' Developments Limited, a Company associated with adjoining landowner Ivan Trimper.

SAL has considered sourcing sand of lower quality, that is, sand that contains silt and clay particles. To utilize lower quality sand would require wash operations to remove the silt and clay particles. However, wash operations utilize high volumes of water. Pumping water, washing the sand, and controlling the sediments, which result so that they do not adversely impact watercourses, is costly in terms of time and money. No less relevant are the valuable water resources that wash operations exploit.

Regarding the second review criteria, alternative routes to the site were carefully reviewed because some trucks will travel through the Village of Kingston, to Highway 101, and onto eastern markets. The proponent has tried to secure alternate access routes to the site without success. An alternative is to travel north along Marshall Road, east on Brooklyn Street, south on Bishop Mountain Road, then onto Highway 101. However, Brooklyn Street is not the preferable route because the roadway is narrow and winding, and is subject to spring weight restrictions. More importantly, at the time this document was written, Brooklyn Street was in poor condition, and hence would be further compromised by additional truck traffic.

Lastly, two options were considered with regards to the placement of screening and stockpiling. Option one would be to carry out screening and stockpiling on open ground. Although this would provide more space for manoeuvring equipment and managing stockpiles, the activities would likely be visible from Marshall Road. The scenery and surroundings are important to the residents living in close proximity to the site. For that reason, we propose as an alternative, to carry out screening and stockpiling within the

confines of the open pit to conceal sand extraction and processing. Using this strategy, the pit embankment can be used to conceal product stockpiles, provided, of course, that the stockpiles are kept below the pit embankment.

The uniqueness of the sand on the Marshall Road property made it an obvious choice; for that reason, the proponent has made a considerable investment both in time and money acquiring the property. The property is not subject to muddy conditions or significant runoff, is relatively isolated from any residential area, and has at least one access point close to Highway 101 (17E is within 500 metres of the site entrance). From a transportation perspective, the property is ideally situated in that it is roughly equidistant from the proponent's two ready-mix concrete plants, which are located in the Kentville Industrial Park and in Bridgetown.

2.2 Scope of the Environmental Assessment

Scotia Aggregates Limited is required to register the proposed project as a Class 1 undertaking pursuant to the Nova Scotia *Environment Act* and the *Environmental Assessment Regulations*. Other relevant provincial regulations and guidelines to be adhered to are the *Nova Scotia Pit and Quarry Guidelines* (1999). Although no municipal regulations apply to this undertaking, other relevant legislation, regulations, and/or guidelines to be adhered to include: the Nova Scotia *Activities Designation Regulations* (1995); and as well, the Federal *Fisheries Act* (1984), *Species at Risk Act* (2002); and the *Migratory Birds Convention Act* (1994).

The proponent and the consultant determined the scope of the environmental assessment for the proposed undertaking based on the activities and environmental components associated with the proposed project. Furthermore, input from the professional judgments of the study team, a review of similar projects, consultation with regulatory authorities and municipal authorities, and field studies carried out at the site, were used to determine the scope of the assessment. The sub-consultant reports/individual field studies can be found in the appendices to this document.

The consultant met with NSEL on November 18, 2004 to discuss the project, the proposed expansion area, and activities and environmental components associated with the proposed project. Information bulletins were distributed to residents living in proximity to the pit and a public meeting was held to discuss the proposed project, valued ecosystem components,

and valued socio-economic components to identify and qualify possible project-environment interactions.

This environment assessment evaluates the potential environmental effects of the proposed undertaking over the life of the project. This study focuses on those Valued Environmental components (VECs) and Valued Socio-economic Components (VSCs) that have been identified as being of significant concern to arrive at meaningful evaluation of the impact of the proposed project. The following VECs and VSCs were investigated to identify and qualify possible project—environment interactions:

- rare and sensitive flora
- rare and sensitive fauna
- freshwater fish and fish habitat
- ground water and surface water resources
- geology
- archaeological and heritage resources
- air quality
- socio-economic environment

Based on professional judgement, a review of databases and existing information; the size, nature, and location of the proposed undertaking, the proponent and the consultants believe that any undesirable effects which may be associated with the proposed project will be limited to the immediate area of site. While the final footprint of the project is expected to be approximately forty-eight (48) hectares, a portion of that area has already been used for sand excavation. If strict adherence to the monitoring and mitigation measures contained herein is followed, the majority of the emissions and discharges will be confined to the Marshall Road property. It is in that light that the scope of this study—i.e., the environmental components—is confined to the Marshall Road property and adjacent areas.

3.0 PUBLIC INVOVLEMENT

3.1 Methods of Involvement

Public involvement was achieved through two main methods: 1) direct contact to targeted stakeholders/representatives, and 2) a public meeting.

Targeted Contacts

Mr. Leo Glavine (MLA for King's West), Mr. Stephen McNeil (MLA for Annapolis), Mr. Wayne Atwater (county councillor for District No. 5), Bill Butler (Director of Community

Development Services for Kings County) were explicitly made aware of the project. Mr. Glavine, McNeil, and Atwater took the opportunity to meet with the proponent, visit the property, and learn first hand about the proposed project and the rehabilitation work that SAL has carried out at Champlain Heights, Kingston, NS. In addition, letters were sent to Mr. John Toney, band chief for the Annapolis Valley First Nations, Cambridge, Kings Co., NS and to Mr. Donald Julien, Confederacy of Mainland Mi'kmaq, Truro, NS, explaining the project and inviting comment. To date, individuals from the two representative groups have not responded

The Public Meeting

A public meeting was designed to generate local interest and to understand the attitudes, concerns, and values of the community, interested individuals and groups. The meeting was held on April 5, 2005 in the Kingston Fire Hall, from 7:00 p.m. – 8:30 p.m. The purpose of the meeting was as follows:

- To inform the residents of Kingston of the details of the proposed Undertaking;
- To learn about the residents' concerns; and
- To answer questions in a collective and transparent manner.

Notice of the meeting was communicated by: 1) hand-delivery of 108 notices to most homes in close proximity to the site; that is, along Marshall Road (including those residing in S. Dalgren Court), Brooklyn Street, and the Bishop Mountain Road2) posting of the public meeting notice at key local businesses; and 3) publishing a meeting notice in the local newspaper with good distribution to the community, the *Monitor Examiner*, on March 23, 2005.

Twenty-five people attended the public meeting. The first half of the meeting was devoted to introducing the project, and describing the undertaking, the property, and the environmental components being investigated. The second half of the meeting was devoted specifically to addressing the participants' concerns, answering their questions, and recording their comments, concerns, and opinions (see Table 7).

To record their participation in the meeting, attendees were asked to register their names as they arrived. A comment sheet, contact information, and a draft proposal (prepared by the facilitator) were provided to each registrant. The document included the following information: introduction, project scope, project operating schedule, property and zoning

features, and the prospective VECs and VSCs to undergo study and be included in this report.

The facilitator introduced the proponent, described the structure of meeting, and the objectives of the meeting. The facilitator informed the participants that he had been retained by the proponent, and explained his background to the participants, his role to take comments and answer questions related to the proposed project at the meeting, to hire the required specialists, and to act as a project manager to oversee the preparation of the environmental registration document.

A PowerPoint presentation was delivered by the facilitator, which included a brief description of environmental components/concerns that would likely be explored. The name of each expert/specialist carrying out the respective component study was also provided. During the presentation, maps were shown identifying two sites for which SAL currently has “Industrial Approval” and other pits (either active or inactive) in close proximity to the property in question. Existing groundwater wells, evaluated by a hydrologist, were also identified on the map. It was explained that groundwater quality at the site would be monitored on an ongoing basis. The facilitator also indicated the likely buffer zones within the property (i.e., the property boundaries, watercourses, the Randall Cemetery by means of a topographical aerial photo. The facilitator provided details of existing treed areas and their significance with respect to the proposed project, specifically the proposed buffer zones, tree plantings, and mature tree stands.

The Environmental Assessment process as it currently exists in Nova Scotia and the proposed timeline for this undertaking was explained in detail by the facilitator.

3.2 Public Feedback and Concerns

Participants at the meeting expressed a range of concerns in terms of socio-economic and biophysical issues (Table 7).

Table 7: Key issues identified by participants

1. Nuisance	2. Socio-economic	3. Biophysical	4. Health and Safety
dust	road degradation	removal of screening and shade trees	dust
speed of truck traffic	recreation/ shared use	protected zone by graveyard	Speed of truck traffic near schools
truck routes (Marshall Rd/other)	possible future benefits to the community	Reclamation plans/policy	n/c
noise: production begins too early	real estate values		n/c
restrict access to site - deter off-road vehicle (OHV) use	dust		n/c
noise: Jake-brakes	reclamation plans/policy		n/c
noise: frequency of truck traffic			n/c

Note: N/c means no comments. Off-road vehicles (OHVs) include all-terrain vehicles, trial bikes, and so forth.

The first issue raised was that of procedure. Concerns were expressed that the project would go ahead regardless of community input. The facilitator explained that the project will go ahead, if the appropriate regulatory approvals are obtained, but stressed the importance of community involvement in that approval process.

Participants raised concerns about truck traffic, truck speed in residential areas, the use of Jake-brakes, and increased travel on Marshall Road. The proposed truck routes and possible alternates were explored, as well as the impact of additional traffic on the road surface, in terms of wear and tear. Some residents expressed concern about the increased truck travel and related safety issues because two schools are nearby. A few residents suggested that the proposed start time for hauling (6:00 am) is unreasonably early and highly disruptive to residents.

Concerns about general nuisance issues from project activities arose during the meeting, such as noise, dust, and property aesthetics, as well as, their potential influence on property values. Residents were assured by the proponent that dust would be minimal during project activities. The residents were told that specific recommendations would be made to keep dust levels down while sand was being processed, loaded and transported.

Site security was also repeatedly mentioned. OHV use on the property is an ongoing concern and may become a greater nuisance for residents of the area. The proponent acknowledged those concerns and indicated that SAL will attempt to restrict points of access. However, it was acknowledged by the participants that responsibility for policing OHVs rests elsewhere and not with the proponent. The proponent suggested that current plans do not include fencing around the site, as this would impede recreational foot traffic.

As for the biophysical concerns, concern was expressed about treed areas to shield site activities and about special areas such as the Randall Cemetery. Participants wished to maintain existing tall tree stands and treed areas planted by the proponent to serve as natural barriers to improve the aesthetic qualities of the site and to reduce noise and dust.

Residents expressed concern over the eventual reclamation, levelling, and seeding to keep dust down. They would like a comprehensive plan in place for clean up and restoration of the site at the end of the project. A comprehensive, concurrent reclamation plan has become part of this document and will be initiated by the proponent as soon as sufficient space is created by sand extraction (see Section 3.0, Reclamation). Residents would like to see some direct benefit to the community at the end of the project such as the construction of a playground.

SAL has publicly stated they are not only "committed to the protection of environmental components in the area," but also committed to responding to the questions and concerns of the community, and to providing further information to the community in future if desired, in particular the residents along Marshall Road who may be most affected by the proposed project. During the meeting, SAL was acknowledged for being a good corporate citizen and for its effort to improve community relations. SAL and its sister companies have enjoyed recognition within the community for having shown "good stewardship" in the region, for example, by freely rehabilitating without cost to the community a decommissioned sand pit in Kingston, which was not excavated by SAL or one of its sister companies. In addition, SAL has been acknowledged for freely providing the time and resources for improving the Ravenswood and Champlain Heights subdivisions.

Responses at the meeting and from returned comment sheets suggest that there is minimal opposition to the proposed undertaking and most residents of the Marshall Road area are generally supportive of the project as it was proposed.

3.3 Steps Taken To Address Public Concerns

The Marshall Road property has been the site of sand extraction since 1981. Given the history of the site and SAL's strict adherence to the monitoring and mitigation program outlined in this document, it is anticipated that a reasonable enjoyment of life and property will not be adversely affected by the proposed project. To that end, SAL will encourage its truck drivers to respect posted traffic regulations (e.g., speed limits) and be mindful of children attending two schools in the area. SAL will discourage the use of engine brakes (or Jake-brakes) by the truck operators to stop or slow down in the Village of Kingston or when approaching the Marshall Road entrance.

Although an assessment of real-estate values has not been carried out, it is assumed that housing values are strongly affected by positive and negative externalities such as air quality, traffic, noise, vibration, visual/aesthetic qualities, and so forth. Researchers in the United States studying real-estate values report externalities associated with the development of pits and quarries are only incompatible with residential development when they are uncontrolled (McKown 1995; Rabianski and Carn 1987). Moreover, the researchers believe that, if pits and quarries were properly developed, positive or negative impacts on the value of housing adjacent to the operation would be unlikely. Rather, it has been suggested that there is a benefit to being located next to such operations because of the open spaces and wooded areas, which are used to buffer site activities.

While security at the site remains an ongoing concern for the proponent, specifically with regards to OHV use, they inform OHV users when found on the property about their and the residents' concerns. The OHV users will be told that they are not welcome because their activities threaten the endangered plant and wildlife species that populate the site. To restrict access, the property, which is gated, will be locked when not in use. This strategy will be enforced throughout the life of the project.

SAL will remain open to and ready to resolve the concerns of the Marshall Road area regarding the activities connected to this project. If desired, SAL is prepared to organize a Community Liaison Committee to help resolve issues that may arise from the proposed project.

4.0 DESCRIPTION OF THE UNDERTAKING

4.1 Proposed Project Overview

It is the intent of Scotia Aggregates Limited (SAL) to expand its existing sand pit operations on their Marshall Road property in Kingston, Nova Scotia (Figure 1). Currently, SAL and its sister company VJ Rice Concrete Limited (both companies are held by the Rice family of Bridgetown Nova Scotia) hold two industrial approvals from Nova Scotia Department of Environment and Labour (NSEL) to construct and/or operate an aggregate or sand pit on the Marshall Road property (see Appendix 1). Approval No. 98-IAW-022—dated, 17th December 1998—expires on 17th December 2008 and Approval No. 2002-031347—dated, 30th January 2003—expires on 30th January 2012. SAL has entered into an agreement with its sister company VJ Rice Concrete Limited, which allows VJ Rice Concrete Limited to extract sand on lands (i.e., the Marshall Road property) held by SAL (see Appendix 1). While SAL holds title to the five separately deeded lands that make up the Marshall Road property, SAL will be, from this time forward, responsible for all site development, preparation of new sand extraction areas, and sand extraction, as well as the restoration, reclamation, and decommissioning of the project site.

Approval No. 2002-031347 is for a sand pit 3.94 hectare in size, in the western portion of the study area. The approved pit overlays a portion of the larger, inactive Banks pit site (see Figure # 2). The Banks sand pit is approximately five (5) hectares in size. Although five (5) metres of sand has been excavated from the Banks pit, SAL plans to extract the remaining three (3) to five (5) metres of available sand. This portion of the property slopes gradually towards Marshall Road.

Approval No. 98-IAW-022 is for a sand pit 3.7 hectares in size, in the northern portion of the study area. The approved pit abuts the western edge of the Keddy pit. The Keddy sand pit is approximately three (3) hectares in size. While the Keddy pit has been extracted to depth of fifteen metres, SAL wishes to incorporate the Keddy pit into the larger project by further developing the pit face to the west, east, and south (see Figure # 2). This portion of the property is relatively flat.

In all areas of the property, a 30 metre buffer will be maintained between any active area of the proposed sand pit and the nearest well, foundation, or property boundary, subject to the option of reducing any setback with the permission of the adjacent landowner. All

physical works, overburden stockpiles, and product stockpiles of aggregates will be located at least 60 metres from the nearest watercourse or established riparian zone. The lands on which the aforementioned proposed project, approved and inactive pits are located are wholly owned by SAL.

The final footprint of the proposed project will include approximately forty-eight (48) hectares of the 60.7 hectare property. This area includes all existing inactive pits and the proposed development of the site.

4.2 Geographic Location

The Marshall Road Sand Pit Expansion Project is proposed on 60.7 ha of land owned and operated by SAL, in Kings County, Nova Scotia. The property is east of Marshall Road, ½ a kilometre north of the Village of Kingston, Nova Scotia (Figure 1).

4.2.1 Property History

For the last 100 years or more, the Marshall Road property has undergone extensive change. The effects of human activity are visible throughout the property. The forests have been harvested, at one time or another. Anecdotal and empirical evidence suggests that the study area was farmed extensively. The remains of a former settlement are evident in the northern edge of the study area (see Archaeological and Heritage Survey; Appendix 9). Also a large open ditch—approximately three (3) metres in depth—obviously dug by people cuts through the northern portion of the property, although its purpose remains unclear.

Aerial photographs taken over the last fifty years track the impacts of farming, forestry, and sand extraction activity in the study area (see Appendix 2), which are evident throughout much of the property. The development of the Keddy sand pit in the northern portion of the study area began in (or before) 1981 (see Figure # 2, Plate #2, in Appendix 2). While in the subsequent years, the study area was no longer used for farming purposes, at least three additional sand pits were developed for the extraction of sand (see Figure 2, Plates 2 & 4, in Appendix 2). It is estimated that the four inactive pits make up roughly 20 percent of the 60.7 hectare property.

What is consistent throughout the site's contemporary history is its use for human purposes and the adaptive capacity of the plant life in the study area.

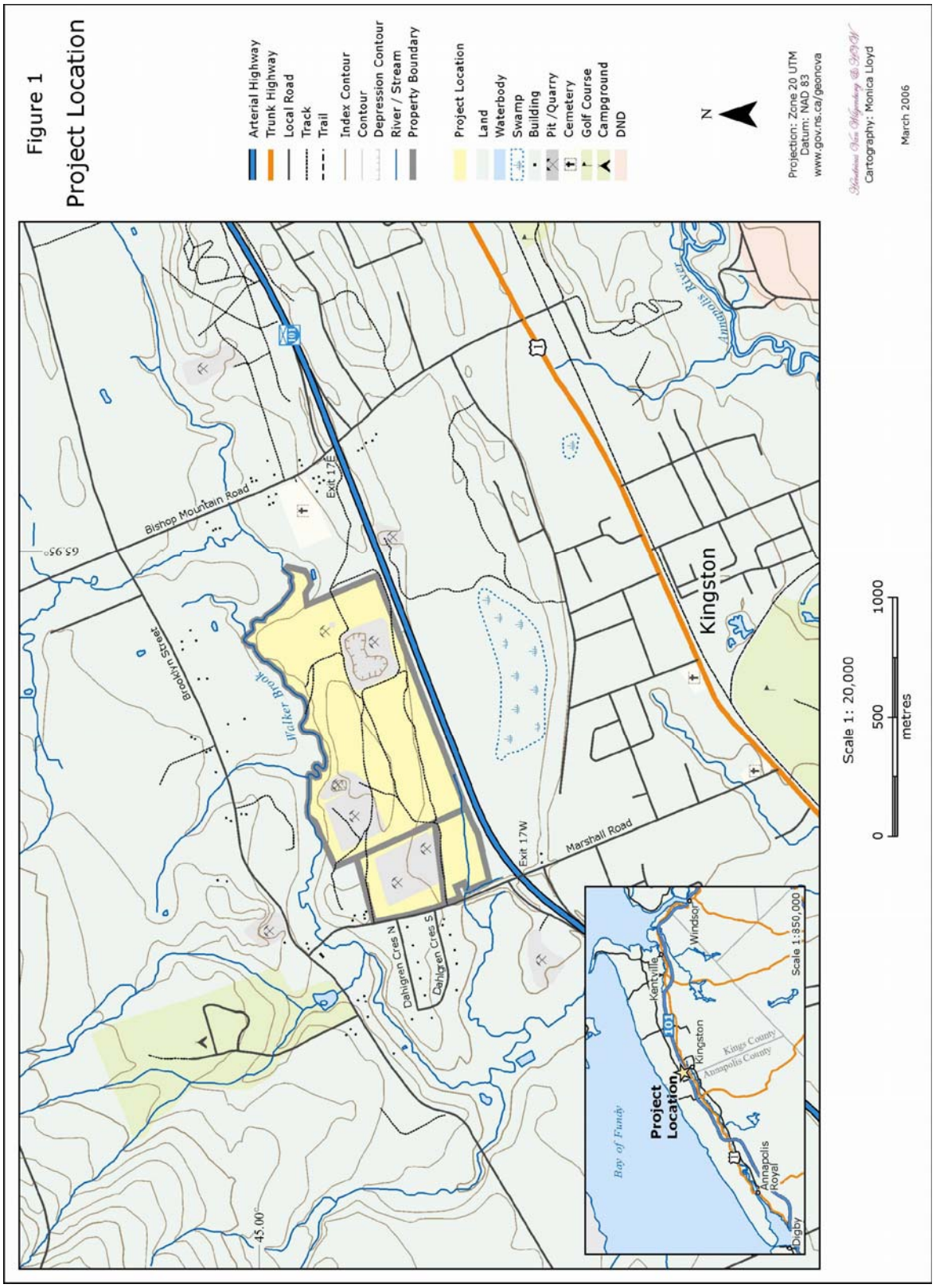
Figure 1
Project Location
Arterial Highway
Trunk Highway
Local Road
Track
Trail
Index Contour
Contour
Depression Contour
River / Stream
Property Boundary
Project Location
Land
Waterbody
Swamp
Building
Pit /Quarry
Cemetery
Golf Course
Campground
DND
N
Projection: Zone 20 UTM
Datum: NAD 83
www.gov.ns.ca/geoncva
Cartography: Monica Lloyd
March 2006
Bishop Mountain Road
Exit 17E
Exit 17W
Marshall Road
Broughton Street
Walker Brook
Kingston
Dahlgren Cres N
Dahlgren Cres S
Scale 1: 20,000
0
500
1000
metres
Project Location
Bay of Fundy
Kentville
Windsor
Kingston
Annapolis Royal
Digby
Kings County
Annapolis County
Scale 1:850,000
45.00°
65.95°

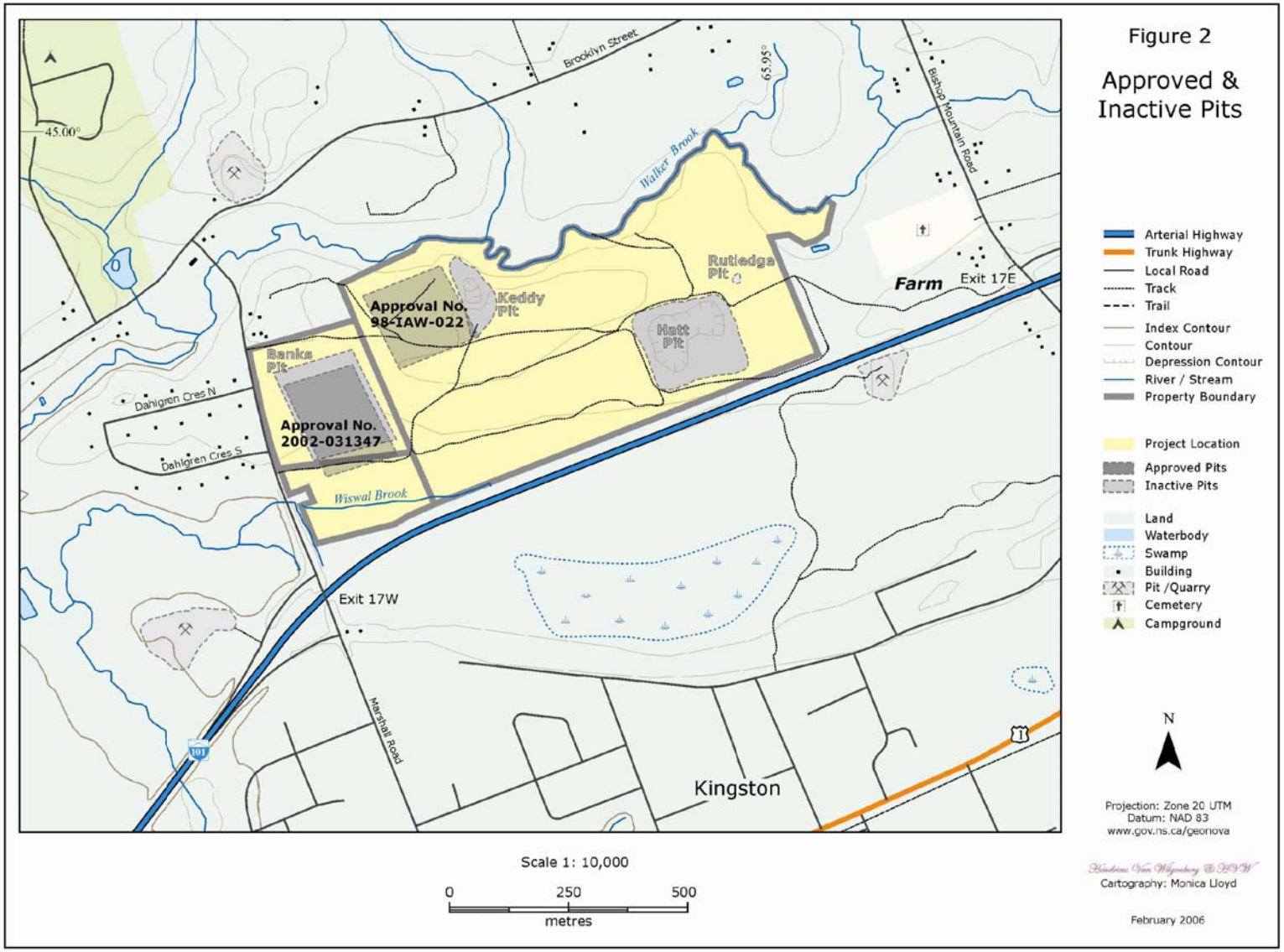
Figure 2
Approved & Inactive Pits
Brooklyn Street
Walker Brook
Bishop Mountain Road
45.00°
65.95°
Approval No. 98-IAW-022
Approval No. 2002-031347
McKeddy Pit
Rutledge Pit
Hatt Pit
Banks Pit
Farm
Exit 17E
Exit 17W
Dahlgren Cres N
Dahlgren Cres S
Wiswal Brook
Marshall Road
Kingston
Arterial Highway
Trunk Highway
Local Road
Track
Trail
Index Contour
Contour
Depression Contour
River / Stream
Property Boundary
Project Location
Approved Pits
Inactive Pits
Land
Waterbody
Swamp
Building
Pit /Quarry
Cemetery
Campground
N
Projection: Zone 20 UTM
Datum: NAD 83
www.gov.ns.ca/geonova
Cartography: Monica Lloyd
February 2006
Scale 1: 10,000
0
250
500
metres

4.3 Physical Components

The property of interest includes at least four (4) developed sand pits (used for the construction of Highway 101 and for private use; see Figure 2); a portion of idle farmland (roughly 1 hectare) in the western portion of the property, and a few isolated forested areas. The property is bounded to the south by Highway #101, to the north by Walker Brook and privately held lands beyond, to the west by Marshall Road, along which is located the South Dalgren Court (a low density subdivision) and to the east are privately held lands along the Bishop Mountain Road (see Figure 1). The eastern edge of Marshall Road property is approximately 177 metres from Bishop Mountain Road.

The property, which has been recognized as a sand barrens (or heathland), can be characterized as dry and sandy, with an undulating landscape. While the soils on the property are inhospitable to some agricultural practices (i.e., without irrigation and added nutrients), it still remains an important habitat for local flora and fauna. There are a variety of plant life and trees scattered throughout the property, some of which are unique to sand barrens. Two watercourses can be found on the property: the Walker Brook, which enters the property from the west (flowing in an easterly direction) and serves as the northern property boundary; and the headwaters of the Wiswal Brook, which is located at the southwest corner of the property, adjacent to Highway 101. Treed areas can be found along much of the property's boundaries, particularly along Highway 101, the headwaters of the Wiswal Brook, and the Walker Brook (see Photos 1 & 2, page 33).

4.4 Site Preparation and Development

Before any proposed pit site is prepared, the proposed area will be surveyed for rare and sensitive plants. Any rare and sensitive plants found will be carefully removed, with the roots and attached soils, using rubber-tired loader, then immediately and carefully transplanted in an inactive portion of the property or an area being reclaimed. In any one year, the cell (area) that is being prepared for a new sand extraction site will be confined to an area, which is sufficient to satisfy production requirements for the following year. This approach will minimise the total area exposed, that which is being prepared for new sand extraction and that which is being excavated. When a cell is being prepared for a new sand extraction site, the overburden stockpiles will be setback ninety (90) metres from any structure and thirty (30) metres from an abutting property.

In preparation for sand extraction, at least thirty (30 cm) centimetres of the surface material layer—that is, topsoil and vegetative materials—will be removed from the intended pit area using a rubber-tired loader and when necessary a D6C dozer. The required depth will be determined primarily by observation of root depth of the plants and the attached surface materials. Although topsoil in the study area is virtually non-existent, what little there is will be stockpiled within the active area of the pit for later use in reclamation.

The vegetative materials will be handled in two ways: in years one (1) and two (2) the vegetative materials and the attached topsoil will be removed from the proposed pit areas and stockpiled next to the proposed pits to be used later to rehabilitate and reclaim an exhausted pit site. The rationale for this strategy is to provide adequate space in the initial phase of the reclamation process. In the succeeding years, site preparation and reclamation will be carried out systematically, with site preparation and reclamation being carried out in tandem (primarily in April and May), and extraction being carried out predominantly in the spring, summer, and fall months (see Figure 3; and Table 6 on p. 42). The rationale for the proposed development strategy is to move the existing common plants and trees from areas being prepared for new sand extraction to areas that have been excavated, when moisture levels in the soils are to the advantage of the plants and trees.

Under no circumstances will topsoil be removed from the site.

4.5 Operation and Maintenance

The proposed operating schedule for the undertaking will be 14 hours/day, 6 days/week—Monday to Saturday—year round (environmental conditions permitting). Although SAL plans to haul sand year-round, it is anticipated that the bulk of the sand extraction and stockpiling will be occur from April to December. Activity at the site will commence at 6:00 a.m. and discontinue at 8:00 p.m. Site operations will be closed on Sundays and statutory holidays.

Equipment at the site will be minimal because of the nature of the site and the materials found there. Typically, equipment at the site will include: a Norberg sw348 portable screening unit, fitted with a conveyor/stacker; a 1987 Caterpillar 950B 4WD rubber-tired loader; and occasionally, there will be an additional 4WD rubber-tired loader required for stockpiling and a 1973 Caterpillar D6C dozer for pit preparation.

At the pit face, the sand will be excavated using a 4WD rubber-tired loader to a depth of 3-15 metres (similar to the existing pits). Once extracted, the sand will be placed into the

screening unit using a 4WD rubber-tired loader. After being screened, the end-product will be stockpiled within the active area of the pit utilizing either the stacking conveyor or a rubber-tired loader.

When required, the sand will be transported from the site to various markets by tractor trailer. SAL plans to transport sand from the site using tarped tandem- or tri-axle trailer trucks. SAL anticipates that the average number of truck hauling will be approximately ten (10) loads per day, which may on occasion increase to twenty (20) loads per day. The level of activity will depend on market demand, as well as on weather conditions at the proposed pit site and at construction sites.

SAL anticipates that the average production will be approximately 75,000 tonnes of sand per year. The proponent anticipates that at any time 30,000 - 60,000 tonnes of sand may be stockpiled, in anticipation of unfavourable winter conditions. All processing and stockpiling areas will be kept within the active area of the proposed pit. A ninety (90) metre setback will be maintained between product stockpiles and any abutting property or structure, subject to the option of reducing any setback with the permission of the adjacent landowner.

At all times, excavation on the proposed site will take place above the water table and in accordance with the following separation distances and site-specific conditions:

Separation distances & site-specific conditions

The proposed active area of the undertaking will adhere to the following separation distances:

a) SAL will not locate the Active Area of the pit within:

- i) 30 metres of the boundary of a public or common highway;
- ii) 30 metres of the bank of any watercourse or ordinary high water mark;
- iii) 100 metres of the Walker Brook;
- iv) 50 metres of any Rockrose plants contained within a designated conservation area;
- v) 30 metres of the boundary of the pit property; and
- vi) 30 metres of the boundary of any cemetery.

b) SAL will not locate the excavation "Working Face" of the pit or stockpiles within:

- i) 30 metres of the boundary of a public or common highway;
- ii) 30 metres of the bank of any watercourse or ordinary high water mark;

iii) 90 metres of the foundation or base of a structure; and

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

The 90 metres separation distance from the foundation or base of a structure and 30 metres from the property boundary is subject to the option of reducing any setback with the permission of the adjacent landowner.

Relevant Considerations

SAL will adhere to the following site-specific conditions:

i) The boundaries of the site shall be clearly marked and kept reasonably clear of new growth;

ii) The corner boundaries shall be clearly marked with permanent markers no less than 1.2 m high;

iii) No soils will be transported to the site;

iv) No topsoil will be removed from the site;

v) No blasting, pumping from watercourses at the site, or wash operations will be associated with the proposed project; and

vi) No facilities will be constructed for the proposed undertaking.

4.5.1 Project Timeline

The proposed undertaking is scheduled to begin immediately after receiving NSEL approvals. The project is designed to proceed in stages beginning with the pits area currently approved (see Figure 2, Table 6). After each portion of land is prepared and then excavated, another comparable area of land will be prepared for future excavation. In any given year, preparation of a proposed pit area is only warranted if the active pits near depletion. Based on previous experience and the porosity of the sand at the site, it is anticipated that standing water and muddy working conditions will not be an issue.

The details in Table 1 are only approximations. At the proposed extraction levels, operations are expected to be sustainable for at least 10 years. If additional markets become available, SAL may wish to increase the yearly tonnage of sand excavated on the property. However, the actual tonnage is difficult to predict, as the amount of end-product required is contingent on market demand and environmental conditions.

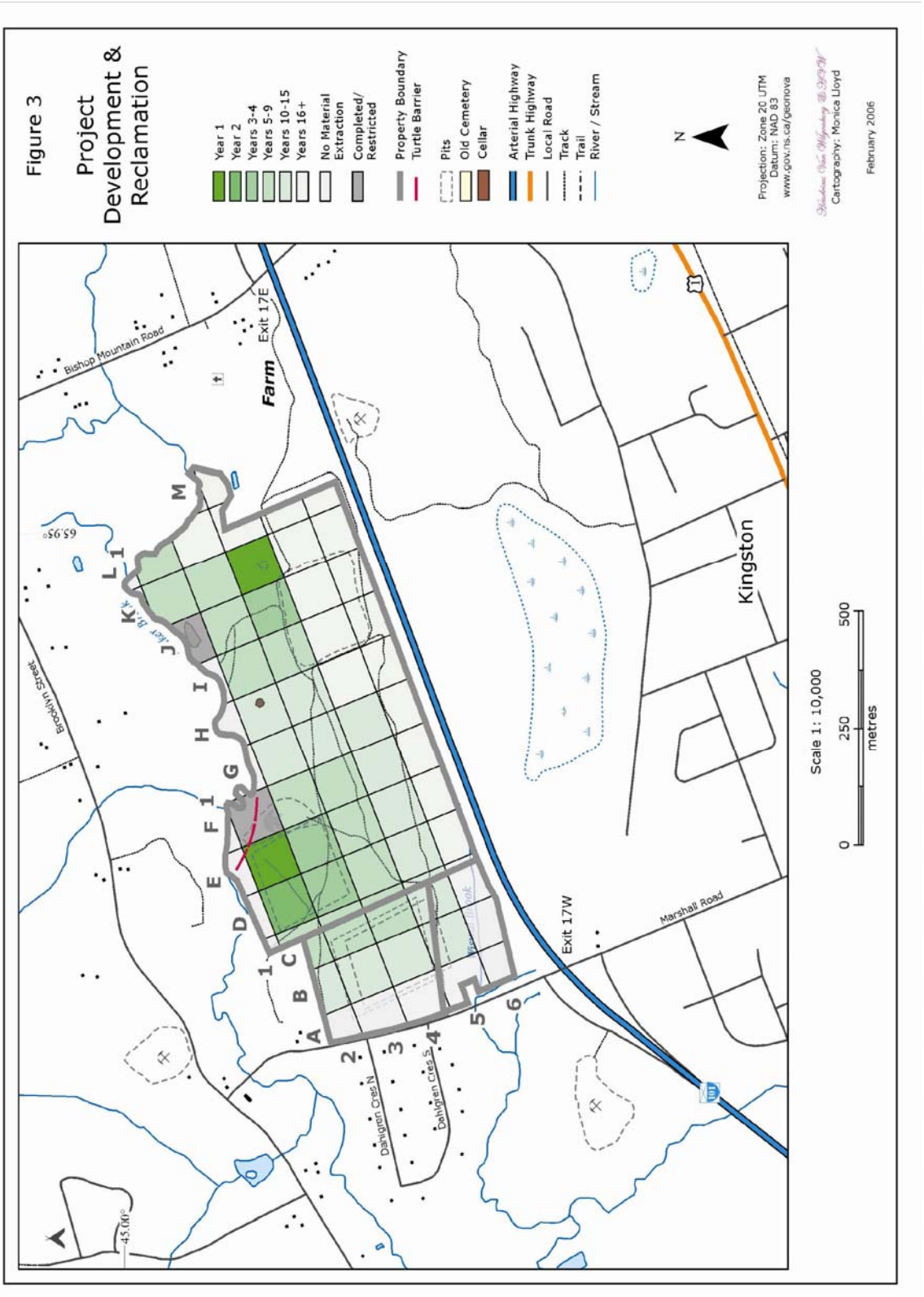
Figure 3
Project Development & Reclamation
Year 1
Year 2
Years 3-4
Years 5-9
Years 10-15
Years 16+
No Material Extraction
Completed/ Restricted
Property Boundary
Turtle Barrier
Pits
Old Cemetery
Cellar
Arterial Highway
Trunk Highway
Local Road
Track
Trail
River / Stream
N
Projection: Zone 20 UTM
Datum: NAD 83
www.gov.ns.ca/geonova
Cartography: Monica Lloyd
February 2006
Scale 1: 10,000
0
250
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metres
Kingston
Exit 17E
Exit 17W
Bishop Mountain Road
Marshall Road
Brooklyn Street
Dahlgren Cres N
Dahlgren Cres S
Farm
65.95°
45.00°
A
B
C
D
E
F
G
H
I
J
K
L
M
1
2
3
4
5
6

4.6 Effluents and Emissions

4.6.1 Erosion and Sediment Impacts

The sources of soil erosion and sedimentation include wind erosion and sedimentation of watercourses due to runoff from melting ice/snow or precipitation events. SAL will rely on three basic rules for erosion and sediment control: (1) soil stabilization; (2) runoff control; and, (3) sediment control. Although there is always the potential for soil erosion and sedimentation with the disruption of the soils, effluent/runoff at the site from weather events (i.e., precipitation) is not likely to be a significant issue because of the high infiltration capacity and relatively low silt/clay content of the soils in the study area. For that reason, overland flow, surface runoff, and subsequent siltation rarely occur (see Section 6.5 Groundwater Resources and Hydrogeology).

Nonetheless, SAL will follow best practices and standard NSEL requirements for erosion and sedimentation controls to ensure that any runoff generated during pit activities is managed properly. The NSEL *Erosion and Sedimentation Control Handbook for Construction Sites* (1988) will serve as the reference document for all erosion control measures. SAL will adhere to the following site design, management, and maintenance principles:[2]

i) Site activities will be coordinated with climate conditions (e.g., halt clearing and grubbing activities when rain and snow fall on the site and stabilize soils before freeze-up).

ii) Cut benches in overburden piles or other unconsolidated material likely to erode and slope away from the center of the bench to allow drainage to either side.

iii) Maintain and promote growth of natural vegetative barriers along the borders of the property.

iv) Maintain an undisturbed thirty (30) metre buffer of native vegetation between all watercourses, any established riparian zone, and any rare and sensitive vegetation.

v) Keep infill material free of contaminants (i.e., for reclamation).

vi) Slope stockpiles toward the appropriate drainage or vegetated areas.

vii) Monitor receiving watercourses on the site.

viii) Preserve and protect areas of natural vegetation on the site.

[2] Cf. Natural Resources Conservation Service (1995). Accessed on, June 05, 2005. Accessed at, http://www.il.nrcs.usda.gov/engineer/urban/index.html.

ix) Prevent the sedimentation of watercourses by taking special measures to prevent damages that could result from project activity by maintaining a thirty (30) metre buffer between the active area of the proposed pit and the bank of any watercourse or ordinary high water mark.

x) Control wind erosion by minimizing the scope and duration of the area exposed by clearing only the amount needed for expansion within one year.

xi) Control raindrop erosion by implementing and maintaining sediment control measures to stabilize exposed soils and prevent on-site damage, such as sediment basins or traps, filter barriers and diversions, and perimeter control practices prior to site clearing, grubbing, excavation, and grading to protect disturbed areas from off-site and onsite runoff and to prevent sedimentation damage to areas off the development site.

xii) Control surface erosion by keeping runoff velocities low and retain runoff within the active area of the site.

xiii) Control storm water erosion by diverting storm water and overland flow around the sand extraction site back into the original drainage areas (e.g., ditches and so forth).

xiv) Prevent sediment from being tracked onto public or private roadways by maintaining road quality with gravel.

xv) Follow a concurrent reclamation strategy by implementing final grading and replacement of topsoil and vegetative materials, and replant excavated areas as soon as possible, but within the growing season (i.e., after a specified area is exhausted of the desired sand resource).

xvi) Follow up with a thorough inspection, maintenance, and mitigate measures of the site during and upon decommissioning.

SAL is committed to following the *Best Management Practices for Reclaiming Surface Mines in Washington and Oregon* set out by the Washington State Department of Natural Resources and *Environmental Objectives and Best Management Practices for Aggregate Extraction* set out by the British Columbia Ministry of Water, Land and Air Protection Vancouver Island Region.

Effluent/runoff at the site will be controlled and contained within the active area of the proposed pits using the aforementioned erosion and sedimentation control measures. During and after large precipitation events, runoff will be allowed to evaporate and infiltrate into the ground. The soil at the site is such that any liquid, including deleterious substances, will move quickly into the soils and also into the groundwater.

The necessary silt fences and diversion controls will be properly constructed and maintained to control potential runoff prior to commencement of site preparation and excavation activities. However, it is highly unlikely that erosion and sedimentation will be of significant concern because the water at the site infiltrates the soil quickly. Silt is virtually non-existent

on the property because of the granular nature of the soils (see Appendix 3); hence sedimentation of watercourses is unlikely to occur. Moreover, SAL will maintain an embankment between any active pit area and the Walker Brook to mitigate potential impacts from project activities on the Walker Brook and the Walker Brook floodplain.

4.6.2 Dust

Open sources such as paved and unpaved roads, construction, agriculture, and forest fires, are the source of 94% of total particulate matter. Total particulate matter consists of airborne particles in either solid or liquid form, with an upper size limit of approximately 100 micro metre (µm) in aerodynamic equivalent diameter.[3] The sources of potential dust emissions associated with this project will likely come from wind erosion, screening, mixing, loading, and truck traffic at the site. It is anticipated that dust from wind erosion will be minimal because the sand is practically devoid of nonsettleable solids (i.e., claysize particles) and contains only minor amounts of fine particles. Further, impact of the dust from screening, mixing, and loading will be minimal because these activities will take place ½ km from the nearest residence. Dust emissions will be controlled by maintaining road surface quality and the application of water obtained from SAL's sister company. When necessary, dust on roadways will be suppressed with applications of water. Under no circumstance will used-oil be used for dust suppression.

The proponent will adhere to the suspended particulate levels as outlined in *Guidelines for Pits and Quarries* (see Table 1).

Table 1. Suspended Particulate Levels

Parameter	Max. Limit
Annual Geometric Mean	70 ug/m 3 annual geometric mean
Daily average (24 hrs)	120 ug/m

Source: NSEL

4.6.3 Noise

The potential for noise impacts on residents and wildlife in and adjacent to the site is a genuine concern for SAL. Although noise connected with this project is not expected to be

[3] Source: Environment Canada. Accessed at, http://www.ec.gc.ca/cleanair-airpur/PM_2.5,10-WS2C68B45C-1_En.htm.2006-02-28; accessed on, 2006-02-28.

significant, there will be some noise from trucks traveling to and from the site and equipment working at the site. To mitigate noise levels from pit operations the proponent will maintain road quality and keep all equipment used at the site in good operating order. The proponent will not exceed the sound level exposure limits as outlined in the Nova Scotia *Guidelines for Pits and Quarries* (see Table 2). Sound monitoring will be carried out at the request of NSEL.

Table 2: Sound Level Limits (Leg.)

07:00 – 19:00 (Days)	19:00 – 23:00 (Evenings)	23:00 – 07:00 (Nights)
Leq. 65dBA	Leq. 60dBA	Leq. 55dBA

Source: NSEL

4.6.4 GHG Emissions

The release of emissions into the atmosphere from fossil fuel combustion will be generated from trucks and equipment operating at the site. The emissions include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). These emissions are likely to be minimal and localized because of the scope of the proposed project. SAL recognizes that greenhouse gas (GHG) contributes to the "greenhouse effect," and hence, it will make every effort to reduce these emissions through proper equipment and truck maintenance and inspection.

4.6.5 Solid Waste

There will be little solid waste generated at the site. All solid waste will be stored in waste receptacles and transported to a recycling facility when appropriate or disposed of at a provincially approved waste disposal facility.

4.6.6 Natural Barriers

Some years ago SAL planted trees along the western portion of the property to screen the property from Marshall Road and residences that adjoin it. This has created a natural barrier of roughly 100 metres between Marshall Road and the nearest active pit area. The existing barriers include a mixture of native plants and trees in varying densities, which line the roadway into and around the site (see Photos 1 & 2). SAL will maintain all existing natural barriers, which currently border the property to reduce any nuisance dust and noise and sustain the aesthetic quality of the site. Once the project is fully underway, additional pine

trees will be planted during the reclamation phase to preserve and enhance the aesthetic quality of the site.

Plate 1. Facing Marshall Road toward northwest

Plate 2. Entrance facing Marshall Road toward west

Plate 3. Ground cover in central portion of study area

Plate 4. Pit area in south-east portion of study area – excavated for Highway 101 in the 1980s

4.7 Hazardous Materials and Contingency Planning

Any spills of toxic materials will be dealt with expeditiously in accordance with the Nova Scotia *Activities Designation Regulations* and the *Petroleum Storage Regulations* of the *Environment Act*. Although diesel fuel and other petroleum products will not be stored on site, diesel fuel and petroleum products used in the machinery will be delivered to the equipment only as required (see Table 3, for chemicals to be delivered and used on site). SAL will maintain a minimum of 160 metre set-back from any watercourse when refilling equipment with oils and other fluids or carrying out maintenance. Equipment refuelling and minor maintenance will be confined to a portable concrete pad designed to prevent spillage and containment of groundwater and water wells, which will be transported to the site and removed at decommissioning. The placement of the refuelling area will be based on the direction and velocity of the groundwater flow, which will be established when ground monitoring wells are constructed.

In the event that a spillage occurs, the spillage will be reported immediately to the 24-hour environmental emergencies centre at (902) 426-6030 or 1-800-565-1633 as set out in the Nova Scotia *Emergency Spill Regulations*. Furthermore, the contaminants will be contained without delay using sand and absorbent pads. Once contained, the contaminated sand and materials will be collected, placed in appropriate barrels, and then transported for processing at the Envirosoil recycling facility in Bedford, Nova Scotia.

As a component of this contingency plan, operators will have access to mobile-radios or phones on site. Shovels, absorbent materials, appropriate barrels (i.e., for holding contaminated soil before disposal, etc.) will be kept at the site. All refuse (e.g., oil containers, waste materials) associated with this undertaking will be placed in refuse containers kept on service vehicles and removed from the site daily and disposed of properly.

In the event of a fire, the local fire authority and the Department of Natural Resources (in the case of the forested areas) will be contacted immediately. SAL will promote safety and conscientiousness among its staff and customers and adhere to the following:

- No deleterious substances will be deposited in watercourses or left at the site.
- No water will be removed from any watercourse on site.
- No watercourse will be diverted on the site.
- No equipment will enter any watercourse on the site.

Recognizing that pollution and waste costs money and can adversely impact the environment, the overall goal of the proponent is to make pollution prevention part of their day-to-day decision making, thereby protecting the environment and reducing potential business liabilities, while enhancing productivity and competitiveness. SAL will follow the *Pollution Prevention Workbook for Business in Nova Scotia* (2003), the NSEL *Contingency Planning Guidelines* (2004), and the *Aggregate Operators Best Management Practices Handbook for British Columbia*, Volume II (2002).

Table 3: Hydrocarbons/Chemicals to be Delivered and Used

Chemicals	Use	Environmental Effects / Precautions	Ecological Information
Diesel fuel	Used in trucks, payloaders, etc.	May cause physical fouling of aquatic organisms.	• Not readily biodegradable. • Potential for bioaccumulation. • May be harmful to aquatic life. **Toxicological Data:** **Fuels, Diesel, No. 2** EL50 - growth rate Algae (72hr) 10 - 100 mg/L.; EL50 Daphnia Magna (48hr) 10 - 100 mg/L. LL50 (WAF method); Rainbow Trout (96hr) 10 - 100 mg/L.
Grease and other Lubricants	Used in trucks, payloaders, etc.	May cause physical fouling of aquatic organisms.	• Not readily biodegradable.
Antifreeze/coolant	Used in trucks, payloaders, etc.	Ethylene glycol is harmful to aquatic life in high concentrations.	• Potentially biodegradable. • Not expected to bioconcentrate.

Source: Material Safety Data Sheets from Shell Canada Limited. Accessed on, 28.02.2006; accessed at, http://www.shell.ca.

4.8 History of Proponent's Practices

Scotia Aggregates Limited and VJ Rice Concrete Limited (companies owned by the Rice family) operate a number of NSEL permitted properties for their sand and stone requirements. They hold Industrial Approvals for company operations in both Bridgetown and Kentville. They also stockpile topsoil at company sites for rehabilitation purposes. The Rice family have been actively involved in the reforestation of abandoned sites. In fact, they are the first in the Bridgetown area to work with the Department of Natural Resources and partner in programs to improve forestry practices, carry out silviculture, and rehabilitate abandoned sites (see Appendix 10).

The Rice family has worked in collaboration with staff from DNR to establish test forests, in which specific species were chosen for location and soil characteristics. Those early test forests adopted, now common, forest management practices such as the establishment of mixed species forests, the preservation of wildlife trees and wildlife islands, and the utilization of native species wherever possible (see Appendix 10).

In that regard, Jaffray Rice has been recognized as DNR's Regional winner of the 1995 Woodlot Owner of the Year. The company has also shown its commitment to the environment in its rehabilitation of the decommissioned "Acadia Construction" sand pit in Kingston. After its purchase by SAL, the decommissioned pit was sloped; covered with a layer of topsoil and organic matter, and has been re-seeded and re-planted with native trees. SAL will also carry forward its commitment to the principles of environmental sustainability at the Marshall Road site.

5.0 RECLAMATION AND DECOMMISSIONING

5.1 Reclamation

Policy objective

SAL shall carry out an integrated, progressive site development, reclamation, and restoration program at the site. SAL shall commence with the reclamation and restoration of the excavated areas, using plants, trees, and materials found on site, as soon as is practically possible and weather conditions permitting.

Rationale

In Nova Scotia, there is no legislative requirement in place that calls for a *comprehensive* reclamation plan, but the residents living in close proximity to the proposed project have requested such a plan be part of this project (see section 5.0 on Public Involvement). The proponent has responded to that call by proposing an integrated site development, restoration, and reclamation program, of which its purpose is to preserve all species of conservation concern, preserve most of the more common tree and plant species, and to restore the site to a state that is comparable to current conditions. However, the moisture conditions and nutrient levels in the soils at the site are less than favourable for re-establishing and transplanting plants and trees.

There is also the added issue of trying to preserve plants and trees found in the study area. This will require that the respective plants and trees be removed from the areas being prepared for sand extraction, and transplanting them to areas that have been excavated. To be successful, the plants and trees will need to be removed and transplanted in a systematic, timely, and careful manner. However, time and space constraints will make this process somewhat complicated. Due to the very thin topsoil, we considered bringing in

composted manure or topsoil to enhance the growth medium in the excavated areas. However, that strategy was rejected because those products usually include seeds of alien species. If introduced to the site, the alien species would compete with existing plants. For that reason, we propose that all nutrient sources used to restore the site come from within the site.

We believe that there are four viable options for reclamation of the Marshall Road property (see Table 4). They are the following:

(1) Post-extraction Reclamation;
(2) Interim Reclamation;
(3) Concurrent Reclamation (Progressive or Continuous);
(4) Segmented Reclamation.

Although Option (1) may be the most efficient in terms of time and resources, we consider it to be the least viable. Waiting until all extraction stops before initiating reclamation potentially exposes the soils to wind and water erosion. Moreover, valuable time is lost in restoring the heathland to its current state. While Option (2) would minimize wind and water erosion, it would not facilitate the expeditious restoration of the heathland.

We consider a combination of Options (3) and (4) as the most viable. Given the slow progress of sand extraction at the site and that ample space is required to effectively carry out shaping and grading of the excavated area, we propose to progressively reclaim roughly the same area as is being prepared for new sand extraction (see Table 6). This approach will minimize wind and water erosion and facilitate the expeditious restoration of the heathland in areas where excavation is ended. This approach will not be typical of segmented reclamation because extraction in one area of the pit will not have stopped. Rather, the pit face will be followed periodically by the reclamation process, which will be integrated with the preparation of any new extraction site.

Table 4: Reclamation strategies

Reclamation Strategy	Notes
Post-extraction Reclamation	• reclamation initiated only after all extraction stops
Interim Reclamation	• temporary reclamation during operation to stabilize disturbed areas
Concurrent Reclamation - (Progressive or Continuous)	• on-going reclamation as aggregate resources are removed • overburden and soil is immediately replaced
Segmented Reclamation	• reclamation after extraction has stopped in one area of the pit or quarry

Source: Norman *et al.* (1997); cited in *Aggregate Operators Best Management Practices Handbook for British Columbia* (2002).

Current situation

The proposed project area has been extensively used for forestry, farming, and sand extraction. In areas where the later two practices have occurred, the variety of plants and trees (e.g., species of conservation concern and those that are more common) have been able to re-establish themselves, without human assistance. For example, in the Hatt and Banks pits a variety of plant species have become re-established over the past 30 years, including plant species of conservation concern (see Figure 2).

Action plan

The proposed strategy to achieve the policy objectives will be a concurrent reclamation (see Table 6), which will integrate site development/ preparation with site restoration and reclamation. However, the actual reclamation phase of the project will begin in the third year of the project's development. It is anticipated that it will take two years before a sufficient area is available to permit proper sloping of the excavated area, efficient removal of trees and plant life from areas being developed and their redistribution to areas that have been excavated. Rehabilitation treatments such as the distribution of available topsoil and overburden will begin as soon as is practical within seasonal constraints and continue throughout construction and post-construction activities.

After each cell has been excavated within one (1) metre of the water table, the area will be graded / shaped so that the landscape is undulating and all above-water excavated slopes left after sand extraction will be 1V:2H or shallower (Norman *et al.* 1997).[4] The excavated

[4] It is suggested that the minimum soil depth for post mine uses should be no less than 12 inches above the water table or rock formation. See David K. Norman, Peter J. Wampler, Allen H. Throop, E. Frank Schnitzer and Jaretta

areas will be covered with available topsoil and vegetative materials either removed during site preparation or from existing overburden stockpiles (see Section 6.3.2, Action Plan for Flora Species and Habitat). After grading, the excavated area will be seeded with native grasses, if available, to stabilize the soils. In excavated areas, a portion of the more common plants, with attached roots systems and soils, will be placed in nested islands to create small microsystems. Dead trees and other woody debris will be placed around the nested islands. White and Red Pine, both native species, will be planted in between the nested islands in early spring (April and May). The benefit of this strategy is fivefold:

(1) A significant portion of the more common plant species will be preserved;
(2) The microsystems (nested islands) will shelter the species of concern from competing tree growth;
(3) The nested islands will form new habitats useful to wildlife;
(4) The viable seeds of native vegetation included in redistributed soils can germinate; and
(5) The microsystems will control wind and water erosion.

Removing plants and their root systems with the associated soils will be more successful in re-establishing the excavated areas. While the proponent does not condone the use of the property by OHV users, we anticipate that placing dead trees and other woody debris around the nested islands will provide the plants with some protection from their activities. Moreover, the dead trees and other woody debris will collect leaves and other biodegradables, thus providing nutrients, which will promote plant survival. These suppositions are supported by research on mine reclamation. Norman *et al.* (1997) suggest that native plants will often out-compete introduced species over time and are the most useful to native wildlife. Soil and native vegetation can be transferred successfully "from areas being prepared for new sand extraction to areas in the final stages of reclamation."[5] Moreover, the authors suggest that soil hauled directly from a new sand extraction area to a reclamation area has an added benefit in that it carries with it viable seeds of native vegetation that can rapidly establish on the re-claimed area.[6] This approach will be less

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M. Roloff, Best Management Practices for Reclaiming Surface Mines in Washington and Oregon (Olympia, WA: 1997).

[5] Norman, Peter J. Wampler, Allen H. Throop, E. Frank Schnitzer and Roloff, Best Management Practices for Reclaiming Surface Mines in Washington and Oregon.

[6] Ibid.

expensive and likely more successful than long-term soil storage or the inclusion of soil from outside sources.

The rational for the proposed reclamation plan is to preserve components of the original sand barrens, specifically retaining a portion of the sand to facilitate the regeneration of the heathland so that the study area will reflect its current state. One alternative is to excavate sand within twelve inches (enough for transplanting trees) of the water table. However, doing so would promote tree development over other species found in the study area because of enhanced water accessibility.[7] To create drier conditions, which will be more reflective of the study area's current state, we propose keeping one (1) metre of the sand in the excavated areas to achieve the stated objectives, which are to preserve, protect, and re-store, as much as is practically possible, the variety of flora and fauna in the study area, while limiting the introduction of alien species to the site (see Table 5).

Success criteria

Indicators used to gauge the progress and achievement of the policy objectives will be the successful re-establishment and survival of the plants relocated in the nested islands. If it is determined that less than 2/3 of the plants fail to survive after transplantation, the proponent will draw on those with relevant expertise to revise re-establishment measures to enhance the survival rate.[8] To achieve the policy objectives, the proponents will follow that best management practices set out in the *Reclamation and Environmental Protection Handbook for Sand, Gravel and Quarry Operations in British Columbia* (1995).

5.1.1 Summary

Based on site observations, it is anticipated that, with the proposed site development and reclamation plans, much of the terrestrial habitat will be restored to its current state, or in various stages of regeneration, before the project is decommissioned.

5.2 Decommissioning

Upon completion of the final extraction phase, it is SAL's intention to have all excavated areas of the site restored with native vegetation and pine and spruce trees. It is SAL's intention to allow land to revert to a state similar to present conditions. Final grading and

[7] Comments from Mr. Peter Romkey, Director of the Irving Botanical Center at Acadia University, January 2006.

[8] Peter Romkey, Director of The Irving Botanical Center at Acadia University and Dianne LaRue have agreed to help, if required, the proponent with the transplanting process.

installation of permanent vegetation on disturbed areas will be followed up with a thorough inspection of the site and any necessary maintenance. The appropriate mitigation and monitoring measures for the overall site and groundwater will remain in place until all activities associated with the proposed undertaking have ceased and the site has stabilized.

At the time of decommissioning, all temporary erosion control structures will be removed or upgraded (see Table 6). The portable concrete pad used for refuelling and minor equipment maintenance will be removed. A final walk-through will be completed at the end of construction or at site closeout to determine whether modifications to restoration design(s) are needed or additional trees necessary to replace trees which failed to survive.

Table 5: Reclamation Plans

Issue	*Objective*	*Action Plan Strategies*
(1) Destruction of nesting habitat (2) Destruction of rare plant and more common plant species (3) Introduction of alien species to the site (4) Impact on aesthetic quality of the site (5) Potential for soil erosion (6) Residual effects (7) Loss of an original sand barren / heathland	▪ To rehabilitate, reclaim, and restore excavated areas of the site ▪ To have excavated areas, over time, reflect current state of site ▪ To preserve and re-establish rare and common plant species ▪ To sustain the aesthetic quality of the site ▪ To create sightlines that screen project activities ▪ To restrict the introduction of alien species ▪ To establish erosion control ▪ To sustain and/or improve on the aesthetic quality of the site ▪ To minimize or eliminate	▪ Prepare excavated areas in the fall for spring transplanting. (5) When shaping land, long continuous slopes will be avoided; will be broken up with complex surface contours; the steepest above-water excavated slopes left after sand extraction will be 1V:2H or shallower; and the depth of the pit floor will be one metre above water table (recommended minimum for transplanting trees is 12 inches of soil above the water table)[9] (1), (2), (3), (4), (5), (6), (7) Create vegetative islands for transplantable trees and plant life to facilitate the capture of wind blown organic materials:[10] (3) When preparing site for proposed pit, remove and relocate / transplant trees and plant life in excavated areas; and use, as much as possible, all dead and living plant material in the reclamation process.

[9] In January 2006, talks with Mr. Peter Romkey, Director of The Irving Botanical Center at Acadia University, resulted in many of the strategies for preserving and transplanting tree and plant life in the study area. Mr. Romkey and The Irving Botanical Center have been very successful transplanting plant and tree species (both large and small), which were removed from various locales and then planted in the Botanical Center. The methodology described regarding plant/tree removal, transplanting, transportation, handling, soil depth, etc. follow from that discussion. The proponent also is familiar with the transplantation of native trees on soils typical of the study area. They have successfully carried out transplantation of native trees at sites within a five (5) kilometre radius of the Marshall Road property.

[10] K. Sharman and C. Smyth, The Progression of Native Species Island Establishment and Monitoring Practices on High-Elevation Waste Rock Dumps at Quintette Operating Corporation (George Dawson Inn, Dawson Creek BC: The British Columbia Technical and Research Committee on Reclamation and The Canadian Land Reclamation Association, 2002).

	any the residual effects of sand extraction on the site ▪ To create new habitats for plant and wildlife species ▪ To re-establish nesting habitat ▪ To preserve components of the original sand barren / heathland	(1), (2), (6), (7) Protect vegetative islands, by surrounding with available trees and brush; monitor progress of transplanted species over time; and based on outcomes, make the necessary adjustments to sustain plant life when transplanting in future. (3) Use trees and plant life and materials from or native to the site. (4), (5) Plant white and red pine in excavated areas (4), (6), (7) Ongoing site-specific evaluations will occur during construction and reclamation; for the most part, the relocation / transplantation and reclamation processes will need to proceed in concert.

Table 6: Development/Reclamation Plan & Timeline

Phase	Site Preparation	Active Pit Footprint	Site Reclamation	Total Area Reclaimed
Year 1	2 hectares	2 hectares	...	...
Year 2	1 hectares	3 hectares	...	...
Years 3 & 4	3 hectares	6 hectares	3 hectares	3 hectares
Years 5 - 9	12 hectares	18 hectares	6 hectares	9 hectares
Years 10 -15	12 hectares	30 hectares	12 hectares	21 hectares
Years 16 +	9 hectares	39 hectares	9 hectares	30 hectares
At Decommissioning			9 hectares	39 hectares

5.3 Summary

It is anticipated that soil erosion from wind and water will be minimal, and thus, the risk of sedimentation of local watercourses is considered to be negligible (see Appendix 3). SAL acknowledges that externalities, such as noise, smells, dust, and so forth can impair the reasonable enjoyment of life or property; hence, SAL will make every effort to eliminate or mitigate those externalities. SAL also understands the seriousness of any petroleum leak or spill; hence, SAL will make every effort to eliminate or mitigate the potential for such through proper equipment and vehicle maintenance and inspection (e.g., daily monitoring of hydraulic equipment). Equipment operators, truck drivers, and other relevant SAL staff will be made aware of the importance of proper equipment and truck maintenance and inspection, in addition to the proper storage, handling, and disposal of petroleum products and containers to prevent leaks or spills from entering the environment. All steps necessary will be taken: (1) to contain, handle, and dispose of wastes, effluents, and sediments, in a manner which prevents their entry into surface or groundwater; and (2) to end a petroleum leak or spill (no matter how small) and to clean the area affected and the environment according to the specifications of the Ministry of the Environment.

The proposed expansion will be consistent with currently held industrial approvals to construct and/or operate an aggregate or sand pit on the Marshall Road property (Approval No. 98-IAW-022; dated, 17th December 1998 and Approval No. 2002-031347; dated, 30th January 2003).

Provided that the measures outlined in this report are adhered to, we believe that the proposed project will result in a modest adverse affect on the enjoyment of life and property of residents of the Marshall Road area and a modest adverse residual effect on the overall environment. It is also believed that if the site development, restoration, and reclamation program outlined for the proposed undertaking is adhered to, the heathland with the plant life and wildlife that inhabit it will in time return to conditions that are reflective of its current state. We anticipate that extracting sand to within one (1) metre of the water table will increase the amount of available moisture in the soil, thereby promoting plant and tree growth.[11]

Once the undertaking has been approved by NSEL, SAL will have the appropriate survey maps (identifying location of proposed pit areas, overburden, stockpiles, etc.) and hydrology report (identifying location of monitoring wells, etc.) prepared and submitted to NSEL (i.e., Environmental Monitoring and Compliance Office, NSEL, Kentville, NS) with specific information detailing the overall site, the location of the planned area, location of the overburden and sand stockpiles, location of groundwater monitoring wells, and other details that may be required.

6.0 VALUED ENVIRONMENTAL COMPONENTS AND EFFECTS MANAGEMENT

6.1 Biophysical environment

6.1.1 Methodology

For the purposes of this environmental assessment registration, six (6) ecosystem components were investigated to identify and qualify possible project/environment interactions. Ruth Newell, B.Sc. (Hons.), M.Sc., Wolfville NS conducted a plant survey, specifically looking for rare and sensitive flora. George Allison, PhD, CWB, Wolfville, NS was asked to conduct a wildlife survey, specifically looking for evidence of rare or endangered wildlife species, and to identify potential impacts of the proposed operations on wildlife at

[11] Comments made by Mr. Peter Romkey, Director of The Irving Botanical Center at Acadia University.

the site. Derick Fritz, fish biologist, carried out a survey of the aquatic environment to identify potential impacts of site activities on fish and fish habitat. Ian Spooner, Ph.D., Wolfville, NS, was asked to conduct an assessment of the geology, geomorphology, and surface water of the site to identify potential impacts of the proposed project operations on surface water. William Shaw & Associates, Antigonish, NS conducted an assessment of the hydrogeology of the site to identify potential impacts of the proposed project operations on groundwater, and to determine an appropriate groundwater monitoring program.

6.2 Flora Species and Habitat

In the spring of 2005, Ms. Ruth E. Newell was retained on behalf of the proponent to carry out a vascular plant survey of the property of interest. Ms. Newell visited, at least once, all found habitats within the property boundaries and those having potential for rare plant species were surveyed at least two or more times. Rare plant species found in the study area were geo-referenced and photographed. Prior to fieldwork, Ms. Newell generated a short list of priority species from several information sources including herbarium records, Atlantic Canada Conservation Data Centre Element Occurrences, and the provincial SigHab database.

6.2.1 Description of Existing Environment

Ms. Newell found no evidence of plant species listed by COSEWIC under the Federal *Species-at-Risk Act* (SARA 2003) or under the *Nova Scotia Endangered Species Act* (NSESA 1999) in the study area. Ms. Newell did find three (3) plant species of conservation concern listed under the *Nova Scotia General Status of Wild Species* website in the study area: Rockrose (Canada Frostweed), Golden-heather Hudsonia, and Arrow-leaved Violet (See Appendix 5, for the complete report). Ms. Newell observed that the lands on which the proposed project is to be located is an “original sand barren (heathland).” She suggests that many of the common species occurring here (e.g., blackberries, cherries, Juneberries, etc.) may have distinctive genotypes, insomuch as this particular habitat has unique qualities (i.e., relative to plants species occurring elsewhere in Nova Scotia). While it has been suggested that less than 3% of this type of habitat remains in the Annapolis Valley, much of that loss can primarily be attributed to road construction and residential, commercial, and agricultural development (see also Appendix 8).

While the Golden-heather Hudsonia, and Arrow-leaved Violet plants are located throughout the property, the Rockrose plants on the Marshall Road property are contained within two

distinct locations: (1) the lower east side of the property approximately 4 m away from the base of a slope close to Hwy. 101, where approximately 130-140 stems in 5 groupings or clusters that parallel the highway for about 15 metres; and (2) in the middle of the property, near an intersection of three ATV trails roughly south of the Keddy pit, where the plants exist in four different groupings along a 40 metre stretch. Ms. Newell identified 40 stems growing either in bare sand along the edge of the ATV trail or up through a Broom Crowberry (*Corema conradii*) mat adjacent to the ATV trail.

6.2.2 Potential Effects, Proposed Mitigation, Follow-up Monitoring

Policy objective

While it might be suggested by others that the study area should not be excavated because the site is a unique sand barrens (heathland), we believe that sand extraction is a viable option, consistent with earlier site activity and disturbances. SAL shall mitigate the impacts of the proposed project on the plant life and study area by:

(1) Leaving behind a layer of the existing sand;
(2) Creating conservation areas with buffer zones for all Rockrose plants;
(3) Saving a portion of the more common plant species;
(4) Collecting the distinctive plant genotypes; and
(5) Initiating site regeneration by means of a concurrent site preparation and reclamation process.

Rationale

Without suitable mitigation measures, the proposed project can result in four interrelated effects / issues:

(1) The loss of a significant portion of the sand characteristic to the heathland;
(2) The loss of the three plant species of conservation concern, especially the Rockrose;
(3) The loss of distinctive genotypes in the study area; and
(4) The loss of the more common plant species.

Preserving some portion of the existing sand is considered essential, if the existing conditions at the site are to be restored. We believe that there are five potentially viable options for mitigating the impacts of any project activities on the variety of plant species (see Table 8). They are the following:

(1) Extract sand around the species of conservation concern;
(2) Dig and relocate all plant species manually;
(3) Dig and relocate all plant species with large earth-moving equipment; and
(4) Relocate only the common plant species using large earth-moving equipment to areas being reclaimed, and establish conservation areas with buffer zones for Rockrose plants and associated species.

We believe that Option (1) is not viable option because large buffer zones would be required to ensure that the plants of conservation concern have adequate protection from project activities and sufficient soil around them to support their moisture and nutrient requirements. As a result, the pits would be small and variously located throughout the property project. From a reclamation perspective, this option is not viable. Attempts to shape excavated areas properly would be unworkable and costly in terms of time and money because the pit sites would be relevantly small. The variously located small pits would undercut the integrated site development and reclamation process (which seeks to preserve a large portion of the plant life) that we propose.

As for Option (2), we have been advised that digging plant species manually is possible, but using large earth-moving equipment is the better option. Large earth-moving equipment is capable of scooping entire root-systems and the associated soils and seeds. However, transplanting the Rockrose, Hudsonia, and Arrow-leaved Violet plants either manually or with large earth-moving equipment are not considered to be a viable options because their root systems are easily compromised, hence undermining both Options (2) and (3). Moreover, Options (1), (2) and (3) do not provide or adequately address acceptable conservation measures for the plant species of conservation concern, in particular the Rockrose plants.

We believe Option (4) is best strategy. Option (4) makes site development and reclamation more efficient. Using large earth-moving equipment would help promote the survival of the more common plant species in the nested islands and the eventual restoration of the terrestrial habitat and the variety of species that would inhabit it. Further, relocating the

common plant species with the associated soils would promote the germination of viable, native seeds captured in the soils (i.e., the plant species of conservation concern and the more common plants). Lastly, the conservation areas with buffer zones would help to ensure the long-term survival of the Rockrose plants and other species such as the Hudsonia and Arrow-leaved Violet plants contained within the conservation zone.

Current situation

The Rockrose, Hudsonia, and Arrow-leaved Violet plants found in the study area are threatened by the proposed project and the current and future activities of the OHV users. While the more common plant species also are subject to the impacts from those activities, the concern is not as significant because they are not endangered or rare species.

Action Plan

The proposed strategy to achieve the policy objectives is to retain one (1) metre of the sand in the excavated areas to facilitate the regeneration of the heathland.[12] Any available topsoil and overburden from the site will be distributed over the excavated areas in the fall. A large portion of the more common plants will be placed in the nested islands. The benefit of this strategy is to create small microsystems conducive to the germination all native plant species and the survival of some of the more common plant species. It is considered that these microsystems will shelter the species therein from competing tree growth. Further, it is understood that the removal and transplantation of plant species in the spring, when soil conditions are moist, will enhance the survival of the plant species.

Moving the common plant species with the associated soil directly from a new sand extraction area to a reclamation area has an added benefit in that it carries with it viable seeds of native vegetation that can rapidly establish on the re-claimed area.[13] Nonetheless, the Irving Botanical Center at Acadia University will be permitted to harvest seed from the study area. The benefit of this strategy is to preserve the distinctive genotypes of the study area in Center's herbarium for possible later seeding. Table 8 provides a summary of the strategies for relocating and protecting plant species at the proposed project site.

[12] Comments from Mr. Peter Romkey, Director of the Irving Botanical Center at Acadia University, January 2006.
[13] Ibid.

We propose to set aside two plots of land on the property as conservation areas with adequate buffer zones to protect the Rockrose plants which are contained within those areas. Those locations also contain Hudsonia, and Arrow-leaved Violet plants. Establishing a buffer zone around a rare plant population is species and ecosystem dependent. However, there is limited available information on the life history of the Rockrose, Hudsonia, and Arrow-leaved Violet plants and established guidelines for the selection of suitably sized conservation areas with adequate buffer zones for those plants. While the establishment of conservation and buffer zones is necessary, monitoring and documenting the health and survival of the plant populations within those zones makes this component of the proposed project a valuable research trial.

One conservation area (entitled area "*b*") and buffer zone will be established next to Highway 101 and the other in the central portion of the property and the second conservation area roughly in the middle of the property (entitled area "*a*") (see Figures 4 & 5). The specific conservation zones will be marked off and will not be subject to any pit activities. The banks bordering the buffer zones will be sloped at incline no greater than 40° to safeguard the integrity of the conservation areas and buffer zones. The rationale for conservation areas with buffer zones is based on an extensive literature review and discussions with biologists concerning the preservation of the Rockrose, Hudsonia, and Arrow-leaved Violet plants —especially the existing Rockrose plants—from the impacts of activities associated with the proposed project (e.g., Debinski and Holt 2000).[14]

Conservation area "b", next to Highway 101, will be protected by 50 metre buffer, that is, between the outer border of the conservation area and any project activities. All existing Rockrose plants will be contained with conservation area "b". In the central portion of the property, conservation area "a" will be 1 ½ hectares in size. The 1 ½ hectare conservation area will provide no less than a 50 metre buffer on all sides of any existing Rockrose plants within the conservation area and any project activities. Conservation area "a" is both a conservation and buffer zone.

Once the conservation and buffer zones are established, the Rockrose, Hudsonia, and Arrow-leaved Violet populations will be monitored and documented on an annual basis to track changes in population size and vigour as well as changes in the health of the

[14] A review of the academic literature such as in *Conservation Biology* reveals little agreement on the appropriate size of conservation and buffer zones for rare and threatened plant species. Guidelines for the conservation of sensitive plant resources may be found on the following website: http://cnps.org/resources.htm.

ecosystem in which the species exist.[15] Surveys will also be conducted on an annual basis to document any new populations of Rockrose that may establish in this particular area and which can then be protected.

The entire sand barren habitat on the property will be monitored for opportunistic alien species, which have the capacity to invade and displace native species and thereby lead to the deterioration in the health of the natural sand barren ecosystem, because landscape/habitat disturbances often provide an opportunity for the establishment of invasive species (aggressive non-native species). One species of current concern in the Annapolis Valley sand barren habitat (also known as the Annapolis heathlands) is Scots Pine (*Pinus sylvestris*).[16]

ATV activity is having both a positive and negative impact on the Rockrose population of concern at the proposed development site. Although creating disturbed open habitat allows for the establishment of the Rockrose at this particular location, every time an ATV runs over a plant of Rockrose, it likely to be destroyed (personal observation by G. Alliston). The conservation areas will be marked off and the appropriate signage installed to discourage OHV usage.

The proponent will not use herbicides and pesticides on the Marshall Road property because they have the potential to harm both rare plants and pollinators of the rare plants.

Criteria for Monitoring Success

The success of the proposed project depends, in part, on the proposed strategy to ensure that all existing Rockrose populations survive and some of the Hudsonia and Arrow-leaved populations. The criteria used to determine success of the proposed relocation strategy will be plant survival rates of two-thirds or higher of relocated plant species. It has been suggested that this survival rate is achievable.[17] If the plant species in the nested islands fail to survive, experts from NSEL, NSDNR, and the Irving Botanical Center at Acadia University will be invited to assist in revising the transplantation strategy. The success of

[15] Suggestions made by Ruth Newell and others regarding the conservation of Rockrose plants and their protection. April 06.

[16] Ibid.

[17] Ibid.

the proposed strategies will require timely monitoring not only to identify unanticipated, undesirable outcomes of project activities, but also to determine whether expanded conservation zones are required for the protection and preservation of Rockrose plants, and alternative measures for transplanting to promote the restoration of the excavated areas. If the integrity of the conservation and buffer zones deteriorate because the embankments are too steep, the incline of pit embankments will be reduced.

6.2.3 Summary

It is anticipated that with the measures previously outlined, the three plant species of conservation concern will not be adversely affected in the long-term by activities associated with the proposed project. Furthermore, it is anticipated that Rockrose and Arrow-leaved Violet will actually benefit in the long-term from the disturbances associated with the proposed development on the property. That belief is supported by the re-establishment of Rockrose and Arrow-leaved Violet plants in previously disturbed / excavated areas of the site such as along Highway 101. Based on advice we have received and site observations, we anticipate that a large portion of the relocated plants and trees will survive. Moreover, it is anticipated that plant growth in the excavated areas will have been largely restored within 10 years of excavation.

Table 8: Preservation & Protection Strategies for Plant species

Concerns	*Issue*	*Objective*	*Strategy*
(1) Rare plant species: Rockrose, Hudsonia, and Arrow-leaved Violet (2) More common plant species – e.g., Broom Crowberry & Lowbush Blueberry (3) Distinctive genotypes (4) Heathland	▪ Destruction of rare plant species ▪ Destruction of more common plant species ▪ Disruption of plant habitat ▪ Loss of distinctive genotypes	▪ To preserve three rare plant species, especially existing Rockrose plants ▪ To preserve a portion of and re-establish the more common plants ▪ To create new habitats for plant and wildlife species ▪ To preserve distinctive genotypes ▪ To promote germination of existing seeds (i.e., distinctive genotypes) ▪ To monitor for opportunistic alien species	(1) Establish conservation and buffer zones for existing Rockrose plants (1) Monitoring, annual surveys, and documentation of Rockrose plants (1) Monitoring, annual surveys, and documentation of Hudsonia, and Arrow-leaved Violet plants in the conservation zones (2) Carryout transplanting activities in early spring (i.e., April & May) (2), (4) Create nested sites to protect transplants trees and plant species (1), (2), (3) Carefully remove plants, with associated soils and seeds, below root depth, using equipment capable of reaching below root depth (e.g., payloader) (4) Create vegetative islands (roughly 6 x 6 metres in size) to facilitate the capture of wind blown organic materials (2), (4) Transplant plant species in vegetative islands promptly, taking care not to dislodge soils attached to the root system (4) Protect vegetative islands, by surrounding with available trees and brush (3) Permit the Irving Botanical Center to harvest seed from the project area, which will be stored in the Botanical Center's herbarium[18]

[18] Mr. Romkey has expressed an interest in harvesting seed from the study area. This seed would be stored in The Irving Botanical Center's herbarium.

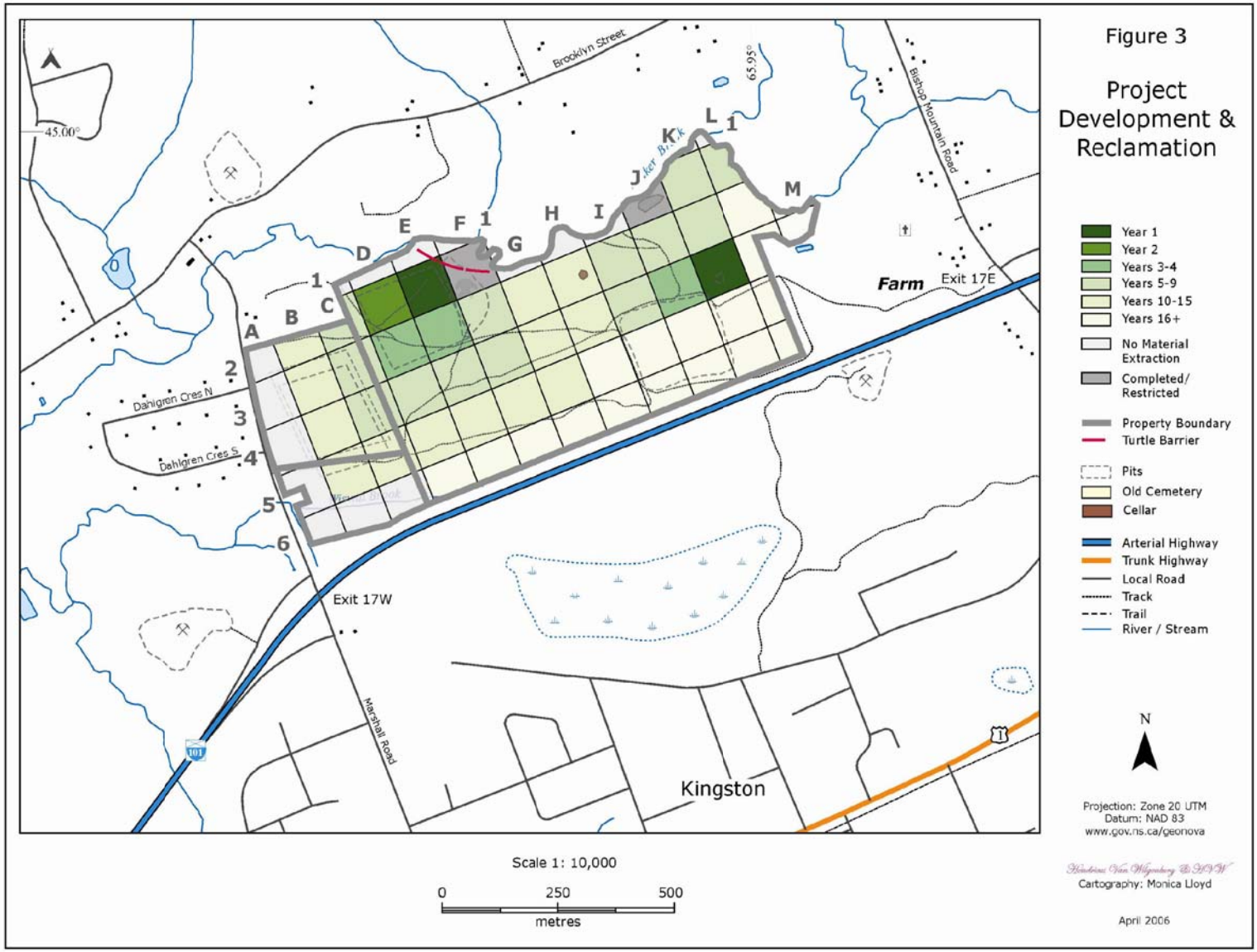
Figure 3
Project Development & Reclamation
Brooklyn Street
Bishop Mountain Road
45.00°
65.95°
Farm
Exit 17E
Exit 17W
Dahlgren Cres N
Dahlgren Cres S
Marshall Road
Kingston
A
B
C
D
E
F
G
H
I
J
K
L
M
1
2
3
4
5
6
Year 1
Year 2
Years 3-4
Years 5-9
Years 10-15
Years 16+
No Material Extraction
Completed/ Restricted
Property Boundary
Turtle Barrier
Pits
Old Cemetery
Cellar
Arterial Highway
Trunk Highway
Local Road
Track
Trail
River / Stream
N
Projection: Zone 20 UTM
Datum: NAD 83
www.gov.ns.ca/geonova
Cartography: Monica Lloyd
April 2006
Scale 1: 10,000
0
250
500
metres

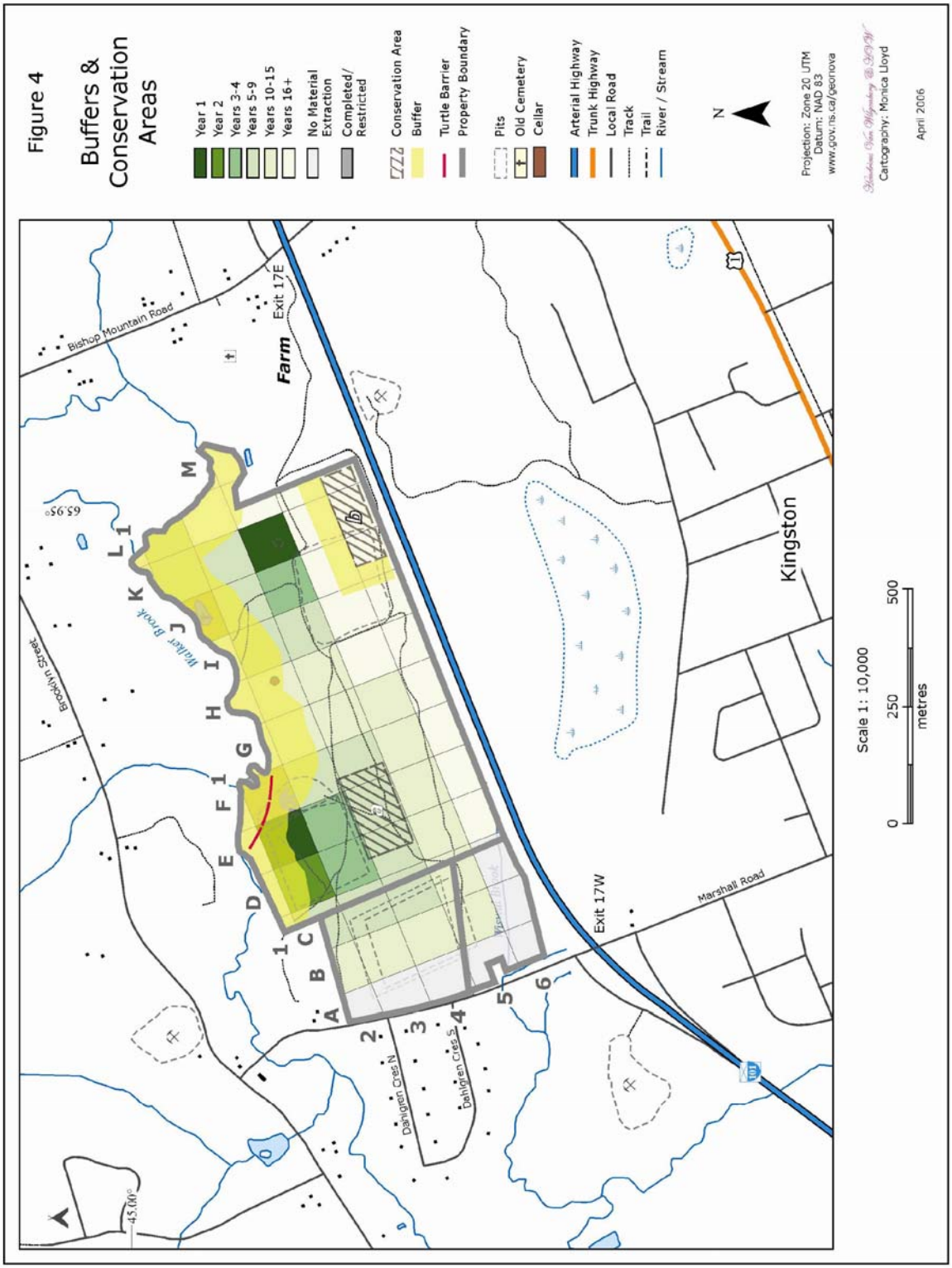
Figure 4
Buffers & Conservation Areas
Year 1
Year 2
Years 3-4
Years 5-9
Years 10-15
Years 16+
No Material Extraction
Completed/ Restricted
Conservation Area
Buffer
Turtle Barrier
Property Boundary
Pits
Old Cemetery
Cellar
Arterial Highway
Trunk Highway
Local Road
Track
Trail
River / Stream
N
Projection: Zone 20 UTM
Datum: NAD 83
www.gov.ns.ca/geonova
Cartography: Monica Lloyd
April 2006
Bishop Mountain Road
Exit 17E
Farm
Walker Brook
Brooklyn Street
Kingston
Exit 17W
Marshall Road
Dahlgren Cres N
Dahlgren Cres S
65.95°
45.00°
Scale 1: 10,000
0
250
500
metres

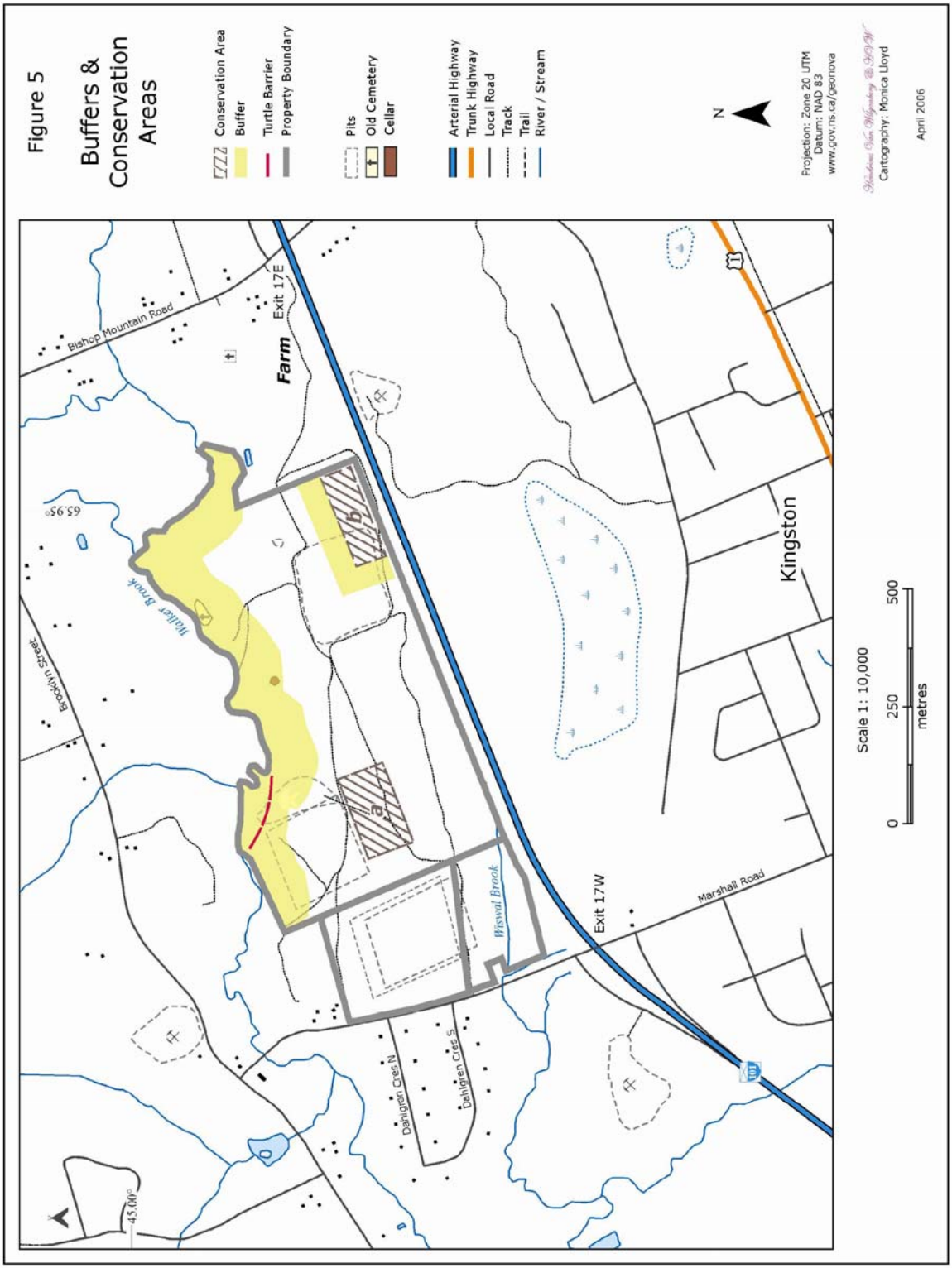
Figure 5
Buffers & Conservation Areas
Conservation Area
Buffer
Turtle Barrier
Property Boundary
Pits
Old Cemetery
Cellar
Arterial Highway
Trunk Highway
Local Road
Track
Trail
River / Stream
N
Projection: Zone 20 UTM
Datum: NAD 83
www.gov.ns.ca/geonova
Cartography: Monica Lloyd
April 2006
Bishop Mountain Road
Exit 17E
Farm
Hutter Brook
Brooklyn Street
65.95°
45.00°
a
b
Kingston
Exit 17W
Marshall Road
Wäswal Brook
Dahlgren Cres N
Dahlgren Cres S
Scale 1: 10,000
0
250
500
metres

6.3 Fauna / Wildlife Species and Habitat

In spring of 2005, George Alliston PhD was retained on behalf of the proponent to carry out a wildlife survey, which included field studies, of the proposed sand pit expansion area. Between April and July of 2005, Dr. Alliston carried out an assessment of the property for use by species of amphibians, reptiles, breeding birds, and mammals, especially those which are considered at risk in Nova Scotia. Dr. Alliston was also asked to make recommendations for potential impact mitigation based on his findings.

6.3.1 Description of Existing Environment

Dr. Alliston concluded that among the species commonly found in the region, there are two wildlife species using the Marshall Road property which are considered at risk: the Wood Turtle and the Vesper Sparrow (see Appendix 6, for complete report). The Wood Turtle is listed as a species of special concern by the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC) and as vulnerable under the *Nova Scotia Endangered Species Act*. Although the Vesper Sparrow is not listed by either COSEWIC or under the *Nova Scotia Endangered Species Act*, they have been assigned a *Yellow* (Sensitive) status under the *General Status Ranks of Wild Species* in Nova Scotia.

Dr. Alliston tells us that Wood Turtles have taken advantage of the excellent nesting habitat in the Keddy pit, created by sand extraction adjacent to the Walker Brook floodplain. However, the Wood Turtle nests are subjected to the destructive activities of OHV users. Dr. Alliston suggests that it is unlikely that this small Wood Turtle population can be sustained under the current level of OHV activity in their nesting area.

With respect to the Vesper Sparrows, Dr. Alliston believes that this local population has adapted to the noise and disturbances generated by air traffic from CFB Greenwood, local vehicle traffic (e.g., Highway 101), and OHVs. Furthermore, he found that the Vesper Sparrow populations were possibly higher in the western end of the property where past sand extraction and farming has altered the vegetation of the sand barrens, excepting the Keddy pit area. Dr. Alliston tells us that the Vesper Sparrows are quite capable of adapting to and surviving changes in their environment, provided that project activities do not disturb nesting Sparrows and that some vegetation is maintained to support the Vesper Sparrow population.

6.3.2 Potential Effects, Proposed Mitigation, Follow-up Monitoring

Policy objective

SAL shall mitigate any effect that the proposed project may have on the Vesper Sparrow and Wood Turtle populations and the activities of OHV users at the site (see Table 9).

Rationale

There are legislative requirements in place that calls for the protection of the Wood Turtle and the Vesper Sparrow, the former which are considered endangered and the later at risk. The primary issue for those species is that activities connected to the proposed project and those not connected to the proposed project, particularly the *unauthorized* and *unwelcome* activities of OHV users can adversely impact Wood Turtle and Vesper Sparrow nests, nesting habitat, and nesting activities and/or result in the death of Wood Turtles. To eliminate threats to Wood Turtle and Vesper Sparrow populations, measures are needed to curb access to the areas in which Wood Turtles and Vesper Sparrows nest, restrict Wood Turtle travel, and to provide nesting site alternatives. Further, if the local Wood Turtle population is to be sustained, curbing OHV activity in areas in which Wood Turtles nest is also an important project consideration.

We have considered three viable options for protecting the Vesper Sparrows nests and nesting habitat:

(1) Carry out site preparation / clearing irrespective of the nest sites and the nesting period, forcing Vesper Sparrows to nest elsewhere;
(2) Confine sand extraction to areas not used by Vesper Sparrows; and
(3) Restrict site preparation / clearing during the nesting period.

Given that the impact of the project on the Vesper Sparrow population will be largely a function of the extent vegetation cleared from the open barrens at any given time to accommodate pit operations, we believe that Option (1) is the least viable. While Vesper Sparrow are quite adept at finding alternative habitats to utilize, carrying out site preparation / clearing irrespective of the nest sites or nesting period would result in the destruction of viable eggs and hatchlings. While it is anticipated that the Vesper Sparrows will continue to use the western portion of the property, it is difficult to predict where on the property they will nest, thus making Option (2) impractical. We believe that Option (3) is

the most viable in that the Vesper Sparrows will be protected during nested period from any project activities. This strategy gives Vesper Sparrow eggs time to hatch and hatchlings time to disperse.

We have considered four viable options for protecting the Wood Turtles and their nesting habitat:

(1) Establish and maintain a favourable nesting habitat on the floodplain of Walker Brook;
(2) Establish and maintain a favourable nesting habitat on the embankment between the Keddy pit and Walker Brook to “short stop” nesting females;
(3) Place a barrier / fence on top of the embankment, north of the Keddy pit, running parallel to the Brook, thereby stopping the nesting females from accessing the pit area; and
(4) Establish and maintain a favourable nesting habitat on the embankment between the Keddy pit and Walker Brook, place a fence barrier on the top of the floodplain embankment north of the Keddy pit and running parallel to the Walker Brook, and maintain a 100 metre buffer zone between any project activities and the Walker Brook (see Figures 4 & 5).

We believe that Option (1) is not viable because it would involve cutting trees along the floodplain embankment. Such would promote the deterioration of the Walker Brook embankment, and subsequently, the sedimentation of the Walker Brook. Removing the trees might also encourage OHV users to use the area. Option (2) is not viable because it would stop the nesting females from travelling to their traditional nesting area and would not protect the nests and nesting females from the activities of OHV users. Option (3) is not viable because nesting females are quite adept at finding ways around barriers / fences, especially when viable nest sites are not readily available.

We believe that Option (4) is the most viable in that it captures the best features of Options (2) and (3). Establishing and maintaining a favourable nesting habitat on the embankment between the Keddy pit and Walker Brook and placing a fence barrier on the top of the floodplain embankment will provide a readily available nest site for nesting females and discourage their travel to other areas of the Keddy pit. Moreover, the fence barrier will confine unwelcome OHV activity away from the nest site.

Current situation

In 2005, 19 nesting pairs of Vesper Sparrows were identified on the Marshall Road property. While Vesper Sparrows have been identified both within and outside the study area, it is unclear at this point whether the study area is their primary nesting site. The local Vesper Sparrow population, which is more densely populated in the western portion of the property close to Marshall Road, has adapted to the noise and disturbances generated by local vehicle traffic and OHVs. It is possible that this population is just a portion of a much larger local population; however, this is not known and cannot be assumed when judging the potential impacts of the project on the population.

A biologist at the *Canadian Wildlife Service*, Sackville, NB tells us that Vesper Sparrow populations are on the decline in Nova Scotia, but that decline can not be merely attributed to activities such as sand extraction.[19] He suggested that the Vesper Sparrows are quite capable of adapting to activities around them, provided that nesting activity is not disrupted or the nesting habitat removed in its entirety.

In contrast, the local Wood Turtle population has suffered from local OHV activity and will continue to do so, if measures are not provided to impede their entrance to nest site. The local Wood Turtle population has taken advantage of the developed sand pit (i.e., the Keddy pit), which they currently use for nesting. The embankment south of Walker Brook (north of the Keddy pit) has been chosen by the Wood Turtles for nesting, hence it would be prudent to protect this area and make further use of it as a turtle nesting habitat.

Action Plan

The proposed strategy to achieve the policy objectives for the Vesper Sparrows is: first, to restrict site preparation / clearing during the nesting period (i.e., from late May to early July); second, to minimize the area being prepared for sand extraction to an area which will satisfy production requirements for the following year; third, to restore the terrestrial habitat lost within the excavated areas through a concurrent site preparation and reclamation process; and fourth, to start site preparation and sand extraction in the central and eastern portions of the site.

[19] In January 2005, the *Canadian Wildlife Service* Sackville NB was contacted regarding the impact of the proposed project on Vesper Sparrows.

The benefits of the proposed strategy are the following:

(1) The Vesper Sparrows can nest in traditional / favoured nesting sites without excessive interruption;
(2) The Vesper Sparrows can utilize alternative nest sites, while their traditional / favoured nesting sites are disrupted by site preparation and sand extraction; and
(3) The concurrent reclamation process will restore, in time, the terrestrial habitat to smooth the transition for nesting Vesper Sparrows (see Reclamation section).

We base these suppositions on the relatively high Vesper Sparrow population in the western portion of the property where sand extraction and farming have been extensive in the past. We believe that the slow progress of sand extraction at the site will give the Vesper Sparrows ample time to adapt to the noise generated by proposed project and to find suitable nesting alternatives. Moreover, the local Vesper Sparrow population seems to favour those areas that have been disturbed by sand extraction and farming.

The proposed strategy to achieve the policy objectives for the Wood Turtles includes the following:

(1) To maintain the south floodplain embankment along the Walker Brook, including existing plants and trees;
(2) To maintain adequate setback distances from the watercourse not less than 100 metres from any active pit operations;
(3) To maintain all vegetation (i.e., trees, shrubs, and so forth) within the 100 metre buffer;
(4) To create a nesting habitat for Wood Turtles either by leaving existing sand or spreading sand along the top of the floodplain embankment, which borders the Keddy pit (see Figure 3 & 4);
(5) To install a barrier fence with mesh small enough not to permit access by wood turtle adults will be installed on the top edge of the Keddy pit, which is oriented toward the watercourse for purposes of reducing use by nesting wood turtles;
(6) To install the barrier fence to the satisfaction of the NSDNR Regional Biologist for the area;
(7) To restrict road access to the pit so that roadways will not run parallel to any watercourse, but rather, oriented as far back from the watercourse and to the inland side of the pit as is possible;

(8) To make all reasonable effort to keep off-highway vehicles from using the pits through the installation of appropriate signage and fencing where required;
(9) To maintain a slope of greater than 40° on all pit faces; and
(10) To maintain 200 metre buffer from May 1st to August 1st in the first year of operation (in the Keddy pit), between the established nesting site and any site preparation and sand extraction (see Figure 4).

The 200 metre buffer will be maintained until the Wood Turtle nesting season ends (i.e., in the *first year* of the project). At the end of nesting season, the barrier fence will be constructed and maintained throughout the life of the proposed project. Once the barrier fence is in place, a 100 metre buffer will be maintained between any project activities and any watercourse throughout the life of the proposed project. Moreover, all vegetation within the 100 metre buffer will be maintained.

The benefit of this strategy is that it will create a relatively safe environment for the Wood Turtles to travel and nest throughout the life of the proposed project. The benefit of the extensive 200 metre buffer from May 1st to August 1st in the *first year* of the project will lessen the impact of noise and vibration on and potential physical threats to the local Wood Turtle population from operating equipment. The 100 metre buffer will provide an extended area of protection for any Wood Turtles that circumvent the barrier fence. The 100 metre buffer will reduce the footprint of the proposed project and provide a nesting habitat for Vesper Sparrow population. The 100 metre buffer zone will also create a conservation area not only for any tree and plant life therein but also for the existing Hudsonia, and Arrow-leaved Violet plants occurring throughout the buffer.

On the advice of NSDNR biologists, we propose installing a barrier fence with narrow mesh small enough not to permit access by wood turtle adults must be installed on the top edge of the pit, which is oriented toward the watercourse for purposes of reducing use by nesting wood turtles. It is anticipated that the barrier fence will “short stop” Wood Turtle travel to areas beyond the north embankment of the Keddy pit where they may be killed by pit operations or OHV activity. The barrier fence may also impede OHVs travel to the Wood Turtle nesting site, thereby protecting the proposed nesting site (see Figures 3 & 4).

It is expected that the Wood Turtles will take advantage of the area north of the barrier fence as a nesting site, if the existing sand is left undisturbed and additional sand provided where absent. That assumption is based on two factors: first, the Wood Turtles habitually favour this area for nesting and second the proposed nesting area faces south, which is

consistent with the location of their nests in the past. However, the barrier fence will likely require ongoing monitoring and maintenance throughout the life of the project. Any strategy that lessens or curtails OHV activity and their impacts on the Wood Turtle population is significantly better than what currently occurs at the site.

It is understood that maintaining a slope of greater than 40° on any working face will discourage Wood Turtles from nesting in areas other than what has been provided. This belief is supported by research on the habits of nesting Wood Turtles, which suggests that they prefer slopes between 40° and 20° (see Wildlife study in Appendix 6). We believe that the action plan outlined above captures all of the suggested experimental methods suggested in the Wildlife Study prepared by Dr. Alliston, and thus, promote the growth of the local Wood Turtle population.

SAL employees will be made aware of the significance of this habitat and its protection. In addition, signage will be installed identifying the area as a habitat for endangered Wood Turtles.

Criteria for Measuring Success

The performance indicators used to gauge achievement of policy objectives will be evidence of Wood Turtle nesting north of the WT barrier fence and destruction of the nesting site. Evidence of Wood Turtle activity in the Keddy pit (south of the barrier fence) will suggest that the fence barrier may need to be repositioned and/or lengthened. Evidence of OHV activity in the proposed Wood Turtle nesting area will signify that additional measures other than signage and fencing may be required such as the reporting of activities by OHV users to the appropriate agencies and authorities (e.g., police and NSDNR).

We understand that the local Wood Turtle population is being monitored by specialists at NSDNR and Acadia University. While the success of the local Wood Turtle population is dependent on a variety of factors, the information generated by the specialists will help to determine the effectiveness of the proposed measures to be put in place by the proponent. In that regard, SAL will work with specialists studying the local Wood Turtle population to protect and promote the growth of the population.

6.3.3 Summary

Given the existing situation, it is anticipated that effective mitigation measures taken by the project will result in a positive impact on this population of Wood Turtles. It is also anticipated that with the mitigation and follow-up monitoring measures previously outlined, it is anticipated that there is little potential that the Wood Turtles or their nesting habitat will be adversely affected by activities associated with the proposed project.

Although the Vesper Sparrow nesting habitat will be disturbed after the nesting period, it is anticipated that nesting Vesper Sparrows are unlikely to be significantly disturbed by project activities because of project development time constraints. Furthermore, the Vesper Sparrows nest in an area that is part of a proposed buffer, which lies between the active area of the proposed project and the Marshall Road, but also in other areas of the Marshall Road property and beyond.

Table 9: Preservation & Protection Strategies for Wildlife species

Species of concern	***Issue***	***Objective***	***Action Plan Strategies***
Vesper Sparrows	▪ Destruction of habitat ▪ Destruction of Vesper Sparrow nests ▪ Disruption of nesting activities	▪ To preserve nesting habitat during nesting periods ▪ To protect nest sites during nesting periods ▪ To restore terrestrial habitat	▪ No site clearing from May through to July (nesting period) ▪ Minimize active pit footprint by maintaining a 100 metre buffer area between any watercourse and any project activities; ▪ Limit preparation of proposed pit area to one year of operation ▪ Transplant plant species from area being prepared to area being reclaimed on an ongoing basis
Wood Turtles	▪ Destruction of Wood Turtles ▪ Destruction of Wood Turtle nests ▪ Destruction of Wood Turtle nesting habitat ▪ Disruption of Wood Turtle nesting activities	▪ To protect turtles from project activities ▪ To protect turtles nests from project activities ▪ To preserve and protect turtle nesting habitat from project activities ▪ To protect turtle nesting activities from project activities ▪ To protect turtles, nests, habitat from OHVs	▪ Install a barrier fence along the northern embankment of the Keddy pit (pit #2) to the satisfaction of NSDNR; ▪ Maintain a 100 metre buffer area between any watercourse and any project activities; ▪ To prevent Wood Turtles from entering the pit area; ▪ To prevent OHVs from entering the Wood Turtle nesting area; and ▪ To protect nesting Wood Turtles and Wood Turtle nests from project activities

6.4 Fish and Fish Habitat

In spring of 2005, Ocean Valley Aquatics was retained on behalf of the proponent to carry an assessment of water quality, fish habitat, and the presence of fish in the Walker Brook, and Wiswal Brook, which flow in close proximity to the Marshall Road property (see Appendix 7, for complete report). Ocean Valley Aquatics was also asked to make recommendations for potential impact mitigation based on their findings. According to Ocean Valley Aquatics, the Annapolis watershed tributaries, to which the Walker Brook and Wiswal Brook belong, have supported healthy, self-sustaining populations of native brook trout (*Salvelinus fontinalis*) and to some measure Atlantic salmon (*Salmo salar*) populations. However, Atlantic salmon are in decline because of environmental and economical stresses in both the fresh water and marine environments in all Maritime rivers.

6.4.1 Description of Existing Environment

Of the two potential water bodies identified in Ocean Valley Aquatics report, only the Walker Brook presently sustains a healthy population of a coldwater fish species. By contrast, the Wiswal Brook collects water from Highway 101 and the adjacent subdivision. Ocean Valley Aquatics found that the water in the Wiswal Brook headwaters appears to be significantly degraded to the extent that it does not contain a quality fish habitat. These factors limit cold water fish species from entering and surviving these waters.

6.4.2 Effects, Proposed Mitigation, Follow-up Monitoring

Policy objective

SAL shall eliminate or mitigate any effect that the proposed project activities may have on the fish and fish habitat from erosion and sedimentation and chemical contamination of adjacent waterways.

Rationale

The potential effects of the proposed project include trapping, blocking migration, and distribution of the local fish population due to excessive erosion and in-stream sedimentation, as well as contamination of fish habitat from accidental fuel spills. The activities connected to the proposed project can increase the potential for sediment erosion and sedimentation of adjacent waterways from prolonged and sustained periods of rainfall, if erosion control measures are not in place. There is potential for sedimentation of

waterways from wind erosion of stockpiles and overburden piles, and also from transportation activities. Chemical contamination of the ground water and adjacent waterways could occur, if petroleum products spilled, because of the high porosity of the sand at the site.

Current situation

The proposed site is composed primarily of well sorted sand, thus the surface water is absorbed quickly and transferred to the watertable as through-flow rather than overland flow (see Section 6.5, Groundwater Resources and Hydrogeology).

Action plan

The proposed strategy to achieve the policy objectives includes the following:

(1) To construct suitable sediment control structures before site preparation commences to mitigate potential erosion and in-stream sedimentation;
(2) Place sediment control structures along all open stockpiles, at least thirty (30) metres from the outer edge of all established riparian zones, namely the Walker Brook floodplain and the Wiswal recharge area (see Section 2.6.1, site design, management, and maintenance principles); and
(3) Once the sand extraction is well underway, product stockpiles will be contained within the pit.

It is highly unlikely that secondary drainage ditches will be required to divert water runoff because of the high porosity of the sand at the site. But if required, secondary drainage ditches will not run directly into Walker Brook. Further, sediment control structures (i.e., crushed stone, lined with a fabric barrier) will be installed before the drainage outfall.

This strategy has a threefold benefit: first, the stockpiles will be barely visible from a distance because the top of the stockpiles will be either level with or below the pit embankment (approximately 15 metres); second, erosion and sedimentation of waterways from stockpile runoff will be eliminated because runoff will be contained within the pit; and third, potential wind erosion will be reduced because stockpiles will be concentrated within the pit and hence open exposure kept to a bare minimum.

All trucks hauling sand will be equipped with the appropriate tarps, which will reduce the potential for nuisance dust and sedimentation of waterways. Roadways will be properly maintained to reduce the potential for nuisance dust and sedimentation of waterways from transportation activities, although this is likely to be insignificant in light of the characteristics of the sand at the site.

While no chemicals or petroleum products will be stored on the proposed site, a minimum 160 metre set-back will be maintained from the Walker Brook floodplain and the Wiswal Brook recharge area when refilling equipment with oils or when maintenance is being conducted. The benefit of this strategy is to reduce the potential chemical contamination of any waterway. Given that the spilled oils will have a greater distance to travel before entering any waterway, the successful outcome of the cleanup measures are enhanced. Further, all refilling of equipment with oils will be carried out on a portable concrete containment area (to be placed on site), which provides an added benefit of containing the oils on an impenetrable surface in the event that a spill does occur.

There will not be any work conducted in the watercourses or within suggested buffer zones on the property; nor will any water be removed from or travel across the watercourses.

Criteria for Measuring Success

Although it is not possible to control all the variables that influence the condition of the groundwater and the fish and fish habitat, the success of policy objectives will be determined and documented by sampling and analyzing three (3) groundwater wells to track quality groundwater changes over time. Further, vigilant monitoring of the site, by means of visual observations, will carried out by project managers to identify occurrences of excessive nuisance dust, erosion from runoff, and failing sediment control structures, particularly during heavy and prolonged rainfall. The success of the policy objectives for protecting the fish and fish habitat require that the people working at the site (e.g., equipment operators) are aware of the setbacks, the importance of refuelling in the containment area, and the importance of the sediment control structures.

6.4.3 Summary

It is anticipated that with the mitigation and follow-up monitoring measures previously outlined, there is little potential for the fish and fish habitat to be adversely impacted by activities connected to the proposed project.

6.5 Groundwater Resources and Hydrogeology

In winter of 2005, Dr. Ian Spooner and William Shaw & Associates (WSA) were retained on behalf of the proponent to carry out a study of the Marshall Road property to determine and provide the following: (1) the amount and a description of the sand resource available for extraction; (2) a description of the surface water resources; and (3) a description of the groundwater resources. Dr. Spooner and WSA carried out this study between January and June of 2005 (see Groundwater Resources and Hydrogeology Report, Appendix 8).

6.5.1 Description of Existing Environment

Dr. Spooner and WSA found that the project area is located in the north-central part of a large deposit of sand and gravel that is in the order of 8 kilometres long (E-W) by about 1.5 kilometres wide (N-S) and underlies most of the Kingston–Greenwood area. They estimate the project area to be approximately 48 hectares in size, excluding the required setbacks, and to contain roughly 3 million tonnes of sand resource available for extraction. The sand resource is relatively silt and clay free and is highly conductive.

Dr. Spooner and WSA describe the project area as relatively flat with a gently sloping topography and elevations from 28 to 36 metres above sea level. They found that stream incision and micro-relief is present along the northern boundary of the project area where land disturbance is minimal, while south of the Walker Brook the property is more subdued because of sand extraction and highway construction. Dr. Spooner and WSA found little evidence of erosion or siltation, other than that from the roads and trails.

At the time of the surface water survey, Dr. Spooner and WSA describe the surface water quality as variable, which, in all probability, reflects regional land use practices. They found that the project area is mantled by a thin soil, which exhibits excessive surface drainage because of the high permeability of the sediments. This soil is called the Cornwallis soil, which in the project area, is characterized by a compound map unit (CNW 85-CNW X5). Hydraulic conductivity of this unit is extremely high (about 10 cm/h) and the pH of the soil water is characteristically acidic (average pH 5.5).

Dr. Spooner and WSA explain that the private water supply wells, which surround the project area, derive potable water from two (2) aquifers: 1) the Sand HU, and 2) the Sandstone HU. The majority of these wells are drilled and cased in the Sandstone Aquifer; a minority produce from the Sand Aquifer. The drilled well database indicates the average

water table depth is approximately 8.0 metres. Dr. Spooner and WSA suggest that preservation of the integrity of groundwater resources in the vicinity of the project area is critical to protecting private water supply wells in the North Kingston area. While the lowering of the water table, resulting in decreased yield of surrounding private wells, should not occur, Dr. Spooner and WSA advise that sand extraction not exceed a depth defined by the highest seasonal watertable elevation.

While much of the proposed project area has been altered by human activity, Dr. Spooner and WSA suggest that the only unique, relatively pristine landform that exists at the site is Walker Brook (and its associated tributaries). They explain that the groundwater is efficiently transferred to Walker Brook, making it relatively resilient to drought. While there is no historical evidence of surface water collecting within the study area in such a way that would require dewatering, Dr. Spooner and WSA suggest that the high infiltration capacity of the soils retards overland flow and ameliorates the effects of sustained precipitation events.

6.5.2 Potential Effects, Proposed Mitigation, Follow-up Monitoring

Policy objective

SAL shall eliminate or mitigate any effect that the proposed project may have on the surface water and the integrity of groundwater resources.

Rationale

The potential effects of the proposed project include: (1) impeding the natural movement of surface water, by intersecting the water table; (2) impeding the natural movement of groundwater by lowering of the water table, thus decreasing the yield of surrounding private wells; and (3), introducing a deleterious substance such as the spillage of fuels into the sediments, thus contaminating the quality of groundwater and surrounding private wells, and also the quality of surface water. In light of those potential effects, there is a need to have in place guidelines to guide sand extraction operations. It is also essential that we know the direction of and velocity of groundwater flow in order to assess the risk to the integrity of the groundwater resources and the surrounding private wells that exist on all sides of the proposed project area.

Current situation

While some sand extraction is taking place within the study area (i.e., areas subject to active industrial approvals), water quality in Walker Brook and tributaries is consistent with the wide range of land use in the study region; thus, further testing is not warranted. While it is known that groundwater is efficiently being transferred through the sediments within the study area and to the Walker Brook, we have no direct knowledge of potential groundwater gradients within the study area, thus a monitoring system and testing is necessary.

Action Plan

The proposed strategy to achieve the policy objectives is to extract to a depth of one (1) metre above the highest seasonal watertable elevation. While easily described, for equipment operators such may be impractical. Nonetheless, operators should be able to recognize when they are close (within 0.5 metres or so) to the watertable because the water content of the porosity within the sand is greater than 50%. When the water content of the pores reaches this percentage, the operator will notice water dripping from the extracted sand. Also, at this point the operator will notice water beginning to accumulate in the base of the pit. It is at this point that the operator is starting to extract sand from the "saturated zone." The radius of influence of an event such as an operator digging up to 100 tonnes of sand in the saturated zone is only a few tens of metres from the digging point. If such an event occurs, it is unlikely that it will adversely affect private wells that are located greater than a few tens of metres from the digging point. However, such an event can impede the natural migration of surface water. If an operator digs into the saturated zone, he/she is to discontinue digging immediately. Before resuming digging, he/she will contact SAL management to secure advice on the proper depth of the pit floor. To do so, advice may be required from a professional engineer.

To avoid any adverse effects on the integrity of the groundwater resources and the surrounding private wells on all sides of the project area, it is critical that we know the direction of and velocity of groundwater flow in order to assess the risk as there is no direct knowledge of potential groundwater gradients within the study area. We propose that a network of groundwater monitoring wells be constructed, at strategic locations around the perimeter of the project area, to provide a suitable effects monitoring system. To achieve the policy objectives, three (3) monitoring wells will be constructed, according to industry

standards, to determine the direction and velocity of groundwater flow and provide network of locations for water quality monitoring between the project area and the private wells. Two monitoring wells will be located in the north-eastern and north-western portions of the property, equidistant from the boundaries. The third monitoring well will be located in the south-central portion of the property. Once the direction and velocity of groundwater flow is established, a decision will be made where place the refuelling area.

The water level in each well will be measured and documented on a monthly basis in year one and two of the proposed project, and in the spring and fall seasons thereafter. The results will be utilized to determine groundwater gradients and their change over time. The wells also will be utilized to facilitate groundwater sampling and analyses in order to determine base line water quality and to track water quality changes over time. Water samples will be collected from all monitoring wells and analyzed for the pertinent parameters on a schedule listed below:

- coliform bacteria (once every six months)
- general inorganics and metals (once every six months)
- volatile organic compounds (once every year)

The wells will be equipped with dedicated Waterra sampling devices, which will be used to purge the well of at least five (5) well bore volumes prior to sampling. Samples will be collected in containers recommended and supplied by an approved laboratory. The water samples will be stored in a cool environment and delivered to the laboratory within 24 hours of the sampling event. The water quality monitoring program will be carried out by an independent geoscience or engineering consulting firm and the results of the monitoring will be compiled and interpreted by a professional geoscientist or engineer, and the results documented and submitted to NSEL.

Criteria for Measuring Success

The performance indicators used to gauge the achievement of policy objectives will be groundwater gradients and water quality change over time. Once the base line for groundwater gradients and water quality have been established, if significant changes occur in either the groundwater gradients and water quality changes, sand extraction will halt and the source of those changes will be established and rectified, documented and reported to NSEL, before sand extraction resumes.

6.5.3 Summary

Provided that sand extraction does not exceed a depth of one (1) metre above the highest seasonal watertable elevation and no deleterious substance is introduced into the groundwater, it assumed that the groundwater mitigation and follow-up monitoring program outlined in this report will preserve the integrity of groundwater resources and protect private water supplies in the vicinity of the Marshall Road Sand Spit Expansion Project. While it is highly unlikely that sediments will enter surface water due to runoff, this concern will be monitored carefully. It is anticipated that the Marshall Road undertaking is unlikely to have any adverse effect on the integrity of the groundwater and surface water resources, and the surrounding private wells.

6.6 Air Quality

6.6.1 Description of Existing Environment

NSEL monitors ambient air quality at ten locations across Nova Scotia. Generally, ambient air quality in Nova Scotia meets or exceeds national standards in most communities. The common air pollutants monitored regularly are sulphur dioxide (SO_2), carbon monoxide (CO), ground level ozone (O_3), nitrogen dioxide (N_2O), and hydrogen sulphide (H_2S). Exceedences for these pollutants are, typically, small and infrequent in Nova Scotia; thus, Nova Scotians have the benefit of good air quality. Aylesford is the nearest NSEL monitoring site to the proposed project, approximately two (2) kilometres north of site. The nearest Environment Canada monitoring site is in Kejimkujik, Nova Scotia.

While the source of most air pollutants in Nova Scotia are either generated by motor vehicles and industrial activities in Nova Scotia or from trans-boundary air pollution from other areas in Canada and the United States (NSEL 1998), the Marshall Road Sand Pit expansion is located in a rural setting with no industry within a ten (10) kilometre radius. It is anticipated that the proposed project will have no substantial impact on air pollutants exceedences in the Kingston area because of separation distances between the site and any urban or industrial centres.

6.6.2 Potential Effects, Proposed Mitigation, Follow-up Monitoring

It is acknowledged that activities associated with the undertaking will generate dust (i.e., particulates) and vehicle emissions; those emissions will be in accordance with the *Nova Scotia Pit and Quarry Guidelines* for total particulate matter.

Open sources of dust emissions will be controlled with the application of water and by maintaining road surface quality and natural barriers. The vehicle emissions will be controlled via proper equipment maintenance and inspection.

6.6.3 Summary

Dust emissions are expected to be negligible because of the particle size of the sand at the site. It is anticipated, with the implementation of the mitigation and monitoring measures outlined in this report, the proposed undertaking will have little adverse affect on air quality in the Marshall Road and Kingston area. All activities connected with the proposed project will be in accordance with NSEL *Air Quality Regulations* (1995).

6.7 Socio-economic Conditions

6.7.1 Description of Existing Environment

From 1991 to 1996, Subdivision A in the County of Kings, which includes the Village of Kingston and the surrounding area, experienced a 6.8% increase in its population, from 21,245 in 1991 to 22,700 in 1996.[3] The subsequent five years saw a 1.2% reduction in the number of persons living in Subdivision A, from 22,700 in 1996 to 22,430 in 2001 (see Table 10). In 2001, the population density in Subdivision A was 18.2 persons per square kilometre compared with 17.2 persons per square kilometre in all of Nova Scotia. The average age of the population in Subdivision A is 37.2 years compared with 38.8 in Nova Scotia. The percentage of the population who are ages 15 and over is 78.5% compared with 81.8% in Nova Scotia.

Of those persons reporting an income in Subdivision A, the average total income is $18,320 compared with $18,735 in Nova Scotia. In 2001, the unemployment rate in Kingston and area was 8.4 % compared with 10.9 % in Nova Scotia. In 2001, of the 10,780 persons employed in the Kingston and area, 1,755 were employed in secondary manufacturing and construction industries, whereas 9,030 were employed in tertiary service industries.

For persons 20 to 64 years of age in Subdivision A, the percentage of the population with less than a high school certificate is 27.3 % compared with 25.3 % in Nova Scotia. For those aged 20 to64 years holding a trade or college certificate or diploma, the percentage is

[3] The source for the socio-economic data is Statistics Canada. Accessed at, http://www.statcan.ca. Accessed on, August 6, 2005.

37.2% compared with 34.1% in Nova Scotia. The percentage of the population 20 to64 years of age with a university certificate, diploma or degree is 13.0% compared with 20.0% in Nova Scotia.

Table 10. Socio-Economic Information

Socio-Economic Data	Kings County Subdivision A	Nova Scotia
General Population Information		
Population Count 2001	22,430	908,007
Population Count 1996	22,700	909,282
Population Change 1996-2001 (%)	-1.2	-0.1
Population Density per km^2	18.2	17.2
Population 15 Years and Over	78.5	81.8
Median Population Age	37.2	38.8
Education		
Total Population 15 Years and Older Attending School Full Time	1,665	82,685
% Population Aged 20-64 with Less than High School Graduation Certificate	27.29	25.31
% Population Aged 20-64 with a Trades Certificate, Diploma or College Certificate, Diploma	37.19	34.06
% Population Aged 20-64 with a University Certificate, Diploma or Degree	12.95	19.97
Income		
Median Total Income of Persons 15 Years of Age and Over ($)	18,320	18,735
Labour Force Indicators		
Participation Rate (%)	63.4	61.6
Employment Rate (%)	58	54.9
Unemployment Rate (%)	8.4	10.9
Industry		
Total - Experienced labour force	10,780	442,425
Agriculture and other resource-based industries	975	29,000
Manufacturing and construction industries	1,755	70,955
Wholesale and retail trade	1,655	71,085
Finance and real estate	295	20,620
Health and education	1,685	80,700
Business services	1,105	70,270
Other services	3,325	99,790

Income Characteristics	Kings County Subdivision A			Nova Scotia		
Earnings	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**
All persons with earnings (counts)	11,325	6,230	5,095	468,830	246,110	222,720
Average earnings (all persons with earnings ($))	24,582	30,861	16,901	26,632	32,328	20,338
Worked full year, full time (counts)	5,880	3,865	2,015	234,950	135,960	98,990
Average earnings (worked full year, full time ($))	35,217	39,595	26,821	37,872	43,166	30,601

Source: Statistics Canada 2001a

Land Use

Land use in the proposed project area is a mix of residential, commercial, open space, institutional developments, and farming (see Appendix 4, for soils classification and land use). The lands surrounding the proposed undertaking are zoned Agricultural, while the property on which the proposed undertaking is to be located is zoned Country/Residential. The Country/Residential designation is "intended to provide opportunities for rural residential development…and to accommodate non-residential resource development" such as industrial development (CKPS, By-Law 56). Appendix 4 shows the mix of land use and urban zoning in the Kingston area, mapped by the County of Kings. Properties immediately adjacent to the site are zoned as follows:

- ⇒ East side: Zoning is A1, Country/Residential
- ⇒ North side: Zoning is A1, Country/Residential
- ⇒ West side: Zoning is A1, Country/Residential
- ⇒ South side: Zoning is A1, Country/Residential

Some residential development has occurred on lands west of the proposed undertaking, namely the S. Dalgren Court. This is a low-density subdivision with houses using private septic and well systems.

Municipal Planning Strategy

The primary aim of the Municipal Planning Strategy for the County of Kings is the protection of the agricultural land-base.[20] The County of Kings has enacted policies and regulations that prohibit the removal of topsoil for commercial purposes. Accordingly, SAL *will not* remove any topsoil or overburden from the site. Responsibility for the excavation of aggregate in the County of Kings falls under the authority of the Province of Nova Scotia.

Recreation and Tourism

Anecdotal information suggests that the proposed project area is currently utilized by local residents for nature/recreational walks. In addition, the Walker Brook is utilized for recreational fishing. Another relevant local recreation and tourism issue is the "Yogi Bear's Jellystone Park Camp-Resort". This Camp-Resort is located on Brooklyn Street, north of

[20] Municipal Planning Strategy. Municipality of the County of Kings. Accessed at http://www.county.kings.ns.ca/. Accessed on June 05, 2005.

Highway 101, approximately .08 km from the Marshall Road site entrance. Although local recreation and tourism traffic may pass by the Marshall Road property, it is anticipated that the project will not have an impact on the Camp-Resort. Given current conditions surrounding the Marshall Road property, it is unlikely that the proposed project will be visible or audible from the Jellystone Park Camp-Resort.

Human Health

The health of residents in Subdivision A (which includes the Village of Kingston and North Kingston) is similar to that of other Nova Scotians. In some categories, such as infant morality, and lung cancer, Kingston and area residents are below the provincial average (see Table 11). Based on existing health information and scope of the proposed project, there is nothing to suggest that the undertaking will have an adverse effect on the health and well-being of residents in the Village of Kinston and the Marshall Road area.

Table 11. Health Information

Health Data	Kings County Subdivision A	Nova Scotia
Life Expectancy at Birth for Both Sexes in Years (1997)	78.7	77.7
Life Expectancy at Birth for Males in Years (1997)	76.3	74.9
Life Expectancy at Birth for Females in Years (1997)	81.2	80.4
Average Rate of Infant Mortality per 1,000 Live Birth (1997)	3.9	4.9
Total Incidence of Cancer per 100,000 for Both Sexes (1997-1998)	374	420.2
Total Incidence of Cancer per 100,000 Males (1997-1998)	429.8	498.8
Total Incidence of Cancer per 100,000 Females (1997-1998)	332.1	368.4
Rate of Death due to Respiratory Disease per 100,000 for Both Sexes (1997)	83.5	76.3
Rate of Death due to Respiratory Disease per 100,000 Males (1997)	122.7	108.5
Rate of Death due to Respiratory Disease per 100,000 Females (1997)	60.7	57.7
Rate of Death due to Pneumonia and Influenza per 100,000 for Both Sexes (1997)	41.5	33.1
Rate of Death due to Pneumonia and Influenza per 100,000 Males (1997)	51.1	42.6
Rate of Death due to Pneumonia and Influenza per 100,000 Females (1997)	36	27.7
Rate of Death due to Bronchitis, Asthma, and Emphysema per 100,000 for Both Sexes (1997)	6.6	5.8
Rate of Death due to Bronchitis, Asthma, and Emphysema per 100,000 Males (1997)	12.3	8.2
Rate of Death due to Bronchitis, Asthma, and Emphysema per 100,000 Females (1997)	3	4.5
Rate of Death due to Lung Cancer per 100,000 for Both Sexes (1997)	52.8	57.7
Rate of Death due to Lung Cancer per 100,000 Males (1997)	78.3	80.5
Rate of Death due to Lung Cancer per 100,000 Females (1997)	33	41.1
Rate of Death due to Circulatory Disease per 100,000 for Both Sexes (1997)	231.7	252
Rate of Death due to Circulatory Disease per 100,000 Males (1997)	295.9	334.9
Rate of Death due to Circulatory Disease per 100,000 Females (1997)	185.6	191.1

Source: Statistics Canada 2001b

6.7.2 Visual / aesthetic Environment

While the only clear view of the Marshall Road property is from the northwest portion of Marshall Road (see Photo 1), much of the landscape is restricted by a barrier of pine trees. Given that the property is relatively flat and rises up away from Marshall Road, some features of the property are clearly visible. They include the plants and trees, which make up its terrestrial habitat and the roadways and trails, which crisscross the property. It is unlikely that a person unacquainted with the area or the relevant expertise would realize that mining or farming has taken place on the property, unless the distinctive depressions in the landscape were pointed out to them—developed pit notwithstanding. While much of landscape is comprised of small plants and trees, the property boundary is comprised of larger trees, with the exception of the east end. The existing barriers include a mixture of native plants and trees in varying densities, which line the roadway into and around the site (see Photos 1 & 2). The homes located (and activities that take place) there are not clearly visible from Marshall Road.

Over the last 20 years, the proponent has planted 4-5000 pine trees in the western portion of the property as a proactive strategy to enhance the visual/aesthetic quality of the site and to screen the property from Marshall Road (see Photo 2). Those trees now form a natural barrier roughly three to five metres in height. The barrier, which runs parallel to Marshall Road, is situated between Marshall Road and the proposed project area, roughly 100 metres from Marshall Road.

6.7.3 Transportation

Access to and from Marshall Road will be located at the south-western edge of the property—approximately two-tenths of a kilometre from Exit 17W near where Highway 101 adjoins Marshall Road. Trucks typically will take two routes: (1) trucks travelling west will access Highway 101 at Exit 17W (approximately .02 km); or (2) trucks travelling east will travel south along Marshall Road to the #1 Highway (approximately 1.4 km), then easterly to the Bishop Mountain Road (approximately 2.0 km), and then northerly up the Bishop Mountain Road to access Highway 101 at Exit 17E (approximately .075 km). Highway 101, its' connector roads (both Marshall Road and Bishop Mountain Road) and Highway 1 are not subject to spring weight restrictions. It is SAL's policy to transport product in accordance within the NSTPW's guidelines.

While it is anticipated that 10-20 truck loads of product will exit the site daily, half of those vehicles will almost immediately access Highway 101. The balance will travel south on the Marshall Road, through the Village of Kingston onto Highway 101, and then east to the Kentville Industrial Park. It is expected that the trucks travelling through the Village of Kingston will add to the current level of noise and dust experienced by its residents, such is not expected to be significant. Proper vehicle inspection and maintenance and adherence to posted speed limits should lessen or eliminate any community concerns.

It is anticipated that significant improvements in the surface of the access road (e.g., paving) will not be required because the site is not subject to muddy working conditions due to the porosity of the sand. If mud is being tracked onto Marshall Road, the proponent is prepared to upgrade the road surface at the entrance to the site to resolve the issue.

No additional access roads are required for the proposed project, nor are any road upgrades required given the relatively low level of truck traffic.

6.7.4 Potential Effects, Proposed Mitigation, Follow-up Monitoring

While it is acknowledged that some activities associated with the undertaking will have an impact on quality of life, for example, air quality, traffic, noise, vibration, and visual/aesthetic qualities, they are expected to be minimal. It is anticipated that the proposed expansion will contribute positively to the local and provincial economy either directly (within the company; i.e., principles, current employees, and their families) or indirectly (outside the company; i.e., in tertiary service industries). Accepting that jobs contribute to individual and community wealth, and wealth contributes to individual and community health and well-being, SAL makes an important contribution to the health and well-being of its principles, employees, and the community generally.

SAL and its sister companies currently employ a local workforce of 45-50 people. The employees work in different sectors of the operation: aggregate pit operations, ready-mixed concrete production, trucking, and so forth. The proposed workforce required to carry out the duties for the proposal project will include clerical staff and truck and equipment operators. The employees will come from SAL's current, local workforce.

If market conditions allow, production will be increased, thereby creating an incentive for additional employees. As an equal-opportunity employer, SAL believes in forward-thinking business and leadership skills. If an increase in production is required, SAL will add

additional employees from the local workforce, and thereby increase its socio-economic contribution locally and provincially.

6.7.5 Summary

In sum, it is anticipated that the proposed sand pit expansion will contribute positively to the health and well-being of the people living in the local area.

6.8 Archaeological and Heritage Resources

In the spring of 2005, Laird Niven was retained on behalf of the proponent to carry out an archaeological assessment of the Marshall Road property to identify any reported or unreported archaeological sites within the study area. The study included a historical review and pedestrian survey of the study area (for complete report, see Appendix 9).

6.8.1 Description of Existing Environment

While the historical review did not identify any aboriginal archaeology sites or reported settlement features during the survey of the study area, the proponent reported that an old cemetery exists within the study area. A pedestrian survey established that a cemetery and a house feature exist within the study area. Moreover, the survey confirms that the study area has seen a great deal of past human activity, which has created a very disturbed landscape.

6.8.2 Potential Effects, Proposed Mitigation, Follow-up Monitoring

Policy objective

SAL shall protect and preserve all archaeological and heritage interests.

Rationale

The cemetery and the house feature are considered to be valuable archaeological resources. There are legislative requirements in place that demand that those archaeological sites be protected from any adverse effect that are connected to the proposed project. In that regard, there needs to be in-place suitable setbacks to protect the archaeological sites from sand extraction activities.

Current situation

While there is no sand extraction taking place in the study area at this time, the archaeological sites located on this property are being adversely affected by the activities of OHV users. No buffers or structures are in place to protect these sites from those activities.

Action Plan

The proposed strategy to achieve the policy objectives is to establish a twenty-five (25) metre setback between the active area of the proposed project and the cemetery and around the house feature. The outer edge of the buffers for the cemetery and house feature will be identified with visible markers. The setback will serve to maintain the integrity of the archaeological sites. The visible markers will assist equipment operators during site preparation so that they do not accidentally disturb the area around the archaeological sites.

Project managers will monitor the archaeological sites, by means of visual observations, regularly to ensure that the sites are not being adversely affected. The proponent has been approached by a local group actively engaged in preserving / restoring old cemeteries. When it becomes clear as to the group's involvement, the proponent will decide the appropriate approach.

If any archaeological remains are found during site preparation or excavation, pit operations in that area will halt immediately and archaeological staff at the Heritage Division, Nova Scotia Museum will be contacted. Equipment operators and other relevant SAL staff will be made aware of the buffer areas and the importance of preserving and protecting archaeological and historical sites and artifacts.

Success criteria

The success of policy objectives will be evidence that the pit embankments are stable enough and the setback sufficient that the integrity of the archaeological sites is preserved.

6.8.3 Summary

In summary, is anticipated that if the buffer areas around two areas of archaeological interest are maintained, operators are vigilant, and regular inspections carried out, the proposed expansion is not likely to result in the destruction of archaeological and historical

sites and artefacts on the property. Nonetheless, the involvement of groups or individuals interested in protecting the archaeological resources would be helpful.

7.0 OTHER UNDERTAKINGS IN THE AREA

There are nine (9) other aggregate pits that are either active or inactive within a five (5) kilometre radius of the proposed pit site. The pits which are active are small; accordingly, they add little in terms of traffic density/flow to the Marshall Road area. SAL does not anticipate its truck traffic to radically increase the traffic density or vehicle emissions in the Kingston area.

8.0 OVERALL EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT

As with most projects, there are advantages and disadvantages associated with this project. Understandably, some short-term undesirable environmental effects connected to the proposed project are anticipated. Firstly, it is anticipated that the project described in this document will result in some short-term loss of terrestrial habitat within the expanded pit footprint. In light of the area exposed in any given year, the loss of habit is not expected to be significant.

Secondly, the impact of activities connected with this project on flora and fauna are not expected to be significant. The site is a unique habitat for three (3) plant species of conservation concern—Rockrose, Canada Frostweed; Hudsonia, Golden-heather; Arrow-leaved Violet—and two (2) species of wildlife—Vesper sparrows and Wood turtles. It is anticipated that the proposed project will have no more impact on these birds or reptiles than what currently occurs on the Marshall Road property; in fact, disruption of the site by the proposed project may enhance the growth of plant species of conservation concern. Furthermore, the proposed development, with its proposed mitigation and follow-up monitoring measures, may limit the negative impacts of current activities such as those from OHV users, and hence contribute to the survival and growth of the Wood Turtle population at the site.

Thirdly, the removal of surface aggregate in the quantities indicated in this study is expected to have little effect on both the quality and the quantity of the surface water and groundwater on or adjacent to the site. Close attention to groundwater monitoring should identify potential impacts of excavation at the site before impacts occur or become significant. Potential impacts associated with this project include both positive and negative impacts, namely air quality, traffic, noise, vibration, visual/aesthetic qualities, and so forth.

Although the aforementioned negative impacts not expected to be significant, close attention to timely monitoring should diminish such occurrences.

Fourthly, there is always a safety concern with vehicular traffic. An increase in truck traffic to and from the site is not anticipated to significant. Lastly, there is the potential for sedimentation and contamination arising from pit activities that may afterward spoil the aquatic habitat of the watercourses on and off the Site. Vigilant monitoring of all site activities is crucial.

The advantages of the project are mostly in the form of socio-economic benefits. The project will provide continued employment opportunities for those individuals employed in activities closely related with the project (e.g., individuals who work for SAL). There are also those who work in tertiary industries that service individuals and organizations associated with the project. The sand excavated from this Site also is important in the construction of waste water treatment systems.

The goal of the proposed project is to service the needs of Nova Scotians, without significantly adversely affecting the environment. With careful application of the monitoring and mitigative measures outlined in this document, SAL believes that potential adverse effects, identified and evaluated in this document, can be avoided, lessened or ameliorated.

9.0 EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING

The environment may affect this Undertaking primarily by way of climatic conditions. Input events (e.g., precipitation) or runoff may hold up the timely preparation, excavation, and reclamation of land within the active area of the proposed project or available markets because of inactivity at construction sites. Further, wet weather or snow may limit when sand can be hauled from the site. If the environmental conditions are not conducive to the applicable activity, the activity will have to be postponed until conditions are more amenable.

10.0 REGULATORY COMPLIANCE AND APPROVALS

Approval for this project will be sought in accordance with the requirements of the following provincial legislation and the regulations made pursuant to them:

- *Nova Scotia Environment Act, and*
- *Industrial Approval for Pit and Quarry Development under the Activities Designation Regulations*.

The proposed Marshall Road Sand Operations will adhere to the most recent versions of the relevant NSEL guidelines and specifications including: *Pit and Quarry Guidelines; Erosion and Sedimentation Control Handbook for Construction Sites,* and *Guideline for Environmental Noise Measurement and Assessment*. In addition, the following joint provincial guidelines and specifications may apply: *Guidelines for Development on Slates in Nova Scotia*. All work at the Site will be carried out in accordance with the *Nova Scotia Occupational Safety General Regulations*, or the relevant legislation in force at the time of construction.

Approvals for this project may not be required in accordance with the following federal and provincial legislation and the regulations made pursuant to them; nonetheless, the activities associated with this project must comply with the following:

- Canadian Environmental Protection Act;
- Canadian Fisheries Act;
- Canadian Migratory Birds Conservation Act;
- Nova Scotia Dangerous Goods Transportation Act;
- Nova Scotia Environment Act;
- Nova Scotia Special Places Protection Act; and,
- Nova Scotia Wildlife Act.

11.0 FUNDING

The proposed undertaking will be 100 percent privately funded.

12.0 CONCLUSIONS

The studies captured in this document identify and evaluate the Valued Ecosystem Components, Valued Socio-economic Components, and potential environmental impacts of activities connected to the proposed Marshall Road Sand Pit Expansion. In addition, this study identifies appropriate mitigation and monitoring measures to eliminate, lesson and mitigate any potential impacts. Part of SAL's site management strategy is to carry out a monitoring and mitigation program, as proposed herein, to ameliorate, lessen or eliminate any potential impacts connected to project activities on surface water, groundwater, flora, fauna, and residents in proximity to the Site. Once the sand is exhausted at the site, SAL will restore the site to conditions similar to its current state. Toward this end, SAL will employ an adaptive management strategy "with the central tenant that management involves a continual learning process that cannot conveniently be separated into functions

like…ongoing regulatory activities" (see Walters 1986: 8; Gunderson, Holling and Light 1995). The strategy here is to envision the biophysical and socio-economic environments as dynamic entities that are interrelated and interconnected, which require from SAL appropriate responses.

From SAL's perspective, the proposed *Marshall Road Sand Pit Expansion* is an important and necessary contribution to the future economic stability of SAL and its sister companies, the needs and well being of the principles, the employees and their families, and Nova Scotians generally. Travel to and from the site will follow the established routes. Treed areas along property borders will be maintained to screen project activities and potential emissions, such as noise or dust. It is acknowledged that the undertaking will result in a short-term loss of terrestrial habitat within the physical footprint of the project, but these impacts are not expected to be significant. SAL will not remove overburden or topsoil from the property. Reclamation will occur at the site as soon as it is physically possible. Lastly, SAL seeks to maintain its strong relationship with the residents and the community of Kingston, and the surrounding area. Assuming that the monitoring and mitigative measures outlined in this report are implemented, and the pit is operated according to existing provincial guidelines and approvals, assuming these measures are adhered to, the information collected for this report indicates that that no significant adverse residual socio-economic effects are likely to occur. However, with the removal of sand some significant adverse residual environmental effects will occur in the interim, namely disruption of the associated heathland and terrestrial habitat. With the implementation of the conservation areas and buffer zones, and reclamation approach outlined in this report, those adverse residual environmental effects, in time, will be alleviated. It anticipated the mitigation measures, which are part of the proposed project, will contribute positively to the survival and growth of the Wood Turtle population and the conservation of the existing Rockrose plants.

13.0 REFERENCES

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14.0 APPENDICES