

# FINAL REPORT

Environmental Assessment  
Registration, MacLeod  
Settlement Pit Development  
2227754 Nova Scotia Limited

**PROJECT NO. SD19677**

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## **REPORT NO. SD19677**

REPORT TO

**2227754 Nova Scotia Limited  
P.O. Box 130  
Port Hood, NS  
B0E 2W0**

FOR

**Environmental Assessment Registration  
MacLeod Settlement Pit Development**

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**August 17, 2007**

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## EXECUTIVE SUMMARY

2227754 Nova Scotia Limited (formerly Ideal Concrete (1993) Limited), proposes to develop a sand pit to allow for excavation, screening, mixing and stockpiling of sand near the community of MacLeod's Settlement, Inverness County, Nova Scotia. The aggregates to be produced at the pit are an important requirement in concrete plants in the region and are of an appropriate quality for concrete manufacturing. The estimated aggregate reserves in the proposed Project area are in excess of 4.3 million tonnes and pit operations are proposed to potentially continue over the next 80 to 90 years, depending upon the demand for the product. The proposed Project area will cover a total area of approximately 21.4 ha in size.

The anticipated operating schedule is 12 hrs/day, 6 days/week between April and December, weather permitting, and the anticipated average production rate is 50,000 tonnes per year. The Project will commence upon obtaining applicable approvals and authorizations.

Proposed Project activities will be consistent with current quarry operations approved by Nova Scotia Environment and Labour and in accordance with the Nova Scotia Pit and Quarry Guidelines (NSEL 1999). As the Project will be a pit, sand will be removed by excavation and no blasting will be required. A pit development plan will be completed (including a figure showing phased development and details on pit reclamation) and included in support of an industrial approval for the Project. The various aggregate products will be stockpiled in designated areas within the pit transported from the pit via tandem and tractor trailer trucks along MacLeod Settlement Road to concrete plants or other sites. The volume of trucks is anticipated to be on average 8 to 10 truckloads (return trips) hauled from the site each day.

2227754 Nova Scotia Limited is required to register this Project as a Class I Undertaking pursuant to the Nova Scotia *Environment Act* and Environmental Assessment Regulations. Other relevant provincial regulations include the Activities Designation Regulations, which requires an Industrial Approval from NSEL for operation of the Project. Provincial guidelines to be adhered to include the Pit and Quarry Guidelines (NSEL 1999). Examples of other relevant federal legislation include the *Migratory Birds Convention Act* and the *Species at Risk Act*.

This environmental assessment registration evaluates the potential environmental effects of the Project and identifies appropriate mitigation and monitoring to minimize these effects. The document focuses on those aspects of the environment of most concern. Components evaluated include:

- fish and fish habitat;
- rare and sensitive flora;
- wetlands;
- wildlife;
- groundwater resources;
- archaeological and heritage resources;
- air quality; and
- socio-economic environment.

Environmental effects from the pit will include the loss of habitat within the pit footprint. Assuming the mitigative measures specified in this report are implemented, and the pit is operated according to existing provincial guidelines and approvals, no significant adverse residual environmental or socio-economic effects are likely.

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## 1.0 PROPONENT AND PROJECT IDENTIFICATION

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### 1.1 Proponent Information

**Name of the Proponent:** 2227754 Nova Scotia Limited  
**Postal Address:** P.O. Box 130  
Port Hood, NS  
B0E 2W0  
**Tel.:** (902) 945-2300  
**Fax:** (902) 945-2087

Registry of Joint Stocks for the proponent company is included in Appendix A.

#### Company Vice President and/or Environmental Assessment Contact

**Name:** Ted vanZutphen  
**Official Title:** Company Vice President  
**Address:** As above  
**Tel.:** (902) 945-2300  
**Fax:** (902) 945-2087

#### Environmental Consultant Contact

**Name:** Angela Swaine  
**Official Title:** Project Manager  
**Address:** Jacques Whitford Limited  
3 Spectacle Lake Drive  
Dartmouth, NS B3B 1W8  
**Tel.:** (902) 468-7777  
**Fax:** (902) 468-9009

  
Signature of Signing Officer

August 14/07  
Date

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### 1.2 Project Information

**Name of the Undertaking:** MacLeod Settlement Pit Development Project  
**Location of the Undertaking:** MacLeod Settlement Road, Inverness County, NS

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## 2.0 PROJECT INFORMATION

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### 2.1 Description of the Undertaking

2227754 Nova Scotia Limited (formerly Ideal Concrete (1993) Limited), herein referred to as the "Proponent", proposes to develop a sand pit to allow for excavation, screening, mixing and stockpiling of sand (the Project). The Proponent owns the land located on MacLeod Settlement Road, Inverness County, Nova Scotia proposed for the Project (Figure 1), as well as the surrounding land. There is a former small area of the property which has been used for sand extraction in the past by others; however there is no current permit for sand extraction for the site. A copy of the registry of Joint Stocks for the Proponent and a copy of the property deed are included in Appendix A. The expected operating area of the pit is predicted to extend beyond 4 ha and is thus subject to registration of a Class I Undertaking, pursuant to the Nova Scotia *Environment Act* and *Environmental Assessment Regulations*.

As a result of field and desktop studies undertaken in support of this environmental registration report, the Project area has been carefully considered so as to minimize potential environmental impacts.

The anticipated operating schedule is 12 hrs/day, 6 days/week between April and December, weather permitting, and the anticipated average production rate is 50,000 tonnes per year. The intended start date of the operation will be as soon as possible after obtaining the proper regulatory approvals including the approval of this EA as well as an Industrial Approval to operate the pit. It is the Proponent's intent to have these approvals in place prior to the end of 2007. The estimated aggregate reserves in the proposed Project area are in excess of 4.3 million tonnes and pit operations are proposed to potentially continue over the next 80 to 90 years, depending upon the demand for the product.

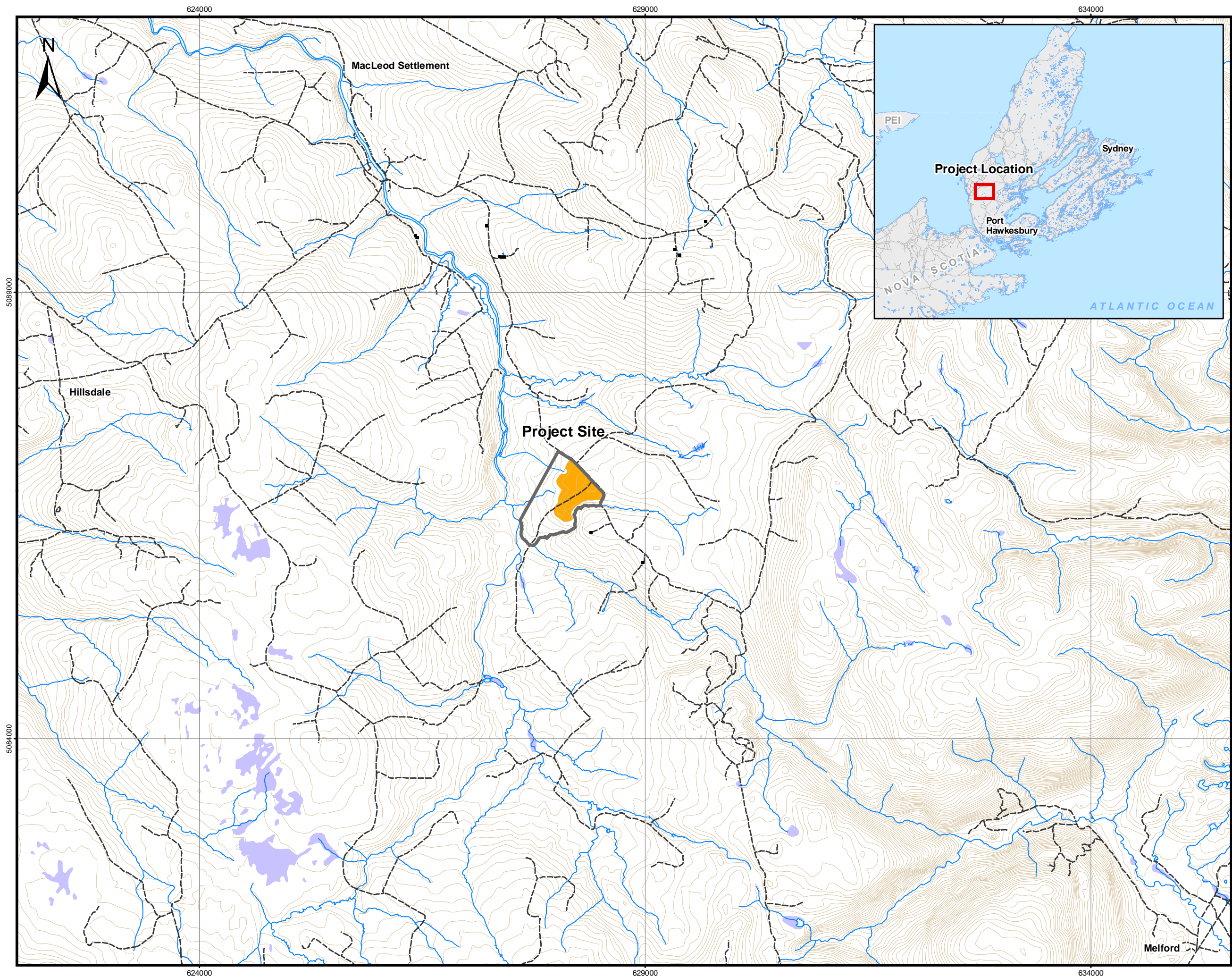
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### 2.2 Geographical Location

The property on which the proposed Project is situated is located on MacLeod Settlement Road, near Upper Southwest Mabou, Inverness County, Nova Scotia and is legally described as Property Identification Number (PID) 50044015. Entrance to the proposed pit is via a privately owned access road located off MacLeod Settlement Road. Generally, the proposed project site is roughly triangular in shape and is bounded by Small Brook and wetlands to the south; wetlands, streams and the termination of sand to the northwest; and MacLeod Settlement Road to the northeast (Figure 2).

The Project area is situated on lands that are located on the western face of a knoll with a slope of approximately 5%. According to available geological maps, the site's surficial geology is mainly composed of glaciofluvial deposits comprised of gravel, sand, silt and diamicton layers while the northern portion of the site includes an area of silty till. Bedrock in the area is reported to be fluvial-alluvial sandstone and conglomerate of the Creignish Formation of the Horton Group.

Residential development in the immediate vicinity of the Project is sparse (*i.e.*, within a 2 km radius of the pit there are two residences, one of which is dilapidated and no longer in use). The nearest communities are MacLeod Settlement approximately 2.1 km to the north, Hillsdale approximately 5.4 km to the northwest, Rear Judique South approximately 8.5 km to the southwest, River Denys Road approximately 6.9 km to the south, and Melford approximately 8.3 km to the southeast.

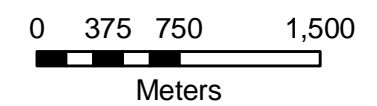


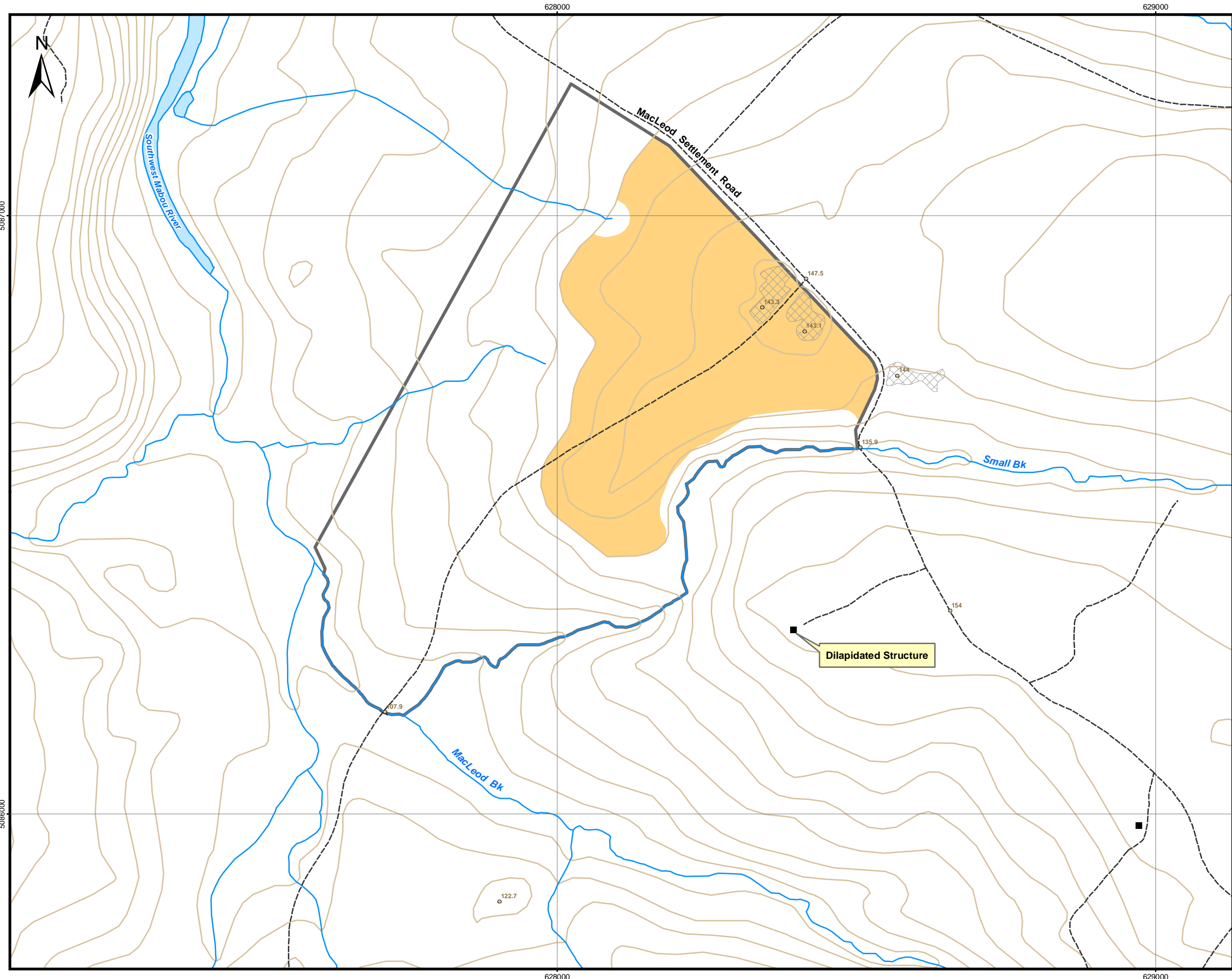
# MacLeod Settlement Sand Pit

Figure 1  
Project Location

## Map Features

- Building
- Roads
- Countour (5m)
- Watercourse
- Waterbody
- Wetland
- Project Property
- Proposed Development Area

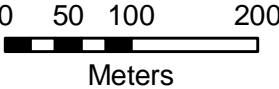




# MacLeod Settlement Sand Pit

Figure 2  
Site Layout

- Legend**
- Building/Structure
  - Spot Elevation
  - Contour (5m)
  - - - Roads
  - Watercourse
  - Waterbody
  - Pit/Quarry
  - Property Boundary
  - Proposed Development Area



Map Parameters  
Projection: UTM-NAD83-Z20  
Scale 1:6000  
Date: July 16th, 2007  
Project No.: SD19677.



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## 2.3 Physical Components

The site currently includes remnants of a former small pit operation (Figure 2) consisting of a small laydown area/pit floor, working face, and access road. This operation is presently not in use. There is no fuel storage, storage of dangerous goods, pipelines, railway or any other infrastructure associated with the existing small pit and none are proposed for the Project.

Topsoil and overburden that may be stripped prior to excavating will be stored on site for subsequent use during site reclamation. The piles will be hydroseeded to reduce potential for erosion and sedimentation. This practice will continue throughout the development and operation of the proposed Project area.

The laydown area will be located on the pit floor and the excavating equipment will be transported to the site as required. Sand stockpiles will be located in various locations within the pit limits, as space allows. As the pit expands and additional space on the pit floor is created, a dedicated stockpile area will be established. Surface runoff and pit drainage will be collected on the pit floor, which will have the capacity to hold a significant quantity of water. A closed circuit wash pond with a mobile screen plant with screen bars and a dewatering bucket wheel (approximately 6 meters long and 3 meters wide) will be established using runoff from the site and natural groundwater infiltration as the primary sources of water. This wash water pond will also double as a settling pond. The wash water/settling pond will naturally fill with water during the winter and spring and will be supplemented as required by intermittently running a two inch pump from an on-site stream, with an average withdrawal of less than 10,000 litres per day. Overflow from the wash water/settling pond will be directed with site grading sloping back to the wash water/settling pond. Overflow can also be directed in three directions, to the small brook to the south, to the MacLeod Brook Tributary to the southwest, and the unnamed stream to the northwest. When the wash water/settling pond fills with sediment a new washpond/settling pond will be excavated. The former wash water/settling pond will either be filled in to the approximate grade of the surrounding area or will be left on the site to act as a wetland.

The nearest building is approximately 330 m from the boundary of the proposed Project area limits, however this building is dilapidated, no longer in use and is likely beyond repair (Figure 2). There is one additional structure located within 2 km of the proposed Project boundary. The general direction of pit advancement will start in the southern portion of the site working northward. The geotechnical properties of the area will be sampled and tested to confirm the suitability of the material. Bedrock in the area is not expected to be acid producing since geologic mapping shows that the site is underlain by fluvial-alluvial sandstone and conglomerate of the Creignish Formation of the Horton Group which is not known to have a high acid generation potential. In addition, no quarrying of bedrock is expected to take place during pit development.

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## 2.4 Site Preparation and Construction

The Proponent purchased the property in November 2004 as shown on the deed provided in Appendix A. Access to the pit development will be along existing roads. The pit access road will be upgraded in order to accommodate the truck traffic and drainage ditches will be installed along the access road to maintain drainage. Upgrades to Provincial road and highways may be necessary by the Nova Scotia Department of Transportation and Public Works (NSTPW) as identified in Section 5.9.1.

To minimize the potential for erosion and sedimentation, grubbing and removal of overburden will be conducted on an as needed basis, to accommodate excavation activities. Topsoil, grubbed material and overburden will be stockpiled on site and will be stabilized with hydroseed for subsequent use during site reclamation. These stabilization procedures will continue throughout the pit operations.

A closed circuit wash pond will be established using runoff from the site and natural groundwater infiltration as the primary sources of water. The wash water pond will naturally fill during the winter and spring and will be supplemented as required by intermittently running a two inch pump from an on-site stream, with an average withdrawal of less than 10,000 litres per day.

Sand pit drainage and surface runoff will collect on the sand pit floor and overflow from the sand pit floor will be directed to a wash water pond located onsite. There will likely be little overflow from the wash water pond as the majority of the water collected on the sand pit floor and in the settling pond is expected to infiltrate into the floor and/or evaporate. Overflow from the pond, meeting regulatory requirements, will be directed toward one or more of the brooks and streams which surround the Project site.

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## 2.5 Operation and Maintenance

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### 2.5.1 Pit Operation Activities

The proposed Project activities will be undertaken in accordance with the Pit and Quarry Guidelines (NSEL 1999). These guidelines apply to all pit and quarry operations in the province of Nova Scotia and provide: separation distances for operations; liquid effluent discharge level limits; suspended particulate matter limits; sound level limits; and requirements for a rehabilitation plan and security bond. As the Project will be a pit, sand will be removed by excavation and no blasting will be required. A pit development plan will be completed (including a figure showing phased development and details on pit reclamation) and included in support of an industrial approval for the Project. Sand pit development will be initiated following approval from NSEL. The proposed Project area will cover a total area of approximately 21.4 ha in size.

The facilities and infrastructure associated with the pit will include: a gated access road; various stockpiles; topsoil and overburden stockpiles; the pit floor/laydown area (for heavy machinery); the working face; flow retention structures and wash water/settling pond(s).

The various aggregate products will be stockpiled in designated areas within the pit. Piles will be built in layers to minimize segregation and prevent contamination by mixing of different piles. The material will be hauled and moved within the pit with a loader. Other equipment will likely include an excavator and/or front-end loader.

Products will be transported from the pit via tandem and tractor trailer trucks along MacLeod Settlement Road to concrete plants or other sites. The volume of trucks is anticipated to be on average 8 to 10 truckloads (return trips) hauled from the site each day.

The proposed operating schedule will be based on 12 hrs/day, 6 days/week, from April to December, weather permitting. The anticipated production rate is approximately 50,000 tonnes per year. The pit will employ 3 full time seasonal site employees. Hauling of materials to and from the pit will also require additional human resources and will generate associated economic activity.

## 2.5.2 Effluents and Emissions

### Erosion and Sediment Control

In accordance with best practices, standard Nova Scotia Environment and Labour (NSEL) requirements and those indicated in the Erosion and Sedimentation Control Handbook for Construction Sites, runoff controls will be in place to ensure that suspended particulate matter generated during operations is managed appropriately. A hydrological review of the MacLeod Settlement Pit was conducted by Hydro-Com Technologies Limited (refer to Appendix B). The report states that a reduction in evapotranspiration and a subsequent increase in the volume of surface runoff will occur as a result of the pit development. It was determined that, based on the proposed development area, the mean volume of annual site run off is estimated to be 257,000 m<sup>3</sup> (assuming the entire Project area is developed).

Surface runoff at the pit can be retained by flow retention/siltation treatment structures or be collected on the pit floor. Once fully developed, the pit floor may have the capacity to contain/retain a significant volume of runoff (*i.e.*, 3,620 m<sup>3</sup>). The placement of free-draining material, flow retention structures, and closed circuit wash water/settling pond(s) is more than adequate to mitigate against the effects on downstream flows for the existing facility.

Currently, overland flow drains in three directions due to two hydrologic divides. Overflow from the wash water/settling pond(s), if any, will be monitored and sampled according to the terms and conditions of an industrial approval for the Project and the Pit and Quarry Guidelines to ensure total suspended solids levels do not exceed the approved final effluent discharge limits. In the unlikely event that overflow exceeds final effluent discharge limits as determined through monitoring, contingency measures may include pumping of sediment laden water to vegetated areas (away from watercourses) or through filter bags for additional filtration and/or use of additional filtration devices or structures.

### Air Emissions

Dust emissions will be controlled with the application of water, obtained from the water contained in the settling pond or water that is pooled on the pit floor. Stockpiled topsoil and overburden material will be seeded and/or covered with hay or mulch to minimize erosion and dust generation. Monitoring of airborne particulate emissions (dust) will be conducted at the request of NSEL and in accordance with the Pit and Quarry Guidelines.

Combustion emissions will be generated from the operation of vehicles and equipment. Given the scope of the planned operations, these emissions will be minimal and localized. Emissions will be reduced through proper equipment maintenance and inspection.

### Noise

As per the Pit and Quarry Guidelines, sound levels from pit operations will be maintained at a level not to exceed the following sound levels (Leq) at the property boundaries:

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

Sound monitoring will be conducted at the request of NSEL.

## Solid Waste

Solid waste generated on-site will be minimal (e.g., domestic refuse). All solid waste will be properly collected and stored until such time that it can be transported to a provincially approved waste disposal facility.

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### 2.5.3 Hazardous Materials and Contingency Planning

There is no planned storage of hazardous materials or petroleum products at the Project site. A qualified company will be contracted to conduct regular maintenance of equipment. Used oil and filters will be removed from the site.

Refuelling of equipment will be conducted onsite on a regular basis, under contract by a tanker truck. Refuelling activities will not be conducted within 100 m of any surface water, and equipment operators will remain with the equipment at all times during refuelling in accordance with the Petroleum Management Regulations of the *Nova Scotia Environment Act*.

In the event of a leak or spill during refuelling, maintenance, or general equipment operation, immediate action will be taken to stop and contain the spilled material. All contaminated material will be collected and stored in an appropriate manner so as not to be re-released to the environment until such time as it will be transported to an approved treatment/disposal facility. All spills will be reported to the 24-hour environmental emergencies reporting system (1-800-565-1633) in accordance with the Emergency Spill Regulations of the *Nova Scotia Environment Act*. A contingency plan which will include contingencies for spills will be developed for the pit in support of an Industrial Approval application for the operation.

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## 2.6 Decommissioning and Reclamation

The Proponent will undertake a progressive rehabilitation program at the pit site. The rehabilitation process at the pit will begin during initial site development with the preservation of topsoil for future revegetation of the pit. As distinct areas within the pit become inactive and not essential for future pit operations, the area will be graded to a stable slope (i.e., maximum slope of 1:1), covered with topsoil, and seeded with commercial seed mix. At the end of the pit operation (within six months of abandonment), rehabilitation will consist of grading the laydown area and settling pond within the pit, as required, taking into account the slight slope required to keep the current drainage regime intact. The laydown area and settling pond will be covered with stockpiled topsoil and the area will be leveled to allow for future use. With the exception of the slight slope required to keep the drainage regime intact, the final topography across the Project site will be relatively flat and the only area of the pit containing a significant slope will be on the northeastern side of the pit along MacLeod Settlement Road. Rehabilitation of the northeastern slope will include grading and contouring of all slopes and exposed faces in consideration of slope stability and safety (i.e., maximum slope of 1:1) by spreading existing stockpiled topsoil and hydroseeding with commercial seed mix.

In interests of habitat diversity and where erosion control is not an issue, small areas of remnant exposed sand substrate could be left without hydroseed application to allow natural succession and possibly provide greater habitat opportunities for less common species (e.g., *Botrychium simplex*). Since no wetlands will be destroyed during the development of the Project, currently there is no plan to develop wetlands on the site as part of the reclamation plan.

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## 3.0 SCOPE

It is the Proponent's intent to develop a gravel pit operation greater than 4 ha, and the Project must be registered for Environmental Assessment under the Environmental Assessment Regulations of the Nova Scotia *Environment Act* as a Class I Undertaking. This report fulfills the primary requirements for Project registration under this legislation.

The Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia (NSEL 2002) was also used to help focus the scope of the assessment. NSEL does not provide explicit terms of reference for environmental registrations for Class I Undertakings. In this case, Jacques Whitford has also relied on previous experience with successful environmental approval applications for several other pit and quarry projects in Nova Scotia.

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### 3.1 Scope of the Undertaking

The proposed Project, as described in Section 2.0, consists of development of the pit footprint for sand extraction. The following is a description of the spatial and temporal boundaries of the proposed Project to be considered in the assessment.

The pit is scheduled to open in Spring 2007 to excavate sand. Currently, there is a small abandoned pit working face at the eastern end of the Project area along MacLeod Settlement Road which does not go below the natural water table (*i.e.*, the pit floor is not under water and is not anticipated to flood). The Proponent expects that additional excavation on the property will also not go below the natural water table with exceptions being made for wash water and settling ponds.

The facilities and infrastructure associated with the pit will include: a gated access road; various stockpiles; topsoil and overburden stockpiles; the pit floor/laydown area (for heavy machinery); the working face; flow retention structures and wash water / settling pond(s).

Sand pit development will be initiated following approval from NSEL. The proposed Project area will cover a total area of approximately 21.4 ha in size. Setback distances described in the Pit and Quarry Guidelines will be adhered to.

The proposed operating schedule will be based on 12 hrs/day, 6 days/week, from April to December, weather permitting. The anticipated production rate is approximately 50,000 tonnes per year. Transport of aggregates from the pit will be via tandem and tractor trailer trucks to concrete plants or other sites. The average number of return trips for trucks daily will be approximately 8 to 10.

The Proponent will undertake progressive reclamation activities at the pit. Refer to Section 2.6 for additional information related to decommissioning and abandonment activities.

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### 3.2 Purpose and Need for the Undertaking

The purpose for the Project is to allow the Proponent to develop the pit and excavate sand. The aggregates to be produced at the pit are an important requirement in concrete plants in the region and are of an appropriate quality for concrete manufacturing.

Pit development is an important component of the natural resource sector of the economy and provides essential raw materials to the province's construction industry. The proposed pit will also provide direct and indirect employment for its workers and suppliers, as well as for the transportation and construction industries.

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### 3.3 Project Alternatives

Other methods for carrying out the undertaking may include different methods of extraction of the resource and alternative facility locations. The method of aggregate extraction at the MacLeod Pit will be excavation, screening, and washing. Alternative methods for extraction of sand (*i.e.*, mechanical means) are not practical or feasible in this instance due to the nature and characteristics of the sand (*e.g.*, loose sediment). Therefore, there are no feasible alternatives to excavation as a means of extracting this material.

Alternative locations for the Project are likely possible, however, not on properties currently owned by the Proponent. Further, the proposed location of the Project is on a property which has formerly been worked as a small pit. Relocation of the Project to another location may likely require development of a new site, construction of new facilities, and would potentially have a greater effect on the surrounding biophysical and socio-economic environment. The current proposed Project location is also located within a short distance of a local concrete plant, making it a cost-effective source of sand.

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### 3.4 Scope of the Environmental Assessment

The proposed Project involves development of a pit footprint beyond 4 ha. Therefore, the Project must be registered for Environmental Assessment under the Environmental Assessment Regulations of the Nova Scotia *Environment Act* as a Class I Undertaking. This report fulfils the primary requirements for Project registration under this legislation.

Other relevant provincial regulations and guidelines include the Nova Scotia Pit and Quarry Guidelines (NSEL 1999). Relevant federal legislation and policies include the *Species at Risk Act (SARA)*, *Migratory Birds Convention Act*, the Federal Policy on Wetland Conservation, A Wildlife Policy for Canada, the Federal Water Policy, the Toxic Substances Management Policy, and the federal strategy for pollution prevention.

The scope of the environmental assessment in relation to the proposed Project has been determined by the Proponent and their consultant and is based upon the proposed Project elements and activities, the professional judgment and expert knowledge of the study team, consultations with the public and regulatory authorities on this and similar projects, and the results of field studies conducted in support of this environmental assessment. The Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia (NSDEL 2002) was also used to determine/focus the scope of the assessment. The Proponent and their consultant met with NSEL on September 29, 2005 to discuss the location of the proposed project, and elements and activities associated with the proposed Project, in an effort to further focus the scope of the assessment. Landowners adjacent to the pit were also contacted (see Section 4.0) for the purpose of issues identification.

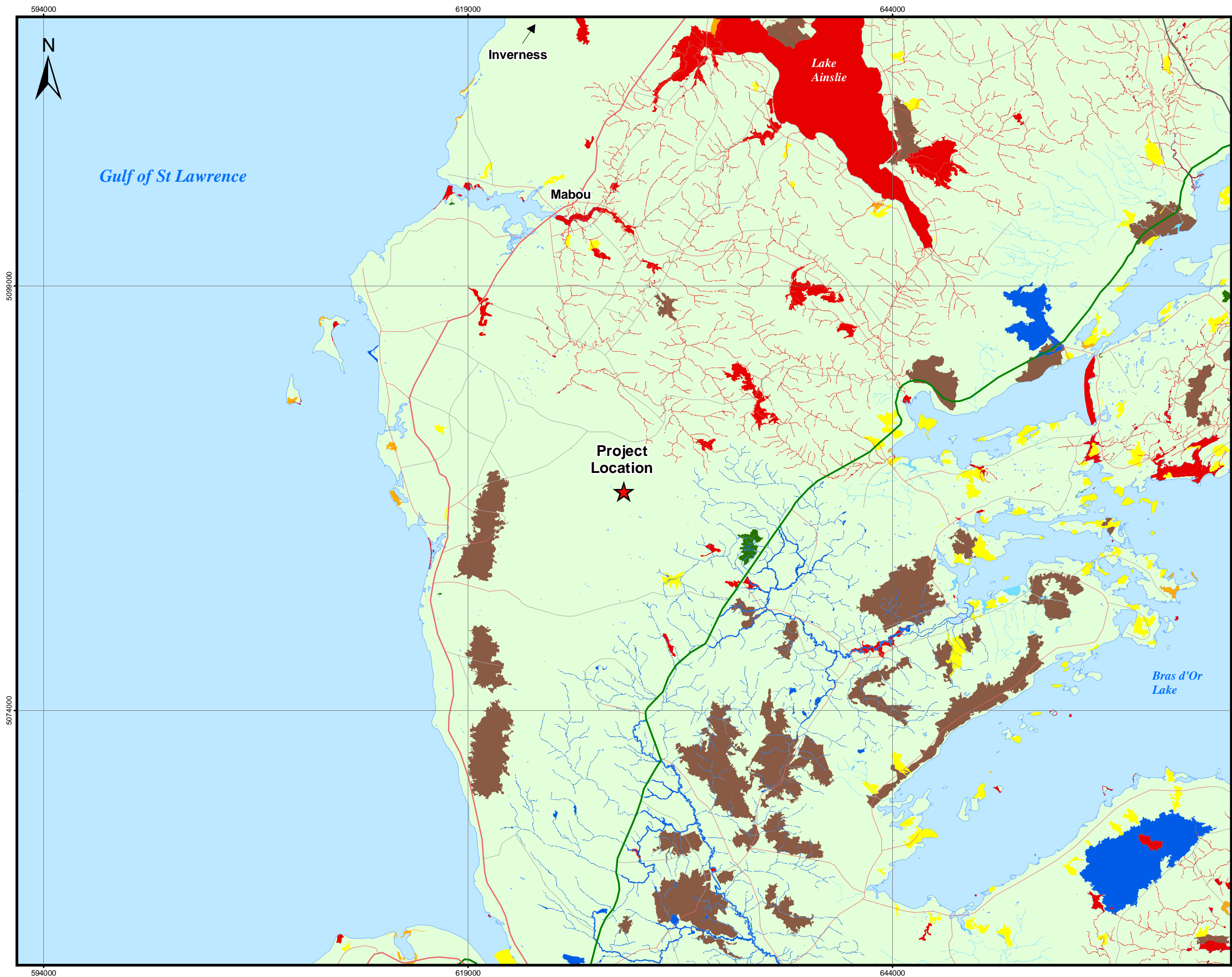
This environmental assessment evaluates the potential environmental effects of the proposed Project elements and activities, for all Project phases, with regard to each Valued Environmental Component

(VEC) and Valued Socio-economic Component (VSC). By assessing potential impacts on VECs/VSCs within the study boundaries, a meaningful evaluation of Project effects on relevant environmental parameters is achieved. Components evaluated include:

- groundwater resources;
- rare and sensitive flora;
- fish and fish habitat
- wildlife (including herpetiles and breeding birds)
- wetlands;
- archaeological and heritage resources;
- air quality; and
- socio-economic environment.

As part of the scoping and assessment process, the Nova Scotia Government's Significant Species and Habitat database was consulted to determine the presence of high priority areas within the general area of the Project (*i.e.*, within 20 km). This database is maintained by the Nova Scotia Department of Natural Resources (NSDNR) and contains information on sites within Nova Scotia that contain species at risk, species of special conservation concern, specialized habitats that could be jeopardized by human activities, sites of high biodiversity and sites of local natural historic interest. The results of this search are provided in Figure 3. According to this database, there are no sensitive habitats identified within approximately three kilometres of the site.

As stated above, this Project must comply with *SARA*, which requires proponents to demonstrate that no harm will occur to listed species, their residences or critical habitat. *SARA* serves to protect listed species by prohibiting activities that may harm individuals or critical habitat. *SARA* has been linked to the *Canadian Environmental Assessment Act (CEAA)* through requirements in both Acts. Section 79 of *SARA* requires that a Responsible Authority (RA) must notify the competent minister (likely Department of Fisheries and Oceans (DFO) or Environment Canada) in writing if a project being assessed is likely to affect a listed wildlife species or its critical habitat. The RA must identify the adverse effects of the project on the species/critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen the effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plan. *CEAA* specifically includes within its definition of "environmental effect" any change a project may cause to a listed wildlife species (*i.e.*, listed under *SARA*), its critical habitat (*i.e.*, the habitat that is necessary for the survival or recovery of a listed species and that is identified in the recovery strategy or action plan for the species) or the residences of individuals of that species (*i.e.*, a dwelling place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating).

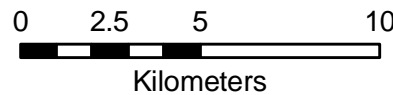


# MacLeod Settlement Sand Pit

**Figure 3**  
**Significant Habitat**

## Legend

- ★ Project Location
- Land
- Waterbody
- Significant Habitat**
  - Deer Wintering
  - Freshwater
  - Migratory Bird
  - Of Concern
  - Old Forest
  - Other Habitat
  - Rare Plant
  - Species At Risk
  - Wetland



Map Parameters  
Projection: UTM-NAD83-Z20  
Scale 1:6000  
Date: July 16th, 2007  
Project No.: SD19677.



## 4.0 PUBLIC INVOLVEMENT

### 4.1 Methods of Involvement

On October 11 and 16, 2006, a Project Information Sheet (Appendix C) was delivered to mailboxes in the following locations:

- residents of MacLeod Settlement; and
- along the following proposed most likely trucking route to Highway 105:
  - MacLeod Settlement Road from MacLeod Settlement to Bornish Road;
  - Bornish Road from MacLeod Settlement Road to River Denys Mountain Road; and
  - River Denys Mountain Road from Bornish Road to Highway No. 105.

The purpose of the information sheet was to advise local residents and businesses immediately adjacent to the Project area (*i.e.*, those who are potentially most affected) and provide them with an opportunity to comment on the proposed undertaking. A letter was posted on October 11, 2006 to the Union of Nova Scotia Indians (Appendix C), to encourage the submission of comments, concerns and questions of First Nations people in the area regarding the Project. This consultation effort assists with issues scoping and development of appropriate mitigation for potential adverse effects. To date, there has been no response from the Union of Nova Scotia Indians.

### 4.2 Stakeholder Comments and Steps Taken to Address Issues

Table 4.1 summarizes the comments received and issues raised as a result of an information bulletin that was distributed to residents within the immediate vicinity of the proposed Project. Table 4.1 lists comments received and the Proponent's response/proposed resolution to each issue raised.

**TABLE 4.1 Summary of Comments and Concerns Raised by Stakeholders**

<b>Raised by:</b>	<b>Issue/Concern</b>	<b>Response/Proposed Resolution</b>
Local Resident	Worried about the effect the quarry may have on salmon which runs in the Southwest Mabou River.	Based on the results of the fish and fish habitat assessment and the buffer zone of at least 30 m that will be maintained between pit activities and the watercourse, there is limited potential for pit activities to interact with fish and fish habitat. With the use of properly sized flow retention/ siltation treatment measures and compliance with the Pit and Quarry Guidelines, effects on fish habitat will be negligible (refer to Section 5.4.2).
	Has noted turtles twice in the last seven years, on the other side of the hill and is concerned how the pit may affect their habitat.	The Wood Turtle is the only turtle species known to have naturally occurring populations on Cape Breton Island and therefore it is assumed that this is the type of turtle identified by the resident. However, the location described is on the other side of a hill from the proposed Project and in addition, no Wood Turtles or evidence of their presence was noted from the Project site during the ecological surveys. Significant Project-related effects on wood turtles are not likely to occur (refer to Section 5.5.2).

**TABLE 4.1 Summary of Comments and Concerns Raised by Stakeholders**

<b>Raised by:</b>	<b>Issue/Concern</b>	<b>Response/Proposed Resolution</b>
	Noted that he and others in the nearby community are concerned about truck traffic on the poor roads being proposed for trucking the sand from the pit and suggested using the back route over the mountain where there are no houses.	The route currently proposed as the most likely route for the trucking is the back route over the mountain referred to by the local resident. To address the poor conditions of the road, upgrades will be required by TPW (refer to Section 5.9.2).
	The resident is a farrier who boards horses approximately 2 km from the site and ½ km off the road. He is worried that large amounts of trucking will bother his horses.	It is estimated that the trucking from the pit will be less than one truck per hour with an average number of return trips for trucks at the site to be between 8 and 10 (refer to Section 5.9.2). With this low volume of trucking coupled with the fact that the resident's barn is located approximately ½ km off the road and 2 km from the main proposed truck route, it is unlikely that the slight increase in traffic on the road will adversely affect the horses.
	Worried about the possibility of the release of contaminants into the environment.	No storage of bulk chemicals will be undertaken at the pit site and fueling requirements will be undertaken with procedures to comply with the Nova Scotia Pit and Quarry Guidelines (refer to Section 2.5.3).

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## 5.0 VALUED ENVIRONMENTAL/SOCIO-ECONOMIC COMPONENTS (VEC/VSC) AND EFFECTS MANAGEMENT

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### 5.1 Methodology

Ecological field studies were conducted by Jacques Whitford on June 23, September 16 and October 5, 2005 to July 4, 2007 to investigate the existing conditions and to determine appropriate mitigation, if necessary, to minimize environmental effects from the proposed Project. These surveys were undertaken by qualified terrestrial and aquatic ecologists employed by Jacques Whitford and consisted of: vegetation survey; breeding bird survey; mammal survey; herpetile, fish and fish habitat survey as well as follow-up surveys for wood turtle and Goshawk. A windshield survey of potential water wells in the vicinity of the Project was undertaken by a qualified hydrogeologist employed by Jacques Whitford. An assessment of potential archaeological and heritage resources was undertaken by a qualified archaeologist. A reconnaissance survey of road conditions was also conducted by a qualified transportation engineer. Additional information, in support of the field studies and the assessment, was gathered through a review of: air photos; site mapping; and other information sources, such as the Nova Scotia Museum, Statistics Canada, the Nova Scotia Department of Transportation and Public Works, and the Nova Scotia Department of Natural Resources.

Temporal and spatial boundaries encompass those periods and areas within which the VECs and VSCs are likely to interact with, or be influenced by, the Project. Both the temporal and spatial boundaries for the assessment vary according to the VEC. Temporal boundaries are generally limited to the duration of, and for a period of time after, the Project activities. Spatial boundaries are generally limited to the immediate Project area unless otherwise noted.

To assess the potential environmental effects of a Project and determine the significance of an effect, it is important to consider the magnitude, frequency, duration, geographical extent and reversibility of the potential effect. The study team has considered these elements for each VEC/VSC.

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### 5.2 Groundwater Resources

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#### 5.2.1 Description of the Existing Environment

Groundwater, an integral component of the hydrologic cycle, originates from percolation of rain, snowmelt, or surface water into the ground. This infiltrating water fills voids between individual grains in unconsolidated materials and fills fractures developed in consolidated materials. The upper surface of the saturated zone is called the water table. The water table intersects the surface at springs, lakes and streams where interaction between the groundwater and the surface water environment can occur. Groundwater flows through soil and bedrock from areas of high elevation (recharge areas) to areas of low elevation (discharge areas) where it exits the sub-surface as springs, streams, and lakes. There is a dynamic interaction between groundwater resources and surface water resources in Nova Scotia. Groundwater generally sustains the base flow of springs, streams and wetlands during dry periods of the year. More rarely, surface water bodies can contribute to groundwater storage under specific hydrogeological conditions.

Groundwater yield to dug or drilled wells can vary greatly, depending on the hydraulic properties of overburden or bedrock aquifers. An aquifer is a formation or group of formations that can store or yield useable volumes of groundwater to wells or springs. Natural groundwater quality is directly influenced by the geochemical composition of the aquifer materials through which it passes, and the time the water resides within that material.

The groundwater resource is a VEC because it provides potable water supply to approximately half of the total population of Nova Scotia, and to almost all of the unserved rural residences.

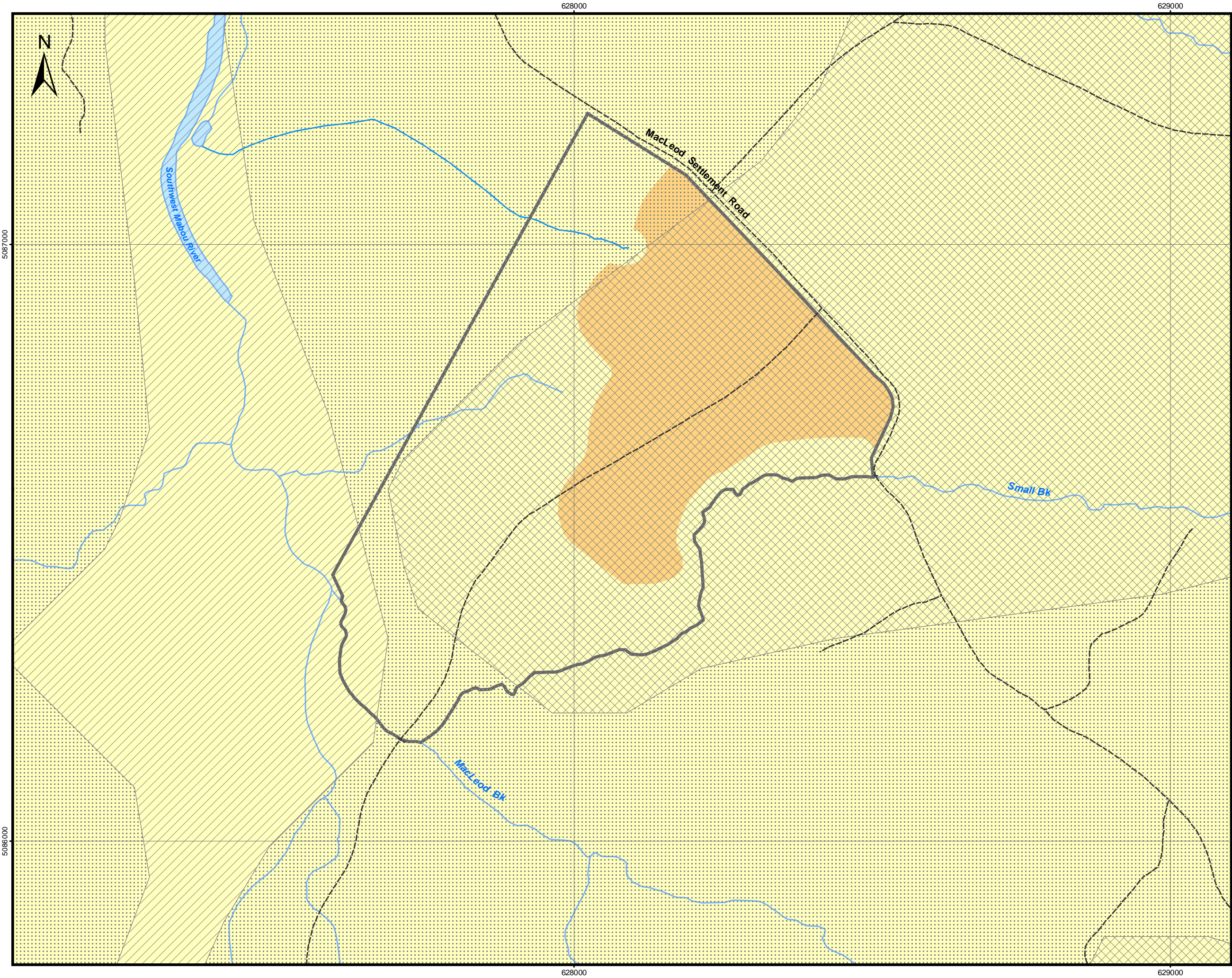
Spatial boundaries for the assessment of groundwater resources are based on a combination of aquifer hydraulic properties, expected groundwater flow directions, and the distance between the proposed sand and gravel pit and wells that may be affected by pit activities. For example, the area of influence or capture area of a typical low yield domestic water well is usually less than about 100 m, and generally in a direction located hydraulically up-gradient of the well. Project related contamination (*e.g.*, accidental petroleum hydrocarbon spills from machinery) within this capture area could potentially affect well water quality. Vibration damage to a drilled or dug well is generally a function of distance between the energy source and the well, and seismic properties of the aquifer materials. However, the proposed area will be operated as a pit and not a quarry, and therefore no explosives will be used. Vibrations occurring on the site from excavation machinery are expected to be minimal. Further, any dewatering activities within the proposed pit are expected to only drop the water table in the immediate area of the pit.

Based on experience, the risk from major dewatering is considered to be greatest within 50 m, moderate from 50 to 200 m, and expected to be minimal beyond about 200 m from the pit. Effects of water table lowering are considered for wells, particularly dug wells, streams and wetlands, to be limited to within 200 m. Potential effects of accidental spills within the pit are considered for all wells within 400 m hydraulically down gradient of the proposed pit; however larger spills could extend to a greater distance.

The following discussion of the local groundwater resources and hydrogeology is based on a desktop study and a “windshield” reconnaissance survey of the immediate area, but does not include any water well or groundwater sampling and analysis, or groundwater depth measurements at specific wells.

The Project area is irregularly shaped, and is approximately 675 m long (north/south) and 500 m wide (east/west) at its longest points (Figure 2). The topography of the Project area is dominated by a northeasterly trending ridge that crosses the southeastern half of the site. The topography slopes away from this ridge, and elevations on the site range from approximately 122 to 147 m above sea level.

The surficial geology in the vicinity of the site consists of two lithologic types: 1) a poorly to well bedded gravel, sand and silt diamicton layers, that forms a series of kame fields and esker systems in the southeastern corner of the site; and 2) silty glacial till containing clasts from local and distant bedrock sources in the northwestern corner of the site (Stea *et. al.*, 1992). The bedrock underlying the site consists of fluvial-alluvial sandstone and conglomerate of the Mississippian aged Creignish Formation of the Horton Group (Keppie 2000) (Figure 4).



# MacLeod Settlement Sand Pit

Figure 4  
Surficial and  
Bedrock Geology

### Legend

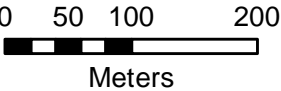
- Road
- Watercourse
- Waterbody
- Property Boundary
- Proposed Development Area

### Bedrock Geology (Formation Group)

Creignish Formation of the Horton Group  
fluvial-alluvial sandstone, conglomerate

### Surficial Geology (Unit)

- Alluvial Deposits
- Gravel, sand, mud; bedded, coarse at base, finer at top, stream channels generally gravelly sand, floodplains sand
- Glaciofluvial Deposits
- Kame Fields and Esker Systems composed of: Gravel, sand and silt, diamicton layers; poorly to well bedded, horizontal to angular beds, faulting and collapse features common
- Silty Till Plain
- Till; silty, compact material derived from both local and distant sources



Map Parameters  
Projection: UTM-NAD83-Z20  
Scale 1:6000  
Date: July 16th, 2007  
Project No.: SD19677.



The study area is situated on a ridge; therefore the site is expected to lie within a local groundwater recharge area, and an inference of the regional groundwater flow direction has been made based on topography. Due to the location of the ridge, surface water runoff (and apparent shallow groundwater flow direction) radiates outward from the ridge along an arc in a southeast, through southwest to northwest direction depending on the specific area of the site. Groundwater recharged in this area would be expected to eventually discharge into the various rivers and brooks in the vicinity of the site (*i.e.*, Southwest Mabou River, MacLeod Brook, and Small Brook).

A site reconnaissance was conducted on October 5, 2006 to determine the location of any water wells servicing residential homes located within 800 m of the Project area. It was determined that only one potential water well was located in the area (*i.e.*, ~350 m south of the Project area). The exact location of the potential well could not be located, however if present, this well is associated with a dilapidated and uninhabitable building, and therefore no groundwater is currently used from this potential well. Further, a review of available NSEL well records did not provide any information to indicate that there are wells within the area.

While there are no wells currently in use in the area, there are three small brooks located on or near the Project area. These brooks may be partially fed from groundwater springs that may occur in the valleys surrounding the site.

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#### 5.2.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

The potential environmental effects on groundwater resources from a pit operation in areas with no current water wells include groundwater level lowering, and possible water quality deterioration from accidental releases of deleterious substances such as petroleum hydrocarbons within the pit. Potential impacts at groundwater discharge points (*i.e.*, springs) are a function of distance and location of the spring with respect to groundwater flow directions.

If the pit floor elevation is extended to below the water table, there may be some localised groundwater table lowering. This is only expected to be significant up to 50 m from the Project. The degree of groundwater level decline would be proportional to distance from the edge of the excavation, decreasing exponentially with distance. Three nearby brooks to the south, west and north are located approximately 35 meters from the edge of the Project area; therefore any minor water table lowering at these locations is not expected to harmfully alter the levels of water in the brooks. Additional hydrological work will be required to support the Industrial Approval application for the Project. This would include information required so that the design of the pit can accommodate directing drainage in the same approximate proportions as under current conditions.

Changes in water quality may theoretically occur as a result of excavations in the recharge area. The main potential impact is the unexpected release of oil and lubricant compounds or other chemicals from machinery within the pit area. However, unless the spill volume is relatively large, significant impacts to potential groundwater receptors in the area (*i.e.*, brooks) are not anticipated due to natural attenuation primarily by dilution and dispersion along the groundwater pathways. In the unlikely event of a large spill and water quality deterioration, mitigation would include appropriate assessment and possible remediation or risk assessment of the source area. Large spills are not expected since volumes of potential contaminants will not be stored onsite.

In summary, due to the fact that no potable water wells are currently utilized within 800 m of the Project, no blasting on the site will be conducted and only very localized groundwater lowering effects will be experienced, significant Project-related effects on groundwater resources are not likely to occur.

### 5.3 Rare and Sensitive Flora

#### General Habitats

The site was surveyed by terrestrial ecologists on two occasions: June 23, 2005 and September 16, 2005. Vascular plant inventories of the property were compiled on each of the survey dates and a compilation of this data is included in Appendix D. The proposed Project area supports a number of habitat types as shown on Figure 5 and can be visibly seen in aerial photographs (Figure 6). The habitats on and surrounding the proposed Project area includes mature coniferous forest. Young forest, as well as upland, wetland and riparian sites.

Upland sites include:

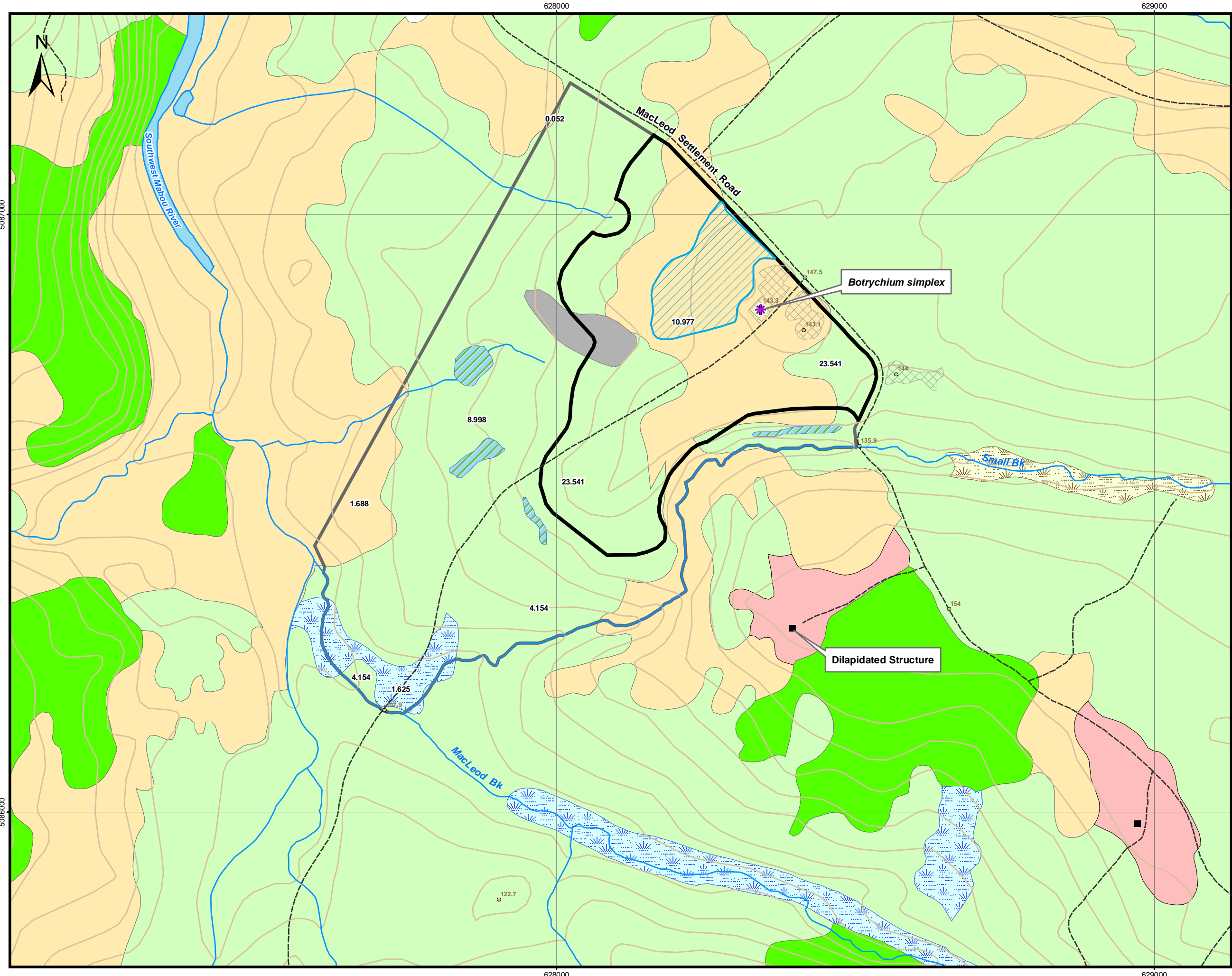
- mesic and drier mature secondary mixed wood stands on slopes, sandy uplands and lower areas;
- areas of coniferous dominated secondary forest;
- patches of younger forest;
- recent clear cuts and cut over areas with initial stump sprout regeneration of shrubs such as Possom Haw Viburnum (*Viburnum nudum*);
- open areas in various stages of development as commercial blueberry fields with blueberries, primarily *Vaccinium angustifolium* and other low shrubs such as Bracken Fern (*Pteridium aquilinum*) and some weedy species including fireweed (*Epilobium angustifolium*) (note: this area is rather sparse and may have had past herbicide applications); and
- sparsely vegetated old abandoned sand pit areas and open and weedy road verge habitat.

Wetland and riparian sites include:

- several small coniferous treed spring swamps (WL's 1, 2 and 4, with a varied mix of species (see Section 5.6 and Appendix G);
- a wetland complex (WL3) consisting of both a small head of low shrub dominated spring swamp (see Section 5.6 and Appendix G); and
- three streams as described in Section 5.4.

#### Rare Vascular Plants

A rare plant modeling exercise was performed to determine the likelihood of presence of rare or sensitive plants within the Project area. As part of the modelling exercise, all records of vascular plant species listed by the NSDNR as at risk (Red listed) or sensitive to human activities or natural events (Yellow listed) (NSDNR 2005b) within a radius of 100 km were compiled by means of an Atlantic Canada Conservation Data Center (ACCDC) data search. A total of 92 Red or Yellow-listed species have been recorded within 100 km of the Project area. Based on the results of the habitat model, 24 Red or Yellow-listed species could potentially be present in the Project area. Table 5.1 lists these species and the habitats present in the Project area where they could potentially be found.



# MacLeod Settlement Sand Pit

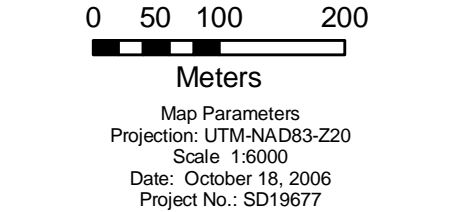
## Figure 5

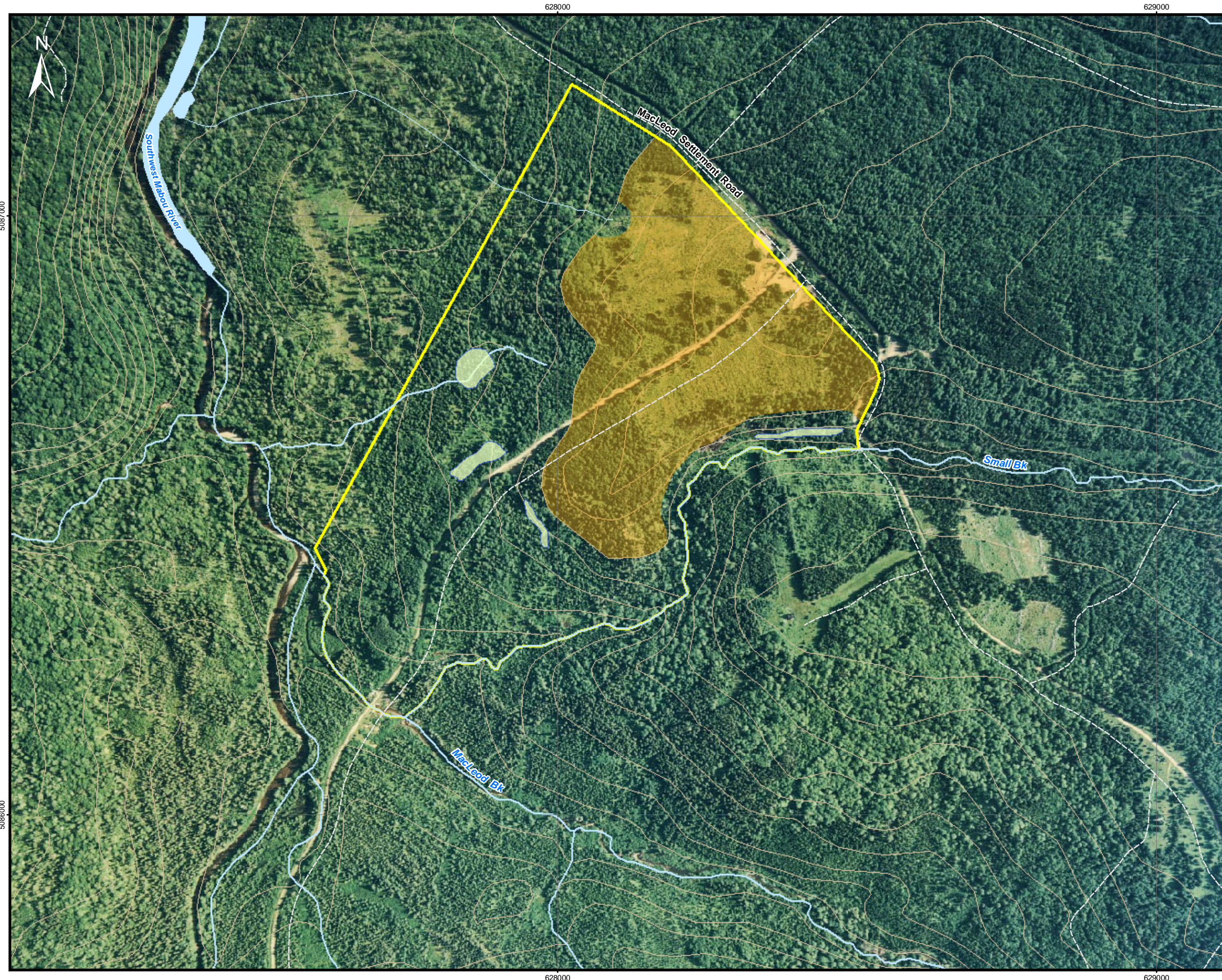
### Site Habitat and Rare Plants

#### Legend

- Building/Structure
- Spot Elevation
- Roads
- Contour (5m)
- Watercourse
- [Cross-hatch] Pit/Quarry
- [Thick black line] Proposed Development Area
- [Thin black line] Property Boundary
- [Blue hatched] JW Delineated Wetlands
- NSDNR Forestry Landcover**
  - [Light green] Softwood (> 75% Softwood)
  - [Orange] Mixedwood (25-75% Softwood)
  - [Bright green] Hardwood (< 25% Softwood)
  - [Blue with star] Open Bog (Tall Shrub Swamp)
  - [Yellow with star] Treed Bog (Shrub Fen)
  - [Light blue] Inland Water
  - [Pink] Urban Lands
  - [Grey] Clearcut
  - [Blue with diagonal] Blueberry-Field

Data Sources:  
Planimetric Data - NSGC; Nova Scotia Topographic Database, 1997, 1:10 000 (GeoNOVA)  
NSDNR Forestry Data - Nova Scotia Department of Natural Resources, Forest Inventory Mapping, 1988-2000, 1:50 000, Tile 21A12





# MacLeod Settlement Sand Pit

**Figure 6**  
**Aerial Photo**

## Legend

- Road
- Contour (5m)
- Watercourse
- Waterbody
- JW Delineated Wetlands
- Property Boundary
- Proposed Development Area

0 50 100 200  
Meters

Map Parameters  
Projection: UTM-NAD83-Z20  
Scale 1:6000  
Date: November 24, 2006  
Project No.: SD19677



TABLE 5.1 ACCDC Vascular Plants Potentially Found in Project Area

Binomial Name	Common Name	NSDNR Rank	ACCDC Rank	Preferred Habitat	Season	Likely on Site?
<i>Carex castanea</i>	Chestnut-Colored Sedge	S2	Red	Swamps and wet meadows, cliff crevices and ledges	Summer	Possible
<i>Carex hystericina</i>	Porcupine Sedge	S1S2	Red	Swamps, swales, and along brooks	May to July	Possible
<i>Comandra umbellata</i>	Umbellate Bastard Toad-Flax	S2	Red	Meadows, openings	Flowering time not given, likely summer	Possible
<i>Hypericum majus</i>	Larger Canadian St. John's Wort	S1	Red	Ponds, lakesides or other low, wet places, riparian zones	July to September	Possible
<i>Sanicula odorata</i>	Black Snake-Root	S1	Red	Mesic deciduous woodlands, north-facing bluffs, areas along woodland paths, seeps, fence rows with woody vegetation, edges of yards underneath trees, and flower gardens in shady areas	Late July to early September	Possible
<i>Alopecurus aequalis</i>	Short-Awn Foxtail	S2S3	Yellow	Wet meadows and the edges of ponds and ditches	Summer	Possible
<i>Anemone quinquefolia</i>	Wood Anemone	S2	Yellow	Wooded riverbanks and shaded intervals	Late May to early June	Possible
<i>Botrychium simplex</i>	Least Grape-Fern	S2S3	Yellow	Usually on lakeshores or the mossy edges of streams or waterfalls although it has been reported in a wide variety of habitats.	Late May and June	Possible
<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	Northern Reedgrass	S1S2	Yellow	Damp woods and shaded cliffs.	Flowering time not given, likely summer	Possible
<i>Campanula aparinoides</i>	Marsh Bellflower	S3?	Yellow	Meadows, ditches and river banks	August	Possible
<i>Cardamine parviflora</i>	Small-Flower Bitter-Cress	S2	Yellow	Shaded or exposed ledges, sandy soil and in dry woods	April to August	Possible
<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper	S2	Yellow	Calcareous rocky river banks	Flowers in June. Plant identifiable from late May to October	Possible
<i>Epilobium strictum</i>	Downy Willow-Herb	S3	Yellow	Wet meadows, boggy swales and marshes	July to September	Possible
<i>Erigeron philadelphicus</i>	Philadelphia Fleabane	S2	Yellow	Fields and open woods	May to July	Possible
<i>Fraxinus nigra</i>	Black Ash	S3	Yellow	Low ground, damp woods and swamps.	May and June. Can be identified without flowers	Possible
<i>Goodyera repens</i>	Dwarf Rattlesnake-Plantain	S2S3	Yellow	Coniferous bogs, particularly under <i>Thuja</i> , but also found in damp woods and rarely drier woods	Late July to end of August	Possible
<i>Hedeoma pulegioides</i>	American Pennyroyal	S2S3	Yellow	Dry soils	August	Possible

TABLE 5.1 ACCDC Vascular Plants Potentially Found in Project Area

Binomial Name	Common Name	NSDNR Rank	ACCDC Rank	Preferred Habitat	Season	Likely on Site?
<i>Piptatherum canadense</i>	Canada Mountain-Ricegrass	S2	Yellow	Dry, sandy, rocky woods	Flowering time not given, likely summer	Possible
<i>Polygala sanguinea</i>	Field Milkwort	S2S3	Yellow	Poor or acidic fields, damp slopes, and open woods or bush.	Late June to October	Possible
<i>Pyrola minor</i>	Lesser Wintergreen	S2	Yellow	Rare, in heather or woodland	June to August	Possible
<i>Symphyotrichum boreale</i>	Boreal American-Aster	S2?	Yellow	Gravelly soil of lake beaches, along streams, and the edges of bogs	August to September	Possible
<i>Symphyotrichum ciliolatum</i>	Lindley's Aster	S2S3	Yellow	Woodland or forest edge	August and September	Possible
<i>Viburnum edule</i>	Squashberry	S2	Yellow	In cold woods and along streams. Characteristic of climax coniferous forest.	May to early August	Possible
<i>Viola nephrophylla</i>	Northern Bog Violet	S2	Yellow	Cool mossy bogs, the borders of streams, and damp woods.	May to July	Possible
Atlantic Canada Conservation Data Centre Species Rank Definitions						
S1	Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.					
S2	Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.					
S3	Uncommon throughout its range in the province, or found only in a restricted range, even if abundant at some locations. (21 to 100 occurrences).					
S4	Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g., watch list).					
S5	Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicably under present conditions.					
S#S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes uncertainty about the exact rarity of the species (e.g., S1S2)					
S#?	Inexact or uncertain ranking.					
Nova Scotia Department of Natural Resources General Status Ranks						
Red	Known to be or thought to be at risk.					
Yellow	Sensitive to human activities or natural events.					
Green	Not believed to be sensitive, or at risk					
Source: ACCDC 2005; NSDNR 2005b						

The ACCDC listing of rare vascular flora and fauna, classed in the S1 and S2 rarity categories and in the provincial rarity classes of Blue, Red, and Yellow, known from within 100 km of the study site was evaluated. Knowledge of the habitats present on site was determined both by analysis of aerial photography topographic, and geological mapping, as well as a summer site visit in which much of the evident flora, and some of the fauna was noted. Initially the various species from a 100 km radius were classed as unlikely, possible or likely given the characteristics of the habitat. Many of the species classed as unlikely would in fact be nearly impossible to be present on the site such as those that would inhabit coastal salt marshes could be virtually eliminated from potentially occupying the site. The potential presence of other species had to be considered more carefully by assessing apparent habitats through the usage of aerial photography and some knowledge of the surficial geology.

Field reconnaissance and on site examination revealed only one of those plants from the ACCDC list of rare species deemed to have high potential to occur on the site. This rare species, Least Grape-Fern (*Botrychium simplex*) S2/S3, was identified along with some Chamomile Grape-Fern (*Botrychium matricarifolium*) S4 during the June 23, 2005 survey. The specimens were only noted in a small area of

lightly vegetated open old sand pit not far from the MacLeod Settlement Road on the north side of the access road which bisects the property as shown on Figure 5. It is characteristic of both of these species of Grape-Fern to wither and disappear above ground by mid-late summer and therefore there was no sign of either species at the site during the second survey in September. As there were Grape-Ferns of both species in both early and more mature development some confusion in separating out specimens in the field may have resulted in Chamomile Grape-Ferns having been lumped into the counts but Least Grape Ferns are recorded on the site (Figure 5). The habitat supporting the Least Grape-fern at this site appears to be the result of a relatively early state of plant succession over abandoned sand pit in an overall open area frequented by various weedy herbs like Mouse-ear Hawkweed (*Hieracium pilosella*), young Pearly Everlasting (*Anaphalis margaritacea*), White Clover (*Trifolium repens*) and scattered young spuce. During follow-up surveys at the site in July 2007, Least Grape-Ferns were positively identified in this area.

The site had a fair variety of flora, and the field reconnaissance revealed some seepage wetlands that might possibly have had either Yellow Lady's-Slipper or Showy Lady's-Slipper but either a lack of sufficiently low pH or the vagaries of dispersal apparently did not permit their presence. One Yellow Lady's-Slipper was positively identified on the property but outside of the proposed Project boundary during a follow-up survey conducted in July 2007. A notable botanical feature was the apparent absence of Violets (genus *Viola*) from all the habitats and areas surveyed with the exception of one individual of the Labrador Violet /Dog Violet group (*Viola adunca*), S5, which was detected in the non-typical habitat of the not overly moist, cleared and open area being developed for blueberry field.

All species of vascular plant encountered during the surveys were identified and their population status in Nova Scotia were determined through a review of the species status reports prepared by NSDNR (NSDNR 2005b), ACCDC (ACCDC 2005), and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2005). A list of the 210 vascular plant species found on the site during the field survey is presented in Appendix D.

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### 5.3.1 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Standard mitigative measures to minimize the environmental effects of the Project on plant communities include the use of seed mixtures free of noxious weed during site reclamation. Wherever practical, native plants should be used for site reclamation. In lieu of native species, seed mixes containing naturalized species which are well established in Nova Scotia and which are not aggressive weeds in the barrens, wetland and forest plant communities which are present in the area should be used for reclamation.

The loss of the anthropogenic habitat that supports the population of Least Grape-Fern and the Yellow Lady's-Slipper will be prevented by flagging or fencing the area to keep it separated from the pit activities such as roads, parking areas, lay down areas for any equipment and/or areas to be mined for sand or aggregate. In preserving the area, the populations should be able to persist and perhaps later be able to colonize retired sections of subsequent pit development if such retired areas (where erosion control is not an issue) are not aggressively manipulated to re-vegetate them but are allowed to re-vegetate naturally. If deemed necessary, the Proponent will further discuss mitigative measures with NSDNR.

In summary, provided mitigative measures are taken, significant Project-related effects on rare or uncommon flora are not likely to occur.

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## 5.4 Fish and Fish Habitat

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### 5.4.1 Description of the Existing Environment

#### Methodology

Identification and preliminary evaluations of the proposed watercourse crossings were based on 1:10,000 mapping and air photos. In keeping with the standard approach used in Nova Scotia, the habitat characterization of the stream was carried throughout the property boundaries of the Proponent.

Fieldwork was carried out on October 5, 2005 by two Jacques Whitford scientists. The Jacques Whitford scientists walked the length of Stream A and B and surveyed the physical and biological parameters of the watercourses immediately adjacent to the Project area (Figure 7). Assessment of aquatic habitat consisted of identifying physical units (*i.e.*, riffles, pools, and runs), instream cover, substrate composition, stream depth and width, overhead cover, water colouration, and presence of fish. Combinations of stream flow, water depth, and substrate are major determinants of the quality of fish habitat for rearing and spawning. As per convention, the left and right stream banks are determined by looking upstream (*i.e.*, while facing upstream the bank on the right is defined as the “right” bank). Stream C was not identified during the October 5, 2005 site visit. However, Jacques Whitford terrestrial biologists identified and photographed the stream during their field surveys. Assessment of the aquatic habitat of Stream C was conducted through collaboration of Jacques Whitford aquatic and terrestrial biological teams. Photographs were taken along the three streams to document habitat as presented in Appendix E.

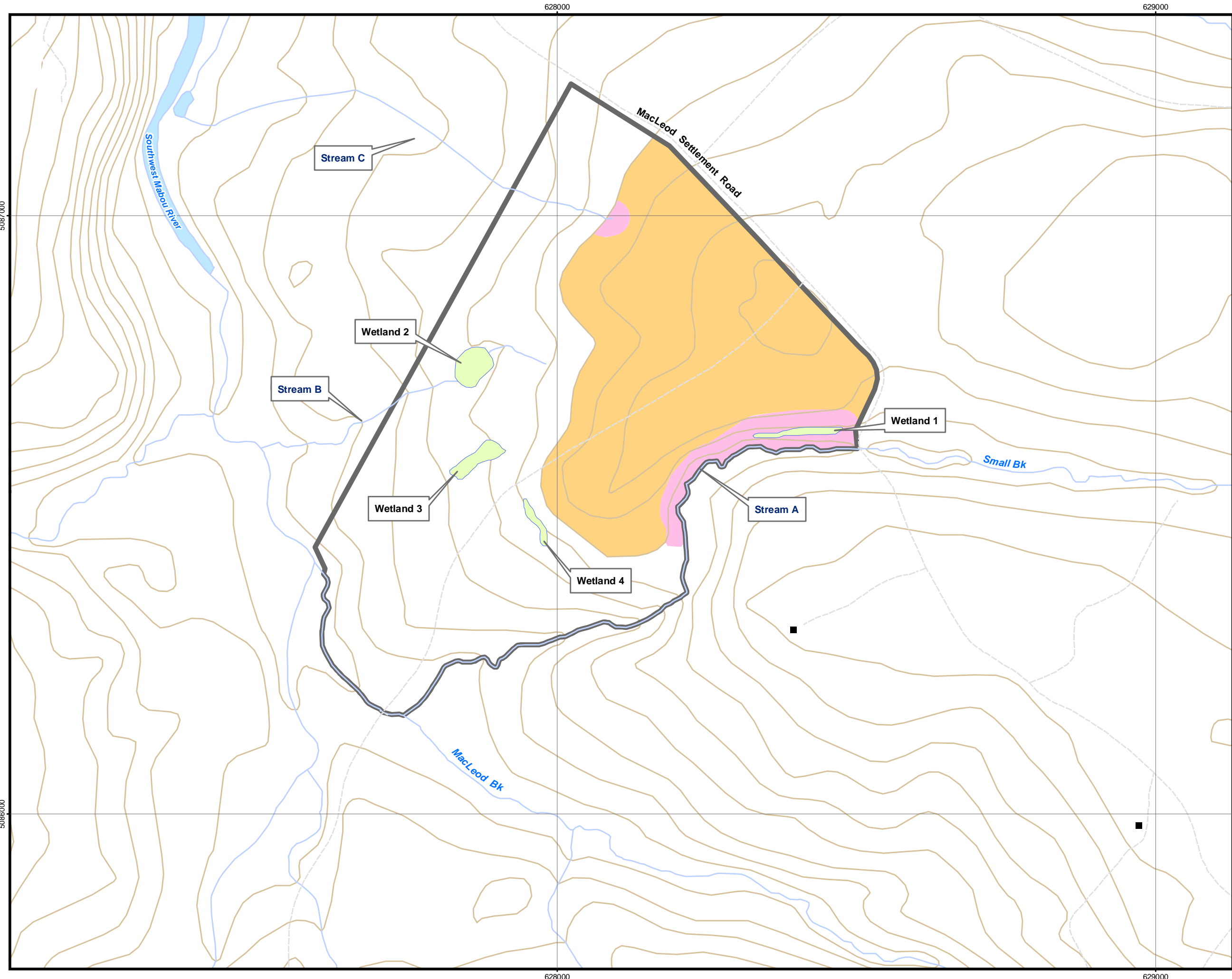
Much of the discussion of fish habitat in Nova Scotia is focused on trout and salmon, which belong to the Salmonid family. Salmonids are valued by society for their role in recreational fisheries. Further, salmonids are sensitive to anthropogenic disturbance. Consequently, their presence can be used as an indicator of environmental health and the conservation of salmonid stream habitats ensure the ecological integrity of aquatic systems, including the protection of lesser known biota. A categorical system for rating salmonid habitat is commonly employed when assessing streams. There are five categories based on substrate, water flow, and stream morphology, and are as follows:

- Type 1: Good salmonid spawning and rearing habitat;
- Type 2: Good salmonid rearing habitat with limited spawning habitat;
- Type 3: Good rearing habitat with no spawning capabilities, or used for migratory purposes;
- Type 4: Poor juvenile salmonid rearing habitat with no spawning capability; may provide shelter for older salmonids; and
- Type 5: No habitat for rearing or spawning

The habitat summary for each of the streams is presented below, with the salmonid habitat rating.

#### Stream A (see photographs, Appendix E)

The property mark of Stream A was a 3 m wide metal culvert with a closed bottom. Substrate composition consisted of 40% cobble, 50% gravel, and 10% sand. Bank undercutting was found to be 25% and embedment was around 30%. The banks were stable and aligned with grasses, raspberry bushes, and alders. Channel width was 4 m with a wet width of 1.5 m. Pools were amidst runs and were 30 cm deep. Heading downstream from the point of origin, the stream was impacted by a blowover causing high instream cover. A fast moving riffle was located 30 m downstream with substrate composition as 60% cobble, 30% clay, and 10% gravel. A large deep pool was located 50 m downstream with an average depth of 50 cm and width of 200 cm.



# MacLeod Settlement Sand Pit

**Figure 7**  
**Wetland & Stream Location**

## Legend

- Building/Structure
- Road
- Contour (5m)
- Watercourse
- Waterbody
- JW Delineated Wetlands
- Property Boundary
- Proposed Development Area
- Stream Protection Buffer

0 50 100 200  
Meters

Map Parameters  
Projection: UTM-NAD83-Z20  
Scale 1:6000  
Date: July 16th, 2007  
Project No.: SD19677



Further downstream, mixed wood forest aligned the stream with woody debris and logs in the stream. Substrate composition continued as mostly cobble with some sand in pools and flats. Small feeder channels were observed along the stream as it winded down with riffles and flats. Log debris was continuous throughout. At 170 m downstream, the channel meandered into a low lying marshy area. Goldenrods and young grasses aligned the left bank, and young grasses, alders, and black spruce trees aligned the right bank. Substrate continued as cobble with some sand. Overhead cover was 0%. Large woody debris was observed in the channel. Further downstream, the channel split and rejoined with riffle and flats. Tall alders, goldenrods, berry bushes, and dead spruce aligned the left bank, while long grasses, dead spruce, and algae covered cobble aligned the right bank.

At 200 m downstream from the point of origin, the stream flowed over a narrow cascade and later turned into a series of alternative riffles and runs. At 220 m, the channel flowed through a wetland-type habitat and split into 3 channels. Long grasses, cattails, sedges, and herbs were the primary vegetation types, and bottom substrate consisted of algae and organic debris in a wet mud mixture. The left bank area was on higher ground and consisted of boulders and rocks. At 250 m downstream, a log jam was observed but water was moving well under the logs. The wetland/rocky area ended and the stream became a small waterfall 1 m in height over boulders. The left bank consisted of a 5% slope with young spruce, and the right bank consisted of young maple and spruce trees with a 20% slope. Fish passage was possible through a side channel adjacent to the main stream.

Further downstream, the stream cascaded over step-like bedrock with a gravely pool. Runs and cascades continued downstream with riffles intermittent. Evergreens and maples aligned both banks and formed an overhead cover of 60%. Lichens were observed on trees and ferns were observed at the bases. Channel width narrowed to 2 m with wet width at 1 m. Along the upstream sections of the channel, brook trout (*Salvelinus fontinalis*) were observed. This stream can be categorized as a Type 2 stream with good salmonid rearing habitat and limited spawning habitat.

### **Stream B (see photographs, Appendix E)**

Stream B began as a narrow channel with intermittent flow above ground and underground. Instream cover was approximately 50% and bottom substrate was sand and organic. Mature spruce aligned the left bank and goldenrods aligned the right bank. Overhead cover was approximately 50% and animal tracks were apparent along the edge of the stream. At 100 m downstream from the point of origin, the overhead cover was 90% and the forest was thick with aspens and alders on both banks. The channel was wet with poorly defined physical units as very little water was apparent. Bottom substrate remained sandy and organic. Further downstream, the flow emerged and appeared semi-continuous. The stream bent and narrowed and was covered with woody debris. The channel was not well defined as it ran through mosses and grasses. Pine and spruce trees aligned both banks and varying hare tracks were observed along the stream's edge.

At 150 m downstream, several pools emerged amongst the undefined channel and a continuous flow did not emerge until 210 m. Channel width was 1 m with wet width at 0.4 m. A series of shallow riffles and runs with very low flow continued downstream. Rock and sand were the primary bottom substrate with goldenrods, ferns, grasses, birch, and aspens along both banks of the stream. Stream B is categorized as a Type 5 stream with no rearing or spawning habitat prevalent for salmonids.

### Stream C (see photographs, Appendix E)

A third stream was identified during the vegetation surveys at the north end of the property (see Figure 7). This stream is a small, first order watercourse and is generated from numerous seepage areas along the moderately steep slope in the northeast part of the property. The stream is likely ephemeral, drying up during the summer months. The stream drains into the South Mabou River.

The stream averaged 50 cm or less in width and the depth was generally 10 cm or less though some deeper small pools were present. The stream gradient was generally steep and flow was rapid along the upper slope portion but slowed where the slope gentled into a semi-terrace effect. Several reaches of the stream were subterranean. The bottom substrate of the stream along the upper slope and in faster portions was fine sand with some small gravel and larger embedded rocks. In the stream's passage over the flatter semi-terraced portions of the gradient the stream had areas of mucky or peat bottom. At the property boundary the stream channel was poorly defined and water was observed pooled in wheel ruts along an existing cut-line. The stream was set amid a mixed wood forest with generally at least 60% overhead cover.

While not classifiable as good salmonid habitat, this small waterway is able to be traversed by fish as evidenced by a single small brook trout (*Salvelinus fontinalis*) that was noted in the stream on the property above several below ground reaches downstream. Nonetheless, this stream is rated as a Type 5 due to the lack of suitable salmonid spawning and rearing habitat and is only marginal habitat for older juveniles and adults.

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#### 5.4.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

The Proponent will maintain at least a 30 m vegetative buffer between all three watercourses and pit activities. This will minimize the potential for environmental effects of the pit operation on fish and fish habitat.

Clearing, grubbing, and topsoil stripping activities can increase the potential for sediment erosion and deposition downgradient, particularly during periods of heavy rainfall or snow melt. These activities will also result in a reduction of evapotranspiration and a corresponding increase in surface runoff, which in turn increases potential for sediment erosion and deposition. Placement of free-draining material over the disturbed areas and the use of properly sized flow retention structures is expected to mitigate erosion and sedimentation effects. As the pit develops, exposed soil capable of producing sediment laden-runoff will be stabilized and stockpiles of topsoil and overburden will be stabilized with hydroseed for future use during rehabilitation (see Section 2.5.2). Surface runoff will be directed to the wash water / settling pond. Overflow from the final settling pond will be monitored and sampled in accordance with an Industrial Approval for the Project and the Pit and Quarry Guidelines to ensure suspended solids levels do not exceed the approved final effluent discharge limits.

Excavation activities adjacent to watercourses can cause direct deleterious effects on fish health, death or damage to fish eggs and larvae, excessive sediment deposited in streams, disturbance to the habitat, and introduction of acidic drainage if the area contains sulphide mineralization. The buffer zone that will be maintained between pit activities and the watercourse will minimize the potential physical effects of erosion (Figure 7).

Based on the results of the fish and fish habitat assessment and the buffer zone of at least 30 m that will be maintained between pit activities and the three watercourses surrounding the Project area, there is limited potential for pit activities to interact with fish and fish habitat. A monitoring program will be developed in consultation with applicable regulators to determine the potential for affecting base flows. In addition, development of an adaptive management strategy will be undertaken in the event that changes are detected. With the use of properly sized flow retention/siltation treatment measures and compliance with the existing Approval and the Pit and Quarry Guidelines, effects on fish habitat will be negligible.

In summary, significant Project-related effects on fish and fish habitat are not likely to occur.

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## 5.5 Wildlife

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### 5.5.1 Description of the Existing Environment

#### **Birds**

Information regarding usage of the study area by birds was derived from two sources, a review of the Atlas of Breeding Birds of the Maritime Provinces (Erskine 1992) and a breeding bird survey conducted in the study area. A review of the breeding bird atlas data revealed that the study area is located within a secondary atlas square for which very little data had been collected. Only one species had been recorded for the 10 km X 10 km atlas square within which the study area is located (see Appendix F). As such, the primary source of information regarding use of the study area by birds was the breeding bird survey conducted in the study area on June 23, 2005 by Mr. Michael Crowell. The survey was conducted between 06:00 and 12:00. Additional bird observations were recorded during the wetland and vegetation surveys conducted on September 16, 2005. The breeding bird survey was conducted using the methods employed in the Atlas of Breeding Birds of the Maritime Provinces (Erskine 1992). All birds observed or heard within and adjacent to the study area were recorded. Data recorded included the number of each species encountered, in each habitat type in the study area and the breeding status of each bird recorded. The breeding status of each species was determined using the criteria used in the atlas of Breeding Birds of the Maritime Provinces (Erskine 1992). Birds observed or heard singing in suitable breeding habitat were classed as “possible” breeders. “Probable” breeders were those birds that exhibited any of the following: courtship behaviour between a male and female; birds visiting a probable nest site; birds displaying agitated behaviour; and/or male and female observed together in suitable nesting habitat. Birds were classed as “confirmed” breeders if they exhibited any of the following: nest building or adults carrying nesting materials; distraction display or injury feigning; recently fledged young; occupied nest located; and/or adult observed carrying food or fecal sac for young.

The population status of each bird species recorded in the study area was determined through a review of the General Status Ranks of Wild Species in Nova Scotia (NSDNR 2002), Species at Risk in Nova Scotia (NSDNR 2005), the ACCDC general status ranks for Nova Scotia (2005), and species listed under the *Species at Risk Act* (SARA 2005).

Bald Eagle (*Haliaeetus leucocephalus*) was the only species recorded in the atlas square within which the study area is located. Bald Eagles are fairly common in Cape Breton but are sensitive to activities around their nest sites. NSDNR has developed guidelines to minimize the adverse effects of human

activities such as forestry and agricultural practices on nesting Bald Eagles. This species was confirmed as nesting in the atlas square; however, no Bald Eagles were observed during any of the site visits or during the breeding bird survey suggesting that the nest was not located within or near the study area.

A total of 41 bird species were observed during the field surveys (see Appendix F). One species recorded during the field survey, Northern Goshawk (*Accipiter gentiles*), is listed as an uncommon breeding bird in Nova Scotia (S3B) by ACCDC and is Yellow listed by NSDNR indicating that it is sensitive to anthropogenic activities and natural events. Northern Goshawks are threatened by disturbance during the nesting season and loss of suitable forest nesting habitat. Northern Goshawks typically nest in mature hardwood or mixedwood forests remote from human activity. One Northern Goshawk was observed during the breeding bird survey. The bird was not agitated and did not display any other evidence to indicate that an active nest was nearby. The habitat to which the bird was flying would provide suitable nesting habitat.

As a follow-up, Jacques Whitford biologists visited the site on July 4, 2007 to conduct dedicated surveys for Goshawk nests on the site. The survey was conducted in July as this is the time of year when young would be present in the nest and the adults would be most aggressive and vocal, thereby being easier to detect. Goshawk call playbacks were used at the time of the survey. No Goshawk and/or nests were observed (visually or vocally) at the site, however the biologists did observe a Goshawk approximately 2 km from the site as they were leaving. An active nest may be present in the general area, however, it is unlikely that it is located in the Project area.

## Mammals

Information regarding the presence of rare mammals and sensitive mammal habitat within the study area was derived from field surveys and a review of Nova Scotia significant habitat mapping data base (NSDNR 2005). Field surveys for mammals were conducted concurrently with vegetation and breeding bird surveys on June 23, 2005 and September 16, 2005. The field surveys provide a good indication of the presence of large mammal species in the study area. Knowledge of the distribution of small mammals in the study area is limited by their secretive nature and the fact that they do not produce spoor that is easily noticed. Fortunately, many small, rare mammals have very specific habitat requirements, which can be used to predict areas where they are likely to be found.

The study area is characterized by moderate habitat diversity of upland habitats. Remnants of mature secondary softwood forest and mature secondary mixedwood forest are found in the Project area along with small patches of immature softwood and mixedwood forest which are found scattered around the property. Clear cut areas and open areas such as commercial blueberry field, an inactive sand pit and road side verge habitat are also present. In addition, as noted in Section 5.6 and Appendix G, four small wetlands are present in the area surrounding the Project.

The species recorded in the study area are generally typical of woodland habitats. Evidence of species recorded during the field surveys included American Black Bear (*Ursus americanus*), Beaver (*Castor canadensis*), Coyote (*Canis latrans*), White-tailed Deer (*Odocoileus virginianus*), Varying Hare (*Lepus americanus*), American Red Squirrel (*Tamiasciurus hudsonicus*), Red-backed Vole (*Clethrionomys gapperi*) and Woodland Jumping Mouse (*Zapus hudsonius*).

A review of the NSDNR significant habitat mapping database (NSDNR 2005c) indicated the presence of deer wintering areas approximately 4 km to the west and southwest of the Project area (Figure 3) but not in the immediate Project area. Moose are present in the general area; however, no evidence of moose was found during the site visits. The mainland moose population (*Alces alces* ssp. *americana*) is protected under the Nova Scotia *Endangered Species Act*. However, the moose present in Cape Breton are *Alces alces* ssp. *andersoni* which were introduced to Cape Breton from Alberta after the extirpation of moose on Cape Breton in the early twentieth century. Moose are abundant in the highlands of Cape Breton and support aboriginal subsistence hunting and a limited sport hunt.

American marten (*Martes Americana*) (Red-listed by NSDNR) were determined to be present within 100 km of the Project site (based on ACCDC data). This species is restricted to the Cape Breton Highlands and is therefore not expected to occur at the site. In addition, American marten prefer climax forest habitat and the vegetation at the proposed Project site is less than 30 years old; therefore the species is not expected to occur in the Project area.

Canada lynx (*Lynx Canadensis*) (Red-listed by NSDNR) was also determined to be present within 100 km of the Project site. Lynx are known to occur primarily in the Cape Breton Highlands but there have been lynx sightings and records near the proposed Project area. However, these occurrences were noted in the River Denys Mountain area, MacIntyre Mountain area, and Glenora area (Anderson, D., NSDNR, July 2007, personal communication), which are all at least 10 to 15 km from the site. The site does fall within the proposed Lynx breeding range mapping as proposed by the Lynx recovery team (in progress) (Anderson, D., NSDNR, July 2007, personal communication); however, it is unlikely that the Project will have any effect on the lynx given the small footprint and nature of the Project.

## Herpetiles

Information regarding amphibians and reptiles and their habitat within the study area was also derived during the field surveys. Field surveys were conducted concurrently with vegetation and bird surveys in the summer of 2005. The following seven herpetile species were encountered during the surveys:

- Reptiles:
  - Maritime Garter Snake (*Thamnophis sirtalis pallidula*)
- Amphibians:
  - Northern Green Frogs (*Rana clamitans melanota*)
  - Wood Frog (*Rana sylvatica*)
  - Northern Spring Peeper (*Pseudacris crucifer crucifer*)
  - Yellow-spotted Salamander (*Ambystoma maculatum*)
  - Red-backed Salamander (*Plethodon cinereus*)

A number of other common Nova Scotian herpetile species, primarily a few species of snakes and frogs are likely residents or transients in habitats present on the site but were not encountered.

As part of the collection of stakeholder comments (see Section 4.2), a local resident has reported the presence of turtles in the general vicinity of the study area. Turtles were observed on two occasions over the past seven years. It is believed that the turtles were observed along the Southwest Mabou River. Since the Wood Turtle (*Glyptemys insculpta*) is the only turtle species known to have naturally occurring populations on Cape Breton Island, it is assumed that this was the species observed. A population of Wood Turtles has been long known from the River Inhabitants and its watershed (Gilhen

1984). More recently a Wood Turtle population has been recorded from the River Denys (Graf, Gilhen and Adams 2003). Wood turtles are listed as a species of Special Concern under SARA and are listed as Vulnerable under the Nova Scotia *Endangered Species Act*.

No Wood Turtles or evidence of their presence was noted from the study area during the initial site surveys. On July 4, 2007, a follow-up survey was conducted for wood turtles, hibernacula or evidence of presence/nesting. The survey was conducted by Jacques Whitford herpetologist Michael Macdonald. The survey yielded no evidence of wood turtles or wood turtle habitat, such as deep pools and sand beaches, turtle shells, turtle eggs shells, diggings or tracks.

Though MacLeod Brook and the nearby Southwest Mabou River are in a different watershed than the River Denys, the possibility of Wood Turtles being present in the Southwest Mabou River cannot be discounted and sightings of turtles twice in the past seven years suggest that a Wood Turtle population may well occur in the area. If present in the area, Wood Turtles would be expected to utilize the Southwest Mabou River as core habitat. The best potential for true core nesting and hibernaculæ sites would undoubtedly be found somewhere along the Southwest Mabou River, which is outside of the Project property boundaries and beyond the study area. MacLeod Brook near the property boundary and the small brooks and smaller streamlets that occur in or along the property have no core hibernation or nesting sites for Wood Turtles along them. Given the lack of suitable habitat, it is unlikely that wood turtles would wander through the area surrounding the Project site.

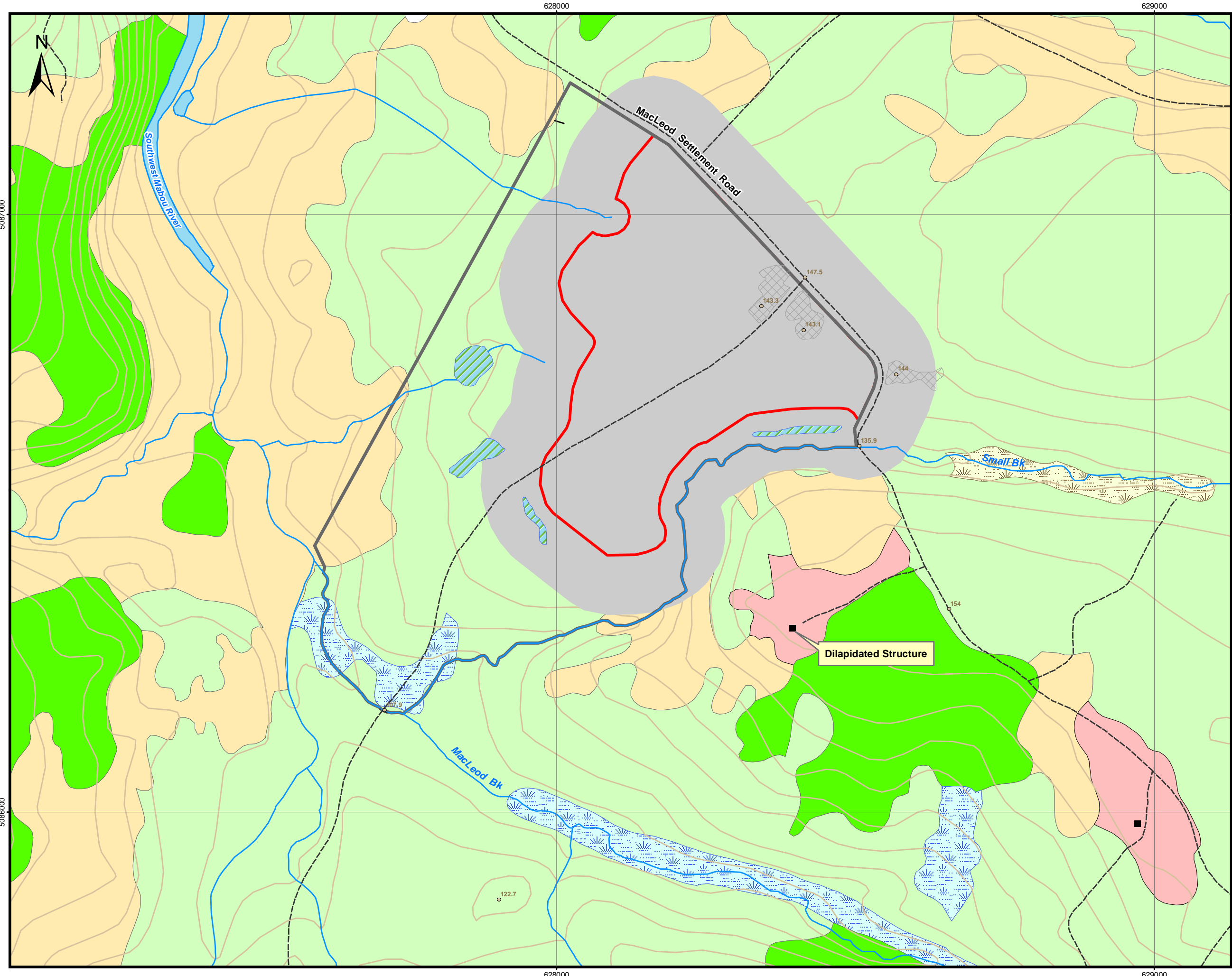
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#### 5.5.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

None of the bird species potentially found in the Project area are listed under the NS *Endangered Species Act*, considered to be rare in Nova Scotia (Erskine 1992). The Northern Goshawk is considered to be particularly sensitive to anthropogenic activities, however, there was no indication of breeding. Migratory birds are protected under the Migratory Birds Convention Act. It is illegal to kill migratory bird species not listed as game birds or destroy their eggs or young. Other bird species not protected under the federal act such as raptors are protected under the provincial *Wildlife Act*. In order to avoid contravening these regulations, clearing and grubbing of areas to be used as part of the pit will be conducted outside of the breeding season for most bird species (April 1 to August 1) so that the eggs and flightless young of birds are not inadvertently destroyed.

Forest interior birds are particularly sensitive to habitat loss since they are affected both by direct habitat loss and through the adverse effects of habitat edge. The most valuable forest interior habitat consists of mature forest situated at least 100 m away from an edge. The amount of forest interior habitat in the proposed Project area was determined by establishing 100 m buffers around edge producing features such as the existing pit, heavily disturbed non-forested habitat, woods roads and recent clear-cuts. Areas remaining after buffering these features were classed as forest interior habitat (all remaining forest habitat regardless of age class) and high quality forest interior habitat (all remaining mature forest habitat). As shown on Figure 8, no forest interior habitat or high quality forest interior habitat is present in the proposed Project area. The lack of forest interior habitat present in the quarry expansion area is largely attributable to the presence of recent clear-cuts in the center of the property and proximity to the main road and access road.

The critical area for deer wintering will not be affected since known deer wintering habitat is outside the Project area and the facility will be operating on a schedule between April and December.



# MacLeod Settlement Sand Pit

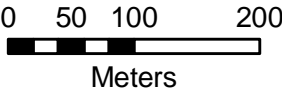
**Figure 8**  
**Distribution of Forest Interior Habitat**

**Legend**

- Proposed Development Area
- Property Boundary
- Building/Structure
- Spot Elevation
- Roads
- Watercourse
- Contour (5m)
- Pit/Quarry
- Edge Affected Areas
- JW Delineated Wetlands

**NSDNR Forestry Landcover**

- Softwood (> 75% Softwood)
- Mixedwood (25-75% Softwood)
- Hardwood (< 25% Softwood)
- Open Bog (Tall Shrub Swamp)
- Treed Bog (Shrub Fen)
- Inland Water
- Urban Lands



Map Parameters  
Projection: UTM-NAD83-Z20  
Scale 1:6000  
Date: August 13th, 2007  
Project No.: SD19677.



No critical herpetile habitats are known to exist in the study area. The species recorded in the study area are generally typical of woodland habitats. The field survey and a review of existing records (NSDNR 2005b) did not reveal the presence of any rare mammal or herpetile species in the vicinity of the study area. The habitats present in the study area are commonly encountered throughout the province and are unlikely to provide habitat for rare small mammal species.

In the remote chance that wood turtles are found foraging, prospecting for nest sites or nesting in the Project area during development of the pit, a plan to limit any potential adult mortality of Wood Turtles from the pit operations would be implemented in consultation with NSDNR. Such a plan could include provision of suitable literature to inform workers of the presence of Wood Turtles and the need to prevent Wood Turtle mortality or the removal of Wood Turtles from the area. As well, if Wood Turtles were actually detected from within the Project site, the use of geo-textile fencing to exclude any Wood Turtles from dangerous areas of pit operations while allowing access to any safe created open sites with nesting potential could be initiated.

In summary, assuming recommended mitigative measures are applied (e.g., clearing outside bird breeding season, implementing turtle protection measures (if necessary)), significant Project-related effects on wildlife are not likely to occur.

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## 5.6 Wetlands

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### 5.6.1 Description of the Existing Environment

Four wetlands were found in the property boundaries of the MacLeod Settlement Sand Pit, but none that are located directly in the proposed pit footprint (see Figure 7). Wetlands 1 and 2 are located immediately adjacent to the borders of the proposed pit area and are described below. Appendix G provides a description of Wetlands 3 and 4.

#### **Wetland 1**

Wetland 1 is a 0.146 ha coniferous treed spring swamp located near the eastern corner of the property. The wetland is situated on a till bench located on a steep slope. A series of groundwater seeps emerge from the hillside and coalesce into a small wetland that occupies much of the till bench. The bench has probably developed as a result of slumping of the slope caused by the groundwater seepage. Similar smaller scale seeps are present on middle slopes at various locations on the property. The seeps may occur in areas where overlying sandy till contacts an underlying less permeable till layer which acts as a conduit for groundwater.

The vegetation of the wetland is characterized by a relatively open tree canopy dominated by black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), and red maple (*Acer rubrum*). The shrub layer is sparse and composed of black spruce saplings, silky dogwood (*Cornus sericea*), swamp red currant (*Ribes triste*), bristly black currant (*Ribes lacustre*), and mountain maple (*Acer spicatum*). Groundcover consists of a variety of species, the most abundant of which are cinnamon fern (*Osmunda cinnamomea*), little prickly sedge (*Carex echinata*), blue-joint reedgrass (*Calamagrostis canadensis*), lady-fern (*Athyrium filix-femina*), and three-seed sedge (*Carex trisperma*).

A vegetation survey was conducted in the wetland that revealed the presence of 57 species of vascular plant. The wetland is characterized by fairly high plant species richness in relation to the size of the wetland. This is probably attributable to the relatively high fertility of this wetland and the interspersed of wetland and upland plant communities. The more fertile conditions are probably attributable to inputs of mineral enriched groundwater at the seeps. None of the species encountered is considered to be rare nationally (COSEWIC 2005) or provincially (ACCDC 2005; NSDNR 2002).

Wildlife observations made in the wetland revealed the presence of two species of birds including black-capped chickadee and northern flicker. The wetland is too small to comprise the entire territory of either of these species. The wetland habitat is structurally similar to the surrounding upland habitat and a variety of upland bird species can be expected to forage in the wetland or establish their nests there. Two mammal species, varying hare and star-nosed mole were noted in the wetland. The loose damp soil of the wetland provides good habitat for star-nosed mole. Varying hare can be expected to forage in the wetland. Northern spring peeper was the only herpetile species encountered in the wetland. The wetland contains no open water habitat and does not provide breeding habitat for pool nesting amphibians. However, the wetland would provide foraging opportunities for arboreal amphibians such as northern spring peeper, wood frog, American toad, red-backed salamander, yellow-spotted salamander, and the red eft larval stage of the red-spotted newt. Snakes such as the Maritime garter snake would be expected in the wetland. None of the bird, mammal or herpetile species encountered in the wetland is considered to be rare or sensitive nationally (COSEWIC 2005) or provincially (ACCDC 2005; NSDNR 2005b).

Wetland 1 is a groundwater discharge site. Water in the wetland is derived mainly from groundwater seepage which eventually either evaporates or drains into Small Brook at the base of the hill. The wetland is not expected to play much of a role in regulation of stream flow since it has very little storage capacity and the rate at which water leaves the wetland and drains into the stream is largely dictated by the flow rate of the groundwater entering the wetland. The presence and development of the wetland is controlled by the movement of groundwater. Expansion of the quarry could adversely affect the hydrology of Wetland 1 if the rate or direction of groundwater flow is altered.

The wetland appears to have relatively little socio-economic value. There is no evidence to indicate that it is used for recreational, agricultural, cultural, or business purposes. The wetland is not part of any protected area such as a national or provincial park, national wildlife area, federal migratory bird sanctuary, ecological reserve, provincial wildlife management area, wildlife refuge, or game sanctuary. The slope that the wetland is situated on has been logged resulting in alteration of the vegetation of the wetland although there has been no apparent alteration of the wetland substrate.

## **Wetland 2**

Wetland 2 is a 0.312 ha coniferous treed spring swamp. The wetland is located on a gentle slope near the headwater of a small stream. Water in the wetland appears to be derived mainly from groundwater discharge. The storage capacity of the wetland is limited by its small size and sloping topography so it is unlikely that the wetland plays a large role in stream flow regulation. The size of the wetland and its location at the headwaters of the stream would also limit its value in flood control.

The vegetation of the wetland is characterized by a heavy cover of mature second growth forest composed mainly of American larch (*Larix laricina*), white spruce (*Picea glauca*), and balsam fir. Shrub cover consists of a moderately dense understory composed of speckled alder and red raspberry

(*Rubus idaeus*). The ground vegetation layer is composed of a mixture of fowl manna-grass (*Glyceria striata*), dwarf red raspberry, perennial bentgrass (*Agrostis perrenans*), creeping butter-cup (*Ranunculus repens*), and purple avens (*Geum rivale*).

A vegetation survey was conducted in the wetland that revealed the presence of 33 species of vascular plant. The wetland is characterized by average plant species richness for a wetland of its size. None of the species encountered is considered to be rare nationally (COSEWIC 2005) or provincially (ACCDC 2005; NSDNR 2005b).

One bird, two mammal and three herpetile species were recorded in the wetland. Golden-crowned Kinglet was the only bird species observed in the wetland. Other bird species that may be expected to nest or forage in the wetland include Ruby-crowned Kinglet, Magnolia Warbler and Blackburnian Warbler. Mammals noted from the wetland included varying hare and American red squirrel. Wetland 2 does not provide habitat for semi-aquatic mammal species such as beaver, muskrat or American mink; however, many of the mammal species present in the surrounding upland habitats can be expected to make use of the wetland. Herpetiles found in the wetland included wood frog, green frog and northern spring peeper. Wetland 2 provides poor breeding habitat for these species since all of the open water in the wetland is rapidly flowing. These species can be expected to forage in the wetland. None of the bird, mammal or herpetile species noted in Wetland 2 is considered to be rare or sensitive nationally (COSEWIC 2005) or provincially (ACCDC 2005; NSDNR 2005b).

The wetland appears to have relatively little socio-economic value. There is no evidence to indicate that it is used for recreational, agricultural, cultural, or business purposes. The wetland is not part of any protected area such as a national or provincial park, national wildlife area, federal migratory bird sanctuary, ecological reserve, provincial wildlife management area, wildlife refuge, or game sanctuary.

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#### 5.6.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Sand pit development could result in the loss of wetland habitat adjacent to excavated areas if care is not taken to develop the pit in such a way so as to direct run off from the site in the same approximate percentages as the current drainage on the site (Appendix B) and if adequate buffers are not supplied between the Project and the wetlands to ensure that precipitation and runoff are allowed to permeate the till to maintain groundwater inputs to the wetlands. Generally, wetland habitat loss is of particular concern to provincial regulators since wetlands are recognized as productive natural areas that are transitory between terrestrial and aquatic ecosystems. Wetlands support a large diversity and abundance of organisms and are often threatened by development activities.

The distance between Wetlands 1, 2 and 3 and the Project area is expected to provide a sufficient buffer so that no significant habitat loss for wildlife and plant species would occur, either through direct disturbance or hydrological effects, so long as the Project is developed to maintain the current drainage regime as much as is feasible. Wetland 4 has the most potential to be negatively impacted due to its close proximity to the Project, however with the proper site development it is likely that this wetland can also avoid destruction through loss of groundwater seepage. As part of the supplementary information to be provided in support of an Industrial Approval application for the Project, the proponent will include a hydrologic study which will include in part whether the pit can be developed in such a way as to maintain the wetlands surrounding the Project. If from the hydrologic study it is determined that the surrounding wetlands will be altered in any way, the Proponent will work with NSEL and NSDNR to

develop the mitigation measures including any required compensation as per NSEL's Operational Bulletin Respecting Alteration of Wetlands.

In summary, assuming the boundaries will not change; significant Project-related effects on wetland functional attributes are not likely to occur.

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## 5.7 Archaeological and Heritage Resources

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### 5.7.1 Description of the Existing Environment

For the purposes of this assessment, archaeological and heritage resources are defined as physical remains that inform us of the human use of and interaction with the physical environment. These resources may be above or below the surface of the ground and cover the earliest Pre-Contact times to the relatively recent past.

Heritage resources are generally considered to include historic period sites such as cemeteries, heritage buildings and sites, monuments, and areas of significance to First Nations or other groups. Pre-Contact refers to the time before the arrival of non-Aboriginal peoples.

The assessment of heritage resource potential within the study area incorporated sources that included archaeological site records at the Nova Scotia Museum and archival resources. There are no recorded archaeological sites within or adjacent to the study area (Powell, personal communication).

Background research was conducted using the records at the Public Archives of Nova Scotia as well as those available on the Internet. Maps consulted included those by A.F. Church (1887) and Fletcher (1884). The historical aerial photographs in the Nova Scotia Department of Natural Resources library were also examined.

MacLeod Settlement is located to the north of the study area. There are no buildings or settlement features shown in the 1887 A.F. Church map, although he does show the home of a Mrs. Campbell and H. McIsaac 1.5 and 2.8 km to the northwest. There are also no buildings or features shown on the 1884 Geological Survey of Canada (GSC) map, which again shows a Widow Campbell and Hugh McIsaac in the same location as the Church map. The GSC map also shows two unidentified buildings south of Widow Campbell, at the end of the road. These buildings are located approximately 300 m northwest of the study area.

A series of 1939 aerial photographs was studied. Three photographs were studied (A6649-65, 64, & 63) but the best one was A6649-63, which showed clearing and a building where the present dilapidated house is outside of the southeast corner of the study area. No other roads or buildings were observed within the study area.

Based on the background research, there appears to be low potential for the study area to contain significant archaeological resources dating to the historic period. While the areas to the north and south were settled in the early nineteenth century, no settlement appeared to occur within the study area until the twentieth century.

The study area is deemed to have a low potential for containing archaeological or heritage resources pertaining to First Nations peoples. There are no apparent resources within the area that would have attracted settlement during the pre-Contact period (400 to 500 years ago). The Southwest Mabou River

runs to the west of the study area and MacLeod Brook runs along the southern edge, but the contours of the river banks suggest that they were too steep to have been used by First Nations peoples in the past.

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#### 5.7.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Certain activities associated with the Project (*i.e.*, grubbing, grading), could affect archaeological or heritage sites if they were present within the zone of surficial and subsurface disturbance. These disturbances, if unmitigated, could result in the loss of resources and the potential knowledge to be gained from its interpretation.

The study area has only low potential for identifiable human use in the pre-Contact and historic periods. No archaeological/heritage resources or areas of elevated heritage potential were identified in the study area. It is assumed that no areas beyond the study area will be disturbed during the development and operation of the proposed pit area. As such, development and operation of the proposed pit are not expected to have any adverse environmental effects on heritage resources.

If archaeological or heritage resources are discovered during development and operation of the Project, the find will be immediately reported to the Curator of Archaeology and the Manager of Special Places at the Nova Scotia Museum. If the resources are thought to belong to First Nations, the Chief of the nearest Mi'kmaq band will also be contacted. In the case of suspect human remains, the Royal Canadian Mounted Police (RCMP) will be called. The appropriate authorities will determine further actions to be undertaken which could include avoidance and further assessment.

In summary, assuming appropriate measures are undertaken in the event that archaeological or heritage resources are discovered, significant Project-related effects on these resources are not likely to occur.

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### 5.8 Air Quality

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#### 5.8.1 Description of the Existing Environment

NSEL monitors air quality at ten stations across Nova Scotia susceptible to air quality problems. Common air pollutants monitored regularly are sulphur dioxide (SO<sub>2</sub>), particulate matter (PM), carbon monoxide (CO), ground level ozone (O<sub>3</sub>), nitrogen dioxide (N<sub>2</sub>O), and hydrogen sulphide (H<sub>2</sub>S). Concentrations and times of elevated levels above applicable guidelines for these contaminants are generally small and infrequent in Nova Scotia.

The closest NSEL monitoring site to MacLeod Settlement is located in Port Hawkesbury. Since 1997, the province began continuous reporting of an air quality index. Since reporting began, air quality has been predominantly in the "Good" category (EC 2006).

Motor vehicles, electrical power generation, pulp and paper processing and oil refining are the major local sources of air pollutants in the province. Port Hawkesbury is monitored for SO<sub>2</sub> levels and does not experience unacceptable levels in air quality. (EC 2006).

MacLeod Settlement is located in a rural setting with little or no industry within a radius of 10 km. It is not anticipated that air pollutants are exceeded at the sand pit location.

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### 5.8.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

Sand pit development activities can generate dust (*i.e.*, particulate emissions) which has the potential to be transported offsite. As per conditions set out in the Pit and Quarry Guidelines, particulate emissions will not exceed the following limits at the site property boundaries:

- Annual Geometric Mean 70  $\mu\text{g}/\text{m}^3$
- Daily Average (24 hrs) 120  $\mu\text{g}/\text{m}^3$

Efforts to minimize the generation of dust at the site will be made by covering lay down and work areas, and covering stockpiled topsoil with seed and hay. Fugitive dust emissions will be controlled with the application of water obtained from the wash water / settling pond. Monitoring of particulate emissions (dust) will be conducted at the request of NSEL.

In summary, assuming appropriate dust suppression measures are undertaken, significant Project-related effects on air quality are not likely to occur.

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## 5.9 Socio-economic Environment

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### 5.9.1 Description of the Existing Environment

#### **Population and Employment**

The pit is located in the Municipality of the County of Inverness on Cape Breton Island, south of the community of MacLeod Settlement, southeast of Hillsdale, northeast of Rear Judique South, northwest of River Denys Road, and northwest of Melford. The pit is located in a rural setting with approximately 15 residences/structures within 3 km of the proposed pit site.

The majority of the sand from the pit will be transported to concrete plants in Cape Breton Regional Municipality (CBRM), predominantly for municipal projects and residential and commercial developments. Based on the latest census data for 2001, the population of Inverness County was 19,937 respectively. The population reflects a 4.7% decline from the 1996 level for Inverness County (Statistics Canada 2001).

The pit will employ three full time seasonal site employees. Hauling of materials from the pit also involves additional resources; hauling (or trucking) is typically arranged through the customers.

#### **Land Use**

**Mining** – The Municipal Planning Strategy for the Inverness Planning Area recognizes the importance of mining. The province of Nova Scotia also recognizes the importance of aggregate mining and is the principal regulatory authority. The municipality has expressed their intent through the Strategy by ensuring proper procedures are adhered to at all times. The Inverness Planning Area will adopt a rehabilitation by-law that industries will be required to follow. The Inverness Planning Area adopts a land use policy that establishes zones for areas in the vicinity of known aggregate deposits.

**Agriculture** – Agriculture is one of the land uses observed in the area of the Project, including on site where a blueberry field is in operation. The Local Government Resource Handbook published by Service Nova Scotia and Municipal Relations in January 2006 indicates that there is a Statement of

Provincial Interest in Agricultural Land which has the goal of protecting agricultural land for the development of viable and sustainable agricultural and food industries. However, the Nova Scotia Department of Agriculture has indicated that the agricultural potential of the lands is marginal and are not significant enough to prohibit the Project. In addition, agricultural lands are neither protected, nor specifically valued by the Municipality and local communities. In a 2003 community based development planning exercise produced a document titled, "A Plan for Community Based Development for the Municipality of the County of Inverness." In this plan, none of the close-by communities of Whycocomagh, Port Hood or Judique identified agriculture as an area of growth or special value. The proponent has been allowing a local blueberry farmer to use a portion of the Project area to harvest blueberry. However, there is no lease in place and the farmer is aware that the land eventually will not be available for use as a blueberry field.

**Forestry** – Major forestry or clear cutting operations have not been identified in the immediate region within and surrounding the Project area. However, small local wood lot operations are likely to be present. Treed area of the property to be cleared for pit activities will be logged first for economical timber where possible.

## **Transportation**

**Road Descriptions** – The proposed sand pit in MacLeod Settlement is located adjacent to the MacLeod Settlement Road. The preferable haul road from the pit to access Highway 105 at Glendale is by use of the following local roads:

- MacLeod Settlement Road from Pit Entrance to Bornish Road (about 2.5 km);
- Bornish Road from MacLeod Settlement Road to River Denys Mountain Road (about 5.3 km); and
- River Denys Mountain Road from Bornish Road to Highway 105 (about 4.9 km).

Nova Scotia Transportation and Public Works (NSTPW) classifies roads using a lettering system that identifies Class A as the highest type of Freeway and Class J as the lowest type of Local road. The three roads that comprise the most preferable haul route are classified as Class I roads, which are typically lower class narrow dirt or gravel roads with traffic volumes of less than 50 vehicles per day. It is probable that these roads will need to be upgraded by NSTPW to make them suitable as a haul route for large and heavy trucks.

The River Denys Mountain Road intersects with Highway 105 in Glendale about 24 km east of Port Hastings. The intersection angle is skewed so that the River Denys Mountain Road meets Highway 105 at approximately a 45 degree angle.

Highway 105 is part of the provincial Primary Highway system and has also been designated as part of the National Highway system. Since the section of Highway 105 in Inverness County has at-grade intersections with intersecting roads and driveways to private properties, it is considered to have limited, rather than full, access control. The posted speed limit on this section of Highway 105 is 100 km/h. At the River Denys Mountain Road intersection location, Highway 105 has three travel lanes, with a through lane and a passing, or climbing lane, upgrade eastbound and one lane downgrade westbound.

**Traffic Volumes** – Traffic volumes are reported as Annual Average Daily Traffic (AADT) volumes and provide an estimate of the average daily volume at a location that would be obtained by counting all

traffic for an entire year and dividing by 365. While traffic count data are not available for the local roads that will serve as haul roads, it is expected that daily volumes are very low and probably less than 50 vehicles per day (vpd). Traffic volume data available from TPW indicates that the AADT volume on Highway 105 near the River Denys Mountain Road intersection was 3670 vehicles per day (vpd) in 2002. Assuming a normal annual growth rate of about 2% per year, and the added traffic generated by trucks serving the Georgia-Pacific gypsum mine about eight kilometers to the east, the volume is projected to be about 4200 vpd AADT in 2006.

**Seasonal Variation in Traffic Volumes** - Daily volumes fluctuate from one time of year to another, with volumes typically higher in the summer and lower in the winter. Table 5.2 indicates approximate seasonal volume variations for the Study Area for three time periods of the year. The seasonal variation factors indicate that while the 2006 AADT volume on Highway 105 is about 4200 vpd, average winter volumes can be expected to about 2600 vpd, while average summer volumes will average about 6100 vpd, with summer peak period volumes expected to be approximately 7500 vpd.

**TABLE 5.2 Seasonal Variation in Average Daily Volumes**

Season	Average Daily Volume as Percent of AADT
Winter (December, January, February, March)	0.62
Spring / Fall (April, May, October, November)	0.85
Summer (June, July, August, September)	1.46

Source: Unpublished data for Counter Group E Factors; NSTPW

**Collision Data** - A review of the collision database maintained by NSTPW indicated that there have not been any reported collisions at the intersection of River Denys Mountain Road and Highway 105 during the five years from 2000 to 2004. The relative 'safety' of a section of roadway is evaluated by comparing Study Area collision rates to the average collisions rates for all similar roadways in the Province. The average collision rate for the Highway 105 section that includes the intersection was 36.7 collisions per hundred million vehicle kilometers (HMK) during the five year period 1999 to 2003. Since the collision rate is about the same as the average rate of 35.8 collisions per HMK for all similar 100 Series Highway sections in Nova Scotia with limited access control, it is concluded that there is nothing to indicate that this section of highway has any abnormal characteristics that affect highway safety for the existing highway and traffic conditions.

**Sand Pit Traffic** – The projected production rate for the sand pit is approximately 50,000 tonnes per year. Assuming an average of 25 tonnes per load, and sand pit operation six days per week for 40 weeks (April to December) per year, the proposed production rate is equivalent to an average of between eight and ten truck loads per day. Since the sand pit is expected to operate 12 hours per day, hourly truck volumes generated by the Sand Pit will average less than one loaded truck leaving and one empty truck returning. Considering these low volumes, the truck traffic volume generated by the Sand Pit is not expected to affect the level of performance of Highway 105.

### Recreation and Tourism

Recreational fishing and hunting are permitted in the region surrounding the Project area. However, recreational fishing records have not been found and the lakes surrounding the Project area are not included in the provincial recreational fish stocking program. Hunting moose and deer is allowed in the region surrounding the Project area. MacLeod Settlement Sand Pit is located in Moose Management Zone 4 where two seasons run with 25 licenses available for each. The seasons run from September

26 to October 1 and October 3 to October 8. The Project is located in Deer Management Zone 6 although stamps have not been allocated in the past three years. (NSDNR 2005a).

There are no designated parks within or immediately surrounding the Project area.

## Human Health

Human health related aspects and potential effects on environmental health include potential impacts on air quality (*i.e.*, particulate emissions) and safety of commuters along the transportation route. Air quality is addressed in Section 5.8, and Sections 5.9.1 and 5.9.2 includes a discussion of the safety of travellers along the transportation route.

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### 5.9.2 Potential Effects, Proposed Mitigation, Monitoring and Follow-up

#### Population and Employment

Pit development activities will produce noise from equipment operation. The pit is sheltered from the road by a partial treed buffer. The potential for noise from the pit site to have a significant effect on residents is minimal considering there will be no blasting and the closest residence is greater than 800 m from the Project.

Pit operations will be conducted in accordance NSEL permit conditions and in accordance with the Pit and Quarry Guidelines (NSEL 1999). As per standard provincial guidelines, sound levels from the operation in the Project area will be maintained at a level not to exceed the following sound levels (Leq) from the property boundaries:

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

Sound monitoring will be conducted at the request of NSEL.

A vegetated buffer will be maintained along the access road. Due to the remote location, no aesthetic impacts are anticipated due to the Project.

The direct and indirect employment associated with operation of the MacLeod Settlement Sand Pit may be considered a benefit, or positive effect, to the regional economy. In addition, the pit produces valuable products that support development and infrastructure, and the growth of the region's economy.

Development of the sand pit will result in an overall positive effect on the regional economy. The availability of additional supply to the market place should encourage a more stable price for aggregate. In some cases (*i.e.*, markets in close proximity to pits), the overall price for aggregates will be lower since cost of aggregate largely reflects the distance it has to be hauled. This, in turn, can significantly reduce costs of construction, which, in the case of public infrastructure such as highways, communities, public works agencies, and taxpayers should result in financial benefits.

Another interpretation of Project-related employment effects is that they may be considered neutral. This is because the market that the Project is supplying is not new, the products are not new, and the demand for aggregate in Inverness County is currently being met by existing pits. Any increase in employment associated with the Project could be offset by reductions elsewhere (*i.e.*, at other pits and quarries).

## Land Use

Due to the distance from residences (*i.e.*, greater than 800 m), impacts on existing and future adjacent land uses are not expected. Pit activities will be conducted in accordance with the Pit and Quarry Guidelines and all setback distances specified in the Guidelines will be maintained. While the Project would displace an agricultural land-use (*i.e.*, blueberry field), it is not considered to negatively impact the overall land use planning goals of the community. Existing easements for access to adjacent properties will be maintained.

## Transportation

In general, truck traffic associated with this Project is average for pit developments. No new access roads will be required to be constructed for this Project although some of the existing roads may need to be upgraded. The transportation impacts of the proposed MacLeod Settlement sand pit can be summarized by the following:

- The local roads that will be used to access Highway 105 are lower class roads which will likely need to be upgraded by NSTPW to make them suitable as a haul route for large and heavy trucks; however upgrade of any roads by NSTPW is outside the scope of this assessment.
- Since the River Denys Mountain Road meets Highway 105 at a skewed angle, it will be desirable for NSTPW to improve the intersection so that the road meets Highway 105 at an angle of between 70 and 110 degrees, and preferably as close to 90 degrees as practical.
- Since the River Denys Mountain Road intersects Highway 105 at a location with an eastbound passing or 'climbing' lane, a warning sign indicating LEFT TURNING VEHICLES IN CENTER LANE should be erected by NSTPW facing eastbound traffic approximately 500 meters west of the intersection.
- While sight distances are adequate, appropriate TRUCKS ENTERING signs (WC-8, *Manual for Uniform Traffic Control Devices for Canada*, Transportation Association of Canada, 1998) with 200 m distance tabs (WA-30S) should be erected by NSTPW about 200 m in advance of the River Denys Mountain Road intersection on both Highway 105 approaches.
- While the Annual Average Daily Traffic (AADT) volume on Highway 105 is about 4200 vehicles per day (vpd), high seasonal variations in Highway 105 traffic volumes will increase summer average daily volumes to about 6100 vpd, with peak period volumes of about 7500 vpd.
- Review of collision data does not indicate any history of collisions at or near the River Denys Mountain Road intersection. Since collision rates on Highway 105 near the intersection are considered average or normal when compared to the collision rates for all 100 Series highways in Nova Scotia with limited access control, it is concluded that there is nothing to indicate that this section of highway has any abnormal characteristics that affect highway safety for the existing highway and traffic conditions.
- With a projected production rate of approximately 50,000 tonnes per year, the Sand Pit is expected to generate an average of about eight to ten truck loads per day during the 40 weeks operating season. Since the Sand Pit is expected to operate 12 hours per day, hourly truck volumes generated by the Sand Pit will average less than one loaded truck leaving and one empty truck returning. Considering these low volumes, the truck traffic volume generated by the Sand Pit is not expected to affect the level of performance of Highway 105. Other routes may be used but they will be less frequent and as such, no special requirements will be necessary for these roads.

## Recreation and Tourism

The proposed sand pit is not likely to have an impact on hunting and recreational fishing in the general area. Signage around the MacLeod Settlement Sand Pit property boundaries during the moose hunting season will increase the overall safety of both employees of the pit, and hunters in the area (*i.e.*, prevent accidental trespass). The pit is situated in a deer hunting management zone that is not at present allocating stamps. It is unlikely that recreational fishing would take place in the tributaries adjacent to the Project area. Fishing may occur to the west of the Project area in the Southwest Mabou River. Development and operation of the pit are not expected to have an impact due to the distance from this potential recreation fishing locations.

## Human Health

Human health related issues are discussed in Section 5.8 (*i.e.*, Air Quality) and Sections 5.9.1.3 and 5.9.2.3 (*i.e.*, Transportation). The health and safety of nearby residences is not expected to be affected by the Project.

## Summary

In summary, assuming effective application of mitigating measures (*e.g.*, Pit and Quarry Guidelines, dust suppression), significant adverse project-related effects on the socio-economic environment are not likely to occur. Operation of the pit will result in economic benefits, including employment and ongoing business opportunities.

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### 5.10 Other Undertakings in the Area

The Proponent is not aware of any other pit operations licensed to operate within a 10 km radius of the Project.

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## 6.0 EFFECTS OF THE PROJECT ON THE ENVIRONMENT

Activities associated with the proposed Project will be conducted in accordance with terms and conditions an Industrial Approval for the Project and the Pit and Quarry Guidelines (NSEL 1999). Environmental effects of the pit will include the loss of terrestrial habitat within the proposed pit area. Field surveys conducted to date indicate that this area does not include unique habitat and only one species of rare plant, *Botrychium simplex*, which is only located in a limited area of the site. Yellow Lady's-Slipper also occurs just outside of the proposed Project boundary.

Assuming the mitigating measures specified in this report are implemented (e.g., progressive reclamation), and the pit is operated according to existing provincial guidelines and approvals, no significant adverse residual environmental or socio-economic effects are likely. Operation of the pit will result in economic benefits, including employment and ongoing business opportunities.

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## 7.0 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The definition of an environmental effect often includes any change to the Project that may be caused by the environment. In the case of a pit operation, potential effects of the environment on the Project are limited to climate and meteorological conditions, specifically precipitation. Precipitation and runoff may cause temporary delays in pit construction, operation, and rehabilitation activities. Wet weather or snow may also affect hauling of material from the site.

On a national basis, Canada shows a warming and cooling pattern with a higher overall warming trend of approximately 1.1 °C since 1895. The Atlantic Region, however, shows a warming trend from 1895 which peaked in the mid 1950s followed by a cooling trend in the 1990s. The overall warming trend of 0.4 °C in Atlantic Canada since 1895 is not statistically significant. With respect to precipitation, the Atlantic Region shows an overall increasing trend in precipitation since 1948, with an increasing trend in the number of daily precipitation events above 20 mm and a very slightly increasing trend in the number of daily snowfall events above 15 cm (Lewis 1997).

There are a number of planning, design and construction strategies intended to minimize the potential effects of the environment on the Project so that the risk of damage to the Project or interruption of service can be reduced to acceptable levels. Mitigation measures include, but are not limited to, designing and installing erosion and sediment control structures to accommodate appropriate levels of precipitation, and considering weather conditions when scheduling activities, including scheduling of activities to accommodate weather interruptions. All Project activities will be taking place out-of-doors and thus weather has been and will be factored into all Project phases and activities. The Proponent proposes that the pit remain open from April to December, weather depending, and will consider severe winter weather conditions when planning activities. Heavy snowfalls and significant snow accumulation will have an impact on the pit's ability to remain open.

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

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## 8.0 OTHER APPROVALS REQUIRED

As stated in Section 2.0, the Proponent is required to register this Project as a Class I Undertaking pursuant to the Nova Scotia *Environment Act* and Environmental Assessment Regulations. Other relevant provincial regulations include the Activities Designation Regulations, which requires an Industrial Approval from NSEL for operation of the Project. Provincial guidelines to be adhered to include the Pit and Quarry Guidelines (NSEL 1999). Examples of other relevant federal legislation include the *Migratory Birds Convention Act* and the *Species at Risk Act*.

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## 9.0 FUNDING

The proposed Project will be 100 percent privately funded.

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## 10.0 ADDITIONAL INFORMATION

No additional information is provided in support of this document.

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## 11.0 REFERENCES

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