Belleoram Marine Terminal Project
Comprehensive Study Report

With Respect to the Requirements of a Comprehensive Study Pursuant to the
Canadian Environmental Assessment Act
CEAR Reference Number: 06-03-19881

August 23, 2007

Submitted by:
Transport Canada
Fisheries and Oceans Canada
Atlantic Canada Opportunities Agency

Prepared by:
AMEC Earth & Environmental

Belleoram Marine Terminal

Comprehensive Study Report

Continental Stone Limited

CEAR Reference Number: 06-03-19881

August 23, 2007
Final

EXECUTIVE SUMMARY

The Proposed Development and the Project

Continental Stone Limited proposes to construct, operate, and eventually decommission a 900 ha crushed granite stone quarry immediately north of the Town of Belleoram, NL. Using standard industry methods, granite will be quarried and conveyed to bulk carriers for shipment to international markets; with the goal of enhancing the long-term viability of the company and the sustainable development of Connaigre Peninsula. The proposed Development is expected to bring 80-100 full time direct jobs with the potential for numerous indirect jobs for a span of 50 years.

The quarry development will be carried out in three stages:

Stage 1: Development - The initial site selection was completed in 2005 using a set of development criteria including a deep-water, ice-free, port and a large tonnage source of high quality aggregate. Results indicated that the site contained large amounts of high quality, non acid-generating granite with only background levels of heavy metals. Development will also include overburden removal, access development, and constructing operational equipment, buildings, settling ponds, and a marine terminal.

Stage 2: Operation – Quarrying operations will progress across the 900 ha site, with rock being blasted, then crushed/screened and conveyed to the marine terminal for ship loading and export. It is estimated that 2 million tonnes of aggregate will be shipped in the first year of operation, increasing to 6 million tonnes for the remainder of the Development. Also, depending on market demands, aggregate may be stockpiled during the summer months for shipment later in the year.

Stage 3: Decommissioning – Once the quarry operation has ceased, the site will be decommissioned by removing all operational equipment and buildings and conducting a Phase I Site Assessment to allow for the remediation of any identified contaminated sites. The site will be progressively rehabilitated, with all inactive work areas regraded and revegetated to revert the land back to a productive forest ecosystem. A rehabilitation and closure plan, pursuant to the requirements of Section 9(1) of the NL *Mining Act,* will be implemented.

Regulatory Requirements

Pursuant to Section 21(2) of the *Canadian Environmental Assessment Act* (*CEA Act*), the Project proceeded as a Comprehensive Study following the recommendation by the Responsible Authorities (RAs) to the Minister of the Environment that it did indeed trigger the *Comprehensive Study List Regulations* under the *CEA Act*. The RAs were identified as:

- Transport Canada (TC) pursuant to subsection 5(1) of the *Navigable Waters Protection Act* for the construction and operation of a marine terminal;

- Fisheries and Oceans Canada (DFO) pursuant to subsection 35(2) of the *Fisheries Act* for the harmful alteration, disruption, or destruction of fish habitat resulting from the construction and operation of a marine terminal;

- Atlantic Canada Opportunities Agency (ACOA) pursuant to paragraph 5(1)(b) of the *Canadian Environmental Assessment Act* for the potential provision of financial assistance.

Expert Federal Authorities (FAs) included Environment Canada (EC), Health Canada (HC), and Natural Resources Canada (NRCan) who have provided specialist and expert information and knowledge which was used during all stages of the environmental assessment.

The Development was also subject to a provincial EA in accordance with the Newfoundland and Labrador *Environmental Protection Act* and it was determined by the Minister of Environment and Conservation that it would proceed as an Environmental Preview Report (EPR) on June 8, 2006. The EPR was required because of the potential interaction with the aquaculture sites in the area. However, on January 26, 2007 the Minister approved the EPR and released the Project from further assessment.

Scope of the Project

The scope of the Project was defined through consultation between the RAs and with input from the FAs. In the early stages of the environmental assessment, ACOA had employed the "In-Until-Out" Approach – meaning that until it was confirmed that the project proponent would not seek financial assistance from ACOA, ACOA would remain involved in the environmental assessment process. On May 30, 2007 the proponent applied to ACOA for funding to construct and operate a marine terminal to be used of loading and shipping aggregate from the proposed quarry, rather than funding for the entire quarry project. Thus, ACOA remained as a RA and limited the scope of the project to the Marine Terminal only.

TC and DFO, the other RAs, determined that the scope of the project for environmental assessment included construction, operation, decommissioning, and/or abandonment of the concrete caisson marine terminal. Therefore, TC, DFO, and ACOA had the same Project scope and a single comprehensive study report was prepared. Each RA has decision-making mandates with respect to their particular interests.

In accordance with Section 15 of the *CEA Act*, the RAs have determined that the scope included construction, operation, and decommissioning of the following Project components;

- Construction of a 200 m long by 30 m wide marine terminal;

- Installation of ship loading equipment on the marine terminal, and;
- Berthing, loading, and de-berthing of bulk carriers.

Taking into account the factors specified in Section 16 of the *CEA Act*, and through consideration of the local environment and potential environmental effects of the Project, a list of Valued Ecosystem Components (VECs) were considered as part of this environmental assessment. These included:

- Fish and fish habitat;
- Aquaculture/commercial fisheries;
- Navigation and marine safety;
- Marine birds including seabirds and sea ducks;
- Species at Risk;
- Atmospheric environment, and;
- Human health and safety.

Further, the CSR contained an assessment of the potential for accidents or malfunctions, cumulative environmental effects, alternative means of carrying out the Project, and any effects of the environment on the Project. Follow Up and monitoring programs were also designed to ensure that the Project's effects would be properly mitigated and that any compensation or post-development measures would be effective in minimizing potential adverse effects.

Even though the CSR was limited to the marine terminal only, the document also contains detailed information on the quarry development, its potential effects, and proposed mitigations. Therefore, Project cumulative effects of the quarry and the marine terminal were considered and assessed for the identified VECs within the context of the CSR report.

<u>Information Distribution and Consultation</u>

In accordance with Section 12.4 of the *CEA Act*, the Canadian Environmental Assessment Agency (the Agency) became the Project's Federal Environmental Assessment Coordinator. The Agency received formal notification of the Project through the Newfoundland and Labrador environmental assessment registration process. The Agency then contacted the FAs to determine their potential roles in the environmental assessment. It was determined that ACOA, DFO, and TC would become the RAs and that EC, NRCan, and HC would become FAs providing specialist expertise.

Information on the Project and the environmental assessment is publicly available on the Canadian Environmental Assessment Registry (CEAR) website under the Reference Number 06-03-19881. A Scoping Document was prepared by the RA's and provided to the public and key stakeholders for review. Key stakeholders included the Town of Belleoram, the Miawpukek First Nations, Port Authority, Fish, Food and Allied Workers. Information on the public consultation and the Scoping Document was posted in The Telegram, The Coaster, and Le Gaboteur. Copies of the scoping document were also made available for viewing at the Belleoram Town Office. The amendment to the scope of the Project was also posted on CEAR.

No letters of concern or opposition were received from the public or non-government organizations during the 34-day public consultation period. Four individuals requested copies of the scoping document but no comments were received.

An open house, held at the Belleoram Community Centre on July 18, 2007, attracted 70 people, mainly from local communities. Most of the 27 people who completed Exit Surveys felt that the proposed quarry is quite positive for the economy of the area and their questions related to what types of employment would be available and when. Several comments related to the general social, aesthetic, and environmental effects on the Town of Belleoram and the area.

Summary of Key Issues considered during the Review

Key issues considered during the Project review are described below.

Effects of the Project on the Environment

It was determined that 1578 m^2 of lobster habitat would be lost due the marine terminal's construction. This will be mitigated by adherence to the fish habitat compensation strategy, as well as the *Fisheries Act*, *Water Resources Act*, *CCME Guidelines*, *Canadian Water Quality Guidelines for the Protection of Aquatic Life*, *Canada Shipping Act*, and any pertinent provincial or federal laws or regulation.

All compensation activities and concepts will be performed in consultation and cooperation with DFO Habitat Management Program, the Town of Belleoram, and the local Belleoram Fisheries Committee. Monitoring will be ongoing, as needed.

To prevent sedimentation during construction of the Marine Terminal, the Proponent will use clean fill (less than 5 % fines). The fill source will be non-acid generating, blasted rock from the quarry site. Prior to any works, silt curtains will be put in place around active work areas, extending from the surface to the seabed. Equipment will be designed to minimize the loss of aggregate or dust during ship loading. Any water release from the site will be tested to ensure their compliance with any applicable guidelines.

Leaks and spills of toxic substances will be prevented through regular maintenance of vehicles and equipment, ensuring they are operated by experienced workers within the confines of the manufacturer's specifications and all applicable laws or regulations.

No refueling or repairs will be done within 30 m of any waterbody. A Spill Contingency Plan and spill kits will be available onsite at all times with mitigations included in an Environmental Protection Plan (EPP).

Blasting will employ the use of the industry's best practices and be conducted in accordance with the *Explosives Act,* NL *Dangerous Goods Transportation Act* and regulations, *Transportation of Dangerous Goods Act*, *Fisheries Act* and associated guidelines, *Environment Act*, and the *Occupational Health and Safety Act*. Blasting at the marine terminal site will occur outside of lobster and marine bird breeding seasons and not be in proximity to any identified sensitive marine bird habitat, with blasting plans being optimized for maximum efficiency and minimal vibrations or noise.

Interactions between the bulk carriers and the marine environment will be minimized by several factors, including: the infrequent passage of the bulk carrier (every 5-7 days), its travel within a designated shipping corridor which maintains a distance of at least 3 km from any identified sensitive marine bird habitat and at least 750 m from the nearest aquaculture site, its slow speed within Belle Bay (2 knots), not dumping bilge or foreign ballast at the marine terminal site or outside the bounds of the *Canada Shipping Act* and associated regulations, not refueling at the marine terminal, registering ships with the Eastern Canada Response Corporation Ltd., and requiring all ships to carry oil spill clean up equipment (e.g. absorbents, inflatable dykes) with trained crew members in spill prevention and clean up techniques.

All activities will comply with *Migratory Birds Convention Act and Regulations* and the *Species at Risk Act*; with the Project's construction and operation being designed to mitigate their effect on these sensitive species.

The Proponent will discuss options to mitigate for disturbance of whales with DFO, including any anticipated monitoring requirements.

Effects of the Project on Human Health and Safety

All ships will adhere to the laws and regulations pursuant to the *Canada Shipping Act*, with all bulk carriers being double hulled and fitted with oil spill clean up equipment (e.g. absorbants, inflatable dykes) with crew trained in their use.

Passage will be relatively infrequent, every 5-7 days, with no dumping of bilge or foreign ballast, and no refueling done at the marine terminal. Engines will be turned off when ships are docked. They will be well maintained and be regularly inspected, with all being fitted with a variety of state-of-the-art electronic navigational aids and radar to ensure the most accurate pilotage. Ships will travel within a designated corridor, coming no closer than 750 m to any aquaculture site within Belle Bay and no closer than 3 km to any landmass. Speeds within Belle Bay will not exceed 2 knots. Ship will have a 24 hour turn around time at the marine terminal. The Local Special Interest Committee will be consulted with respect to ship arrival and departure times so that the community will be aware of ship traffic to enhance local marine traffic safety.

Effects to air quality will be mitigated by adherence to all air pollution regulations and standards, with any equipment utilizing a combustion engine to be well maintained and operated by an experienced employee. In addition, crushed rock will be washed at the quarry site and therefore have limited dust particles that might become airborne. To minimize noise and dust from ship loading, all crushed rock will be moved to the marine terminal by a covered conveyor. This is essentially a rubber tube with dust skirts that can be placed well into the ships' holds so that the rock drop is one metre only.

In terms of dust and emissions, the decision to move the crushed rock to market using ocean going vessels is preferable than moving the material by trucks over local roads. While there will be local truck traffic to deliver materials during construction, barges will also be used for deliveries to the marine terminal construction site. During operations, only small company owned service vehicles will operate at the marine terminal.

Some blasting will occur at the shore to prepare the access to the marine terminal. Best practices will be used to minimize noise and dust emissions. These blasts will be smaller than those used at the quarry. They will be designed for efficiency so that as little as possible blasting will occur. While the shoreline is mainly exposed granite, all overburden will be removed prior to blasting and areas of potential dust generation will be sprayed with water when appropriate.

Toxic materials will be handled, used and stored in accordance with the manufacturers' specifications and any applicable laws or regulations, with no toxic substances being stored within 30 m of a waterbody. Employees will be trained in accident prevention and the use of spill containment and clean-up equipment (e.g. absorbents, floating booms), with these materials being kept onsite at all times. Details of contingency planning and responses to spills have been included in the EPP.

The marine terminal has been engineered to meet all design standards required by the applicable building codes and standards, with the structure and any associated machinery, equipment and vehicles, being regularly inspected and maintained and operated by properly trained employees. Only small company owned vehicles will operate at the marine terminal.

All Project activities are to comply with the provincial *Occupational Health and Safety Act* and associated regulatory requirements to reduce the risk of accidents malfunctions and fire; with all employees receiving thorough, and regular, safety training specific to their jobs. Protective gear will be worn according to each specific task.

Access to the Project site will be restricted to employees and signs will be posted warning of any dangers.

Effects of the Environment on the Project

The engineering, design and operations at the marine terminal will involve consideration of effects of the environment on the Project during its lifespan. This includes accounting for the region's climatological, geological, and topographic characteristics and the potential environmental effects on the Project related to extreme weather, climate change, icing, and, seismic events.

Proposed Mitigations

Work will only be conducted when it is reasonable to assume that weather conditions will not be detrimental to worker safety, the operation of any equipment or the integrity of any structure. All equipment will be rated for working in the anticipated climatic conditions at the site.

Engineering of the marine terminal is in accordance with the legal standards set out in the *National Building Code of Canada* at a minimum, and designs will also take into account the possibility of an upsurge in extreme weather events. It has been designed to operate for at least 40 years before requiring any repairs; however, it will be continually inspected for any loss of structural integrity, with any repairs required to be performed immediately.

Shipping activities will adhere to all federal and provincial permits, licences, and certificates, and meet all regulatory standards pursuant to the *Canada Shipping Act*. Ships will be fitted with state-of-the-art communications and radar equipment to maintain constant communication to be altered to developing weather situations or the location of sea ice. Crews will be fully trained of their responsibilities in the event of a weather-induced emergency at sea, and proper emergency response and escape equipment will be onboard at all times.

Conclusions

Based on the information contained in the Comprehensive Study Report, communications with federal and provincial agencies, the public, and other stakeholders; the RAs concluded that the Project is not likely to cause any significant adverse environmental effects.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ACRONYMS AND DEFINITIONS

ACOA	- Atlantic Canada Opportunities Agency
AIS	- Automatic Identification System
BMP	- Aggregate Operators Best Management Practices Handbook for British Columbia 2002 Volume 1-2
CCME	- Canadian Council of Ministers of the Environment
CEA Act	- Canadian Environmental Assessment Act
CEAR	- Canadian Environmental Assessment Registry
CICS	- Canadian Institute for Climate Studies
CIS	- Canadian Ice Service
COSEWIC	- Committee on the Status of Endangered Wildlife in Canada
CSA	- Canadian Standards Association
CSR	- Comprehensive Study Report
DFO	- Fisheries and Oceans Canada
DOEC	- Department of Energy and Conservation
DTH	- Down The Hole
DWT	- Dead Weight Tonnes
EA	- Environmental Assessment
EC	- Environment Canada
ECRC	- Eastern Canada Response Corporation Ltd.
EPP	- Environmental protection Plan

EPR	- Environmental Preview Report
FA	- Federal Authority
FEAC	- Federal Environmental Assessment Coordinator
HADD	- Harmful Alteration, Disruption, or Destruction
HC	- Health Canada
IC	- Infrastructure Canada
NL	- Newfoundland and Labrador
NRCan	- Natural Resources Canada
NWPA	- Navigable Waters Protection Act
PPV	- Peak Particle Velocity
PVC	- Polyvinyl Chloride
PWGSC	- Public Works and Government Services Canada
RA	- Responsible Authorities
RLU	- Rural, Local, Undivided
SAR	- Species at Risk Act
TC	- Transport Canada
VEC	- Valued Ecosystem Components

1.0 INTRODUCTION

Continental Stone Limited (Proponent) proposes to construct, operate, and eventually decommission a 900-hectare crushed granite stone quarry immediately north of the Town of Belleoram, NL (Figure 1.1). Granite will be quarried and crushed on site using standard industry methodologies, loaded onto transport ships and sent to international markets (Development).

The Development includes constructing and operating a 2 to 6 million tonnes per annum rock quarry and an associated marine terminal designed to handle vessels larger than 25,000 Dead Weight Tonnes (DWT). Additional constructed features will include a rock crusher, a conveyor system, and administrative buildings. A conveyor system will transport crushed rock from the crushers and screeners to waiting transport vessels.

Transport Canada (TC), Fisheries and Oceans Canada (DFO), and the Atlantic Canada Opportunities Agency (ACOA) have initiated the federal environmental assessment process pursuant to the *Canadian Environmental Assessment Act* (the *CEA Act*) for the marine terminal (Project) component of the Development. These departments have a responsibility to conduct an environmental assessment pursuant to paragraphs 5(1)(b) & (d) of the Act and are therefore considered Responsible Authorities (RAs) for this Project. TC's and DFO's responsibility to ensure an assessment is conducted is related to the issuance of a permit, license, or other approval that is included in the *Law List Regulations* made pursuant to the *CEA Act*. ACOA's responsibility to ensure an assessment is conducted is related to a payment or any other form of financial assistance provided to the proponent to enable the project or part of the project to be carried out.

Environment Canada (EC), Natural Resources Canada (NRCan), and Health Canada (HC) will provide specialist or expert information and departmental knowledge in support of the environmental assessment process.

1.1. Purpose of the Comprehensive Study

In accordance with Sections 16 and 21 of the *CEA Act*, when a development proposal is prescribed in the *Comprehensive Study List Regulations*, the RAs must ensure that the development proposal is assessed through a comprehensive study process. Development proposals that are usually assessed through a comprehensive study process are those large projects that may have the potential for significant adverse environmental effects. Such projects may also be of concern to the general public.

Pursuant to Section 16 of the *CEA Act*, the following factors must be considered in an environmental assessment conducted as a comprehensive study:

Figure 1.1 Map illustrating the location of Belleoram, NL.

- the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- the significance of the environmental effects referred to above;

- comments from the public that are received in accordance with this Act and the regulations;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- the purpose of the project;
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
- the need for, and the requirements of, any follow-up program in respect of the project;
- the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future; and,
- the inclusion of community knowledge and aboriginal traditional knowledge may be considered with the environmental assessment.

The public are given an opportunity to participate at various stages of the comprehensive study process. The Comprehensive Study Report (CSR) must also detail all the public concerns that were raised in relation to the development proposal during the comprehensive study process and how these concerns were addressed. Based on the potential environmental effects, cumulative effects, residual effects, and the public concerns the RAs must provide conclusions with respect to whether the project is likely to result in significant adverse environmental effects. The RAs must also design a follow-up program for the project and ensure its implementation, as defined by subsection 38(2) of the *CEA Act*.

The Canadian Environmental Assessment Agency (CEA Agency) will invite the public to comment on the CSR prior to the Minister of the Environment making a final decision. The Minister of the Environment may request additional information or require that public concerns be addressed further before issuing the environmental assessment decision statement. If the CSR is deemed adequate and all public concerns have been addressed then the Minister may issue an environmental assessment decision statement that includes:

- The Minister’s opinion as to whether the project is likely to cause significant adverse environmental effects, and;
- Additional mitigation measures or follow-up program that the Minister considers appropriate.

The Minister then refers the project back to the RAs for the appropriate course of action.. If it has been determined that the development proposal is not likely to cause significant adverse environmental effects with the implementation of mitigation measures, the RAs may exercise any power or perform any duties or functions that would permit the development proposal, or part of a development proposal, to be carried out.

2.0 DESCRIPTION OF DEVELOPMENT

2.1 Proponent Information

Continental Stone Limited (herein as Continental Stone or the Proponent) is a privately owned company based in St. John's, NL, and is equally owned between Pennecon Limited and Central Construction Limited. These companies have played a major role in building the roadways, bridges, aviation runways, and industrial sites of Newfoundland and Labrador for over 30 years.

The following corporate and contact information is provided for the proponent:

Name of Corporate Body: Continental Stone Limited

Address: P.O. Box 8274, Station A
St. John's, NL A1B 3N4

Chief Executive Officer: Edward Murphy

Contact Person: Robert Rose
(709) 782-3404
rrose@pennecon.com

2.2 Description of Development Proposal

Continental Stone proposes to develop a crushed rock granite quarry to supply raw material to international markets. Using standard industry methods, granite will be quarried and conveyed to bulk carriers for shipment to various international markets. This Project allows the proponent to gain a market share of the aggregate industry, with a view of enhancing the long-term viability of the company and the economy of the Connaigre Peninsula through the creation of sustainable employment. The Development is expected to bring 80-100 full time direct jobs with the potential for numerous indirect jobs for a span of 50 years.

The proposed quarry will be carried out in three stages:

Stage 1: Development - The initial site selection was completed in 2005 (See Appendix A for representative photos) using a set of development criteria designed to maximize success of the Project. These criteria included a deep-water, ice-free port, and a large tonnage source of high quality aggregates.

Reconnaissance sampling of the potential quarry site (Figure 2.1) was conducted in February of 2006 when several hand samples were collected and tested, indicating the site's potential for a high quality aggregate source. In May 2006, the area was

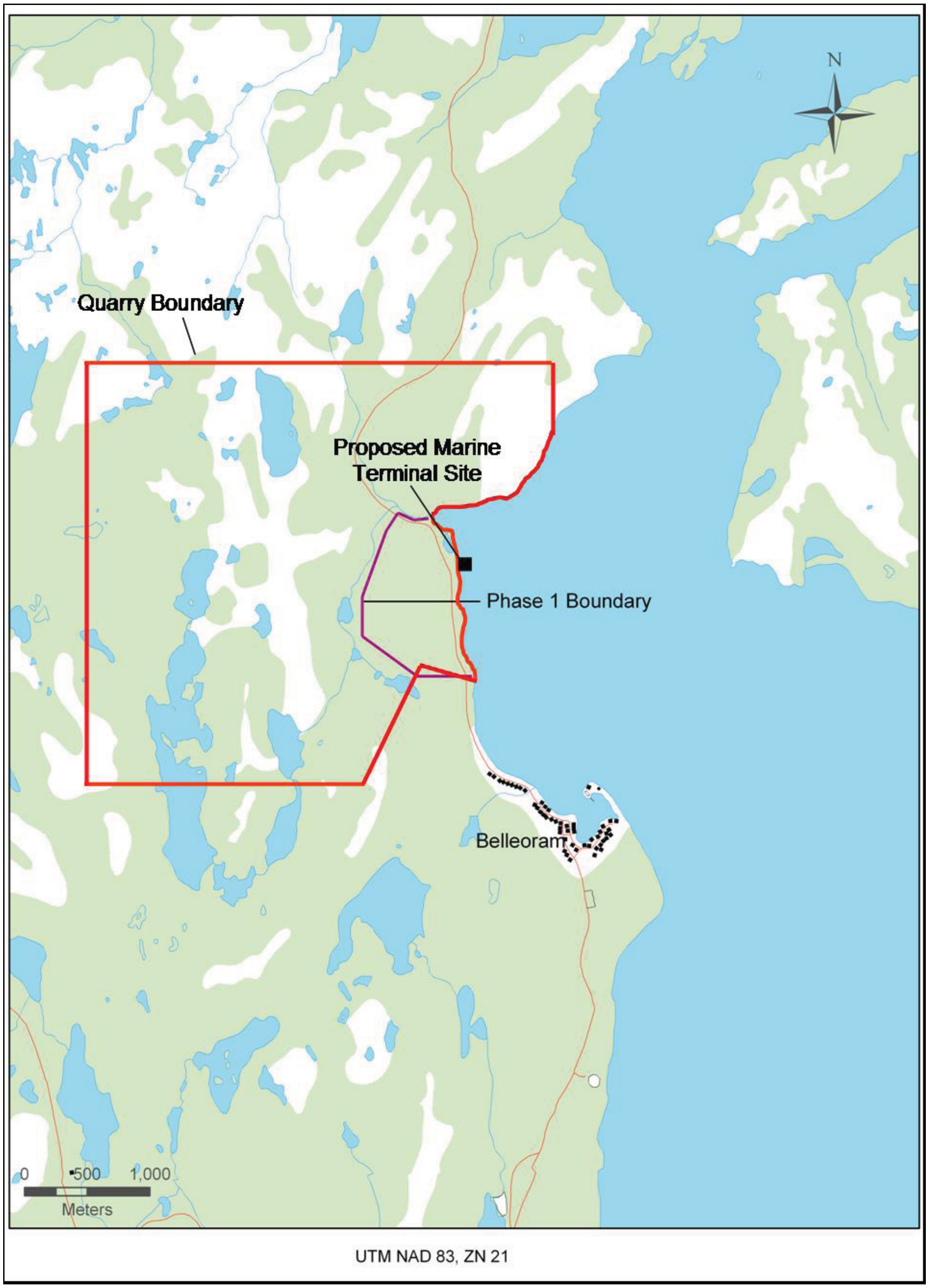


Figure 2.1 Location of the proposed quarry and marine terminal in Belleoram, NL.

geologically mapped and representative bedrock samples were collected and tested. Subsequently, in August 2006 a diamond drilling program was completed over the 80 ha Phase 1 area with approximately 800 m of drill core collected from 7 diamond core holes drilled to depths of 115 to 130 m. Results of this study indicated that the northern portion of the site contains an aggregate resource of high quality granite, approximately 61 million tonnes, and a measured aggregate resource in the southern section of approximately 80 million tonnes. The rock was concluded to have no natural acid-rock potential (e.g. low iron) and only contains background levels of lead or arsenic (Appendix B).

This stage will also include the excavation and removal of overburden material to enable the construction of access roads. Once access is established, the initial setup of the crusher, office/welding facilities, and associated equipment (Figure 2.2) and the construction of the marine terminal will begin.

Stage 2: Operation – Operation will consist of drilling and blasting of the rock source, with the fractured rock being crushed into various sizes. The crushed rock will then be conveyed to a marine terminal for loading onto a bulk aggregate carrier and shipped to international markets. It is estimated that 2 million tonnes of aggregate will be shipped in the first year of operation, increasing to 6 million tonnes per year for the remainder of the Project.

Stage 3: Decommissioning – This will involve demobilizing all machinery and structures at the site, including the removal of the crushers, screeners, conveyors, and office/welding building. A rehabilitation and closure plan, pursuant to the requirements of Section 9(1) of the NL *The Mining Act*, is being prepared. See Section 2.2.5 for a detailed outline of the proposed decommissioning and rehabilitation measures.

2.2.1 Location

The proposed site of the quarry (55°25'27" W - 47°32'37" N) is a 900-hectare parcel of land and intertidal zone of Belle Bay that shares its southern boundary with the Town of Belleoram, NL (population 450) (Figure 2.1). The nearest permanent residence is approximately 800 m from the quarry's southern-most point. The site has been chosen due to the high quality and high yield of granite available. The site is also proximal to international shipping routes for easy distribution via ocean-going bulk carriers.

Due to the large volume of granite available in proximity to the shoreline there will be a relatively slow progression of development across the site, with the initial 80 ha phase lasting 20-25 years. Once deposits at this phase have been quarried, reclamation procedures will begin and operations will progress to the remainder of the 900 ha Project

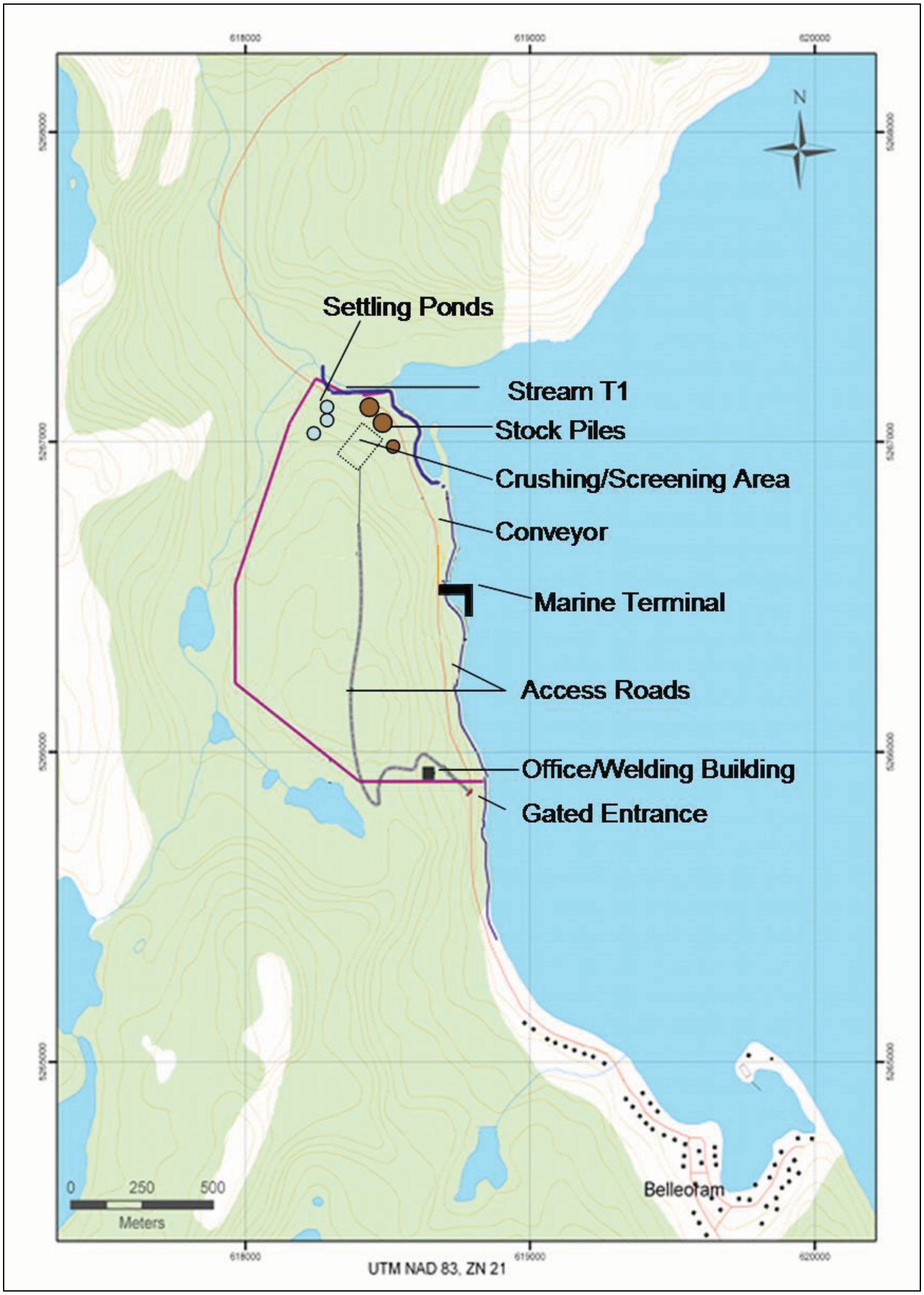


Figure 2.2 Approximate locations of major features, equipment, and related structures**.**

area. The granite will be quarried and crushed on-site using standard industry methodologies and loaded onto ships via a conveyor belt system and then shipped to market. The physical features will include the quarry itself, new access road(s), crushing and grading equipment, settling ponds, water extraction pumphouse/intake, conveyors, utility installations, office and laboratory building, and marine terminal.

2.2.2 Land Facilities/Activities

2.2.2.1 Construction Activities

Development of the quarry is anticipated to start in early fall of 2007, with construction activities taking one year to complete. The construction phase will consist of:

- Access development;
- Timber salvage;
- Stripping of overburden;
- Building and marine terminal construction; and
- Settling pond construction.

Construction activities will adhere to high industry standards, including those outlined in the: *Aggregate Operators Best Management Practices (BMP) Handbook for British Columbia 2002 Volume 1-2*, *Newfoundland and Labrador Environment Act*, and *Occupational Health and Safety Act*. The BMP Handbook addresses all aspects of a quarrying operation; from planning, to evaluating community and environmental concerns, permitting, risk assessment and monitoring. A table of contents and list of best management topics discussed in the BMP Handbook are given in Appendix C.

Access Development

Access to the quarry will be facilitated by expanding and grading an established trail from the Belleoram to the quarry. The access road will be used to transport employees and service vehicles to the site but will not be used on a regular basis for heavy equipment. A network of roads will be constructed on-site (as needed) to facilitate safe and efficient movement of personnel and equipment (approximately 1.6 km).

Road development to access the marine terminal site will require use of explosives to level steep, rocky, slopes along the shoreline of Belle Bay. The extent of blasting will be assessed at the time of access development, with crews drilling and setting charges based on the specific weather and topographic conditions encountered at that time. However, all blasting will adhere to the guidelines set out in the NL Department of Municipal and Provincial Affairs' *Municipal Water, Sewer and Road Specifications* and be confined to the initial stages of construction only. Construction of the access roads is expected to take approximately 4 weeks.

The access roads will be a modified RLU 60 design (Figure 2.3). They will be 5 to 10 m wide with 2 m shoulders and 2% crown slopes. All roads will be constructed to a finished elevation of 1 m above the adjacent land to facilitate drainage and to mitigate the impact of snow accumulation. Access roads will not be paved, but will be surfaced with gravel (Class 'A' fill). Fill required for the base will be obtained from the quarry site. Drainage ditches, where needed, will be excavated along the sides of the roads to collect drainage from the road surface and to capture runoff from surrounding areas. Culverts will be provided for drainage, as appropriate. Designs will adhere to the guidelines in the NL Department of Works, Services, and Transportation *Highway Design Specifications Book* (2003) and the DFO Land Development Guidelines for the Protection on Aquatic Habitat. Culverts will be maintained according to the DFO *Operational Statement for Culvert Maintenance* (2007).

Timber Salvage

Timber salvage will progress across the Development area as overburden stripping and quarry continue. Merchantable timber (greater than 10 cm diameter-at-breast-height) will be salvaged by local contractors when site clearing and overburden removal operations commence. Trees suitable for firewood will be made available to local residents as cutting operations commence. Timber salvage and vegetation clearing procedures have been outlined in the Proponent's Environmental Protection Plan (EPP; See Appendix D for its Table of Contents).

Stripping of Overburden

Overburden will be removed to uncover bedrock at active work sites. Overburden thickness varies (being very shallow; approximately 1 m), with the initial pit targeting an area of minimal cover, minimizing the volume to be removed and stored. Prior to stripping, sediment control structures (i.e. silt curtains, dykes, sediment fences) will be constructed to limit the amount of sediment-laden runoff leaving active work areas. These structures will be regularly monitored and maintained, remaining in place over the course of activities. Overburden will be stored in an area north of the settling ponds to be used for future land reclamation projects.

Land Based Infrastructure

The establishment of the quarry operations will require the construction of some permanent structures. These include crushers and screeners (types and sizes vary; pending final design approval) which will be connected via conveyor belt systems (Figure 2.4). A building will also be built at the main gate entrance to house offices, a laboratory, and a future welding facility. This facility will be built in accordance with all *National Building Code Regulations and Standards*, and also meeting all requirements for fire prevention/protection and employee health and safety. A transmission line will be needed for electrical power and telephone services. However, installation of this transmission line is the responsibility of Newfoundland and Labrador Hydro. As there are currently no municipal water supply lines or wells in the area, the quarry will connect to

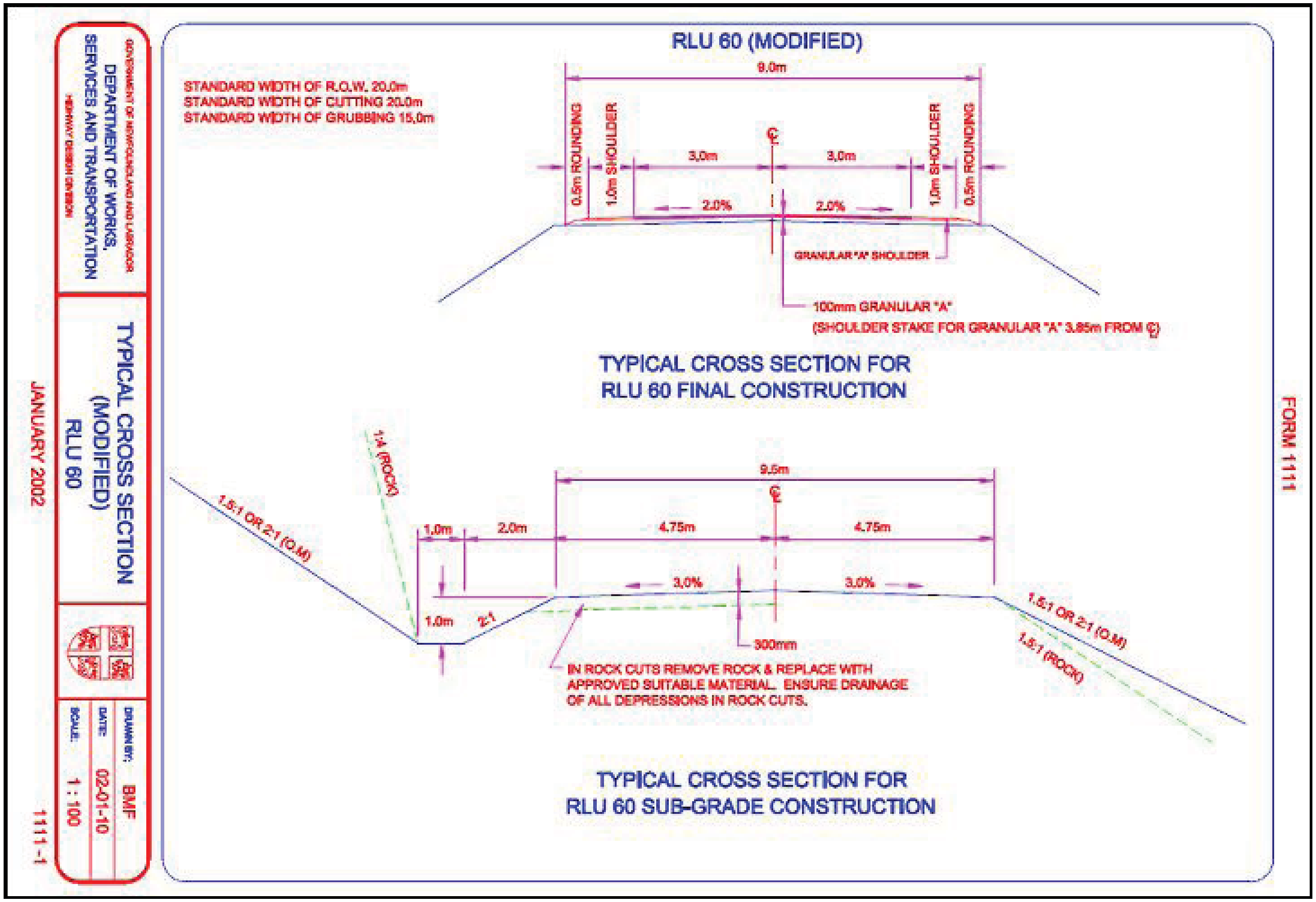
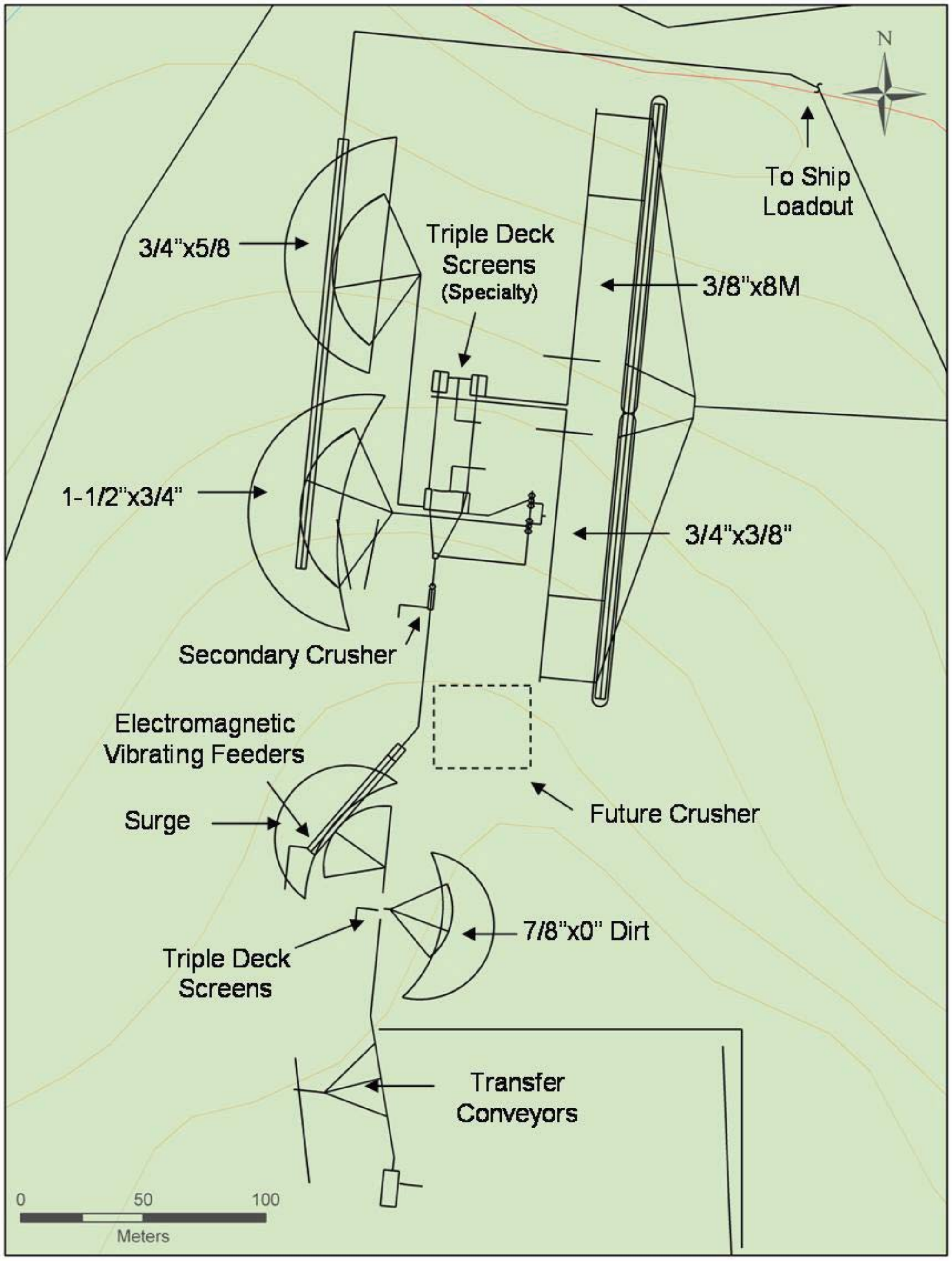


Figure 2.3 Typical cross section of an RLU 60 road. Design as outlined in the NL Department of Works, Services, and Transportation Highway Design Specifications Book (2003).



UTM NAD 83, ZN 21

Figure 2.4 Approximate design layout of the crusher/screening area. Equipment size, type, and location may vary pending final Project design approval. Various stone sizes will be obtained (i.e. 0" dirt to 1-1/2" stone) depending on the stage or type of crusher being employed**.**

the Town of Belleoram's water supply lines to obtain water for the offices and laboratory building. Waste water and sewage from the building's sinks and toilets will be treated with approved Blivet™-style waste management tanks installed during the initial construction process.

<u>Settling Ponds</u>

Settling ponds will be constructed to process aggregate wash water and blast site runoff. Aggregate settling ponds will receive wash water from the crushing and screening operations via a fully sealed PVC pipe system. These ponds will be designed according to DFO's *Land Development Guidelines for the Protection of Aquatic Habitat* and *Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador*. The number and size of ponds required for the quarry will be based on preliminary tests; with local stone being crushed and washed and the amount and size of fines found in the collected wash water being assessed. The results of this analysis will be used by a professional engineer to accurately calculate the size and number of ponds required, taking into account any and all guidelines set out by DFO. Ponds will be built with required safety factors, adhering to guidelines with respect to such design standards as the accommodation of storms (1:5, 1:10, and 1:100 years storms), effective capacity, retention times and location. Their operation and maintenance will include regular inspection and assessment of accumulated sediment load, removing it when required. Settled sediments are not expected to possess any acid rock potential or contain any significant levels of heavy metals due to the inert nature of the quarry's stone (See Section 2.2.4).

Runoff water from the wash water ponds will adhere to the guidelines set by DFO, containing less than 25 mg/liter of suspended solids (or non-filterable residue) above the back-ground suspended solids levels of the receiving waters during normal dry weather operation, and less than 75 mg/liter of suspended solids above background levels during design storm events. Suspended solids in effluent will be regularly tested to ensure compliance.

Bench runoff has the potential to contain nitrogenous residues from the use of ammonia-based explosives (See Section 2.2.4). Therefore, bench runoff will be directed to specially designed, lined, settling pond(s) to allow for chemical degradation of nitrogenous wastes. Again, the number and size required will be assessed and designed by a professional engineer. Generally the pond design will consist of an impermeable layer (e.g. clay), a gravel layer that provides a substrate, and an above-surface vegetation zone. The impermeable layer prevents infiltration of wastes down into lower aquifers. The gravel layer and root zone is where water flow, bioremediation and denitrification take place. The above ground vegetative layer contains plant material which, along with denitrifying bacteria, drives the chemical breakdown process. Bench runoff ponds will be built to incorporate all prudent safety factors and mitigative measures to ensure no unwanted release of contaminated water. Any releases that may enter freshwater will meet the required limit of 0.019 mg/L for ammonia (*Canadian Water Quality Guidelines for the Protection of Aquatic Life*, Canadian Council of

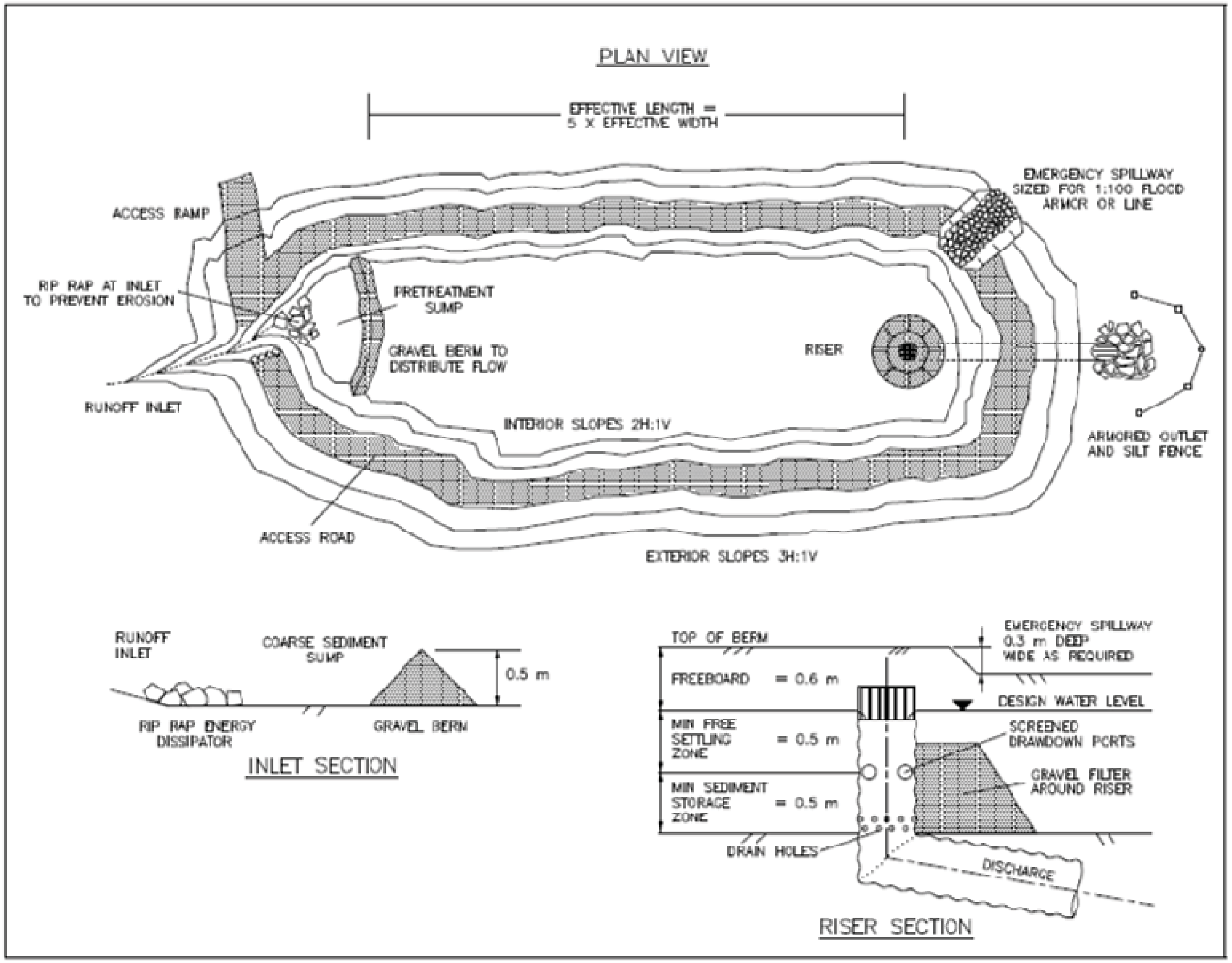


Figure 2.5 Dry Detention Pond Plan and Sections as outlined in the Land Development Guidelines for the Protection of Aquatic Habitat, DFO (1993).

Ministers of the Environment; CCME 2006). Currently there is no set limit for ammonia levels entering marine waters (CCME 2006).

2.2.3 In-water Facilities/Activities

Marine Terminal

Crushed stone from the proposed quarry will be shipped via bulk carriers which will dock at a purpose-built marine terminal to be constructed within Belle Bay. Construction is expected to begin in the early fall of 2007, and will take approximately one year to complete. The proposed marine terminal will consist of an approximately 75 m long earth-filled approach, with its width ranging from about 10 m at the shoreline to 50 m at the wharf location (Figure 2.6). The approach will consist of a clean rock-filled base, with armour stone protection on both sides, and a gravel surface; all being put in place using dump trucks, loaders (980 Cat Loader) and D8 dozers. This structure will have a footprint of approximately 2,800 m^2.

The proposed wharf will be 15 m wide by 200 m long and be constructed with a concrete caisson base (Figure 2.7) and support girder sections with the deck being paved with concrete. Some dredging will be needed to facilitate the construction of the wharf's base, utilizing a 30 tonne long-reach excavator and a floating plant comprised of a spudded barge and dump scowls.

The approach to the marine terminal will be completed first. The caissons will be built on the Development site using a portable concrete batch plant as there is no nearby concrete supplier. The caissons will be floated out to their permanent locations and then backfilled will ballast using a barge. For installation, the caissons will be placed on a compacted rock mattress for stability. This rock mattress is a prefabricated, self contained, high strength, unit that will be installed using a crane operated from a barge. This process is faster that pile driving or drilling and less disruptive to the seabed.

The wharf portion of the marine terminal has been engineered to operate for at least 40 years before any major repairs are required; meeting all design standards required by the applicable building codes and standards. These Include:

Overall Structure:	CSA Standard S6-06 – *Canadian Highway Bridge Design Code*
Concrete:	CSA Standard A23.3 – *Design of Concrete Structures*
Steel:	CSA Standard S16-01 – *Limit States Design of Steel Structures*
Wood:	CSA Standard O86-01 – *Engineering Design in Wood* and Standard O80.0 – *Wood Preservation*

The wharf has been engineered to withstand a variety of operational and environmental loads to ensure its safe operation and long-term structural integrity. Its design has taken into account the following loads:

Dead Loads:	Includes self weight of all components.

Uniform Live Loads: A uniform live load will be applied to the deck of the new wharf. Typically this load would be 50 kPa. However, this load will be revisited as the full operational regime is developed for this site.

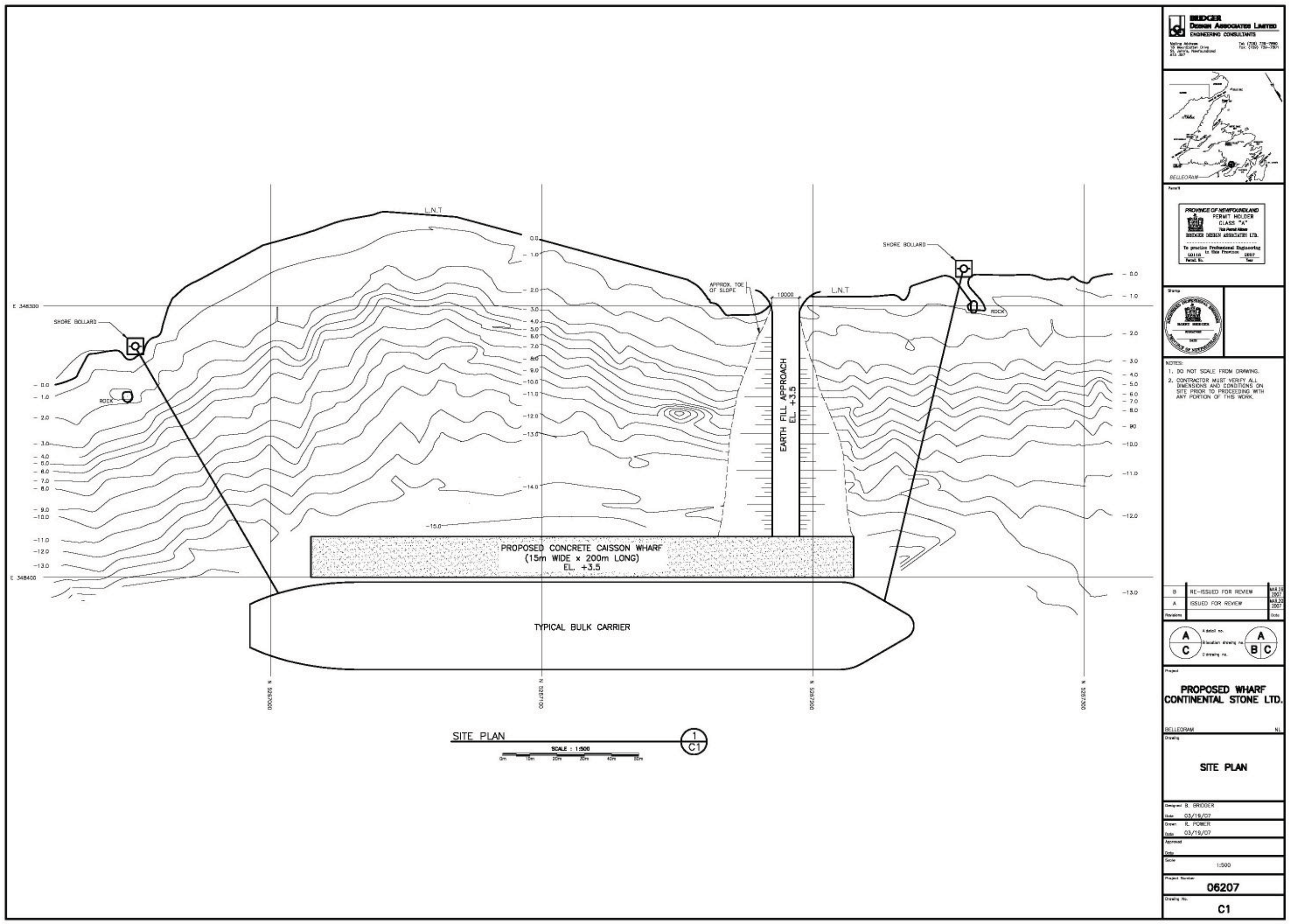


Figure 2.6 Proposed marine terminal layout**.**

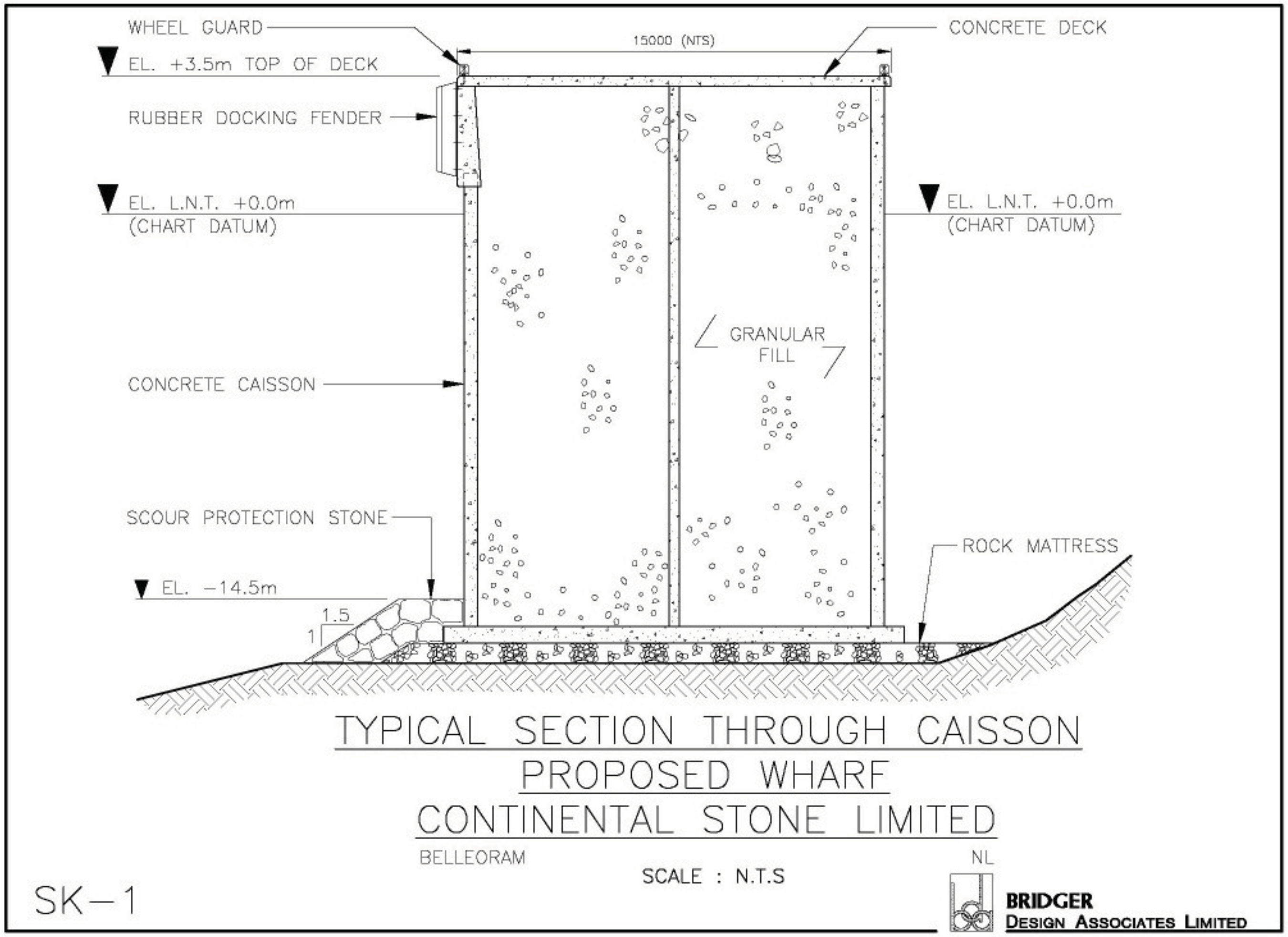


Figure 2.7 Proposed marine terminal caisson cross-section,

Traffic Loads:	Traffic loads will be in accordance with the *Canadian Highway Bridge Design Code* based on the largest vehicles operating on the wharf.
Operational Loads:	Special loads from the ship loader and other specialized equipment operating on the wharf will be as per manufacturer's requirements.
Docking and Mooring Loads:	The fendering system and mooring bollards will be designed to accommodate the fleet of vessels proposed for the site.
Seismic Loads:	The dock will be designed for seismic load in accordance with *Canadian Highway Bridge Design Code*.
Ice Loading:	The location of the wharf in Belle Bay is considered to be ice free (See Section 9.1.3). No special ice loading criteria are envisaged for the wharf. However, the concrete caisson type of structure is very robust and is commonly used in ice infested waters.

For waves impinging directly upon the wharf, the walls of the structure will be designed to resist peak dynamic pressures. Typically for concrete caisson type structures, waves are not a governing load because the walls are already sufficiently robust due to other design constraints. For waves and current acting on a docked vessel, the fender system will be designed for the expected extremes. If ships remain alongside in extreme conditions there is a risk of damage to the vessel as well as the dock. For this reason, it is assumed that the vessel will leave the dock once wind/wave/current conditions exceed a pre-set maximum. It is currently anticipated that the finished elevation of the wharf will be of the order of +3.5 m to +4.0 m above Lowest Normal Tide. However, the projected sea level rise in the next 50 to 100 (as per Section 9.1.2) years will be addressed in the final design. This will include engineering the wharf such that its height can be modified at a later date to account for any change in sea level, without compromising its structural integrity or operation.

Infrastructure on the marine terminal will include a conveyor system to transport aggregate from the stockpiles to a ship loader to be loaded onto the waiting bulk carrier. The shiploader will be a rail mounted, luffable and slewable machine with a capacity of 3,000 TPH at 2.6 kg/m^3 granite rock density. While the specific model of shiploader and conveyor system has not yet been finalized, Figures 2.8 to 2.10 illustrate the typical style that will be used. All equipment will be obtained from a standard industry supplier and manufacturer and will conform with any applicable health and safety and environmental regulations and guidelines with respect to their operation. The conveyor and shiploader will be electric and not require fuel storage or handling at the marine terminal.

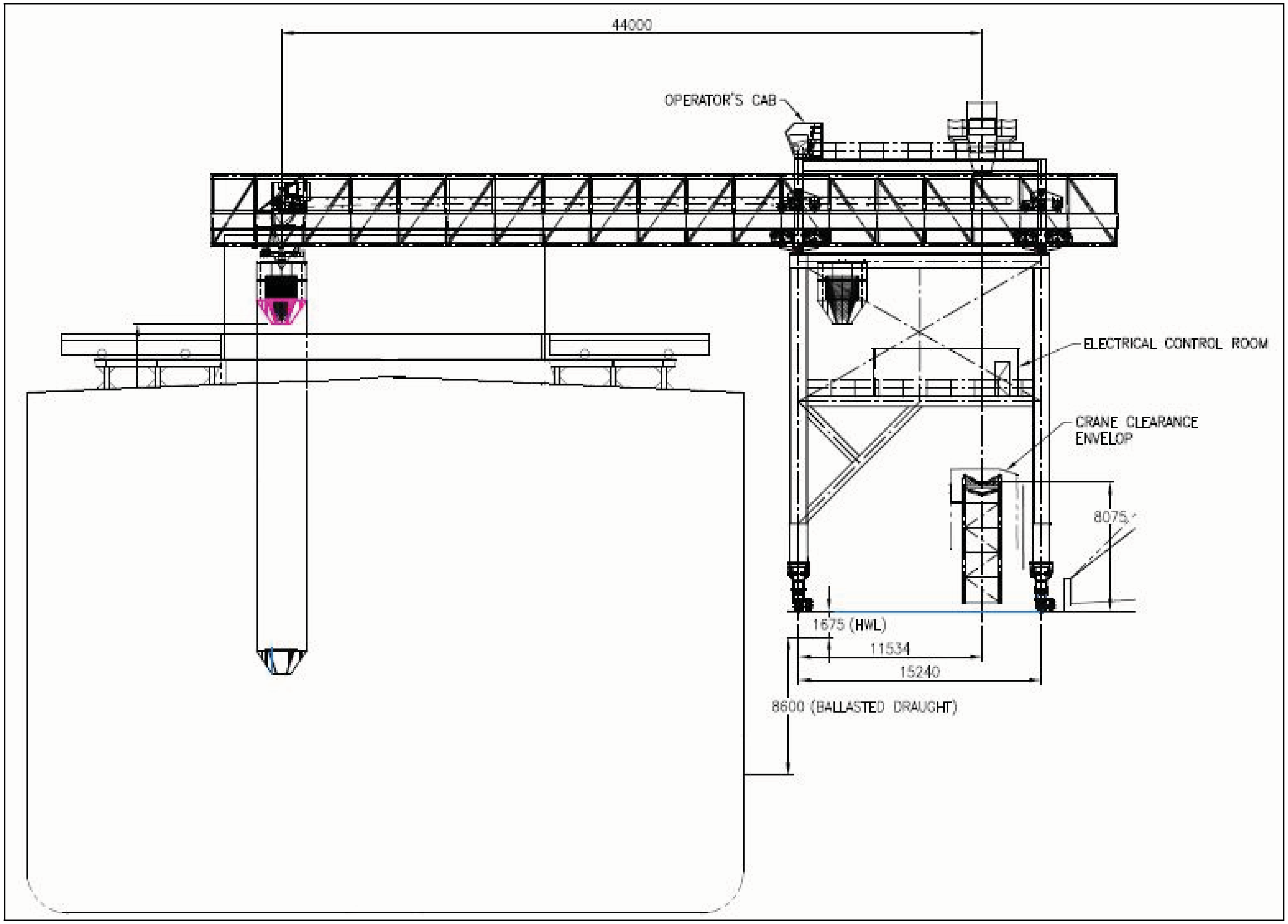


Figure 2.8 Diagram of a shiploader typical of that which will be used at the proposed marine terminal (modified from Comalco Aluminum Ltd.).

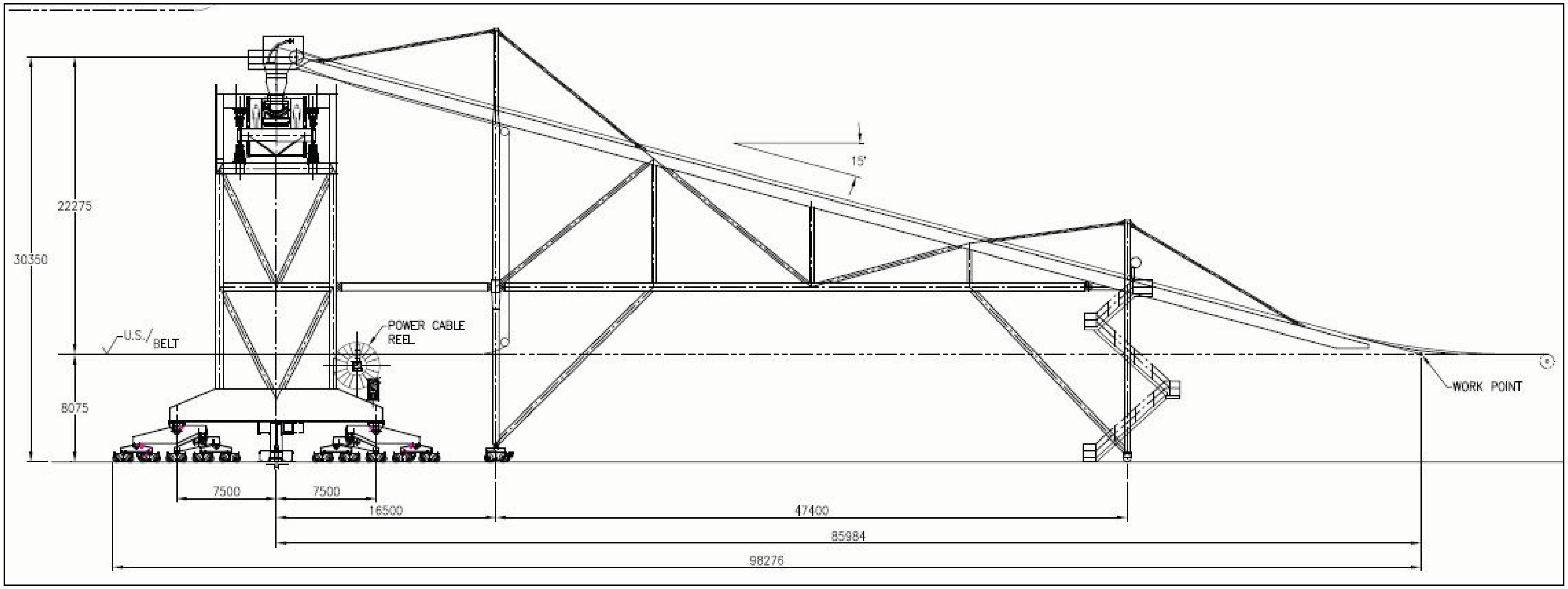


Figure 2.9 Diagram of a shiploader conveyor typical indicative of that which will be used at the proposed marine terminal (modified from Comalco Aluminum Ltd.).

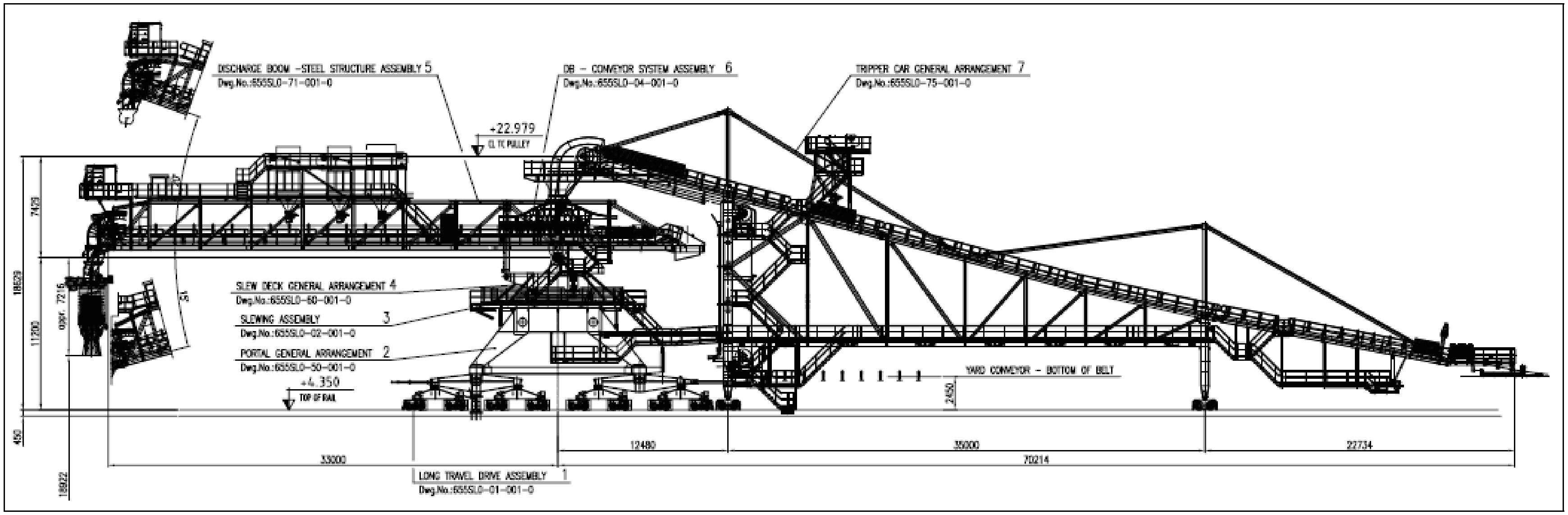


Figure 2.10 Typical configuration of a shiploader and conveyor system indicative of that which will be used at the proposed marine terminal (modified from Comalco Aluminum Ltd.).

Shipping

The preferred method to transport the crushed granite aggregate from the proposed quarry to market is via marine bulk carriers. With an anticipated aggregate production level between 40,000 and 80,000 tonnes weekly, the 60,000 tonne capacity (anticipated) carriers will be required to service the site every 5-7 days depending on the particular production level at that time. Due to their large size, and the need for these vessels to turn one-hundred-eighty degrees once they reach the dock for loading, speeds within Belle Bay are anticipated to be less than 2 knots. Outside of Belle Bay, ships will generally travel at a speed of 14 knots.

Shipping activities will be contracted to a third party, CSL International Inc. (CSL), who will be responsible for the vessels' operation and maintenance. However, Continental Stone is committed to ensuring that strict environmental and safety policies are followed and will ensure the contractor abides by them through the stipulations set out in the contract. Ships shall adhere to all relevant laws, regulations and permits to ensure environmental compliance, and meet all regulatory standards pursuant to the *Canada Shipping Act*, including, but not limited to the:

- *Oil Pollution Prevention Regulations*;
- *Ballast Water Control and Management Regulations*;
- *Navigation Safety Regulations*;
- *Merchant Shipping (Safety of Navigation) Regulations*, and;
- *Ship Station (Radio) Regulations*.

These large vessels represent a very high level of investment to their owners who have equipped them with a variety of modern navigational aids, such as radar and GPS, to ensure their safe operation. CSL is also registered with Eastern Canada Response Corporation Ltd. (ECRC), an organization certified under the *Canada Shipping Act* which provides emergency spill response services to companies operating in Canadian navigable waters. Registration with ECRC helps ensure fast and effective maritime spill clean up and remediation should an incident occur. Ships crews will be fully trained of their responsibilities in the event of a weather-induced emergency at sea, and proper emergency response and escape equipment will be onboard at all times

It should be noted that no "tanker" traffic will occur as part of the Development and that there will be no bulk oil/fuel transport, no oil/fuel transfer to or from ships while at the marine terminal and no bilge water discharge at the Project site. Figure 2.11 represents the proposed route the bulk carrier will take as it enters Fortune Bay.

The route has been planned by a professional sea captain employed by CSL to account for the conditions specific to the region, including depth and presence of hazards. This has been determined to be a safest route for the ships to traverse to service the marine terminal (Personal Communication: Capt. Scott Clegg, CSL). The route will see the ship coming no closer than 3 km to the nearest shore; at the straight between the Island of St. Pierre and the Island of Miquelon. Figure 2.12 illustrates the anticipated corridor in Belle

Bay. This route has been designed to maintain a maximum distance from aquaculture sites in Belle Bay, maintaining at least 750 m between the corridor and the nearest farm. Standard mitigations with respect to vessel traffic have also been included in Continental Stone's EPP and contingency planning.

Figure 2.11 Proposed bulk aggregate carrier shipping route on the south coast of Newfoundland servicing the proposed marine terminal at Belleoram**.**

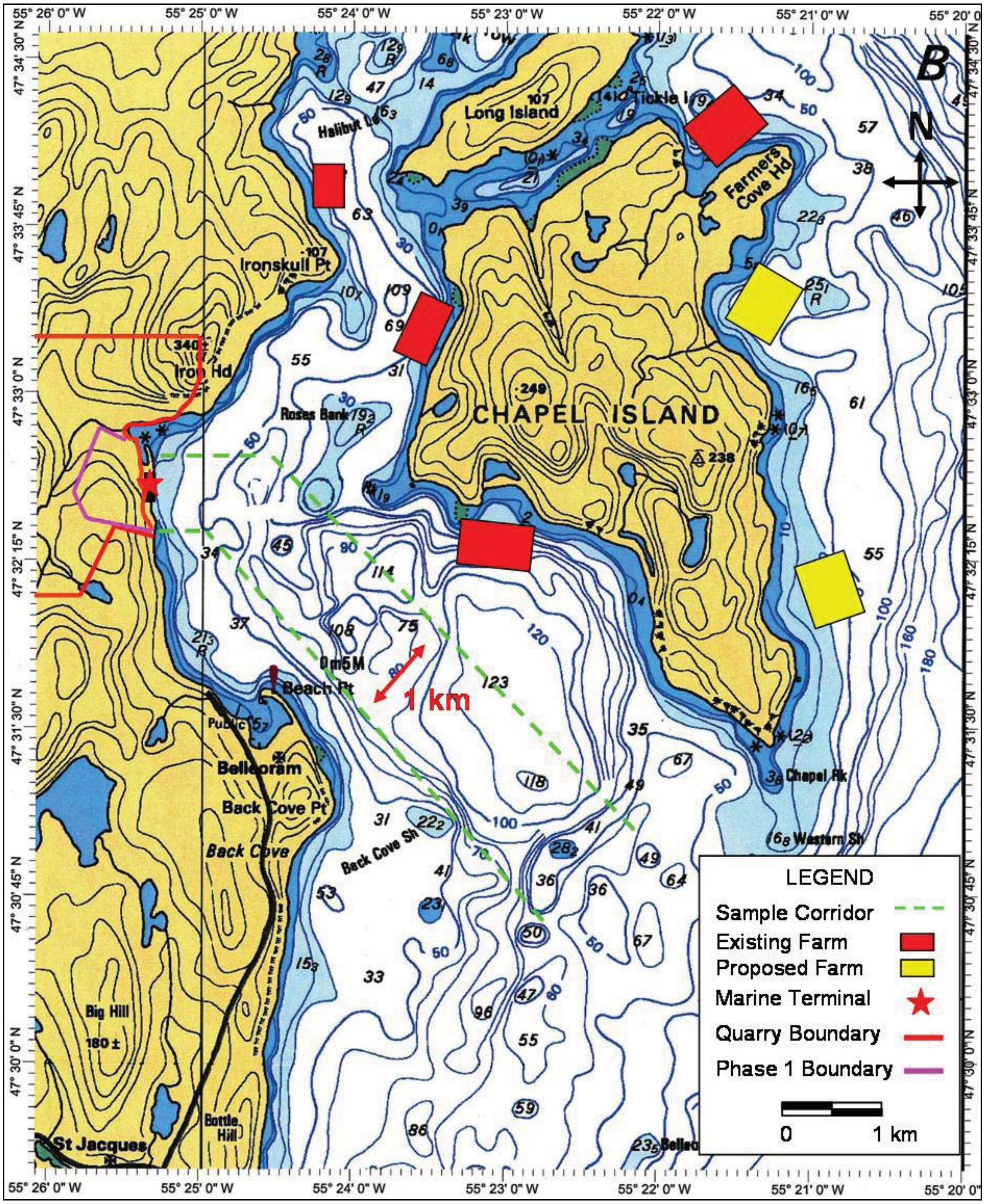


Figure 2.12 Proposed bulk aggregate carrier shipping route into Belle Bay in relation to the other operations and physical features of the area. Aquaculture site mapping obtained from the Newfoundland and Labrador AquaGIS database (2007).

2.2.4 Ancillary Facilities/Activities

Blasting

Blasting operations will be conducted at the proposed quarry in accordance with the:

- *Explosives Act*;
- NL *Dangerous Goods Transportation Act* and *Regulations*;
- *Transportation of Dangerous Goods Act* (Canada);
- *Fisheries Act*;
- *Newfoundland and Labrador Environment Act and Occupational Health and Safety Act*;
- *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky 1998), and;
- *Dyno Nobel Canadian Blast Site Safety Procedures* (2002).

Blasting during quarry start-up will be once per week and twice per week during full production, corresponding to a yearly production of 2 million tonnes at startup and increasing to 6 million tonnes during the life of the quarry (year-round operation). All blasts will be conducted between the hours of 0700 hours and 1900 hours. At the entrance to the quarry a 'Blast Notice Board' shall be erected detailing the time and date of any proposed blast as well as a description of the blast signaling system.

Continental Stone will be employing the following blast parameters during production operations:

Bench Height	12.0 m
Hole Diameter	165 mm
Burden	4.87 m
Spacing	4.87 m
Subdrill	1.52 m
Collar	3.04 m

Each bore hole will be loaded with 290 kilograms of Dyno Gold 70-30 Bulk Emulsion Blend explosive pumped in to the bore hole using bulk explosives delivery systems. The bore holes will be double primed using 350 gram cast boosters used in conjunction with Nonel EZ detonators having a 25 millisecond surface delay and a 500 millisecond in-hole delay interval. The Nonel EZ detonators are to be used with Nonel EZ Trunkline Delays in such a fashion that each bore hole in the blast is fired independently and with a minimum of 8 milliseconds of delay interval. The collar of each blast hole will be filled with 20 mm diameter clean crushed stone to contain the gasses within the bore hole and reduce unwanted air overpressure. Drilling will be conducted using Down The Hole (DTH) drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism.

A Blasters Safety Certificate (from the NL Department of Energy and Conservation; DOEC) and a Temporary Magazine License (from the NL Department of Mines and Energy) will be obtained prior to drilling and blasting to ensure that the proper procedures are known and followed.

In light of the potentially hazardous nature of ammonia-based explosives and their residues, the following measures will be put into place during all blasting operations. These include:

- Using a bulk emulsion explosive that is proven to have a reduced ammonia release rate, which will allow any wastage to assimilate into the environment at a more sustainable rate;
- Using suppression and/or collection equipment during drilling, using DTH drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism;
- Capping each 12 m bore hole with 3 m of 20 mm, clean, crushed stone to trap gases and dust during blasts;
- Discharging water from blasting areas to vegetated areas to encourage bio/chemical-degradation of any ammonia present;
- Direction bench water to dedicated settling ponds to allow for the degradation of nitrogenous residues, with all water releases being regularly monitored to ensure they comply with appropriate regulations (e.g. CCME limit of 0.019 mg/L)
- Ensuring that the handling, transportation, storage and use of explosives will be conducted in compliance with all applicable laws, regulations, and orders of the DOEC and the Department of Natural Resources-Mines.
- Only allowing persons properly trained and qualified to handle explosives in accordance with the manufacturer's instructions and governmental laws and regulations;
- Maintaining the integrity of all storage containers, tanks, and loading equipment to prevent spills of explosives, and following the manufacturer's spill clean up recommendations;
- Using explosives in a manner that will minimize scatter of blasted material beyond the limits of the activity;
- Designing blasting patterns and procedures which minimize shock or instantaneous peak noise levels and ensures that the magnitude of explosions is limited to only what is necessary; such as optimizing drill patterns and those outlined above;
- Making a blasting plan available to the local committee;
- Disposing of all blasting associated debris (e.g. explosive boxes and used blasting wire) in government approved facilities designed to handle such wastes;
- Surveying the immediate area prior to blasting, with blasting operations being delayed if big game (such as moose) are observed within 100 m and allowing animals to leave of their own accord; and
- Not blasting underwater or within a waterbody.

Crushing, Screening and Stockpiling

Rough blast rock will be placed in dump trucks (Caterpillar 770 and 773F) by loaders (Caterpillar 990H and 992G) and excavators (Caterpillar 385CL and Hitachi Giant EX1200) to be taken to the rough stockpiles. Aggregate stored in the stockpiles will then be conveyed to a series of primary, secondary and tertiary crushers to be prepared according to the desired aggregate size for the current market. The specific model of crushing and screening equipment has not yet been determined; however, they will be of a type standard to the industry and from a reputable manufacturer (e.g. The Norberg Group). These machines will be operated and maintained according to their manufacturers' specifications and be fitted with safety, noise suppression and dust suppression devices. Aggregate will be screened and washed of fines and then conveyed to the final stockpiles to await shiploading. All stockpiles will be sloped to avoid the collection of water, with runoff from storage areas being directed to properly installed and maintained sediment control structures. The non-acid rock potential of the area's granite, and its minimal natural heavy metal content, ensures this material will not leach contaminants to the surrounding water or land.

Wash Water Activities

Aggregate wash water will be obtained from the lower portion of the freshwater steam T1 system via an installed water intake system (as per the DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines). A pumphouse (with intake) will be installed in the stream T1 adjacent to the settling ponds. Water will be extracted and held in a storage tank located in the crushing/screening area of the quarry. It has been anticipated, based on conversations with Metso Minerals Canada Inc., that water requirements will be 5US gallons (19 L) per tonne of granite. With a rinsing screen and recycling of water, it is anticipated that a loss of 10% can be expected (i.e. evaporation, waste water discharge). The first year of operation will expect production of 450 tonnes per hour. With recycling, ongoing water extraction will therefore be required at a rate of approximately $0.00024m^3/s$ (0.237L/s). In subsequent years, the quarry capacity will most likely be doubled (900 tonnes per hour) which will require a total water extraction of $0.00048m^3/s$ (less than 0.500L/s).

Wash water from aggregate washing will be collected and sent through an enclosed PVC pipeline to the settling ponds as outlined in Section 2.2.2. This will significantly reduce fugitive water effluents from the site into the surrounding environment, with the wash water recycled from the settling ponds back into the operations to decrease the drawdown required from the stream T1 (with a predicted recovery of 90%).

2.2.5 Development Schedule

Physical development of the Belleoram Crushed Rock Granite Quarry spans fifty years including the construction phase in Year 1, the operational and maintenance phase in Years 2 through 49, and the decommissioning phase in Year 50. Quarry plans for the 900 ha site are being developed; however, it is known that the initial 80 ha Phase 1 is expected to last 20-25. After quarrying at Phase 1 is complete, the remainder of the 900 ha will be quarried, with successive reclamation operations being ongoing in areas that have already been quarried out.

<u>Year 1 – Construction</u>

Construction of the quarry and marine terminal infrastructure is scheduled to take place in Year 1, beginning in the fall of 2007. This will include the creation of access roads and the initial clearing of timber and overburden on the 80 ha Phase 1 site only. All operational equipment will be set up including the crushers and screeners, along with the associated wash water infrastructure and settling ponds. The office/welding facility will be constructed at the gated entrance to the quarry, with all other ancillary structures (e.g. fuel and explosives storage sheds) will be built. The marine terminal's construction will commence, initially with the construction of access roads to the site, infilling of the earthen-filled approach and then the wharf.

<u>Years 2 – 25 Operation</u>

The construction phase is expected to finish after the first year of development, but may last into Year 2 depending on conditions at the time. At this point the operational phase will commence. The major operational activities include quarry by blasting the rock and subsequently primary, secondary and tertiary crushing, screening and washing. Aggregate will be processed according to market demands at the time and then conveyed to the marine terminal for shiploading. Excess rock will be stockpiled and sediment control and bench runoff ponds will be continually monitored and cleared as appropriate. Reclamation procedures will be ongoing in quarried out areas, with continual assessment and maintenance being done on all sediment control structures to ensure their stability.

<u>Years 26 – 49 Operation</u>

This stage will see the reclamation of the initial 80 ha Phase 1 quarry site and the continuation of operation on the remainder of the 900 ha site. Operations will consist of the same activated undertaken during years 2-25, including quarrying, processing, progressive reclamation, maintenance and shipment of rock.

<u>Year 50 – Decommissioning</u>

This phase will see the decommissioning of the quarry including the removal of all operational equipment (e.g. crushers and screeners), buildings, conveyors and ship loader. The Closure Plan will be implemented and reclamation efforts will see the grading of the land and vegetation being planted. A Phase I Site Assessment will be conducted and the sediment ponds and any sites found to be contaminated will be remediated according to any applicable, laws and legislation, as necessary.

2.2.6 Decommissioning/Reclamation

The CEA Act requires that all phases of the project under review be considered, including: construction, operation, decommissioning and final closure of the site. The quarry is expected to have a lifespan of at least 50 years at which point the Decommissioning Phase will commence. This will entail the removal of all processing equipment, conveyors, buildings and infrastructure located at the marine terminal. All toxic materials and storage tanks will be removed from the site and disposed of in compliance with regulatory requirements. The demolition of buildings and infrastructure will be conducted in a fashion that promotes the maximum recovery and recycling of materials and will apply provincial and municipal regulations and guidelines on waste management and separation.

2.2.6.1 Decommissioning

To ensure public safety, access to the site will continue to be restricted with service roads at the quarry either blocked off or rehabilitated depending on their potential use in the future. Should the site be converted for public use, access and safety issues with this option will be addressed during the development of the final Decommissioning and Reclamation Plans.

Details of the site decommissioning and the associated site reclamation will be determined at the end of the Project life and described in a Decommissioning Plan. This plan will specify decommissioning objectives, approach, activities, and schedules and will be developed in consultation with the Provincial and municipal government, community and stakeholder groups. In particular, objectives of the decommissioning plan will be to:

- Identify applicable municipal, provincial, and federal regulations and standards;
- Identify and consider objectives of local stakeholders;
- Define the decommissioning objectives and specify works to be completed;
- Protect public health and safety;
- Identification of any contaminated sites and define their remediation;
- Reduce or eliminate potential adverse environmental effects beyond Decommissioning, and;
- Develop a materials management strategy to maximize reuse/recycling options for decommissioned facilities.

The decommissioning work will be conducted in full compliance with all the federal, provincial and municipal regulations and standards that apply at the time of the decommissioning. In order to support the site reclamation with respect to such aspects as habitat creation, re-vegetation and access, the decommissioning plan will be closely coordinated with the reclamation plan. Following the removal of buildings, infrastructure and materials a qualified environmental expert will assess the quarry site with respect to contamination that may have occurred as a result of the production or decommissioning activities. A Phase I site assessment will be done to identify any contaminated sites and remediation plans will be designed for their cleanup.

It should be noted that, at this time, it is anticipated that the marine terminal will not necessarily be decommissioned at the time of the quarry's closure. The structure has been engineered to last 40 years before any major works are required, and will also receive regular inspections and servicing to ensure its structural integrity and safety. While it is foreseeable that the infrastructure and equipment (e.g. conveyors and ship loader) will be removed from the marine terminal, the use of its superstructure for alternative projects will be discussed at the time of closure. All stakeholders will be consulted and the feasibility of alterative uses will be assessed. This will also include the possibility of its demolition.

2.2.6.2 Progressive Reclamation

Reclamation is generally designed to control erosion, ensure watershed stability, and re-establish wildlife habitat and the aesthetics of the area. Work will include site grading and drainage, soil preparation and planting operations. Reclamation will be incremental over the life of the Project, and will include such measures as regrading the landscape and revegetating the land with local plant species. The progressive reclamation strategy is designed to allow the land to recover back to productive forest as soon as possible and minimize the extent that operations will be occurring at the site at any one time. The reclamation plan will be refined over time and with input from the local stakeholders including the Town of Belleoram, adjacent landowners, First Nations and local special interest groups.

Reclamation efforts will also serve to maintain the integrity of sensitive habitats (e.g. wetlands) that were maintained throughout the operation of the Project. This is accomplished by maintaining the buffer zones around such lands, with incremental planting being done to create various successional stages of vegetation for food and cover for wildlife, and the establishment of a more productive habitat. The reclamation process begins after the environmental controls (sediment retention ponds, drainage channels, etc.) are in place. Any organic material stockpiled during overburden clearing operations will be use to regrade the land. Also, sediment retention structures will be either phased out or maintained depending on the need for them at the time.

2.2.6.3 Closure Plan

A Closure Plan, pursuant to Sections 8, 9 and 10 of the NL *Mining Act*, will be developed by the Proponent outlining measures to be taken upon closure and decommissioning of the site. This plan will include all activities required to close down the quarrying operations and establish financial assurances to ensure that funds are in place to carry out the closure plan. The objectives of the Closure Plan are to:

1) Restore the landscape to a physically and chemically stable and safe

environment;
2) Reduce or eliminate potential adverse environmental effects;
3) Rehabilitate the land to a state similar to original use, and;
4) Return the property to the Crown for long term care and monitoring.

The quarry will be progressively rehabilitated as operations progress across the entire Project area. Specific details of the Closure Plan will change over time, with the plan being evaluated yearly and updated appropriately. Based on existing decommissioning standards and protocols for mines and quarries, it is anticipated that the following description of closure procedures and activities will occur.

Open Pit

The site will be cleaned of all waste, garbage and debris which will be disposed of at an approved waste disposal site. Drainage patterns will be stabilized and/or reestablished throughout the site. This may include:

1. Constructing a berm at the top of the slope to stop water from running into the pit;
2. Laying brush and slash across the slope to slow run-off and hold back sediment; and
3. Directing run-off away from the pit by cutting drainage ditches or pumping.

The pit will be graded to a suitable angle of repose no steeper than two horizontal to one vertical (2:1). The final shape of the pit should blend into the natural contour of the land. Overburden stockpile during the progressive clear operations across the site will be used to regrade the pit to a state that is suitable for final revegetation operations to commence. The primary aim of the final reclamation/revegetation operation is to control erosion, establish an initial plant cover, and accelerate the migration of native vegetation into the reclaimed area to reestablish a self-sustaining, natural vegetative cover. Revegetation of disturbed areas will be accomplished by a combination of grass and herb seeding, hand planting of tree seedlings, and natural regeneration. Only species native to the region will be used for revegetation. Revegetated areas will be monitored for up to 10 years after closure to ensure that a self-sustaining vegetation cover is successfully established.

Overburden and Low-Grade Product Stores

The principal concerns associated with the closure of the stockpiles therefore involve slope stability, erosion control, vegetation cover, and aesthetics. Overburden and low-grade granite product stores that have no potential to generate net acidity, or to leach metals in concentrations that would be of environmental concern (as per the CCME Soil Quality Guidelines) will be progressively remediate throughout the life of the quarry. Reclamation measures may include, where appropriate: covering rock stockpiles with overburden and subsequently seeding/hydroseeding, and hand planting of tree seedlings. Local species will be used for all reclamation procedures.

Site Drainage

Site drainage will be restored to the extent practicable at the end of operations, including the removal of all culverts. When ponds and streams are scheduled to be quarried, they will be drained in such a manner as to avoid flooding of active work sites. The progressive quarrying operations will include provisions for restoring site drainage at decommissioned work areas through the use of such measures as drainage ditches and diversion channels.

Buildings, Machinery, Equipment and Infrastructure

All onsite machinery and buildings will be decommissioned upon the closure of the quarry. It is anticipated that all operational equipment such as rock crushers, screeners, earth movers, conveyors, pipelines and the like will be taken off site and either sold for reuse or be recycled/disposed of in a government approved waste disposal facility. All fuel, explosives or chemical storage sheds will be dismantled and recycled/disposed of offsite, with the underlying soils in the area being tested for the presence of contaminants. Contaminated soils will be removed and disposed of in an appropriate manner. The office building/welding facility will be demolished and disposed of in the landfill unless another economic alternative is available. All marine terminal infrastructure (e.g. the ship loader and conveyors) will be removed. The super structure will be either dismantled and removed, or an alternative use will be decided upon at the time of closure through consultation will all stakeholders, in which case the marine terminal will be left to operate into perpetuity.

Roads, Bridges and Power Lines

The main access roads servicing the quarry site from the Town of Belleoram will be left intact to the point where it meets the quarry boundaries. This will be done to allow access to the closed quarry for future monitoring and to enable local residents to access the site for recreational activities. However, the road entering the quarry pit will be blocked off (e.g. using boulders or a berm) to prevent vehicles from entering the pit. All onsite roads will be filled or graded during rehabilitation and revegetation and will no longer be in use. The Bailey bridge spanning the stream T1 will be dismantled and removed and recycled/disposed of offsite. The 115 kV transmission line from servicing the quarry, and any on-site power lines and other power equipment and materials including oil-filled transformers will be removed. However, if future demand in the area at the time of closure would benefit from leaving these services intact (as determined by Newfoundland Hydro), they will be maintained to service these future functions.

Petroleum Products, Chemicals and Explosives

All petroleum products and chemicals will ultimately be removed from the site by licensed haulers for reuse or appropriate disposal.

Contaminated Soil

A Phase 1 Environmental Site Assessment will be conducted at the end of operation or early in the closure phase. Pursuant to Section 28(1) of the NL EPA, a Remedial Action Plan will be submitted to the Minister outlining the remediation measures required to rehabilitate the site. This may include such measures as removing soils found to exceed acceptable criteria for substances such as hydrocarbons, explosive residues and caustic chemicals and disposing of them in a government approved facility by a qualified contractor

Ponds and other Water Structures

Settling ponds will be decommissioned as part of progressive reclamation activities. It is anticipated that once the pipeline supplying these ponds with wash water is removed the ponds will dry up. However, if drainage patterns are such that these ponds can be serviced by natural stream flows, and it is feasible that they can become productive fish habitat, they will be left intact. All water intake structures will be removed.

2.2.7 Local Special Interest Committee

In keeping with Continental Stone's commitment to ensuring a minimum impact on the local environment and its residents, it will invite all interested parties to participate in a committee which will allow them to voice their concerns and offer any comments they have on a regular basis. This committee could include residents of Belleoram, property owners in the area, local business owners, owner/operators of aquaculture sites within Fortune Bay, representatives from the Conne River Miawpukek First Nation, and recreational users of the area. It is recommended that a scientific advisor also be a member, such as a veterinarian specializing in fish aquaculture or an aquatic scientist.

Continental Stone will openly accept and consider all comments and concerns expressed by these interested parties and strive to provide any information requested by them. The ultimate goal of this committee will be to provide an avenue for efficient communication between stakeholders and to prevent conflicts from escalating to situations that may negatively affect any of the parties involved, whether the issues are environmental, social, or quality of life. This preventative, hands on, approach should ensure the prosperity, stability and long term viability of the region through the elimination of potential conflicts and the minimization of the quarry's negative effects.

3.0 CEAA ENVIRONMENTAL ASSESSMENT PROCESS

An environmental assessment (EA) of a project is required under the Act if a federal department is required to exercise certain powers or perform certain duties or functions in respect to the project for the purpose of enabling the project. Under Section 5 of the Act, a federal environmental assessment may be required when, in respect of a project, a federal authority proposes to:

- Be the proponent;
- Make or authorize payment or any other form of financial assistance to a proponent;
- Sell, lease or otherwise dispose of land; or
- Issue a permit, or licence or other form of approval pursuant to a statutory or regulatory provisions identified in the *Law List Regulations*.

These functions are known as triggers. Once a federal department has triggered the Act then that department becomes a Responsible Authority (RA). The RA(s) has a responsibility to ensure that an environmental assessment is conducted in accordance with the Act prior to taking any action that could enable the project.

If the RA(s) has determined that component of the development proposal is prescribed on the *Comprehensive Study List Regulations* of the *Act* then the RA(s) must ensure the comprehensive study process is conducted. Pursuant to Section 21(2) of the *Act*, the RA(s) must report to the Minister of the Environment after public consultation on the following aspects;

- the scope of the project, the factors to be considered in the environmental assessment, and the scope of those factors;
- public concerns in relation to the project;
- the project's potential to cause adverse environmental effects; and
- the ability of the comprehensive study to address issues relating to the project.

The RA(s) must also recommend to the Minister of Environment whether the environmental assessment should continued by means of a comprehensive study or whether the project should be referred to a mediator or review panel. After considering the Subsection 21(2) report and recommendation, the Minister of the Environment will decide whether to refer the project back to the RA(s) to continue with the comprehensive study process, or refer the project to a mediator or review panel. If the Minister of the Environment decides that the project should continue as a comprehensive study then the project cannot be referred to either a mediator or review panel at a later date.

If the Minister of the Environment determines that the environmental assessment process will continue as a comprehensive study then the RA(s) will coordinate to prepare a single CSR. The public will be given an opportunity to participate during the comprehensive study process. Once completed, the CSR will be submitted to the Minister of the Environment and the Canadian Environmental Assessment Agency (the Agency).
The Agency will invite the public to comment on the CSR prior to the Minister of the Environment making a final decision. The Minister of the Environment may request additional information or require that public concerns be addressed further before issuing the environmental assessment decision statement. Once the Minister of the Environment issues the decision statement the project will be referred back to the RAs for appropriate action.

3.1 Responsible Authorities

In relation to this Project, TC and DFO have determined that the proposed marine terminal construction will likely require specific regulatory authorizations or approvals from each department that are listed under the under the *Law List Regulations* of the *CEA Act*. ACOA, pursuant to paragraph 5(1)(b) of the CEA Act, may potentially provide funding to the proponent to enable portions of the project. Therefore, the decision by these three federal departments triggers the need for an environmental assessment under Section 5 of the CEA Act. More specifically:

- TC may issue an approval pursuant to subsection 5(1) of the *Navigable Waters Protection Act* for the construction of a marine terminal used for loading and shipping aggregate from the proposed quarry.

- DFO may issue an authorization pursuant to subsection 35(2) of the *Fisheries Act* for the harmful alteration, disruption, or destruction of fish habitat resulting from the construction of a marine terminal used for loading and shipping aggregate from the proposed quarry.

- ACOA may potentially provide financial assistance to the proponent for the purpose of enabling the construction of the marine terminal used for loading and shipping aggregate from the proposed quarry.

Therefore, TC, DFO, and ACOA are RAs due to their decision-making responsibilities relative to the above components and must ensure that an environmental assessment pursuant to the Act is conducted.

3.2 Expert Federal Authorities

An expert Federal Authority (FA) is any federal department or agency which has determined they have an obligation to provide any specialist or expert information or knowledge that it possesses with respect to a project. This expertise can be used during any stage of the environmental assessment, from the commencement of the environmental assessment to the implementation of the mitigation measures or any follow-up program.

In relation to this Project, EC have participated within this environmental assessment process because the department has determined that they possess specialist and/or expert information related to the *Department of the Environment Act*, *Fisheries Act* (Section 36), *Canadian Environmental Protection Act*, *Canada Water Act*, *Canada Wildlife Act*, and the *Migratory Bird Act*. EC's focus within each of these statutes are focused primarily on promoting sustainable development, protecting the environment, conserving certain renewable resources, and reporting on environmental conditions.

NRCan has participated in this environmental assessment process because the department has determined that they possess specialist and/or expert information related to geological incidents (earthquakes, landslides, flooding, deep water hazards, tsunamis, and geomagnetism), landscape process and stability (coastal, fluvial Aeolian slope), and their response to climate change, marine environment and marine resource geosciences.

Health Canada has participated in the environmental assessment process because the department has determined that they possess specialist and/or expert information related to minimizing potential human health risks that could arise in relation to the Project as scoped by the RAs.

4.0 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

The "scope" defines what is included or excluded from the federal environmental assessment analysis. It focuses the information gathering and analysis activities on the appropriate and important elements related to a specific project or environmental component. It can greatly influence the outcome of an environmental assessment by defining what will be assessed. Therefore, scoping establishes the boundaries of the federal environmental assessment. The scope identifies elements of the project to include in the environmental components likely to be affected and focuses the assessment on relevant issues and concerns.

4.1 Scope of the Project

The scope of the project is defined as the components of a proposed undertaking relating to a physical work, or a proposed physical activity not relating to a physical work, that are determined to be part of the project for the purposes of the environmental assessment (Canadian Environmental Assessment Agency, 2006).

TC has determined, based on the NWPA Section 5(1)(a) trigger under the *Law List Regulations* of the Act, that the scope of the project for the purposes of the environmental assessment will include the construction, operation, and decommissioning and/or abandonment of the marine terminal.

DFO has determined, based on the anticipated *Fisheries Act*, Section 35(2) trigger under the *Law List Regulations* of the Act, that the scope of the project for the purposes of DFO's environmental assessment will be the construction, operation, and decommissioning and/or abandonment of the marine terminal.

ACOA has determined that the scope of the project for the purposes of ACOA's environmental assessment will include the construction, operation, and decommissioning and/or abandonment of the marine terminal.

During the initial stages of this environmental assessment, ACOA employed the "In-Until-Out" Approach to becoming an RA for the comprehensive study process. ACOA had not received an application for funding from the proponent but was informed that the proponent intended to apply for funds at a later date. Given the proponent's intent to request funding ACOA decided to become involved as an RA due to the likelihood of a Section 5 funding trigger.

During the scoping phase of the comprehensive study process ACOA scoped the project in its entirety given that the proponent had not yet applied for funding. ACOA maintained this full scope of project through the public comment period of the Scoping Document and the Environment Assessment Track Report. On March 22, 2007 the Minister of the Environment announced his determination that a comprehensive study was the most appropriate type of environmental assessment for this Project.

On May 30, 2007 the proponent applied to ACOA for funding under the Business Development Plan to construct and operate a marine terminal to be used of loading and shipping aggregate from the proposed quarry. At this time, ACOA amended their scope of project to the Marine Terminal component only, which is related to their Section 5 funding trigger.

Currently, TC, DFO, and ACOA have the same scope related to their Section 5 triggers therefore a single comprehensive study report has been prepared and each RA will perform their decision-making authority respective to their trigger.

In accordance with Section 15 of the Act, the RAs have determined that the scope of the proposed Project would include the following project components;

- Construction of a 200 m long by 30 m wide marine terminal;
- Installation of ship loading equipment on the marine terminal, and;
- Berthing, loading, and de-berthing of bulk aggregate carriers.

4.2 Comprehensive Study Rationale

As defined in the Act, "comprehensive study" means an environmental assessment that is conducted pursuant to Section 21 and 21.1, and that includes a consideration of the factors required to be considered pursuant to subsections 16(1) and (2).

> *16. (1) Every screening or comprehensive study of a project and every mediation or assessment by a review panel shall include a consideration of the following factors:*
>
> *(a) the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;*
>
> *(b) the significance of the effects referred to in paragraph (a);*

(c) comments from the public that are received in accordance with this Act and the regulations;

(d) measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project; and

(e) any other matter relevant to the screening, comprehensive study, mediation or assessment by a review panel, such as the need for the project and alternatives to the project, that the responsible authority or, except in the case of a screening, the Minister after consulting with the responsible authority, may require to be considered.

16. (2) In addition to the factors set out in subsection (1), ***every comprehensive study of a project*** *and every mediation or assessment by a review panel shall include a consideration of the following factors:*

(a) the purpose of the project;

(b) alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;

(c) the need for, and the requirements of, any follow-up program in respect of the project; and

(d) the capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future.

Therefore a comprehensive study is the type of environmental assessment conducted for projects that are likely to have significant adverse environmental effects. Such projects are prescribed in the *Comprehensive Study List Regulations* of the *CEA Act*.

Upon review of the development proposal, the RAs determined that the project as scoped was subject to a comprehensive study under the Act pursuant to paragraph 28(c) of the *Comprehensive Study List Regulations,* which reads:

28. The proposed construction, decommissioning, or abandonment of

(c) a marine terminal designed to handle vessels larger than 25,000 DWT unless the terminal is located on lands that are routinely and have been historically used as a marine terminal or that are designated for such use in a land-use plan that has been the subject of public consultation.

Accordingly, a comprehensive study process was initiated for the Project by the RAs.

4.3 Factors and Scope of the Factors

The scope of assessment defines the factors proposed to be considered in the environmental assessment and the proposed scope of those factors. The RAs are required to consider the factors specified in Section 16 of the CEA Act, taking into consideration the definitions of the environment, environmental effect, and project.

As defined under the CEA Act, "environmental effect" means, in respect of a project:

> *a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act*
>
> *b) any effect of any change referred to in paragraph (a) on*
> *i) health and socio-economic conditions*
> *ii) physical and cultural heritage*
> *iii) the current use of lands and resources for traditional purposes by aboriginal persons, or*
> *iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or*
>
> *c) any change to the project that may be caused by the environment whether any such change or effect occurs within or outside Canada;*

Under Section 16 of the CEA Act, the following factors must be considered in an environmental assessment conducted as a comprehensive study:

- the environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- the significance of the environmental effects referred to above;
- comments from the public that are received in accordance with this Act and the regulations;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;
- the purpose of the project;
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
- the need for, and the requirements of, any follow-up program in respect of the project;

- the capacity of renewable resources that are likely to be significantly
- affected by the project to meet the needs of the present and those of the future; and,
- the inclusion of community knowledge and aboriginal traditional knowledge may be considered within the environmental assessment.

Scope of the Factors to be Considered

The following list outlines the scope of the factors to be considered within this environmental assessment;

- Fish and fish habitat;
- Aquaculture/commercial fisheries;
- Navigation and marine safety;
- Marine birds including seabirds and sea ducks;
- Species at Risk;
- Atmospheric environment, and;
- Human health and safety.

Accidents and Malfunctions

The probability of accidents or malfunctions associated with the any phase of the Project and the potential adverse environmental effects of these effects has been assessed (e.g. accidental spills, contingency measures for responding to emergencies, risks of facility malfunctions, etc.).

Cumulative Environmental Effects

The Project also has the potential to generate cumulative environmental effects. The cumulative effects assessment has evaluated the likely cumulative effects that may result in combination with other activities in the area as well as those activities that will occur in the foreseeable future.

Effects of the Environment on the Project

The environmental hazards that may affect the Project and their predicted effects including natural hazards such as extreme weather events, seismic activities, extreme tidal conditions, fog events, and climate change has been evaluated.

Spatial and Temporal Boundaries

Spatially, the project as scoped is located at the proposed marine terminal site in the intertidal zone immediately north of the Town of Belleoram, NL. The spatial boundary has been determined for each factor in order to effectively assess the potential environmental effects of the Project.

The temporal boundaries encompass the entire lifespan of the Project. The environmental assessment will discuss the effects of the Project on each factor in relation to the construction phase, operational phase (including any maintenance and modifications), and through to the completion, decommissioning and/or abandonment phases of the Project.

The scoping document and the track report were developed by the RAs. The RAs also delegated preparation of the CSR document to the Proponent.

Follow-Up Program

This environmental assessment includes the consideration for the need for and requirements of an environmental monitoring and follow-up program.

5.0 THE PROVINCIAL REVIEW PROCESS

The Project was also subject to a provincial EA in accordance with the Newfoundland and Labrador *Environmental Protection Act*. The project was registered with Newfoundland and Labrador Environment and Conservation on April 5, 2006. This Registration described all three phases of the project (i.e. Development, Operations, and Decommissioning) and described mitigations related to each phase. On June 8, 2006, the Minister of Environment and Conservation announced that an Environmental Preview Report (EPR) was required because of the potential interaction with the aquaculture industry in the area. On November 20, 2006 the Proponent submitted their EPR to the provincial government for review. On January 26, 2007 the Minister of Environment and Conservation approved the EPR and released the project from further assessment.

Although the Project did not require further assessment by the provincial government, the proponent does require a quarry permit from the provincial Department of Natural Resources. The quarry permit will be issued in accordance with the Provincial *Mining Act* and *Quarry Material Act*. Prior to receiving the quarry permit the proponent is required to submit an Environmental Protection Plan (EPP), Spill Contingency Plan, Development Plan, and a Rehabilitation and Closure Plan for the quarry site. These documents will be reviewed and approved by the provincial government before the operations can commence.

6.0 INFORMATION DISTRIBUTION AND CONSULTATION

The Canadian Environmental Assessment Agency (the Agency) received formal notification of the Project through the Newfoundland and Labrador environmental assessment registration process. On April 12, 2006, pursuant to the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements*, the Agency notified Federal Authorities of the project to determine their potential roles in the environmental assessment. The notice was sent to ACOA, DFO, TC, Environment Canada (EC), Natural Resources Canada (NRCan) and Health Canada (HC). By April 28, 2006, DFO and TC had identified as Responsible Authorities and EC, NRCan and HC as Federal Authorities with specialist expertise. In mid-August, ACOA also identified as a Responsible Authority because the proponent indicated their intent to apply for funds to enable the project, or components of the project. In accordance with Section 12.4 of the Act, the Agency is the Federal Environmental Assessment Coordinator (FEAC) for the project.

6.1 Project Team

The Agency received confirmation on April 28, 2006 that the federal working group consisted of TC, DFO, EC, HC, and NRCan. TC and DFO would be RAs for the project given each department's Section 5 trigger in accordance with the Act. TC acted as the Principle RA with the Agency participating as the FEAC for the comprehensive study process. The remaining departments would participate as FAs for the Project and provide expert and/or specialists information related to their departmental mandates. In mid-August 2006 ACOA determined they would be a likely RA for the project given the proponent's intent to apply for funding to aspects of the project. Public Works and Government Services Canada (PWGSC) participated in the EA process on behalf of ACOA. Representatives from each department made up the project team that has met on a regular basis and reviewed all relevant documents including the Scoping Document, Track Report, and draft CSR. The Scoping Document and the Track Report were prepared by the RA's and the preparation of the CSR was delegated to the Proponent.

6.2 Public Consultation Conducted by Proponent

The Proponent participated in two informal public meetings in the Town of Belleoram in April, 2007. The first public meeting was a Skills and Education Summit attended by approximately 100 people held to discuss the description of the Project and the activities that it would entail. The purpose was to illustrate to the residents of the area what work opportunities would be available to them and the skill sets that Continental Stone would require to fill their staffing needs. The feedback from those in attendance was very positive and the residents showed a great deal of excitement and optimism with respect to the Project

The second presentation was given at the Coast of Bays Economic Development Corporation's meeting that was held in Harbour Breton, NL, on April 12, 2007. At this meeting a representative gave a presentation about the proposed quarry Project to those in attendance; outlining the Project's scope, activities, and the operations that it would require. Again, this presentation was very well received and the feedback was overwhelmingly positive.

6.3 Public Participation under *CEA Act*

CEA Act requires that public consultation be conducted a minimum of three times during a comprehensive study:

- during the preparation of the scoping document [subsection 21(1)];
- during the preparation of the comprehensive study report (section 21.2); and
- during a review of the completed Comprehensive Study Report (CSR) prior to the

Minister of the Environment's issuance of an environmental assessment decision Statement (section 22).

6.3.1 *CEA Act* Section 21 – Public Participation Regarding Proposed Scope of the Project

The public comments were sought on the environmental assessment scoping document for the proposed granite rock quarry and marine terminal near Belleoram, NL. The scoping document was prepared by the RAs and included information on the purpose of the document, the environmental assessment process, opportunities for the public to make comments and other public participation opportunities.

In relation to the scoping document, the following public consultation and communications initiatives were undertaken:

- Information on the Project and the environmental assessment was made publicly available on the Canadian Environmental Assessment Registry (CEAR) website. The CEAR reference number for this project is 06-03-19881. The CEAR includes the Notice of Commencement, the notice regarding the opportunity for public comment on the scoping document, and the notice advising on the availability of participant funding.

- Notices advising of the public comment period on the scoping document were placed in the following newspapers: The Telegram, The Coaster, and Le Gaboteur. The notices provided information on the length of the public comment period, how to obtain a copy of the scoping document, the availability of participant funding, and how to provide feedback.

- Copies of the scoping document were also made available for viewing at the Belleoram Town Office.

In addition to the public notices, copies of the scoping document were forwarded to key stakeholders prior to advertising public notices. These stakeholders included the Town of Belleoram, Harbour Authority of Belleoram, Cooke Aquaculture, Nordland Aquaculture, Coast of Bays Corporation, Fish, Food and Allied Workers Union, and the Newfoundland and Labrador Department of Environment and Conservation.

The public and key stakeholders were invited to comment on the following specific points during the consultation period which ran from September 23, 2006 to October 27, 2006: 1) the proposed scope of the project for purposes of environmental assessment; 2) the factors proposed to be considered in its assessment; 3) the proposed scope of those factors; and 4) the ability of the comprehensive study to address issues relating to the Project.

No letters of concern or opposition were received from the public or non-government organizations during the 34-day public consultation period. Four individuals requested copies of the scoping document but no comments were received.

6.3.2 *CEA Act* Section 21.2 – Public Participation in the Comprehensive Study

Pursuant to subsection 21.1 of the *CEA Act*, a second round of public consultation was held in Belleoram, on July 18, 2007. The open house provided the public with an opportunity to review the Development Proposal and get an update on the environmental assessment process, including the scoping revisions made in May 2007.

The open house invitation was send to the all residents of Belleoram via a letter drop at the local Canada Post Outlet. Copies of the invitation were sent to the key stakeholders identified during the scoping phase. This includes the Town of Belleoram, the Harbour Authority of Belleoram, the Coast of Bays Corporation, the Conne River Band Council, Cooke Aquaculture, the Fish, Food and Allied Workers Union, and the Newfoundland and Labrador Department of Environment and Conservation. On July 9, 2007, a Notice of Public Participation was posted.

The Proponent, environmental consultants, and RA's displayed posters and talked with people who attended the open house. The public was provided with information on project description, existing environment, potential environmental effects of the marine terminal, and proposed mitigation measures.

The open house was held at the Belleoram Community Centre from 6:00 pm to 9:00 pm. A total of 70 people attended (as per the Sign-in Book and Exit Survey). Most attendees were from ten local communities. Two were from Central Newfoundland and two from out of the province. Several attendees were from St. John's and some of these were representatives of Federal Departments.

Twenty-seven completed Exit Surveys were received at the end of the meeting. All but two were completed by residents of Belleoram or nearby communities. Most people indicated that they found the poster panels and the information provided by project personnel to be very useful. Most of those who responded to the Survey felt that the Development Proposal is quite positive for the economy of the area and their questions related to what types of employment would be available and when.

Several who completed surveys expressed concern, in non-specific terms, about the social or general effect of development on the community. Participants had questions about project impact in terms of size of the development and distance from the community and Iron Skull – an iconic rock formation near the proposed quarry.

The public was given until Friday, July 27, 2007 to provide comments to the RA's on the environmental assessment process. No comments were received.

6.3.3 *CEA Act* Section 22 – Public Access to the Comprehensive Study Report

Pursuant to Section 22 of the *CEA Act*, a third opportunity for public input on the Project and the associated environmental assessment will occur through a public review period on this report. The Agency will facilitate public access to the CSR, including administering the formal comment period. All comments submitted will be provided to the RAs and will become a part of the public registry for the Project.

6.4 Consultations with Federal Authorities

Throughout the comprehensive study process the FAs have been consulted and provided an opportunity to comment on the Scoping Document, Track Report, and the draft CSR. Each FA was asked to provide comments specific to their respective departmental mandates. Comments outside the scope of the project were not incorporated into the CSR unless the FA agreed to accept responsibility for the implementation and follow-up of those components outside the legislative mandates of the RAs.

6.5 Consultations with Aboriginal Persons

The Project is located along the south coast of the island of Newfoundland, in the province of Newfoundland and Labrador. The Project is not located within land settlement areas or areas where Aboriginal groups assert traditional rights.

Currently, there is only one aboriginal community located on the island portion of Newfoundland and Labrador. The Miawpukek First Nation is located in Conne River approximately 75 km north from the Project site. However, the land claims settlement agreement for the Miawpukek First Nation does not extend beyond the boundaries of the community.

During the public consultation period on the proposed Scope of the Project, a copy of the Scoping Document was forwarded to the Conne River Band Council (Chief Misel Joe, Miawpukek First Nation) for review and comment. The Band Council did not submit any comments or concerns on the Scoping Document. There are no known traditional Aboriginal fishing areas near the proposed marine terminal site therefore further Aboriginal consultation was not warranted. The Band Council was sent an invitation to the July 18, 2007 open house in Belleoram. No attendees at the open house identified themselves as being from Conne River or representing the Band Council.

6.6 Other Federal or Provincial Regulatory Consultation

In addition to the public consultation requirements pursuant to *CEA Act*, the proponent has conducted a public notification period for the construction of the marine terminal required as a condition of obtaining a Section 5(1) Authorization under the *Navigable Waters Protection Act* (NWPA). The proponent was required to submit a set of engineered drawings to the local town office for public display for a period no less than 31-days. In addition, public notices were published in the Canada Gazette on June 3, 2006, The Telegram on May 25, 2006, and The Coaster on May 25, 2006. The Navigable Waters Protection Program did not receive any letters of concern or opposition to the proposal.

Also, the public had an opportunity to comment on the development proposal throughout the provincial environmental assessment process. The project registration document was posted on the provincial Department of Environment and Conservation website on April 2, 2006 and the public had until May 15, 2006 to submit comments to the provincial Environmental Assessment Division. The provincial Minister of the Environment and Conservation issued a release on June 8, 2006 stating that a Environmental Preview Report (EPR) was required for the development proposal to address additional concerns related to the Aquaculture industry in the vicinity of the project. On November 20, 2006 the proponent submitted the EPR to the provincial government. The public were given an additional 35-days to review the EPR and submit comments to the provincial Environmental Assessment Division. The Minister of the Environment and Conservation approved the EPR and released the project from further assessment on January 26, 2007.

6.7 Consultation Summary – Summary of Comments Received

The initial public consultation period for this project was conducted in accordance with Section 21(1) of the *CEA Act*. A Scoping Document was available to the public for review and comment for a 34-day period between September 23, 2006 and October 27, 2006. No comments were received during this public consultation period.

Pursuant to Section 21(2) of the *CEA Act*, a second round of public consultation was required. A public open house was held in Belleoram on July 18, 2007. Those who attended the open house were mainly interested in the Development as an employer and economic catalyst for the area. Residents were keen to learn when employment opportunities would be available. Several comments related to the social, aesthetic, and environmental effects on the Town of Belleoram and the area. No further comments received by TC during the 10-day review period which concluded on July 27, 2007.

7.0 ASSESSMENT OF ALTERNATIVES

7.1 General

The *CEA Act* defines the alternative means of carrying out a project as the various technically and economically feasible ways that a project can be implemented or carried out. This could include alternative locations, routes and methods of development, implementation and mitigation.

7.2 Need for the Project

The demand for granite has increased greatly in recent years primarily due to it being favoured as a component in high quality asphalt used in road construction. International markets, such as southern Florida, are currently overhauling their road infrastructure which has intensified the need for new sources of granite. It is estimated that 2 million tonnes of aggregate will be shipped from Belleoram in the first year of operation, increasing to 6 million tonnes for the remainder of the development's 50 year lifespan. The marine terminal (Project) is required in order for the proposed development to be viable.

7.3 Purpose of the Project

The Proponent has stated that the proposed development will quarry and process high quality crushed granite for sale to international markets, to provide a competitive return on investment, and to do so in an environmentally sustainable and socially responsible manner. Shipping such large volumes of materials by sea is more economically, environmentally, and socially feasible than trucking the material by road. Therefore, the marine terminal is required.

7.4 Alternatives to the Project

The primarily alternative to the Project is not to construct a marine terminal in Belle Bay, NL thereby maintaining the status-quo. This is not a preferred option because the Proponent would not be able to deliver crushed stone from their adjacent quarry to the international markets.

The second alternative to the Project is the mode of transportation. In terms of transportation, consideration was given to the environmental and socio-economic implications of transporting crushed stone overland. It was determined that the construction and operation of a marine terminal for the purpose of shipping crushed stone in bulk carriers would be considerably less expensive and less intrusive to the surrounding community. Furthermore, it was determined transportation overland would require considerable construction and maintenance of roads and highways able to withstand heavy loads. Constructing the marine terminal also has the added benefit of restricting the spatial extent of the potential effects on the terrestrial environment in the project area.

7.5 Alternatives to Carrying-Out the Project

The Proponent has examined and evaluated the technically and economically feasible alternative means of carrying-out the Project, including different construction options and alternative facility locations.

In terms of construction options, construction of a fully encapsulated marine terminal was considered over the construction of the concrete caisson marine terminal. However the footprint of an encapsulated marine terminal is larger than the concrete caisson marine terminal footprint and would have resulted in a greater loss of fish habitat. Also, consideration was given to the completed infilling between the marine terminal and shoreline. This option would have also resulted in a greater loss of fish habitat in the project area and is not required given the design of the shiploader.

In terms of alternative locations, the Proponent conducted reconnaissance investigations of two other sites within Fortune Bay, both of which are north of the proposed marine terminal. The Proponent considered moving the marine terminal to shallower water in the area. However, the large service ships' draft would prohibit this. The Proponent also considered moving the marine terminal to deeper water, however this would have resulted in greater financial costs to the Proponent and would result in a larger footprint and a greater loss of aquatic habitat.

Based on this comparative exercise, the Proponent has concluded that the proposed Project is the most technically and economically feasible means of carrying-out the Project. Further, while some of the alternatives may be economically feasible, they may have resulted in greater environmental impacts or lead to additional safety concerns.

8.0 CONSIDERATION OF POTENTIAL SIGNIFICANT ADVERSE ENVIRONMENTAL EFFECTS

8.1 Information Considered

In order to predict the potential effects of the Project on the environment, it is important to focus the assessment. To do this, the "Environmental Components" (i.e. the various aspects of the biological, physical, and social environment) are determined for the area of interest. These Environmental Components can refer to a physical feature (i.e. waterbodies), a process (i.e. biodegradation), or a condition (i.e. biodiversity). "Valued Ecosystem Components" (VECs) are the Environmental Components that exist in the area and therefore could be effected by the Project. This document addresses all VECs pertaining to the proposed marine terminal with respect to their legal, scientific, ecological, cultural, economic value.

The following is a list of identified VECs that have been considered in this environmental assessment.

- Fish and fish habitat;
- Aquaculture/commercial fisheries;
- Marine birds including seabirds and sea ducks;
- Species at Risk;
- Atmospheric environment,
- Navigation and marine safety, and;
- Human health and safety.

The environmental assessment methodology used by the proponent included the following:

1) Describe the potential interactions between the Project and each VEC.
2) An overview or study, as appropriate, for each of the VECs, in order to describe the actual conditions in the study area (i.e., baseline conditions).
3) Prediction of environmental effects.
4) Identification of mitigation that can be used to avoid or minimize adverse effects on the environment.
5) Identification and assessment of cumulative residual (i.e. still remaining) and cumulative effects (to be discussed in Sections 10.4 and 10.3, respectively).
6) A description and implementation procedure for a follow-up program (see Section 11.0).

8.2 Methodologies for Assessing Environmental Effects

The environmental effects section provides a summary of the Project-related environmental effects on the VECs identified that will occur during, or remain after, the life of the Project. Mitigation refers to the elimination, reduction, or control of the adverse environmental effects of the Project, and includes restitution for any damage to the environment caused by such effects through displacement, restoration, compensation, or any other means. Mitigation includes any measures the Proponent has proposed to eliminate, or reduce environmental effects, and includes preventative elements inherent in the Project's design. Mitigation within the context of the *CEA Act* also includes compensation. In accordance with the *CEA Act*, criteria used to evaluate significance include consideration of magnitude/geographic extent, duration and frequency, and ecological/socio-economic context of each effect, as well as whether the effect is likely to occur. The terms magnitude/geographic extent, duration, etc., are referred to as attributes. The significance of environmental effects was determined for effects after the application of any appropriate mitigation measures, and was evaluated on the basis of criteria described in Tables 8.1 to 8.3.

Significance criteria defined herein, and the associated methodology for criteria application, are used to determine whether or not a particular environmental effect is likely to be significant, after mitigation. Associated with each attribute is a set of criteria used to evaluate the attribute. Criteria are categorized into three levels (Levels I, II, and III); where: Level I is indicative of a negligible or **Non-Significant** environmental effect, Level II represents an **Moderate-Significant** effect, and Level III has a high potential to contribute to an overall **Significant** environmental effect.

Table 8.1 Environmental Impact Significance Criteria

Significance Level	Context		Extent		Frequency	Reversibility	Likelihood of Occurrence
	Ecological	Socio-economic	Magnitude/ Geographic Extent	Duration			
I	No significant adverse ecosystem effects	No significant adverse Socio-economic effects	See Table 8.2 for VEC specific criteria	See Table 8.3 for group specific criteria	Effect expected to occur infrequently or not at all	Effect is readily reversible	Unlikely to occur
II	Adverse effects involve common species or communities, or resources of limited significance	Adverse effects involve meaningful disturbance to local residents or land users, or to local character or services	See Table 8.2 for VEC specific criteria	See Table 8.3 for group specific criteria	Effect expected to occur intermittently, possibly with some degree of regularity	Effect is reversible at substantial cost, or with difficulty	Could reasonably be expected to occur
III	Adverse effects involve locally or regionally important species, communities, or resources	Significant adverse effects to livelihoods and/or Traditional Use activities, or to community character or services	See Table 8.2 for VEC specific criteria	See Table 8.3 for group specific criteria	Effect expected to occur regularly or continuously	Effect is not reversible	Will occur, or is likely to occur

Table 8.2 Significance Criteria - Magnitude and Geographic Extent

Component	Level I	Level II	Level III
Fish and Fish Habitat	No net loss of the productive capacity of habitats	Potential for the unacceptable loss of the productive capacity of local fish habitat	Unacceptable loss of the productive capacity of regional fish habitat
Aquaculture and Commercial Fisheries	Affecting a portion of a size class of penned fish, but not causing any change in abundance beyond typical industry expected mortality and morbidity rates	Affecting a whole size class of penned fish but not causing any change in abundance beyond typical industry expected mortality and morbidity rates	Affecting a whole size class of penned fish causing a change in abundance beyond typical industry expected mortality and morbidity rates
Navigation/Marine Safety	Effects are considered minor and localized to the marine terminal	Activity has the potential to have a meaningful affect to local and far-field marine traffic	Activity is likely to have a meaningful affect to local and far-field marine traffic
Marine Birds including seabirds and sea ducks	Effect considered to be minor, and/or solely confined to the Project area	Potential to considerably affect species within the Project area and off-property	Activity is likely to considerably affect species with the Project area and off-property
Species at Risk	No direct loss of a protected species or the productive capacity of its habitat	Potential loss of a protected species or the productive capacity of its habitat	Direct loss of a protected species or the productive capacity of its habitat
Atmospheric environment	Minor or no effect within, but not beyond, the immediate Project area	Minor effect within, or beyond, the Project area	Major effect within, or beyond, the Project area
Human Health and Safety	Health effects are minimal and confined to the active Project area	Health affects are potentially serious and can occur within, or beyond, the active Project area	Health affects are serious and are likely to occur within, or beyond, the active Project area

Table 8.3 CEAA Significance Criteria – Duration

Component	Level I	Level II	Level III
Biophysical environment	Short-term - Effect will occur for the construction phase, and not measurable after reclamation	Medium-term – Effect likely to persist for life of project	Long-term - Effect will occur persist after decommissioning and reclamation
Socio-economic	Short-term - Effect will occur for the construction phase only	Medium-term - Effect will occur over the life of the project (operations and decommissioning phases)	Long-term - Effect will occur persist after decommissioning and reclamation

9.0 ENVIRONMENTAL EFFECTS

Pursuant to Section 16(1) of the *CEA Act*, the CSR will review all effects of the environment on the Project, and the effects of the Project on the environment. As per the scoping document, effects and mitigations will only be included for activities pertaining to the marine terminal only. Any construction, operation, decommissioning, or rehabilitation activities outlined in the Project Description (Section 2.2) that are not confined to the marine terminal site are not included. Therefore, following discussions include only those effects of the environment on the marine terminal (including shipping, Section 9.1) and only those effects of the marine terminal on the environment (Sections 9.2-9.9).

<u>EFFECTS OF THE ENVIRONMENT ON THE PROJECT</u>

9.1 Effects of the Environment on the Project

Engineering planning and design of the marine terminal will involve consideration of effects of the environment on the Project during its lifespan. The design and engineering of all Project components will take into account the region's climatological, geological, and topographic characteristics to ensure work at the site is safe and efficient. Potential environmental effects on the Project included:

- Wind and Wave Climatology
- Extreme weather;
- Climate change;
- Ice, and;
- Seismic events.

9.1.1 Wind and Wave Climatology

Wind and wave climate summaries are presented based on hindcasts available from Environment Canada's Meteorological Service of Canada (formerly the Atmospheric Environment Service (AES)). The best available source of wind and wave information for estimation of normal and extreme waves is the MSC50 Wind and Wave Climatology[1] an update to the long standing AES40 North Atlantic Wind and Wave Climatology[2]. The AES40 was developed at Oceanweather with support from Climate Research Branch of Environment Canada. The hindcast involved the kinematic reanalysis of all significant tropical and extra-tropical storms in the North Atlantic for the continuous period 1958-1998. Oceanweather's 3rd generation wave model (OWI3G) was adopted onto a .625 by .833 degree grid, wind and wave fields were archived at all active model points. The AES40 methodology and validation has been extensively documented and presented in

1 http://www.oceanweather.net/MSC50WaveAtlas/
2 http://www.oceanweather.com/metocean/aes40/

peer-reviewed journals and conferences. In 2005, the AES40 hindcast in Canadian waters was improved by a shallow water version of the OWI3G on a 0.1 degree grid covering much of the Canadian Maritimes. The North Atlantic basin model was similarly upgraded and run at a 0.5 degree resolution. The MSC50 also extended the time-series to the 50 years 1954-2005.

Two MSC50 grid points were selected for Fortune Bay (#12159) and Belle Bay (#12546) for an indication of conditions in the deeper water approaches of Fortune Bay and closer to Belleoram (Figure 9.1). These two grid points are located approximately 34 km southwest and 10 km east-southeast of Belleoram, respectively.

Winds along the south coast of Newfoundland are predominantly from the southwest in summer and from the west and northwest in winter. Annually about 22% of winds are from the west, 21% from the southwest, 14% from the northwest, and 14% from the south. Figure 9.2 shows an annual wind rose for the Fortune Bay grid point: the picture for #12546 is virtually identical.

Figures 9.3 and 9.4 present monthly wind roses for both locations while Figure 9.5 shows monthly mean and maximum wind speeds for the 50-year MSC50 hindcast record. As noted, winds are predominantly from the west in winter (28% of the time for December-February). In the spring there is a general shift in the winds from the northwest to the southwest. In April there is no preferred direction: winds can be from any direction, on average 11-17% of the time. By June winds are predominantly from the southwest. This pattern persists through August and by late fall the pattern of winds from the southwest through northwest, and predominantly from the west is reestablished.

As seen in Figure 9.5 there is virtually no difference for the two grid point locations. In practice, particularly near Belleoram and approaches, one would want to be aware of possible channelling (change in wind direction) or funnelling (increased wind speed) and possibly other local effects. Wind speeds range on average from about 5.3 m/s (19 km/h or 10 knots) in July to 10.4 m/s in January. Maximum wind speeds range from 18 m/s in August to 31 m/s (112 km/h or 60 knots) in October.

While waves in Belle Bay can be susceptible to a large fetch to the southwest, conditions are considerably less than in Fortune Bay. Figures 9.6 and 9.7 show monthly wave roses for both locations and Figure 9.8 presents monthly mean and maximum significant wave height statistics.

Significant wave height ranges on average from about 0.22 m in July to 0.70 m in December for Belle Bay compared with 0.49 m in July to 1.26 m in December for Fortune Bay. Maximum significant wave heights range from 1.29 m in July to 2.55 m in December for Belle Bay compared with 2.74 m in August to 4.63 m in January for Fortune Bay. On average the monthly mean and maximum significant wave heights in Belle Bay are about 54% of those in Fortune Bay. 100-year return period estimates of wave height are between 5.1 m (method of moments) and 5.5 m (maximum likelihood estimation) for Fortune Bay (#12159) and between 2.7 m (method of moments) and 2.8 m (maximum likelihood estimation) for Belle Bay (#12546).

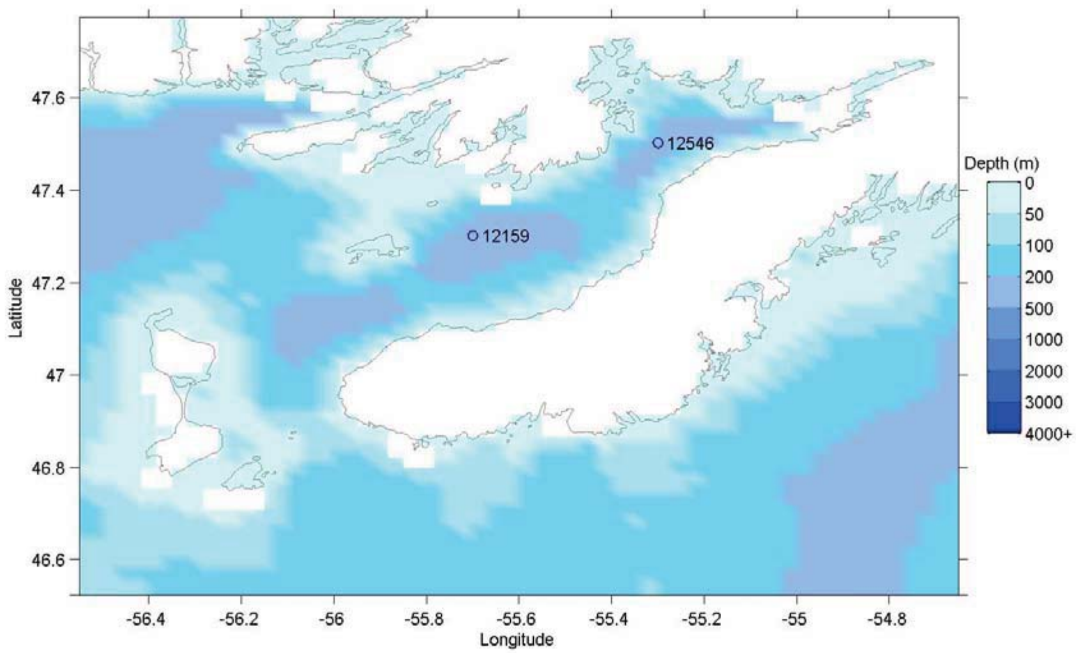


Figure 9.1 MSC50 Wind and Wave Climatology Gridpoints, # 12159, Fortune Bay, and # 12548 Belle Bay, Newfoundland.

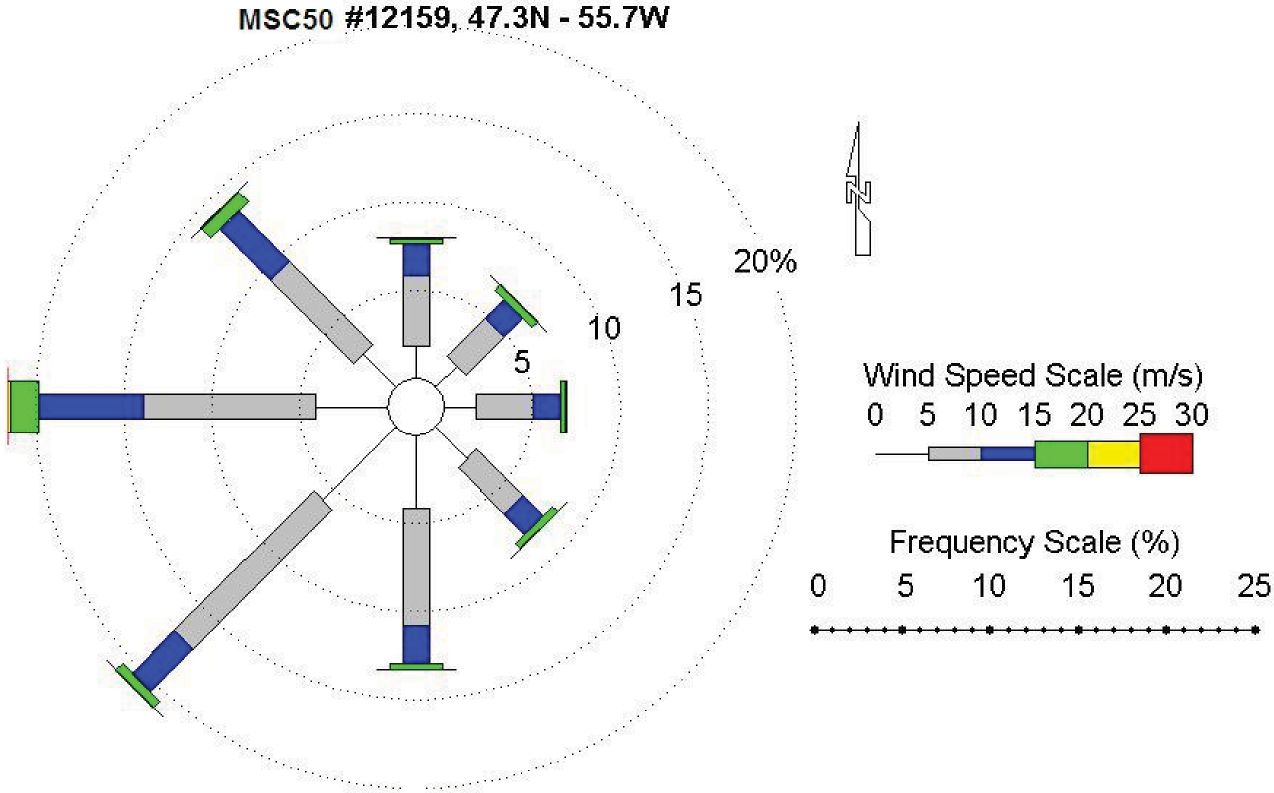


Figure 9.2 Annual Wind Rose, MSC50 grid point #12159.

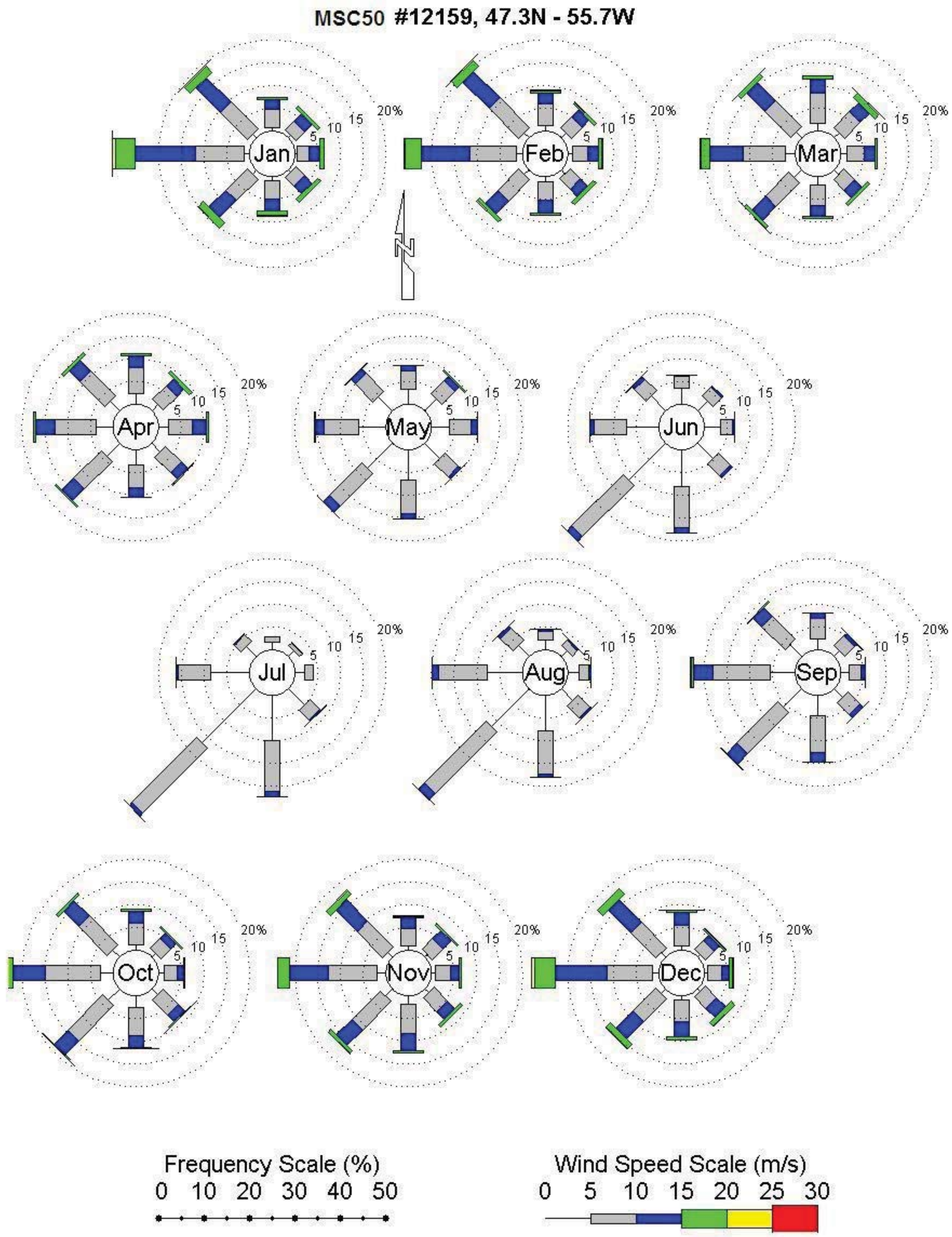


Figure 9.3 Monthly Wind Roses, MSC50 grid point #12159.

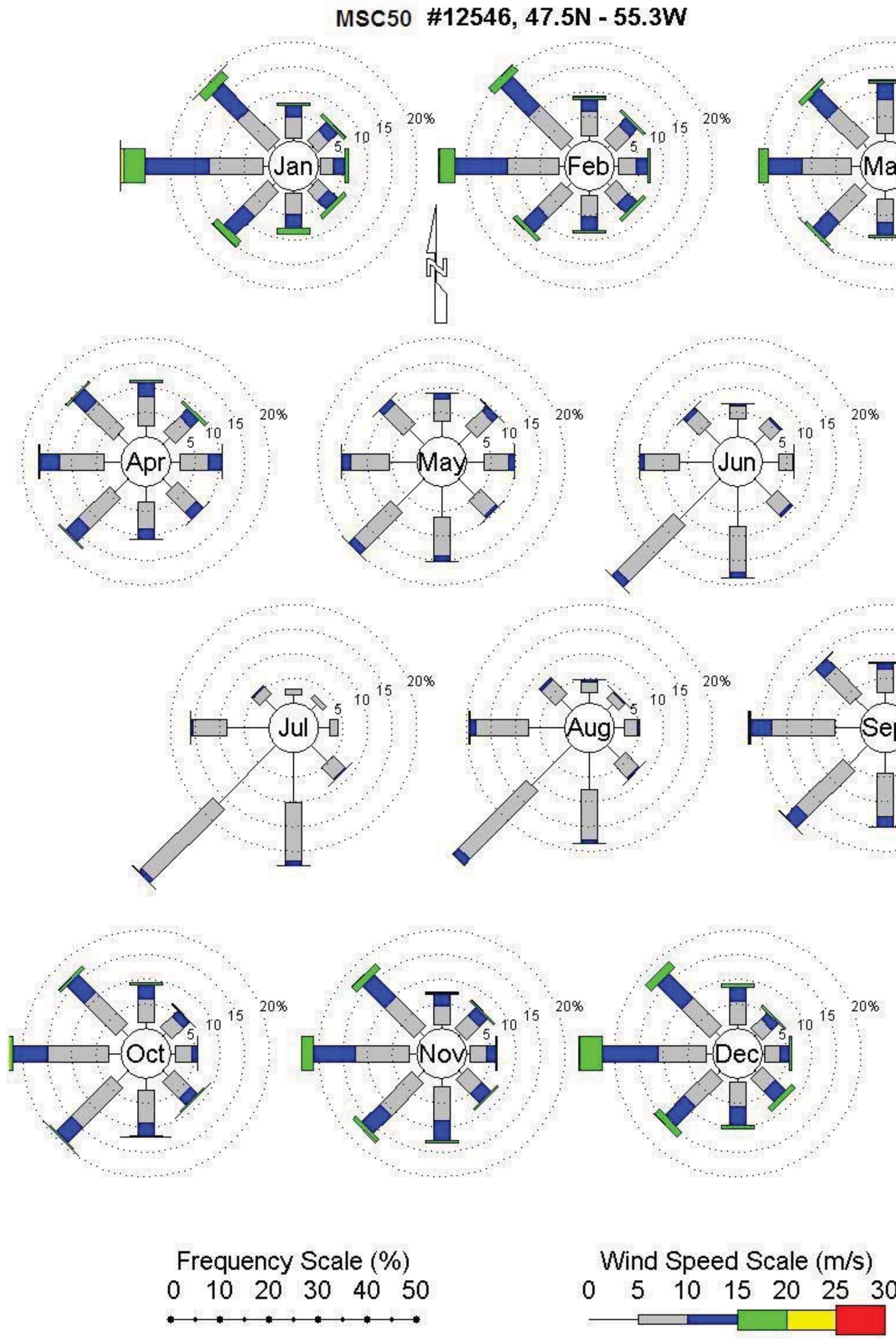


Figure 9.4 Monthly Wind Roses, MSC50 grid point #12546.

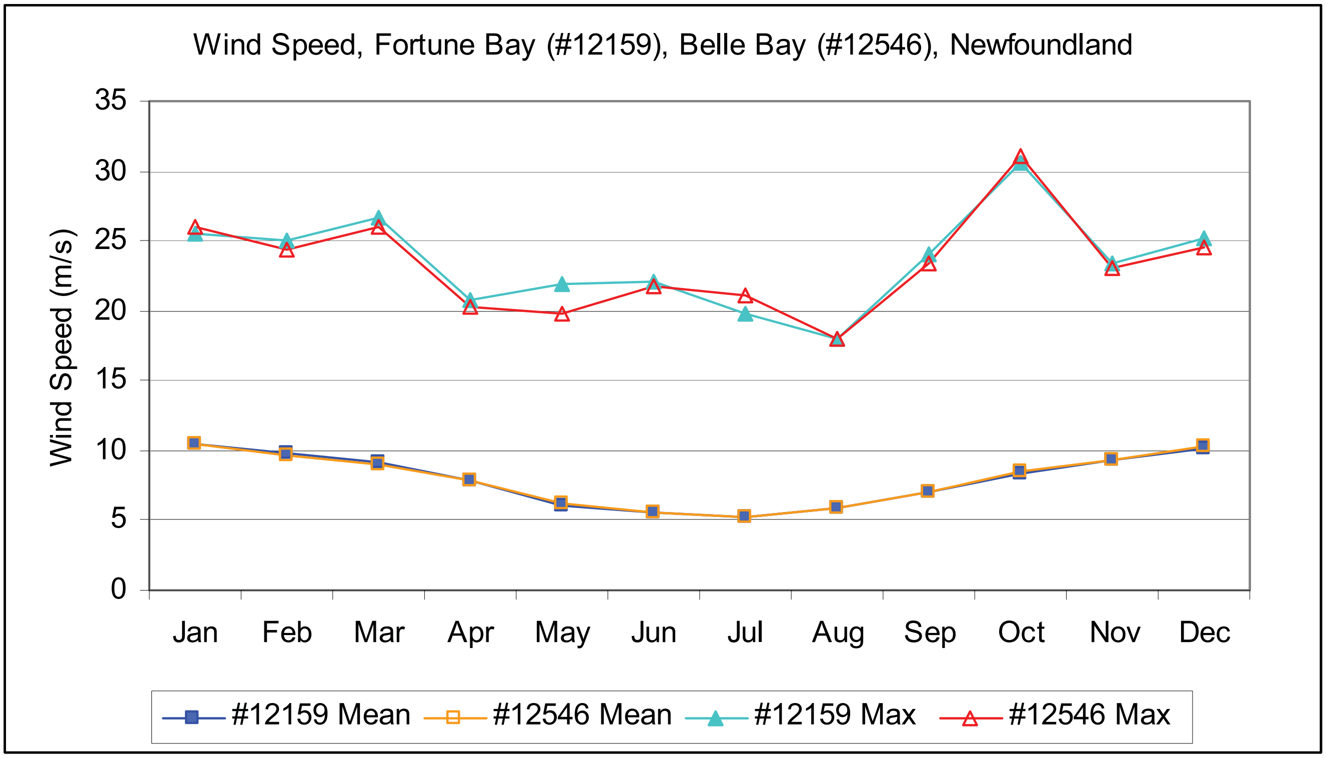


Figure 9.5 Wind Speed, Fortune Bay (#12159), Belle Bay (#12546), Newfoundland.

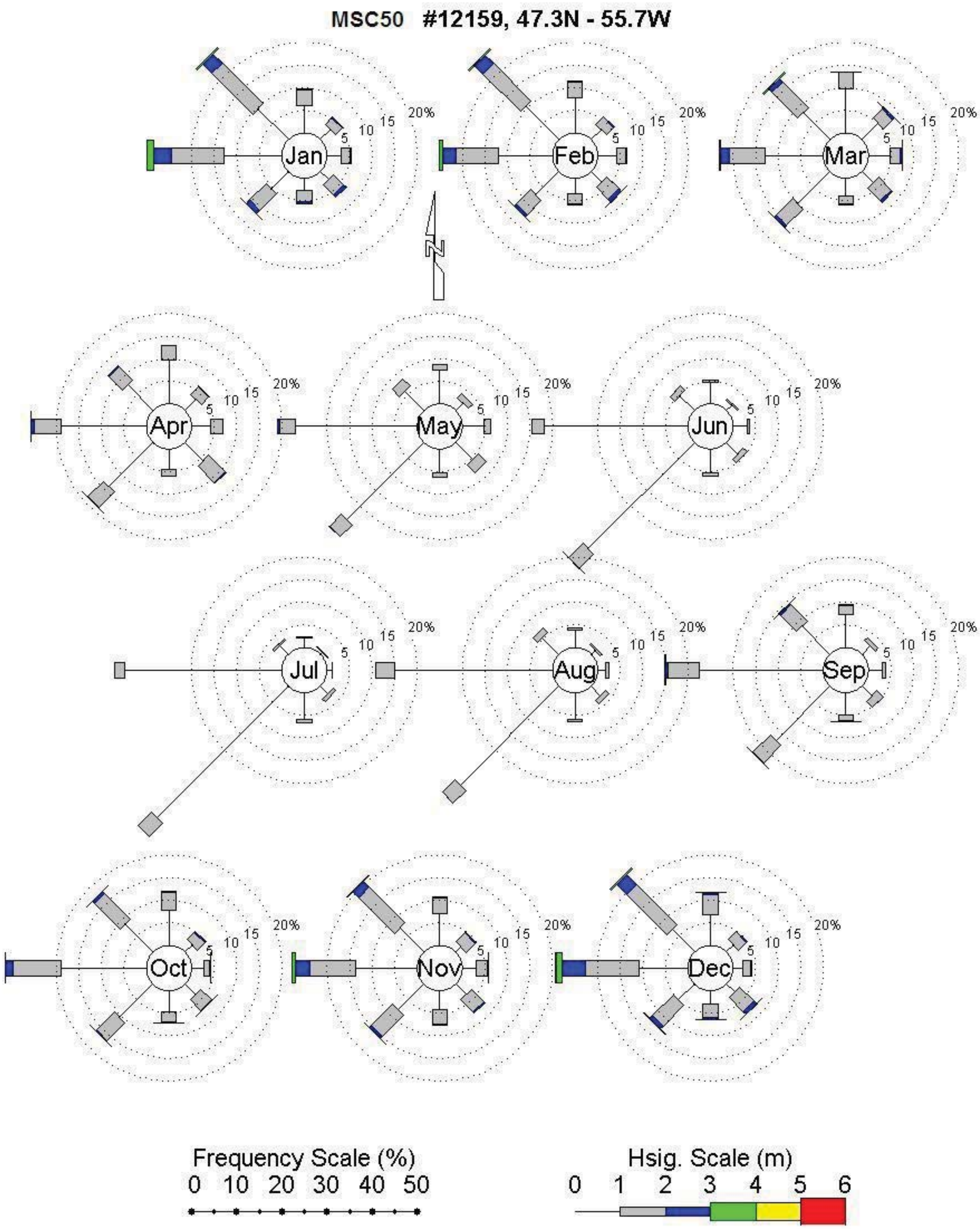


Figure 9.6 Monthly Wave Roses, MSC50 grid point #12159.

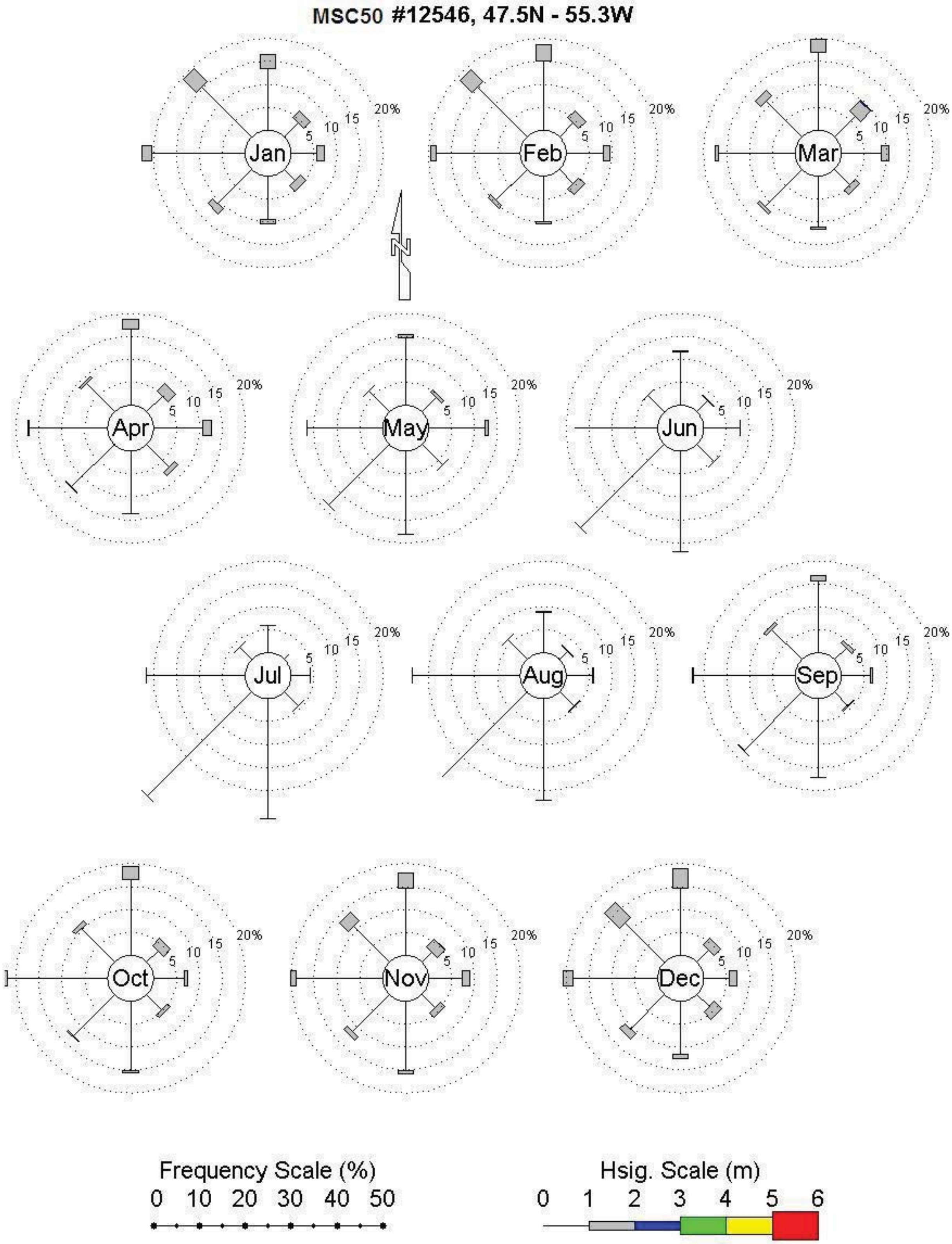


Figure 9.7 Monthly Wave Roses, MSC50 grid point #12546.

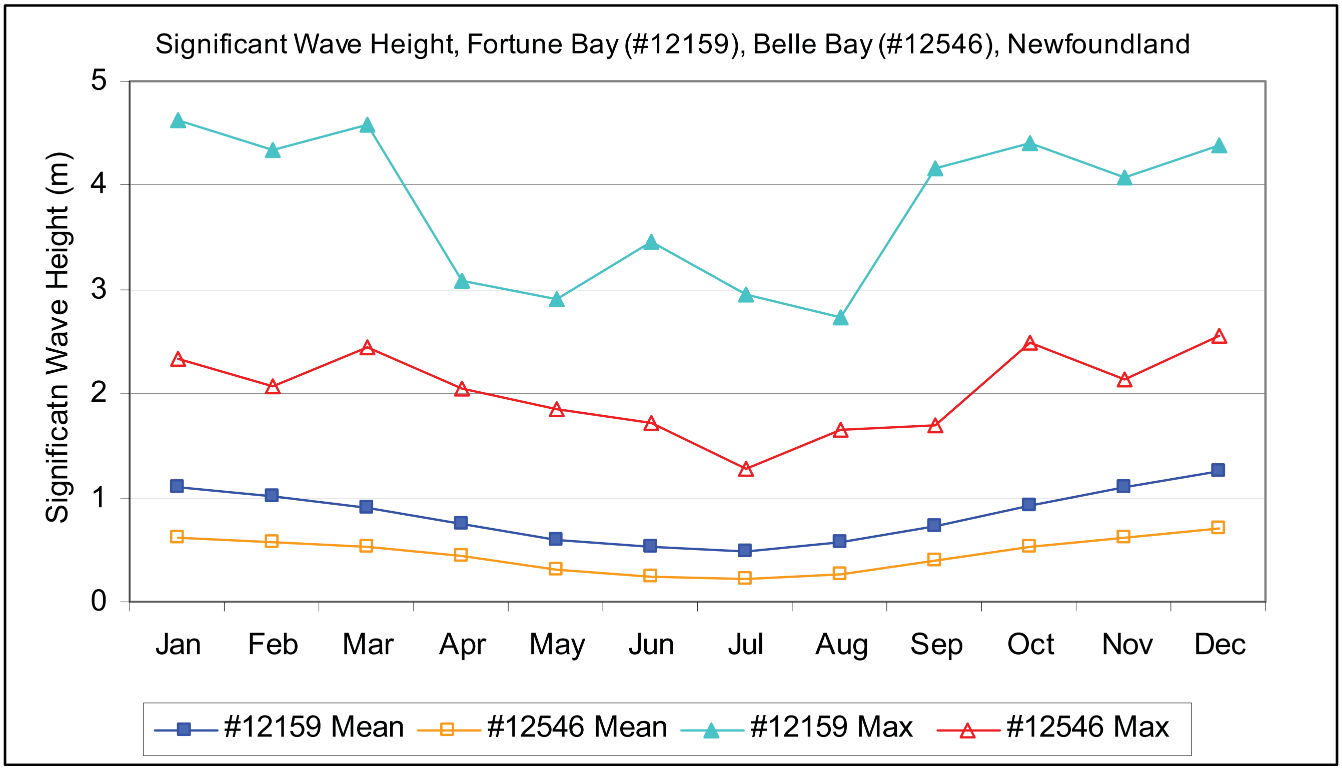


Figure 9.8 Significant Wave Height, Fortune Bay (#12159), Belle Bay (#12546), Newfoundland.

9.1.2 Extreme Weather

9.1.2.1 Background

Newfoundland is subject to many forms of severe weather that can potentially effect the marine terminal's operations and the safety of its workers. For instance, snowfall dominates winter precipitation, with average amounts exceeding 300 cm in most areas of the province, being in the 200-300 cm range for the south coast (EC 2004). Heavy snowfalls in the region can reach 20-60 cm over a period of hours. Winter cyclones are also a concern, with these fast-moving storms (up to 80 km/h) bringing abundant and varied precipitation. They can pose a serious threat to fishermen, commercial shipping, and offshore oil and gas exploration activities.

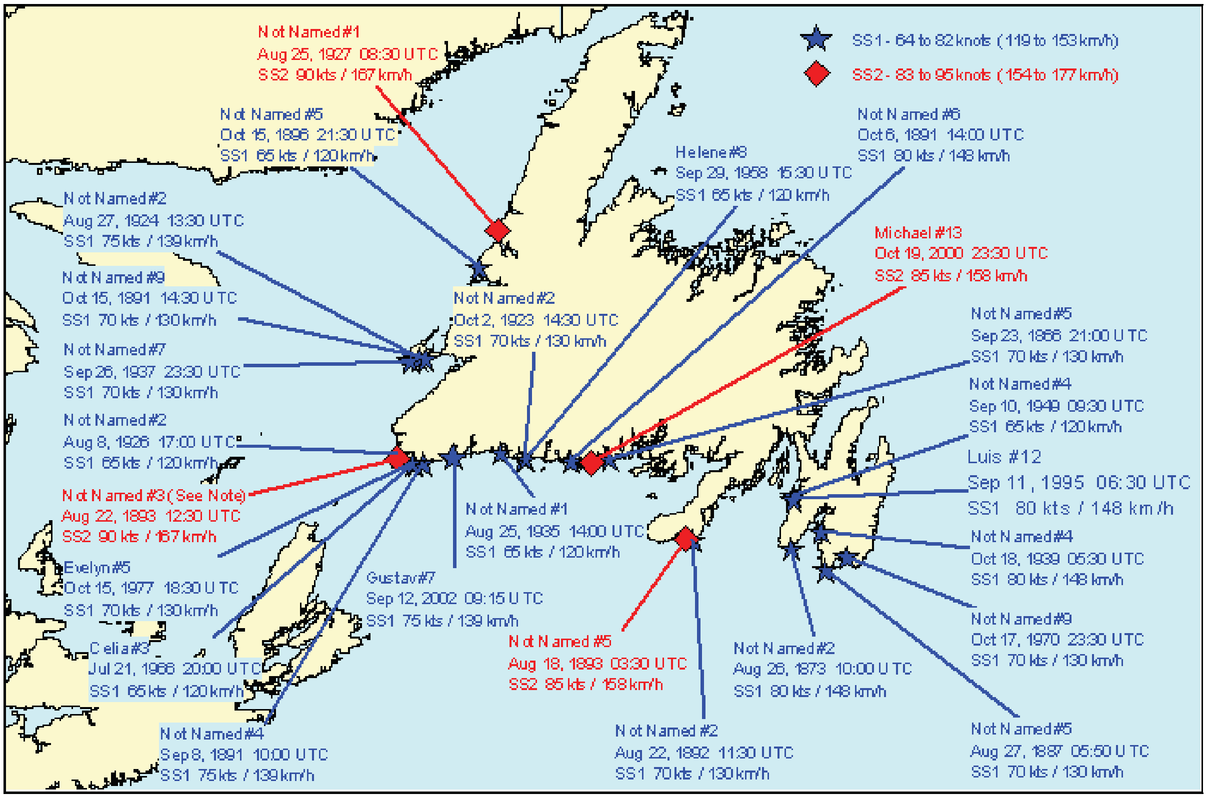


Figure 9.9 Times, dates, strengths, and location of all landfalling hurricanes in Newfoundland since 1851 (obtained from Environment Canada's Hurricane Centre).

There are several extreme weather events that have occurred in Newfoundland within recent history. Of particular interest to the Project, are those events that related to tropical storms that often affect the coastline and can cause severe damage or loss of production. Tropical storms travel northward after being spawned in southern clines and, while they generally lose intensity on their journey; they do occasionally possess significant strength to cause concerns as far north as Newfoundland (Danard et al. 2003). In the hundred years between 1901 and 2000, an average of 3.3 tropical storms affected Canada each year, with that rate showing an increase to 4.9 storms per year for the period between 1993 and 2002 (EC 2003). Figure 9.9 illustrates the landfall locations and strengths of all landfalling hurricanes in Newfoundland since 1851. The most recent storm to hit Newfoundland was Hurricane Florence in 2006. A brief overview of this event is given below.

Hurricane Florence entered the waters off Newfoundland on September 12th, 2006 (then downgraded to a post-tropical storm) and intensified slightly and maintained hurricane force winds as it passed within 19-37 km of southeastern Newfoundland. Peak wind gusts reported from Newfoundland on September 13th reached 163 km/h at Sagona Island, 133 km/h at St. Lawrence, and 128 km/h) at St. Pierre. Peak marine winds of 124 km/h were reported by a buoy in southeastern Maritime waters while the highest waves were reported by buoys in the Grand Banks (9.8 m significant waves and 18.7 m maximum waves). Southeastern Newfoundland received 30-50 mm of rain with a maximum official report of 58.8 mm and an unofficial report of 67 mm. The storm resulted in the destruction of a house in the community of Francois, roads being washed out by coastal waves, power blackouts in portions of southeastern Newfoundland, grounded boats, fallen trees and some damaged roofs.

While heavy precipitation events can lead to localized flood and washouts, a greater impact is usually seen from storm surges that result in coastal flooding. These storm surges can have major impacts on coastal infrastructures, causing damage to property and leading to saltwater intrusion into coastal drinking water aquifers. Hurricane Michael made landfall in October of 2000 at Harbour Breton, NL (35 km east of Belleoram), bringing high winds that caused power outages and structural damage, damaged or capsized boats, and disrupted ferry services throughout much of the southern shore of Newfoundland. While there were no confirming statistics, estimates of a possible 1.5 m storm surge within Fortune Bay were inferred, with a known storm surge of 80 cm at the nearest tidal station (Argentia, 200 km east) (Fogarty 2002). However, nearly all damage reported was only due to high winds, and not to the storm surge (Fogarty 2002).

9.1.2.2 Potential Effects and Proposed Mitigations

The primary effect of weather on the Project will be the temporary delay of construction and operational activities during periods of inclement weather. Inclement weather may present a safety hazard for workers, or may make it difficult to perform specific construction and operational tasks. Precautions will include such measures as only conducting work when it is reasonable to assume that weather conditions will not be detrimental to worker safety, the operation of any equipment or the integrity of any structure (either complete or under construction). All equipment will be rated for working in the anticipated climatic conditions at the site (e.g. low temperatures). The on-site supervisor(s) will be charged with assessing the safety and integrity of the sites and determining if is prudent to continue with operations.

The marine terminal will be constructed along the shoreline of Belle Bay and it may potentially be exposed to large storms and the high winds, waves, and storm surge that generally accompanies them. Therefore, engineers have taken into account the forces that will be placed upon the structure and designed it to handle them accordingly. Its design will comply with all building codes and standards (as outlined in Section 2.2.3) and is anticipated to last for at least 40 years before any major repairs are required. The terminal's structure will be such that it can withstand any foreseeable storms (noting the anticipation for an increase in the frequency of strong storms in the next 100 years; (Bruce et al. 2000) and will be well maintained and regularly inspected to ensure its stability.

Mooring devices will be designed to withstand the breaking strength of the vessel mooring line, with a safety factor of 1.5. Therefore, the design would safely resist a force which is 50% greater than the maximum line strength.

For extreme environmental conditions, there is a danger of the vessel being damaged if it remains alongside the dock. Even though climate change trends may indicate more frequent and more violent storm conditions in the future, it is assumed that the vessels will continue to leave the dock once a pre-set storm level is reached. Therefore, designing for maximum mooring line pull remains a valid and safe method.

The bulk aggregate carriers used to transfer the final product to market will also be susceptible to the effects of extreme weather. Storms at sea have the potential to cause delays in transit times and also safety and environmental concerns related to the potential for groundings or capsizing. Shipping activities will be contracted out to a third party, who will be contractually responsible to adhere to all federal and provincial permits, licences, and certificates, and meet all regulatory standards pursuant to the *Canada Shipping Act* (including, but not limited to the *Navigation Safety Regulations*, the *Merchant Shipping (Safety of Navigation) Regulations*, and the *Ship Station (Radio) Regulations*). Ships will be fitted with state-of-the-art communications and radar equipment and it is reasonable to assume that they will be well informed as to the current, or developing, weather conditions. Ships crews will be fully trained of their responsibilities in the event of an weather-induced emergency at sea, and proper emergency response and escape equipment will be onboard at all times.

9.1.2.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

While there is a potential for extreme weather to adversely affect the Project's construction and operational activities, as well as compromising employee and the public's safety. However, with the implementation of the mitigative measures outlined above, the magnitude/geographic, context and frequency of occurrence are anticipated to be rated as Level I. Therefore, on the basis of Level 1 Significant and considering the input from EC and NRCan, the RAs have concluded that the potential for adverse effects to the Project from extreme weather is Non-Significant.

9.1.3 Climate Change

9.1.3.1 Background

Designs that do not account for potential changes in the climate may over or underestimate the effects of climatic variables. Consideration of past climate change is necessary to understand trends that may be occurring in the area in order to predict future situations. Analysis of temperature trends for Newfoundland by Environment Canada show no significant trend in the 100 years between 1895 and 1995 (EC 1993). Environment Canada's climate change projections suggest that Canada could see warming by an average of 1° to 3.5° C over the next century. A recent study by Sutherland and Lines (2001) observed a warming trend in Atlantic Canada that is on a scale greater than the warming experienced on a global scale. However, coastal Newfoundland saw the least amount of warming over the past 100 years. Although less significant than the remainder of the Atlantic region, Newfoundland will experience further warming in the future.

Further, Atlantic Canada is particularly vulnerable to rising sea levels; whose impacts could include greater risk of floods, coastal erosion, coastal sedimentation, and reductions in sea and river ice. The Intergovernmental Panel on Climate Change (IPCC) states that global sea level is anticipated to rise by 21-48 cm by 2090-2099 (IPCC 2007). However, NRCan has refined this estimate by considering local sea-level rise in the Atlantic region today. A discussion of this refinement is given below.

The closest tide gauge to proposed Project is located at Argentia, in Placentia Bay. In an unpublished contract report to the Geological Survey of Canada, Geometrix-Geodetic and Hydrographic Research Inc. demonstrated that sea level is rising at Argentia at a rate of 28 cm/century (data provided by NRCan). A portion of this increase is eustatic (i.e. ocean level rising) and part is due to the sinking of the Earth's crust. Earlier work by Carrera and Vaniek (1988) showed that, in Atlantic Canada, a reasonable estimate of local crustal subsidence is obtained by subtracting 10 cm/century from the local tide-gauge record. Thus, at Argentia, the ongoing crustal subsidence is: 28-10 = 18 cm/century. Therefore, a more accurate measure of sea level rise by 2090-2099 is obtained by adding local crustal subsidence (18 cm/century) to the global prediction, yielding an increase of 39 to 66 cm. Further, for the complete range of scenarios, the predicted increase ranges from 36 to 77 cm by the end of the 21^{st} century.

9.1.3.2 Potential Effects and Proposed Mitigations

The proponent acknowledges that climate change should be incorporated into the design of the quarry's infrastructure. An Infrastructure Canada (IC) report entitled 'Adapting Infrastructure to Climate Change in Canada's Cities and Communities: A Literature Review' (2006) outlines that the vulnerability of an area is determined by three factors. These include the:

- Nature of climate change;
- Climatic sensitivity of a region, and;
- Capacity of the region to adapt to the changes.

In the case of the Belleoram areas, regional climate change may result in concerns such as an increase in heavy precipitation events, potential increase in the frequency of strong storms in the next 100 years (Bruce et al. 2000), and a cooling of Atlantic coast temperatures (IC 2006). Therefore, the marine terminal will meet the legal standards set out in the *National Building Code of Canada* at a minimum (See Section 2.2.3), and designs will also take into account the possibility of an upsurge in extreme weather events. The design of the marine terminal, utilizing concrete caissons for support, will be a very robust structure engineered to withstand the current and anticipated conditions at the Project site. It is expected to operate for at least 40 years before requiring any repairs; however, it will be continually inspected for any loss of structural integrity, with any repairs required to be performed immediately.

Coastal erosion should not pose a concern with respect to the marine terminals stability or operations. The marine terminal site contains a relatively narrow (approximately 5 m wide) beach of cobble/rubble/boulders leading to a steep hillside composed of areas of exposed granite bedrock or areas with shallow overburden and trees. Stive (2004) and Walkden and Hall (2005) both note that soft and sandy shores are much more prone to erosion and coastal retreat than steeper, rocky, shorelines. Further, the marine terminal will be built on solid granite bedrock and will employ armour stone to dampen wave action on the structure. Therefore, the shoreline and subsurface characteristics at the marine terminal site make it naturally resilient to erosional forces. While the structure has been designed to have at least a 40 year lifespan before major repairs are anticipated, it will still undergo regular inspections and maintenance. This will allow engineers to note any areas of concern and employ mitigative measures to account for changes in climate and erosional forces; with the marine terminal designed to allow adjustments if the need arises.

9.1.3.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

It has been established that climate change is an inevitable phenomena and it does have the potential to compromise the future operation of the Project. However, with the implementation of the mitigative measures outlined above, the magnitude/geographic, context and the long timeframe for which to prepare for any effects (i.e. infrequent timescale), the anticipated rating is a Level I. Based on input from EC, the RAs conclude that on the basis of a Level 1 rating, the adverse effects to the Project from climate change are Non-significant.

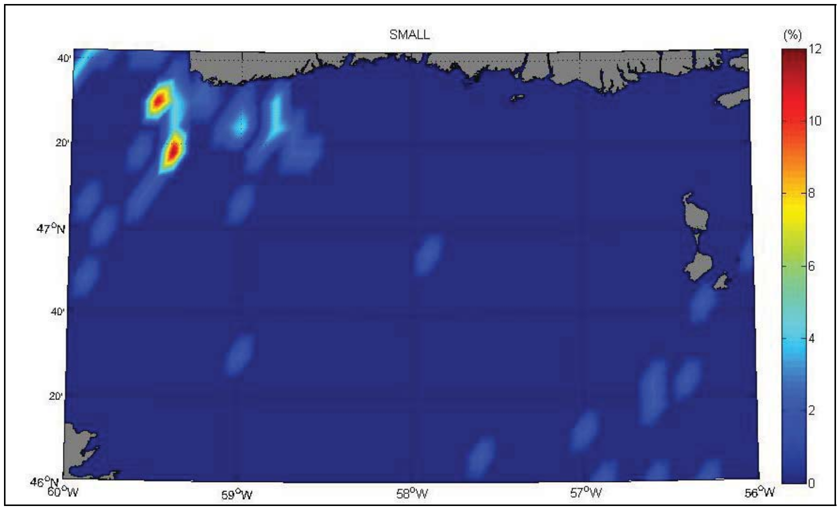
9.1.4 Ice

9.1.4.1 Background

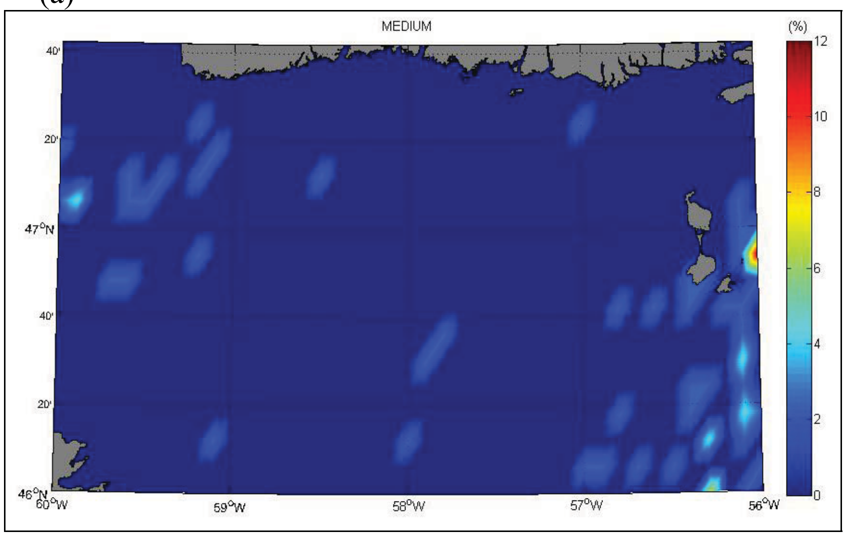
Icebergs are common along the coast of Newfoundland from March until July. They are carried south by the Labrador Current which reaches its most southerly extent in late April. The abundance of icebergs along the Newfoundland coast depends on a complex interaction between winds and current, with deviations in these variables causing changes in their trajectory (Canadian Ice Service; CIS 2007). The occurrence of icebergs on the south coast of Newfoundland is low (Figure 9.10 a,b,c), with a frequency of 12% for small (5-15 m asl) and large (46-75 m asl). This corresponds to approximately one small iceberg every eight years. Medium sized icebergs (16-45 m asl) have a frequency of 4-5%, corresponding to approximately 1 iceberg every 20 to 25 years. There were no very large (>75 m asl) icebergs seen in these waters between 1971-2000 (International Ice Patrol 2007).

The CIS, a branch of Environment Canada’s Meteorological Service of Canada agency, is the leading authority for information about ice in Canada's navigable waters. The CIS has tracked and mapped ice conditions around Newfoundland and Labrador, creating 30-year ice maps outlining ice frequency, concentration and type. The CIS considers the incidence of sea ice and icebergs on the south coast of Newfoundland, including the Project area and all waters within Fortune Bay, to be very infrequent (CIS 2007). Sea ice statistics provided in this document are for February 26th only from 1971 to 2000 as this represents the date when ice reaches its southern most extent in Newfoundland waters (median of the last 30 years, CIS 2007). Thus, it is at this time of year when ice is nearest to the Project area, after which point the rate of melting at the ice edge increases sufficiently to counterbalance the southward ice drift, and the northward retreat of sea ice begins.

In general, historically the south coast of Newfoundland has low concentrations of sea ice with the Project area seeing less than one ice event every ten years (Figure 9.11). The 30-year frequency of sea ice for Fortune Bay is between 1-15%, with the most common type being 'new ice' (Defined by Environment Canada as: recently formed ice with a thickness <10 cm, being composed of ice crystals which are only weakly frozen together (if at all) and have a definite form only while they are afloat) (Figure 9.12). When present, this loose aggregation of ice does not last long in Fortune Bay, being absent until mid February and usually gone by March 5th (30-year median).



(a)



(b)

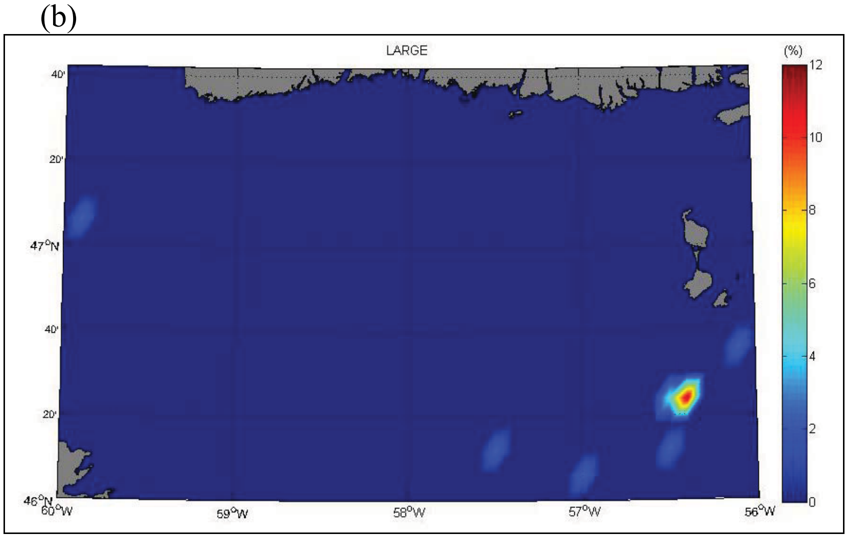


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Figure 9.10 Extent of small, medium, and large iceberg frequency along the south coast of Newfoundland between the years 1960 and 2005 (International Sea Ice Patrol 2007).

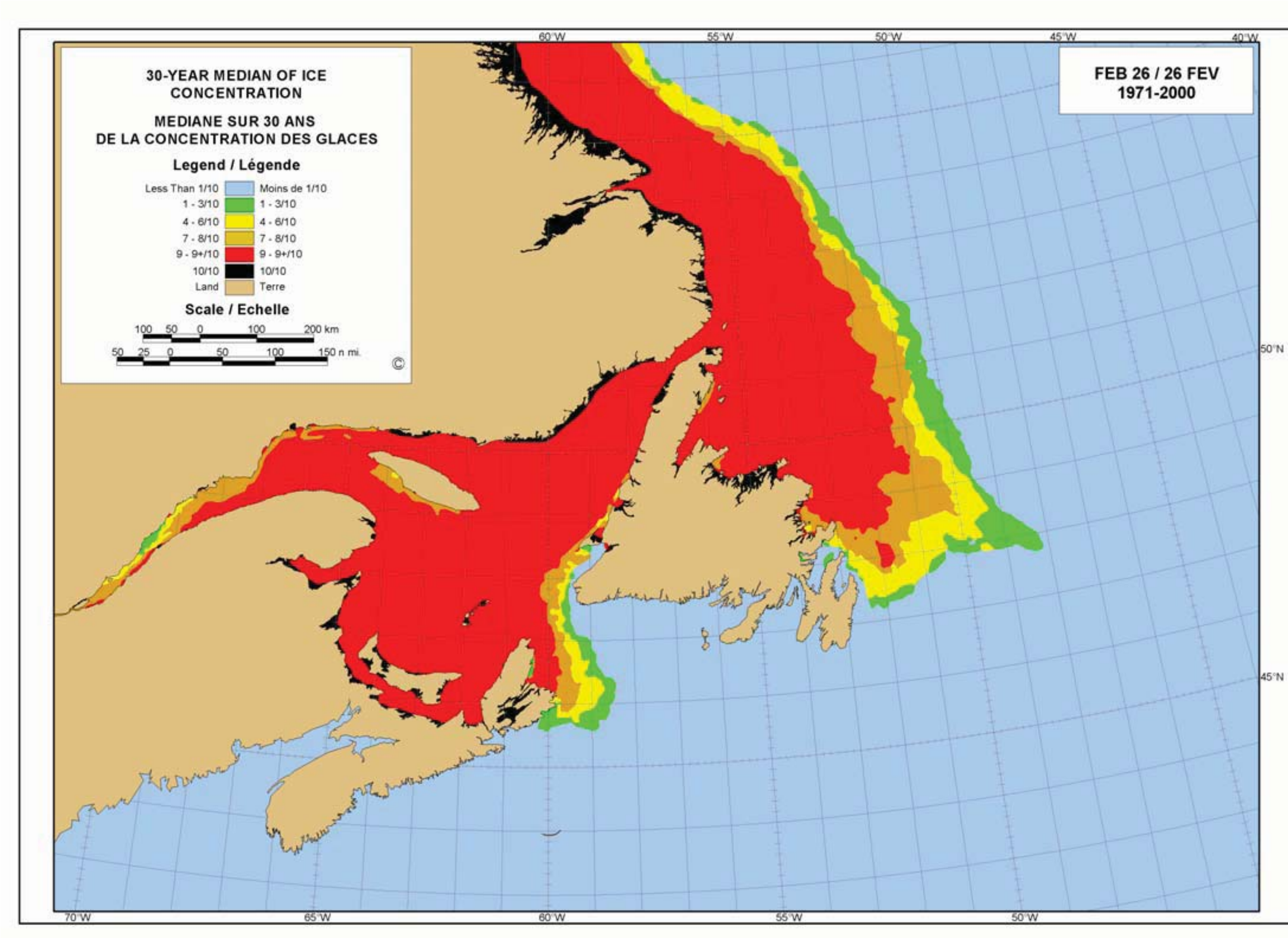

Figure 9.11 30-year median of ice concentration Newfoundland and Labrador, February 26, 1971-2000 (obtained from the Canadian Ice Service 2007).

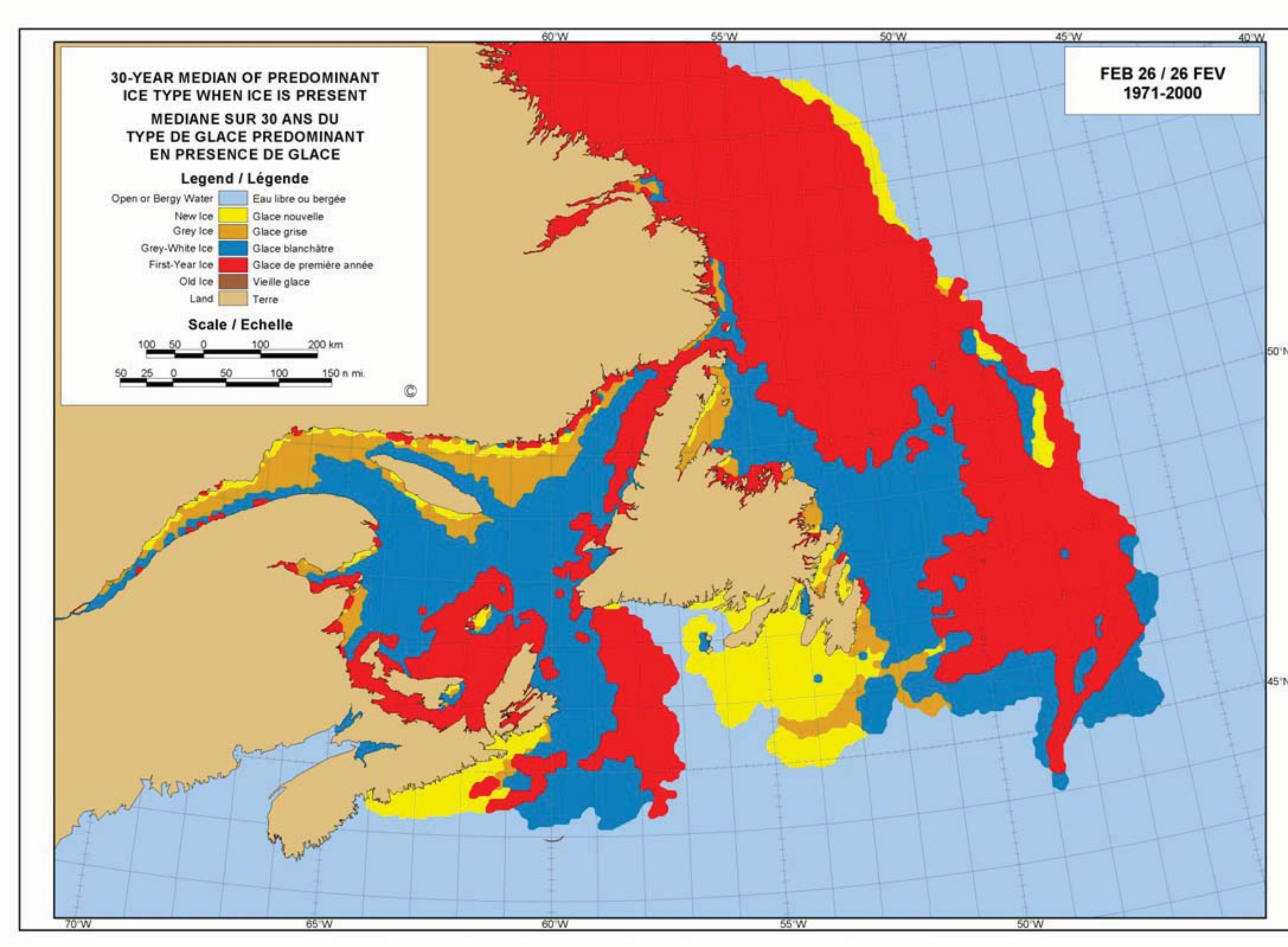

Figure 9.12 30-year median of predominant ice type when ice is present in Newfoundland and Labrador, February 26, 1971-2000 (obtained from the Canadian Ice Service 2007).

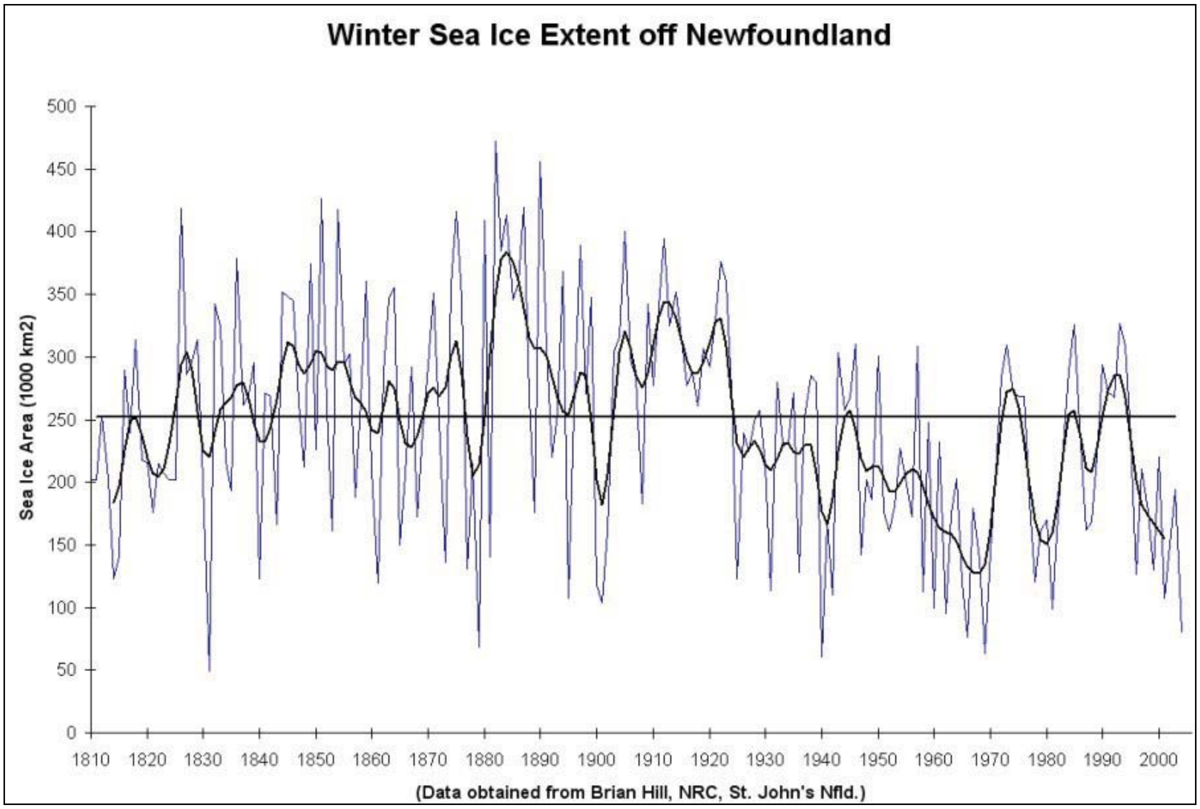

Figure 9.13 The Sea Ice record of Newfoundland from 1810. A reconstruction of the historical record of sea ice cover off Newfoundland has been carried out by Hill and Jones (1990), and more recently work by Hill (1999) who has extended the record back to 1810**.**

Figure 9.13 shows the trend in sea ice cover off Newfoundland during the winter season (February and March) as reconstructed back to 1810 (Hill 1999; Hill and Jones 1990). The graph also shows a longer term trend to less ice between the mid-1920s to 1970, then a recovery from 1971 to the early 1990s and then another decrease from the mid-1990s to the present. The Canadian Institute for Climate Studies (CICS) has created the *Canadian Climate Scenarios Network* which has predicted this decrease in sea ice cover to continue. Modeling scenarios show that total sea ice in Newfoundland and Labrador waters will decrease by approximately 200 kg of sea ice per meter of ocean by 2080 (CICS 2007). The extent to which sea cover reaches offshore, as well as the extent to which it is able to drift to warmer southern latitudes is expected to decrease due to changes in thickness as well as changing air and water temperatures (NRCan 2006a).

However, regional variations are also evident, and are perhaps more important to this study. The northeast sections of Newfoundland and Labrador exhibited higher than average sea ice concentrations in 2007 (CIS 2007). Despite such changes in the north, this phenomenon was not seen south of the Bonavista Peninsula, and there were no deviations from the 30-year trend observed within the south coast of Newfoundland (CIS 2007). The lack of historic sea ice cover, and the predicted decline in future sea ice cover, leads to a low probability that icing with affect the quarry's operation. With ships only entering and exiting from southern waters, there is no reasonable assumption that ice conditions will negatively affect ship traffic or safety while servicing the quarry.

9.1.4.2 Potential Effects and Proposed Mitigations

It has been established that the chance of an iceberg or sea ice interfering with operation within Belle Bay, Fortune Bay, or along the shipping route (which only services markets to the south) are very small. There is a historical lack of icebergs or sea ice on the Southern shores of Newfoundland, and further predictions that icing events will become even more infrequent. However, ships servicing the marine terminal will be contractually responsible for the adherence to all federal and provincial permits, licences, and certificates, and meet all regulatory standards pursuant to the *Canada Shipping Act*. They will be fitted with state-of-the-art communications and radar equipment and it is reasonable to assume that they will be well informed as to the presence of sea ice or ice bergs well in advance and be able to avoid them completely.

9.1.4.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

It has been established that the potential for ice to adversely affect the Project's construction and operational activities is very low, being ranked as a Level 1 for the magnitude/geographic, context and frequency of occurrence. Based on input from EC, the RAs conclude that on the basis of a Level 1 rating, the adverse effects to the Project from ice and icebergs are Non-significant.

9.1.5 Seismic Events

9.1.5.1 Background

Eastern Canada is located in a stable continental region within the North American Plate and, as a consequence, has a relatively low rate of earthquake activity (Figure 9.14). Each year, approximately 450 earthquakes occur in eastern Canada, with only 25 of these events being strong enough to be felt (NRCan 2006b). This low probability of detectible earthquakes is due to the stable position the region has within the North American Plate; with quakes being primarily concentrated in regions of crustal weakness (NRCan 2006b). Table 9.1 shows the earthquakes measured in Newfoundland over the last 5 years. Each of these ten quakes had magnitudes less than 3.0 Nuttli units (Nu) and were not felt (generally earthquakes less than 3.5 Nu are not felt, only recorded) (NRCan 2006b). Further, in the last 5 years, ten seismic events have been recorded on the Scotian Shelf within 500 km of Newfoundland, with only four measuring above 3.0 Nu in magnitude.

The only deaths in Canada caused by an earthquake occurred on November 18, 1929, when 27 people were killed by a tsunami that struck the Burin Peninsula of Newfoundland. This tsunami was triggered by a magnitude 7.2 earthquake that struck approximately 250 km to the south along the edge of the Grand Banks. No records of damage, as a result of this event, were recorded in Fortune Bay This is attributable to the protective positioning of the Burin Peninsula in the path of the tsunami wave.

9.1.5.2 Potential Effects and Proposed Mitigations

The marine terminal will be built on a stable foundation of granite bedrock. According to Part 4, Division B of the National Building Code (2005), the Project site is classified as Site Class “B - Rock” and “C - Very Dense Soil”. Thus, the nature of the site, as well as the low probability of a seismic event in the area, leads to a very low probability of a seismic-induced event affecting construction of operations at the marine terminal. The structure’s engineering will adhere to *National Building Code of Canada* regulations and standards (See Section 2.2.3), with appropriate strength and safety factors built in. The structure will be regularly inspected and maintained to ensure its structural integrity and long term viability.

9.1.5.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

It has been established that the potential for seismic events to adversely affect the Project’s construction and operational activities is very low, being ranked as a Level 1 for the magnitude/geographic, context and frequency of occurrence. Based on input from NRCAN, the RAs conclude that on the basis of a Level 1 rating, the adverse effects to the Project from seismic events are Non-significant.

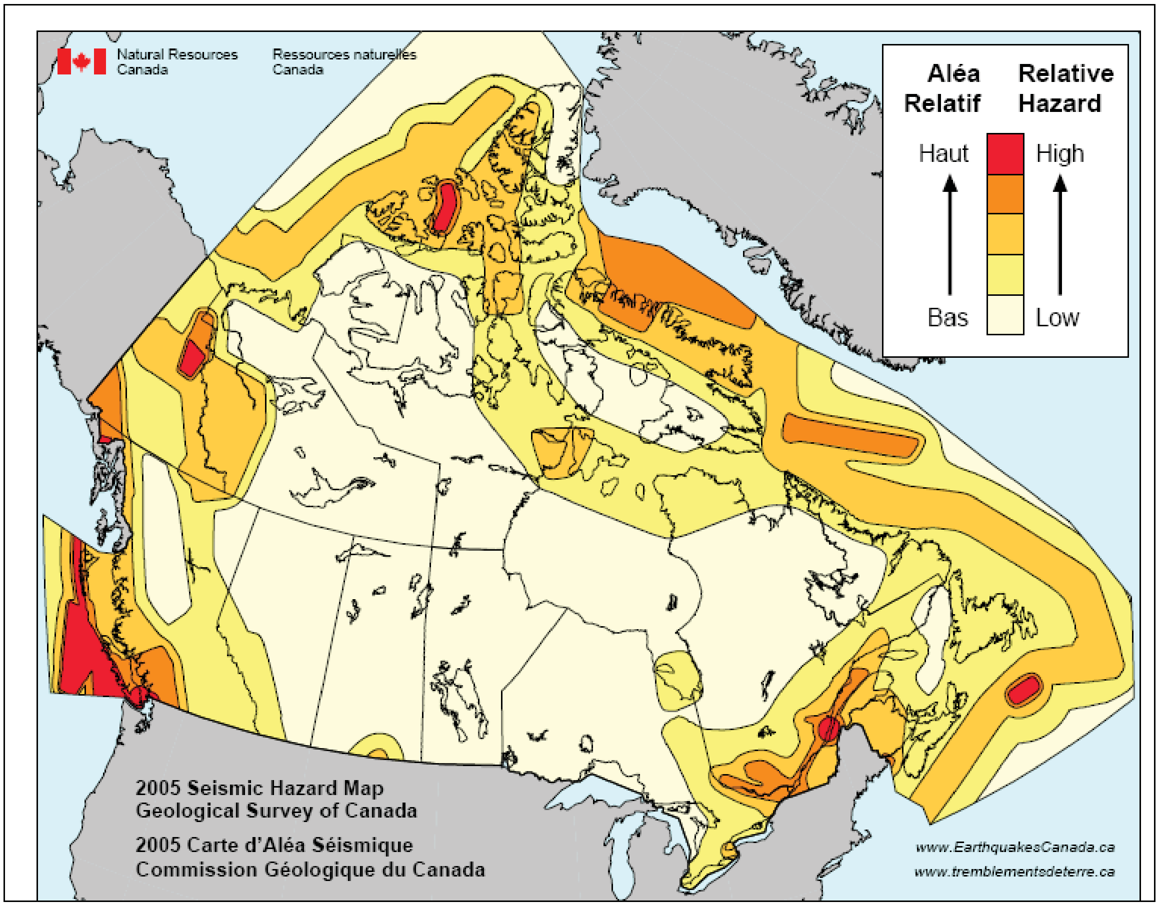

Figure 9.14 Assessment of the relative seismic hazard level for regions across Canada (Map obtained from Natural Resources Canada, Earth Sciences Sector).

Table 9.1 Incidence of earthquakes measured in the last 5 years in Newfoundland. Magnitudes are expressed in Nuttli units as a measure of body wave magnitude.

Date	Location	Magnitude
2007/04/29	56 km S of Pasadena, NL	1.1
2007/04/25	59 km S of Pasadena	1.9
2007/04/24	48 km S of Pasadena	1.6
2007/04/23	48 km S of Pasadena	2.0
2007/04/23	48 km S of Pasadena	1.2
2007/04/23	48 km S of Pasadena	1.5
2007/04/23	48 km S of Pasadena	2.9
2006/07/05	40 km W of River of Ponds, NL	1.4
2005/08/14	93 km E of Burgeo, NL	2.0
2002/08/04	400 KM NW of Corner Brook, NL	2.5

EFFECTS OF THE PROJECT ON THE ENVIRONMENT

9.2 Fish and Fish Habitat

9.2.1 Background

The Project site is located on the south coast of Newfoundland within Fortune Bay; with the marine terminal being constructed in Belle Bay. Underwater benthic surveys were conducted by divers utilizing video surveillance equipment within the proposed marine terminal site on October 28th and 29th, 2006 (Figure 9.15). A brief summary of the area's substrate, macroflora and macrofauna profile is presented below. A detailed table of the findings from each transect distinct marine area are located in Appendix E.

Description of the Benthic Habitat at the Marine Terminal Site

The marine terminal site habitat is typical of a semi-protected marine bay ecosystem. The habitat observed throughout was fairly consistent for the whole area surveyed. Substrates generally consisted of small/large boulders interspersed with gravel patches and small sections dominated by bedrock. The marine terminal site macroflora consisted primarily of large beds of wave damaged and stunted kelp (Laminaria) beds in the deeper water (>15 m offshore) and wave damaged knotted wrack/rockweed within the nearshore. Other algal species observed included tubed weed, crustose algae, sea colander, sour weed, dulse, cord weed, kelp (Alaria), red fern, sea lettuce, Irish moss, and sausage weed.

The marine terminal Macrofauna was dominated by cunners that were consistently encountered from shoreline to deeper water. Periwinkle were encountered in substantial numbers on large boulders both within the nearshore and deeper water. Sea urchins were noted in moderate numbers from the shoreline to a distance of 50 m along one of the four 100 m transects conducted. Starfish were generally noted in moderate numbers from the shoreline to a distance of 50 m, although they were occasionally observed within the 90-100 m distance upon shallow boulder clusters. Tube worms were occasionally observed in moderate to high numbers growing on kelp leaves.

Species observed infrequently within the surveyed area included blue mussel, frilled anemone, lobster (one individual), sponge (one individual), shorthorn sculpin (one individual), sea raven (one individual), white crust, leafy bryozoan (two individuals), ocean pout (one individual), cod (one individual), and scallop (one individual).

9.2.2 Potential Effects and Proposed Mitigations

The construction and operation of the marine terminal could potentially result in the disturbance or direct mortality of fish or their habitat in the waters of Belle Bay. Effects from incidents such as hydrocarbon spills or leaks or sediment degradation from increased sedimentation may result in:

- A change in the productive capacity of aquatic systems, and/or;
- The harmful alteration, disruption or destruction of fish habitat.

9.2.2.1 Quantification of HADD and Fish Habitat Compensation

The *Fisheries Act* contains a prohibition with respect to the harmful alteration, disruption, or destruction of fish habitat (HADD). The *Act* permits the Minister to issue an Authorization (under Section 35 (2)) which will permit a HADD to occur. The issuance of an Authorization is at the discretion of the Minister. However, the “rules” for issuing an Authorization are well established. A HADD Authorization will be issued only in accordance with the Policy for the Management of Fish Habitat. This policy has an objective of achieving a “net gain” in the productive capacity of fish habitat in Canada. The Policy has a Guiding Principle of “No Net Loss”, i.e. existing fish habitat will be protected, while unavoidable habitat losses are to be balanced by development of new habitat. An Authorization must be issued before any action can be taken to destroy fish habitat.

In order to receive an Authorization, the following must occur:

- DFO determines that a HADD is likely, triggering assessment under the CEAA.

- The Proponent is required to quantify the habitat that will be harmfully altered, disrupted or destroyed by their undertaking. This represents the amount of habitat that requires fish habitat compensation. This quantification must reflect the productivity of the habitat, and take into account the actual and potential use of the habitat by different fish species and life cycle stages. It must also identify all opportunities to avoid or mitigate potential habitat alteration, damage or disruption.

The Proponent then develops a Compensation Plan in two stages:

- A Compensation Strategy
- A Compensation Plan

Based on review of the habitat information and discussions with DFO Habitat Management Program staff (January 18, 2007 and March 2, 2007) it has been determined that a HADD is likely to occur in the area of the proposed marine terminal used by adult and juvenile American lobster (*Homarus americanus*). The footprint of the earthen-fill approach from a depth of 2 m to a depth of 60 m cover approximately 2428 m^2 (Figure 9.15; Transect T-2). Habitat surveys within the footprint of the proposed earthen-filled approach indicated that from the shoreline to a distance of approximately 60 m, approximately 65% of the habitat is considered optimal for large juvenile/adult lobster (variable sized boulders with a number of crevices and substantial kelp cover). Utilizing this ratio, the construction of the terminal access will result in the HADD of approximately 1578 m^2 (nine x 200 m^2 units) of viable adult lobster habitat that will require fish habitat compensation as a condition of the *Fisheries Act* Section 35(2) Authorization.

The habitat characterization of the proposed wharf location (any waters past 75 m from shore and at depths of 14 m to 15 m) revealed an area which consisted primarily of bedrock interspersed with small amounts of fine gravel, sand, and silt. It is inferred from this habitat characterization that the area of the proposed wharf construction does not constitute fish habitat and will not result in a HADD to fish habitat. Though, dredging may be required for placement of wharf footings, this will also be limited to areas that are not fish habitat. Therefore, a HADD to fish habitat will not result from this activity.

Habitat compensation will consist of strategic placement of at least 1578 m^2 of armour stone shared between both sides of the marine terminal's earthen-filled approach. This will constitute a like-for-like habitat replacement strategy within the same ecological unit. Based on consultation with DFO's Habitat Management Program, the 1578 m^2 will include any portion of the approaches' toe slope in waters deeper than 2 m. The armour stone to be utilized will be clean (less than 5 % fines), non-acid generating granite of appropriate size obtained from the adjacent quarry. Habitat compensation also includes placement of scour protection armour stone around the bases of the concrete caissons for the marine terminal. All compensation activities and concepts will be performed in consultation and cooperation with DFO Habitat Management Program, the Town of Belleoram, and the local Belleoram Fisheries Committee.

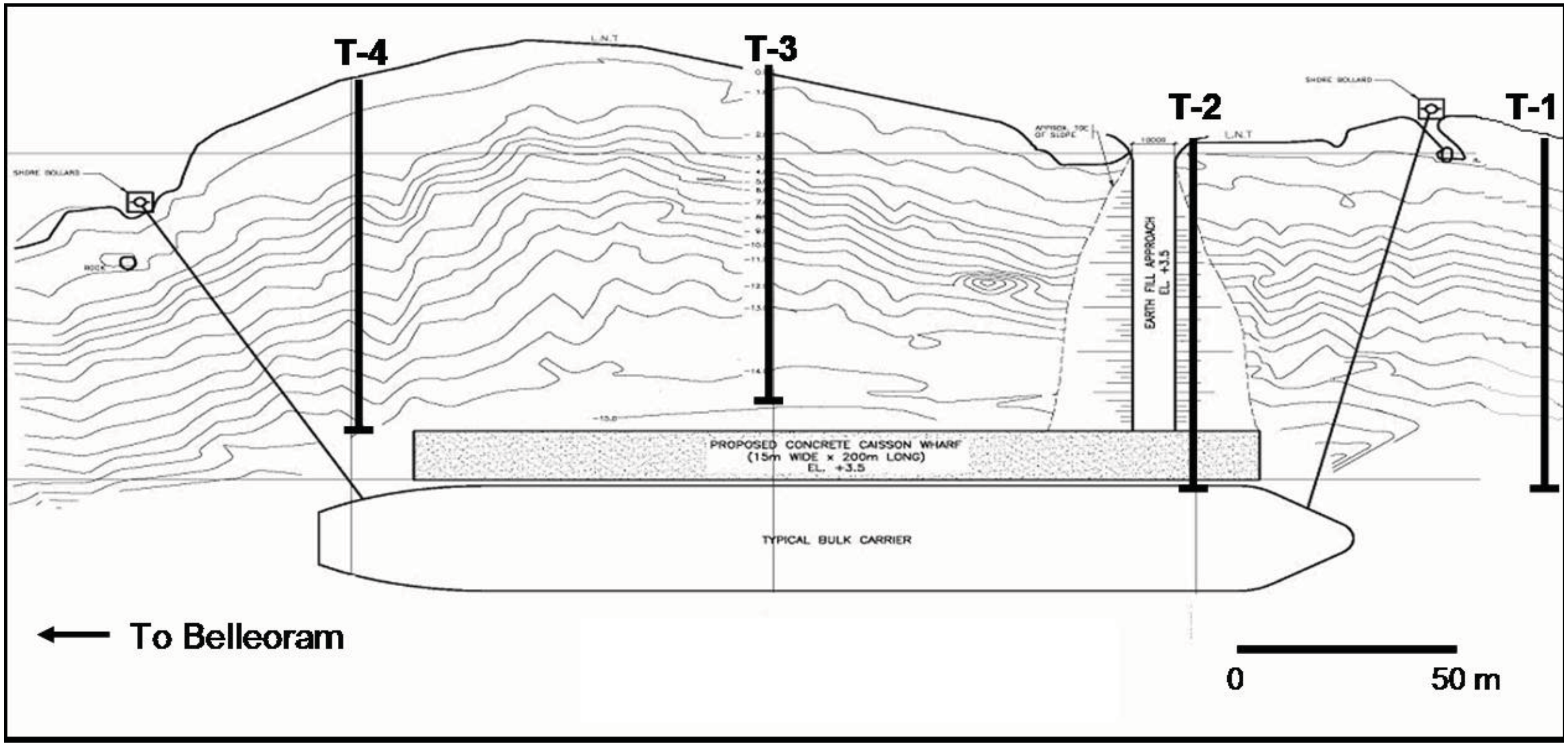

Figure 9.15 Marine benthic habitat survey locations at the proposed marine terminal location for the Belleoram Crushed Rock Export Quarry, Belleoram, NL.

9.2.2.2 Marine Terminal Construction and Operation

Direct mortality of lobsters and fish during the marine terminal's construction is unlikely, with these fish generally avoiding the area once the activities start. Loss of sessile invertebrate and plant species may result from the marine terminal's construction; however, as outlined in Section 9.2.1, the area consists mostly of rock and silt with few plants and a low density of sessile invertebrates. Therefore, the effect of the marine terminal on their population is expected to be minimal. However, the Proponent will adhere to all applicable DFO publications designed to preserve local fish and fish habitat. These include (but are not limited to) the:

- *National Policy for the Management of Fish Habitat*;
- *Fisheries Act* - *Habitat Protection and Pollution Prevention Provisions – Compliance and Enforcement Policy*;
- *Fisheries Act – Guidelines for the Use of Explosives in or near Canadian Fisheries Waters*;
- *Environmental Control Water and Sewage Regulations* under the *Water Resources Act*;
- CCME guidelines, including those outlined in *The Canadian Water Quality Guidelines for the Protection of Aquatic Life*;
- *Canada Shipping Act;*
- *Storage and Handling of Gasoline and Associated Products Regulations,* and;
- *Used Oil Control Regulations*.

9.2.2.3 Loss of Fines and Changes to Sediment Quality and Transport

Any activities within marine waters will be conducted in strict compliance with all authorizations and/or permits as required by all federal and provincial agencies. Clean (containing less than 5 % fines, non-acid generating) blasted rock from the quarry site will be used for the marine terminal's base and infilling. Prior to any works, silt curtains will be put in place around marine activities to prevent sediment from entering the water column outside work areas. The silt barrier will be attached to a flotation boom and extend from the surface to point as close to the seabed as possible. During the marine terminal's construction, infill will be dumped in place and not stockpiled along the shoreline, with placement not being conducted during periods of high wind, waves or precipitation. Armour stone will be placed progressively to minimize shoreline erosion and prevent the loss of infill material.

Seabed sediment removed during dredging activities to facilitate the wharf's footing (where required) will be placed on barges operating inside the silt curtain, and removed for disposal on land in an approved area of the quarry or waste management facility. The caissons will be placed on a compacted rock mattress for stability. This rock mattress is a prefabricated, self contained, high strength, unit that will be installed using a crane operated from a barge. This process is faster that pile driving or drilling and produces less disturbances to the seabed, resulting in a lower potential to affect the turbidity of the surrounding water.

Water releases leaving the silt curtains, or any work area in or near the marine environment, will have suspended solids concentrations not exceeding 25 mg/L (monthly average) or 50 mg/L (grab sample) as per Section 36 of the *Fisheries Act*.

Loading of the final product onto ships moored at the marine terminal could result in unexpected water quality issues within the marine environment. Losses of aggregate from spills, accidents or machinery malfunctions could increase the sediment load of the surrounding waters; resulting in adverse affects on the local flora and fauna. However, prior to its conveyance to the marine terminal the aggregate will have already been washed, significantly lowering its fine particle content (<5%) and diminishing its potential to release sediment or dust. Further, losses will be mitigated by having all conveyors servicing the marine terminal fitted with hoods to prevent dust release and spills. Conveyors and ship loading equipment will be maintained in a state of good repair and regularly inspected to ensure maximum efficiency and to minimize the potential for malfunction. All machinery will be operated by only those employees properly trained to do so. The EPP and contingency plans outline appropriate responses to accidental spills, with spill kits (containing such things as silt curtains and floating booms) available on barges or boats servicing the marine terminal and the terminal itself.

9.2.2.4 Chemical Losses Affecting Water and Sediment Quality

Bore hole testing at the quarry site has found that the area does not contain any natural acid-rock potential (low iron) and only contains background levels of lead or arsenic (Appendix B). This reduces the possibility of leachate from infill material increasing acidity or contaminating the waters surrounding the marine terminal over time.

Construction of the terminal will require the use of heavy machinery, boats and barges, each with the potential to leak hydrocarbons into the surrounding waters. Chemical losses (e.g. fuels, greases, detergents) will be mitigated by taking a proactive approach to prevent leaks or spills. Hydrocarbon releases from machinery and vehicles can be minimized through regular maintenance to ensure they are in good working order and thoroughly checked for leakage. Heavy equipment used during construction (e.g. cranes dump trucks, loaders) will only be used on dry, stable, land or barges specifically designed for that purpose; with heavy equipment not operating from barges completing work below the high water mark during low tide. No refueling or repairs of construction equipment will be done on the marine terminal or within 30 m of any waterbody. Floating booms will be in place during all construction activities which will contain potential leaks or spills. Spill kits, containing such items as absorbents capable of retaining and removing oil sheen and waste storage containers, will be available on barges and boats required for construction and the terminal itself.

The loss of uncured concrete into marine water has the potential to adversely affect fish and fish habitat due to its high alkalinity. To mitigate losses, all concrete formwork required for the marine terminal's construction (e.g. pile caps) will be made either onshore and put in place once dry, or be set in place within leak-proof forms in a manner that will prevent fresh concrete or cement paste from leaking into the ocean. Chutes or concrete pump delivery lines will have joints and connections sealed and locked and crews would ensure that concrete forms will not be overfilled. Tools are to be washed in freshwater that will be disposed in an approved location on land (and not within 30 m of any waterbody). Any wooden concrete forms or any other wooden structures built on or near the marine environment will be made of wood deemed safe for use as per the Guidelines to Protect Fish and Fish Habitat From Treated Wood Used in Aquatic Environments in the Pacific Region (Hutton and Samis 2000).

During operation, the ship loader and conveyor equipment located on the marine terminal will contain only small quantities of hydrocarbons. Only hydraulic fluid and medium oils (for gearboxes) will be used. The hydraulic fluid storage is to be located at least 30 m from any waterbody within a secure equipment room provided with secondary containment of at least 110% of the tank's capacity. Gearboxes will have catchment trays as would bearings where regular greasing occurs (as per manufacture's specifications). Any machinery requiring minor repairs will be taken to a suitable location on land to be fixed, with no repairs of mobile machinery being performed on the marine terminal or within 30 m of any waterbody. However, only minor repairs and maintenance of 'non-mobile' equipment (such as greasing of conveyors) will be performed on-site. All major repairs will take place offsite at an approved facility.

Fuel, and other toxic substances (as defined under Schedule 1 of the *Canadian Environmental Protection Act*; *CEPA*), will only be handled, stored, or disposed by persons who are trained and qualified to do so in accordance with the manufacturers' instructions (e.g. Material Safety Data Sheets) and governmental laws, acts (e.g. *CEPA*), and regulations (e.g. *Storage and Handling of Gasoline and Associated Products Regulations; Used Oil Control Regulations)*. Procedures will include:

- Having operators present for the duration of refueling;
- Refueling equipment and vehicles at least 30 m from any water body, and over a non-permeable surface;
- Having basic petroleum spill clean-up equipment on-site, with adsorbents being used to recover any hydrocarbon sheen on the water;
- Reporting spills to the 24-hour Canadian Coast Guard Spill Line (1-800-563-9089);
- Allowing no on-site bulk storage of fuel or oil;
- Not disposing of wastes in or near waterbodies, and;
- Routine water testing as per criteria listed in Schedule A of the *Environmental Control Water and Sewage Regulations (2003)*, under the *Water Resources Act* and ensuring any discharges from the site conform to CCME limits.

A Spill Contingency Plan will outline appropriate responses to accidental spills (such as those resulting from collisions, fires, structural failures), with spill kits (containing such things as floating booms and absorbents) being available on barges and service boats and the marine terminal itself. All water releases will meet the regulatory requirements of the *Environmental Control (Water and Sewage) Regulations* and the CCME limits (e.g. metals, dissolved oxygen, hydrocarbons).

9.2.2.5 Shipping

Shipping activities and maritime accidents (i.e. fuel spills, contaminated bilge discharge) could also affect local lobster habitat through water quality degradation and habitat loss. Shipping activities will be contracted out to a third party, who will be contractually responsible for the vessels and shipping as well as its operation and maintenance. Continental Stone is committed to environmentally safe shipping practices, and will require the contractor to: not refuel at the marine terminal, or dump bilge or foreign ballast water outside the allowable restrictions of the *Canada Shipping Act* (not within the Belle Bay area), having the ships registered with the Eastern Canada Response Corporation (ECRC), and requiring bulk carriers to carry oil spill clean up equipment (e.g. absorbents, inflatable dykes) with trained crew members in spill prevention and clean up techniques. Details of standard mitigations with respect to shipping activities are outlined in Section 2.2.3 and will be included in Continental Stone's EPP.

9.2.2.6 Blasting

Blasting along the shoreline will be required in the initial stages of construction to facilitate access to the marine terminal site. Minimal information is available on the effects of acoustic stimuli and waterborne vibrations on aquatic invertebrates (Wiese 1976; Tautz and Sandeman 1980; Heinisch and Wiese 1987; Breithaupt and Tautz 1990); with none of it pertaining specifically to the American lobster. In terms of physical and/or behavioural impact of sound energy on decapod crustaceans, research of this nature is also limited. Further, while there are guidelines for the use of explosives near fish and their spawning habitat (Wright and Hopky 1998), no such guidelines exist for any invertebrates.

It can be assumed that the most sensitive stages for the lobster will be during molting, reproduction, and incubation. For the American lobster, these stages occur during the summer months in shallow, nearshore, waters (Pezzack et al. 2001). However, with the initial construction set to be in the early fall, any blasting required for the marine terminal's construction should avoid these sensitive stages. At this time, it can be anticipated that any lobsters that use the Project area for spawning or rearing habitat have finished spawning and begun their retreat to deeper offshore waters where they are known to overwinter (Christian 1995). With respect to adult lobsters that may be in the vicinity of a blast, research has shown that even very high sound pressures do not significantly alter decopod's (e.g. lobsters and crabs) physiological parameters (Christian 2004). Therefore, the minimal use of small land-based charges required to construct the marine terminal are not anticipated to have any significant effect on lobsters residing in the immediate Project area.

Regardless of the lack of anticipated effects, blasting during marine terminal construction will adhere to all mitigative measures as outlined in Section 2.2.4 for quarrying operations and will be done in accordance with all acts, regulations and guidelines described therein. This includes allowing no blasting to occur in the marine environment.

9.2.2.7 Monitoring

As a condition of the Fish Habitat Compensation Agreement, DFO Habitat Management Program will require monitoring of the newly created lobster habitat. The site will be monitored for structural stability and habitat utilization of the newly created large juvenile/adult lobster habitat. The monitoring program will be conducted over a 10 year period with monitoring occurring between June 1st and October 31st in years 1, 2, 3, 5, 7, and 10. The monitoring program will consist of but not necessarily be limited to the following:

- Video and photographic surveys;
- Visual inspections (monitoring any structural changes);
- A record of flora and fauna related succession with respect to utilization of the new habitat, and/or;
- A record of lobster utilization of the new habitat.

In addition to the scientific/quantifiable monitoring initiatives it also anticipated that local lobster fishers will be involved in the monitoring process. This will involve the collection of quantifiable replicate fishing data with respect to lobster populations both within and outside of the newly created lobster habitat.

9.2.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The level of disturbance to fish and fish habitat in the area waters surrounding the marine terminal is rated as Level I for the magnitude/geographic extent. While there is a potential for habitat degradation of fish habitat over the lifespan of the Project due to such events as hydrocarbon spills/leaks or loss of aggregate and fines affecting sediment quality, with the implementation of the mitigative measures outlined above, their ecological or socio-economic effects are anticipated to be insignificant (Level I). Therefore, TC, DFO, and ACOA conclude on the basis of a Level 1 rating for magnitude/geographic extent and context, the adverse effects to fish and fish habitat are **Non-significant**.

9.3 Aquaculture and Commercial Fisheries

9.3.1 Background

Marine vessel traffic in the waters immediately adjacent to the quarry and Chapel Island is mainly aquaculture-related, and includes supply and harvest boats that make daily trips between the Town of Belleoram and the fish farms within Belle Bay (Figure 9.16). There are 4 finfish aquaculture sites near Chapel Island, with 2 more proposed, all within 5 km of the Project site. The closest site is approximately 2.2 km away from the proposed marine terminal. Boats servicing these sites regularly pass through the proposed bulk aggregate carrier corridor to access the farms.

Seasonal commercial fishing exists in the region, with most local vessels fishing in the waters off the southern portion of Fortune Bay, or within Fortune Bay to the east of Chapel Island (towards the Burin Peninsula). According to the Fisheries and Oceans Community-Based Coastal Resource Inventory Atlas for Bay d'Espoire/Connaigre Peninsula there is an active fishery for cod, lumpfish, herring, and lobster operating out of the community of Belleoram; however, there is no active fishery for either of these species in the vicinity of the proposed marine terminal site (DFO 2000). No quantifiable records with respect to the amount harvested have been identified.

Based upon discussions with DFO Habitat Management Program (See Section 9.2.2.1), it has been determined, while no commercial fishery currently exists (DFO 2000), the area of the marine terminal does possess habitat utilized by the American lobster (*Homarus americanus*). American lobsters typically exhibit seasonal inshore-offshore movements, moving into shallow water during the summer and to deeper water in the winter. These movements can range from a few hundred meters to hundreds of kilometers depending on factors including available habitat, degree of bottom slope, water temperature, and degree of exposure to wave energy. Molting and reproduction occurs nearshore, generally during the months of June and July (Pezzack et al. 2001).

9.3.2 Potential Effects and Proposed Mitigations

Potential concerns with regard to the marine terminal's interaction with the aquacultural and commercial fisheries in the area include:

- Change in the productive capacity of aquatic systems;
- Direct mortality of wild and caged fish, and;
- Effects of blasting on wild and caged fish.

9.3.2.1 Change in the Productive Capacity of Aquatic Ecosystems

As was outlined in Section 9.2.2.2, a total of 1578 m^2 of lobster habitat will be compensated for as a result of the direct loss from the marine terminal's earthen-filled approach. Compensation measures will consist of replacing this habitat on a like-for-like basis through the use of armour stone on either side of the marine terminal's earthen-filled approach. This will constitute a like-for-like habitat replacement strategy within the same ecological unit.

All compensation activities and concepts will be performed in consultation and cooperation with DFO Habitat Management Program, the Town of Belleoram, and the local Belleoram Fisheries Committee. A monitoring program has been designed, as outlined in Section 9.2.2.8, to determine if the compensation strategy is successful and adjust the plan accordingly if necessary. Therefore, it is reasonable to assume that the compensation plan will be successful in maintaining the productive capacity of the waters surrounding the Project area, ensuring its capacity to sustain a fishery in the future.

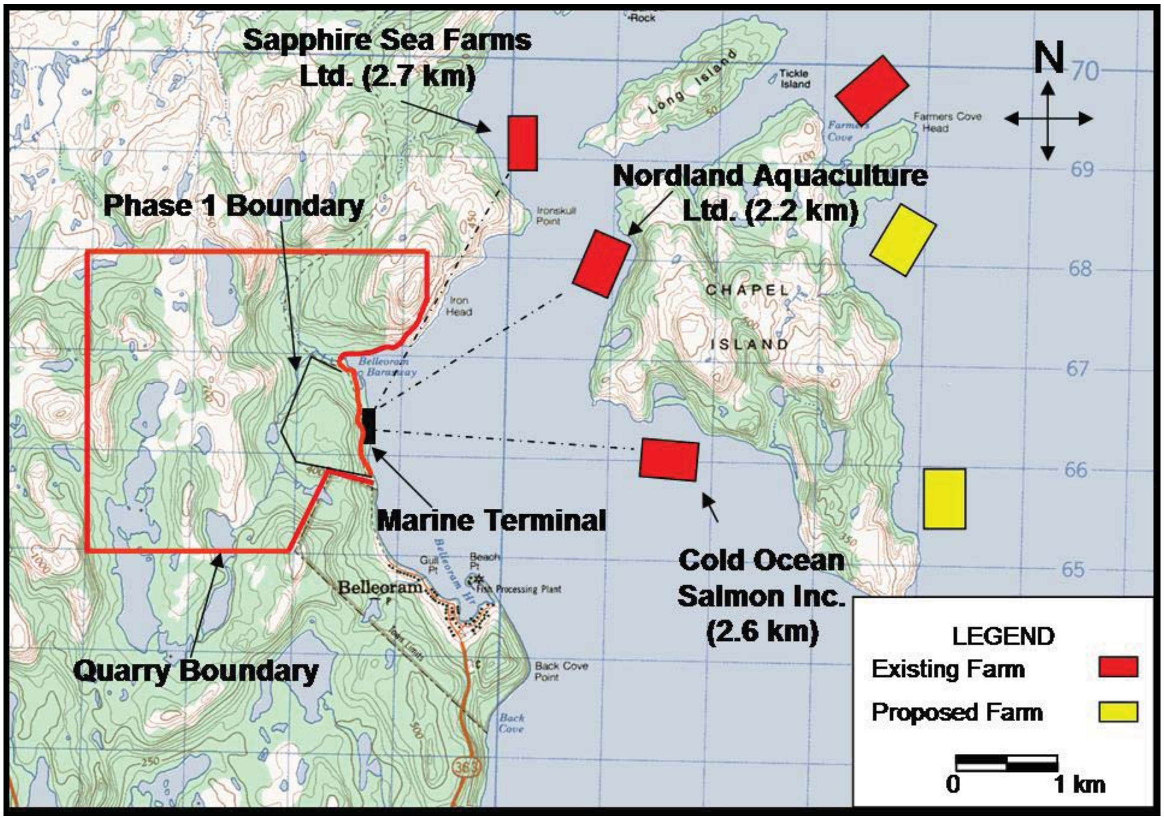

Figure 9.16 Locations and distances of aquaculture farms in relation to the proposed marine terminal. Aquaculture site mapping obtained from the Newfoundland and Labrador Aquaculture GIS database (2006)**.**

9.3.2.2 Direct Mortality of Wild and Caged Fish

<u>Marine Terminal Construction and Operation</u>

As per Sections 9.2.2.4 and 9.2.2.5, the construction and operation of the marine terminal will be done in accordance with the *Fisheries Act* and regulations, the Canadian Water Quality Guidelines for the Protection of Aquatic Life, and all associated permits and laws. This will ensure that any construction or operational activities do not degrade local water quality, thus minimizing the potential loss of fish or fish habitat (both wild and caged). Adverse effects on water and sediment quality will be mitigated against through the use of such measures as utilizing only clean fill material (<5 % fines) for the earth filled approach, maintaining floating booms and silt curtains around all work areas and ensuring all equipment used at the marine terminal during construction and operation will be well maintained to guard against leaks or spills to the marine environment. A Spill Contingency Plan is included in the EPP and outlines appropriate responses should an event occur, and spill kits (e.g. absorbents, floating booms, catchments) will be available at the marine terminal site and on any barges or ships while docked.

Timing of the marine terminal's construction (early fall) helps minimize the effect that construction may have on the local lobster population. The majority of activities will occur outside the lobsters' reproductive stage, as they spawn in the early-to-mid summer (Pezzack et al. 2001). Therefore, it is anticipated that construction will commence as the lobsters are preparing to move back into deeper waters away from the marine terminal area.

Shipping

Shipping activities, and maritime accidents (i.e. fuel spills, contaminated bilge discharge), could also affect fish (both wild and aquacultural) through water quality degradation and habitat loss. Shipping activities will be contracted out to a third party, who will be contractually responsible for the vessels' operation as well as their maintenance and adherence to all laws, standards and regulations. Continental Stone is committed to environmentally safe shipping practices, and will require the contractor to: not refuel at the marine terminal, not dump bilge or foreign ballast water outside the allowable restrictions of the *Canada Shipping Act* (not within the Belle Bay area), and requiring bulk aggregate carriers to carry oil spill clean up equipment (e.g. absorbents, inflatable dykes) with trained crew members in spill prevention and clean up techniques. Details of standard mitigations with respect to shipping activities are outlined in Section 2.2.3 and are included in Continental Stone's EPP.

Interference/navigation issues between the bulk aggregate carriers and commercial fishing or fish farm boats are expected to be negligible, with all quarry-related vessels following the mitigations outlined in Section 2.2.3 and adhering to all procedures and protocols contained in the *Canada Shipping Act*. Interactions between the bulk aggregate carriers and local marine traffic will be minimized by several factors, including: the infrequent passage of the bulk aggregate carrier (every 5-7 days), its travel within an identified shipping corridor, the distance to the nearest fish farm (at least 750 m), its slow speed within Belle Bay (approximately 2 knots), communicating arrival and departure information with the Local Special Interest Committee, and finally the low concentration of commercial fishing vessels in the area. Further, these ships will be fitted with state-of-the-art navigation, radar, and communication equipment which will allow them to be in constant communication with other vessels and shore stations, ensuring their presence is known and alerting them to any other vessels in the area.

9.3.2.3 Effects of Blasting on Wild and Caged Fish

Effect on Lobster

As was established in Section 9.2.2.7, the blasting required along the shoreline during the initial stages of construction is not anticipated to pose a concern to the lobsters inhabiting or breeding in proximity to the marine terminal. Data exists to suggest that adult crustaceans are not affected by high intensity acoustic events (Christian 2004). However, some experiments have been completed to determine the impacts of seismic work on crustaceans but the results are mostly inconclusive. While most studies have shown that there are no outright lethal effects of high intensity acoustic events, some studies have demonstrated that there are sub-lethal effects of seismic events on lobster. With construction at the marine terminal anticipated to start in the early fall, any blasting activities will be performed outside of the lobster's breeding season, thus mitigating any concern regarding stock recruitment.

Effect on Caged Fish

Detonation of explosives on land during the quarrying operations will produce some vibrational and acoustic noise in the surrounding marine environment. The extent to which these factors can cause negative impacts is directly related to the distance from the blast, the magnitude of the blast and the sensitivity of the organism to vibrations or sound (OSB 2003). Some species use sound for communication and courtship (Popper & Fay 1993; Fay & Popper 2000; Popper *et al*. 2003), and aggression (Hawkins and Rasmussen 1978; Hawkins 1993).

With respect to how fish receive and can be affected by sounds or vibrations, there are two main variables of interest; 1) shock pressure, represented and measured in Peak Particle Velocity (PPV), and; 2) compressional seismic waves, measured as a pressure force (kPa). Wright and Hopky (1998) have set recommended guideline for these forces, outlining the limits below which fish are not expected to be adversely affected. Overblast, in this case being the propagation of sound from air into water, may also pose a concern if the force is sufficient enough to penetrate the water.

The following is a discussion of the forces involved with the nearshore, land-based, blasting required for the marine terminal's construction. It should be noted that the size of the charge used in the calculations is the same as the anticipated charge required for quarrying operations. However, while it is impossible to estimate the exact size of the charges to be used for the actual nearshore blasts (as they will vary in size based on the conditions at the time), it is known that these will be significantly smaller than those used for quarrying. Therefore, utilizing the quarrying charge size of 290 kg/per bore hole inherently implies a large safety factor when determining the potential for adverse affects on caged fish related to nearshore blasting. Further, the guidelines set by Wright and Hopky (1998) are designed for the fishes' most sensitive life stage; egg incubation. Since the local aquaculture sites only contain more resilient juveniles and adults, this adds an additional significant safety factor when assessing the effects of blasting. Finally, no blasting will occur within the marine environment.

Peak Particle Velocity

Wright and Hopky (1998) state that: "*no explosive is to be detonated that produces, or is likely to produce a PPV greater than 13 mm/second in a spawning bed during the period of egg incubation*".

An estimate of PPV can be calculated using the following equation (Oriard 2002):

$$PPV = 150(SD/W^{0.5})^{-1.6}$$

Where: PPV is in inches per second, SD is the distance from the blast in feet, and W is the weight in pounds per delay. By altering the blast configuration and estimated weight of each charge for the proposed Belleoram Quarry (294 kg), the PPV experienced by any nearby aquaculture facilities can be estimated. The current blast design produces the following predicted PPV at various distances:

50 m	187mm/sec.
200 m	20 mm/sec.
300m	13.0 mm/sec.
500 m	4.87 mm/sec.
1500 m	0.75 mm/sec.
2000 m	0.37 mm/sec.

By observing the suggested guideline, blasting would need to be approximately 300 m from any area of fish egg incubation. As shown, the particle velocity values for distances between the proposed quarry and the aquaculture facilities (estimated conservatively at 2.2 km; Figure 9.16) are not likely detectable using currently available blast monitoring seismographs (Personal Communication: Keith Phelan, Hard Rock Newfoundland, 2006).

<u>Compressional Seismic Waves</u>

Wright and Hopky (1998) further state that: "*no explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change greater than 100 kPa (14.5 psi) in the swimbladder of the fish*".

To calculate the minimum distance that an onshore blast could occur from fish habitat, the following equation can be used:

$$SD = 5.03(W)^{0.5}$$

Where: SD is the distance from the blast in meters, and W is the charge weight per delay (Personal Communication: Keith Phelan, Hard Rock Newfoundland, 2006). Using this formula and based on the predetermined charge weight of 294 kg, the distance that the blast must be from fish habitat is estimated at 86 m, far less than the 2.2 km to the nearest fish farm.

<u>Propagation of Sound from Air to Water</u>

Although sound may propagate in air over several kilometers as a result of blast detonations, its effect relative to submerged marine fishes is considered to be minimal.

This statement is supported by Rayles Equation which describes the reflective abilities as sound passes from one medium to another. Salt water is a far more dense substance than air (1,027 kg/m^3 and 1.2 kg/m^3, respectively). Using when Rayles Equation, the following results are obtained.

Rayles Equation: $R = \frac{(z_2 - z_1)}{(z_2 + z_1)}$

Where: z_1 = acoustic impedance of air = density (1.2 kg/m^3) x the speed of sound in air (343 m/s) = 411.6

z_2 = acoustic impedance of salt water = density (1027 kg/m^3) x the speed of sound in salt water (1500 m/s) = 1540500

Solving for R, we get a value of 0.99. An R-value of <1 indicates a rigid boundary where most of the sound energy will be reflected off the surface with little transmission. Due to the distance between the aquaculture sties and the proposed quarry operation, the sound pressure in air would not likely be enough to penetrate the water's surface.

9.3.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The level of disturbance to the local aquaculture and commercial fisheries is rated as Level I for the magnitude/geographic extent. While there is a potential for habitat degradation of fish habitat over the lifespan of the Project due to such events as hydrocarbon spills or loss of aggregate affecting sediment quality, with the implementation of the mitigative measures outlined in Sections 9.2.2.4 and 9.2.2.5, their ecological or socio-economic effects are anticipated to be insignificant (Level I). Therefore, TC, DFO, and ACOA conclude that on the basis of a Level 1 rating for magnitude/geographic extent and context, the adverse effects to aquaculture and commercial fisheries are **Non-significant**.

9.4 Navigation/Marine Safety

9.4.1 Background

The southeast coast of Newfoundland experiences a considerable amount of commercial shipping. Oil tankers regularly enter Placentia Bay to access the oil refinery at Come By Chance and/or the transshipment facility at Whiffen Head, with oil exploration being ongoing off the coast. In 2006, 161 commercial vessels, 1552 fishing boats, and 126 pleasure craft were registered in NL (TC 2006). Both St. John's and Bay Bulls harbours receive regular service for both commercial shipping and offshore oil supply operations. There is also various commercial fishing activity and traffic off the entire coast. Seasonal coastal ferries run from Nova Scotia to Argentia, Placentia Bay, and between the two islands of St. Pierre and Miquelon and the town of Fortune, NL. Ecotourism is also popular throughout the region, with it becoming increasingly more common, especially within the Witless Bay Seabird Ecological Reserve, and near Bay Bulls and Bauline. Recreational boating and other localized traffic are present throughout the coast as well.

Despite the prevalence of maritime activity within the region, the marine vessel activity within the waters immediately adjacent to the marine terminal (Belle Bay) are local in scale and mainly aquaculture-related. These include supply and harvest boats that make daily trips between the Town of Belleoram and the fish farms. There are four existing, and two proposed, finfish aquaculture sites in the waters of Belle Bay and along the shores of Chapel and Long Islands, all within 5 km of the Project site. The closest site is conservatively placed at 2.2 km from the Project site. Boats servicing the aquaculture sites routinely pass through the proposed corridor bulk aggregate carriers will use. General shipping routes the bulk aggregate carriers will take are given in Figures 2.11 and 2.12.

According to the Fisheries and Oceans Community-Based Coastal Resource Inventory Atlas for Bay d'Espoire/Connaigre Peninsula there is an active fishery for cod, lumpfish, herring, and lobster operating out of the community of Belleoram; however, there is no active fishery for either of these species in the vicinity of the proposed marine terminal site. (DFO 2000). The majority of commercial fishing vessels disembarking from Belleoram Harbour head south to the fishing grounds at the mouth of Fortune Bay, or to the east/north east towards the Burin Peninsula (Personal Communication: Steward May, Mayor of Belleoram).

9.4.2 Potential Effects and Proposed Mitigations

The most economical method to transport the crushed granite product from the proposed quarry site is via marine bulk aggregate carriers. These ships will service the marine terminal approximately every 5-7 days and will have an anticipated 60,000 tonne capacity. Due to their large size (approximately 200m long), and the need for these vessels to turn one-hundred-eighty degrees within Belle Bay to moor at the wharf, there is an inherent potential for interactions between the bulk aggregate carriers and other marine traffic in the immediate area. Interactions between the bulk aggregate carriers and other vessels may lead to a decrease in navigability of Belle Bay, with a potential for safety concerns for smaller craft. Further, these ships will increase the amount of shipping traffic throughout the southern shore of Newfoundland in general, potentially interfering with the navigability of the region.

9.4.2.1 Mitigations for Shipping Activities within Belle Bay

Bulk aggregate carriers will service the marine terminal every 5-7 days, with the bulk aggregate carrier remaining inside an identified shipping corridor while approaching and leaving the marine terminal. The corridor will be at least 750 m away from the nearest aquaculture site and allow for unobstructed operation of the farms. Bulk aggregate carriers should not interfere with the normal day-to-day navigation of farm boats through the proposed corridor, with the ship's passage being short in duration, and the more maneuverable farm boats easily able to avoid them. The bulk aggregate carriers will travel at a very slow speed within Belle Bay, approximately 2 knots, preventing the generation of a significant wake; thus alleviating any safety concerns related to potential swamping of farm boats or other small craft. All ships will adhere to the mitigations and guidelines outlined in Section 2.2.3, meeting all regulatory standards pursuant to the *Canada Shipping Act*. The proponent acknowledges that the bulk aggregate carriers will represent a significant presence within Belle Bay due to their size, and will minimize their turnaround time at the marine terminal, restricting it to approximately 24 hours. The Local Special Interest Committee will be consulted with respect to ship arrival and departure times to further mitigate potential interactions.

9.4.2.2 Mitigations for Shipping Activities Outside of Belle Bay

Shipping activities will be contracted out to a third party, who will be contractually responsible for the adherence to all federal and provincial permits, licences, and certificates, and meet all regulatory standards pursuant to the *Canada Shipping Act*. Vessels will follow the *Collision Regulations* and report as per the *Eastern Canada VTS Zone Regulations*. As per the *Navigational Safety Regulations*, bulk aggregate carriers will be equipped with Automatic Identification System (AIS) equipment which will alert the Coast Guard their presence within the 12-mile limit, and a VHF transponder used to track the ships between 30 to 50 nautical miles from shore. Specific mitigative measures are outlined in Section 2.2.3, and have been incorporated into Continental Stone's EPP and contingency planning. It should be noted that the bulk aggregate carriers will not travel within the waters of Placentia Bay and, as such, have a low probability of encountering oil tankers servicing the refineries in the area.

9.4.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The level of disturbance to the navigability and safety of the marine waters in proximity to the Project area and throughout the south coast of Newfoundland as a whole has been rated as Level I for the magnitude/geographic extent; with any effect being seen on a local, and not regional, scale. While shipping activities may potentially interfere with other marine traffic, with the implementation of the mitigative measures outlined in Section 2.2.3 and 9.4.2.1 and 9.4.2.2, their effects are anticipated to be insignificant (Level I). Therefore, TC, DFO, and ACOA conclude that on the basis of a Level I rating for magnitude/geographic extent and context, the adverse effects of the Project on marine navigation and safety are expected to be **Non-Significant**

9.5 Marine Birds Including Seabirds and Sea Ducks

9.5.1 Background

Conservation is increasingly important as marine birds are very vulnerable to habitat loss resulting from human disturbances. This is due to the fact that many of these birds live in colonies with very specific habitat niches (Russell and Fifield 2001). The destruction of a nesting colony can have a great effect on a seabird's population. The Fortune Bay region is home to colonies of terns and gulls, and known to contain nesting Great and Double-crested Cormorants and the Common Eider. Marine bird colonies have been identified in the region around Belleoram, with colonies of terns and gulls at Harbour Island, Boxey Harbour Head, Little Sagona Island, and in the area of Brunette Island. These areas, ranging from 14 km (Boxey Harbour Head) to 44 km (Brunettes Island area) distance from the proposed marine terminal, are not in proximity to the shipping route of bulk aggregate carriers entering or exiting the quarry site.

There are concentrations of eider ducks wintering near The Platts and St. Pierre and Miquelon. Wintering/migrating eiders can be found in Fortune Bay from October to May. Harlequin Ducks are known to winter off St. Pierre and Miquelon, and breed on the Bay du Nord River. Therefore it is likely that Harleqiun Ducks will be noticed along the coastal areas of Fortune Bay.

There can be large concentrations (up to tens of thousands) of wintering thick-billed murres in Fortune Bay throughout the winter months, with the greatest concentrations in the late winter months (January to March). Although locations vary with sea ice conditions, they generally concentrate towards the mouth of Fortune Bay. The most significant concentrations are found at a small group of islands referred to as The Platts and the French Islands of St. Pierre and Miquelon.

There are several Important Bird Areas (IBA; as designated by the Natural Legacy 2000 program in concert with Ducks Unlimited Canada) on the south coast of Newfoundland (Figure 9.17). These IBAs were identified to acknowledge areas of unique habitat that are utilized by marine birds (Table 9.3), as there is concern for the population status of most of the seaducks breeding or overwintering in the area. Many of these birds winter in Greenland; with some known to winter throughout the Maritimes (e.g. Harlequin duck, see below). Habitat loss is a major concern for these species, with factors such as pollution, oils spills, shoreline developments, hunting, and interference by fishing operations all contributing to their hardships. The lack of population trends and insufficient long-term surveys further complicate the issue from a conservation standpoint (Russell and Fifield 2001).

9.5.2 Potential Effects and Proposed Mitigations

The construction and operation of the marine terminal may lead to potential negative effects on marine birds through:

- Direct loss of habitat at the marine terminal;
- Direct or indirect mortality;
- Disturbance of feeding, nesting, and/or breeding habitats; and
- Impacts resulting from accidents and malfunctions at the marine terminal or ships.

9.5.2.1 Habitat Maintenance

The construction of the marine terminal will create a permanent structure that has the potential to interfere with marine bird habitat. The terminal's footprint is not located within or in proximity to any identified marine bird sanctuary, reserve or important bird area as recognized by any federal, provincial or international agencies. Further, the anticipated start date for construction is in the later summer/early fall, after the most seabirds have left their breeding sites for the open ocean (Snow 1996). However, should a nesting marine bird be found at any stage of construction or operation of the marine terminal, all required measures will be taken to preserve their habitat. Continental Stone understands, and will comply with the *Migratory Birds Convention Act* and regulations which provides for the protection of migratory birds, their nests, eggs, and young. The proponent will comply with this *Act* during all Project stages. Under Section 5.1 of this *Act*:

No person shall deposit or permit to be deposited oil, oily wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds. In addition, no person shall disturb, destroy, or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird

Nesting will be left undisturbed, with adequate buffers being maintained between the nest and construction activities (as per the requirements of the *Migratory Bird Convention Act* and regulations). Nests or eggs will not be moved or obstructed and no vegetation clearing in the area will take place during the breeding season until fledglings have left parental territories. However, since the rocky shoreline supports no vegetation within approximately 5 m of the waterline, this in not anticipated to be an issue. Regardless, if a nest is found:

- The nest site and neighbouring vegetation should be left undisturbed until nesting is completed, and;
- Construction activities should be minimized in the immediate area until nesting is complete.

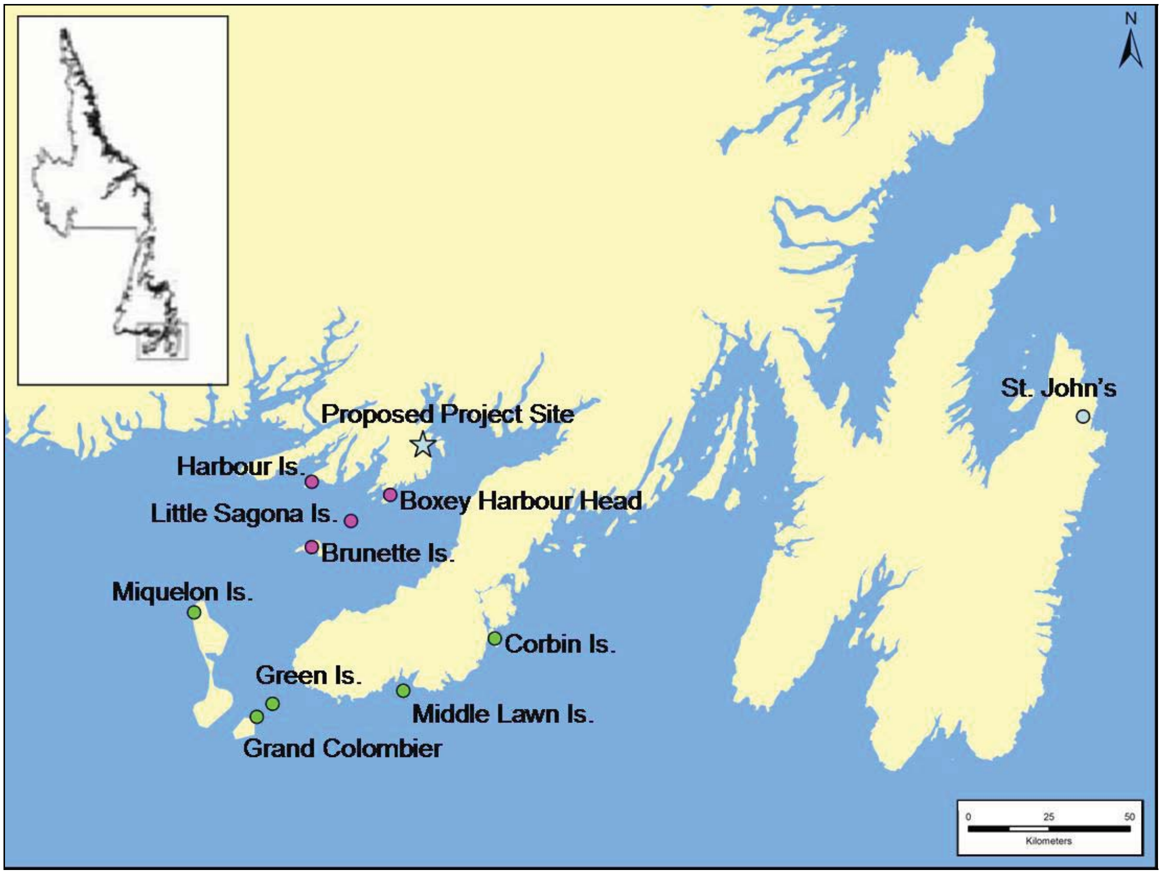

Figure 9.17 Location of known marine bird colonies (purple) and Important Bird Area (green) sites for marine birds on the south coast of Newfoundland (figure adapted from Russell and Fifield 2001).

Table 9.2 Important Bird Area sites and the marine bird species present on the south coast of Newfoundland. Populations are presented, where available. Information obtained from Russell and Fifield (2001).

IBA	Major Triggering Species (# of Breeding Pairs)	Other Species Present	Distance From Project Site (km)
Corbin Island	Leach's Storm-Petrel (100,000^{B})	Herring Gull (5,000^{B})	52
Middle Law Island	Leach's Storm-Petrel (100,000^{B}) Manx Shearwater (100 pairs, 400 non breeding B,S)	Herring Gull (20^{B})	58
Green Island	Leach's Storm-Petrel (100,000^{B})	Black Guillemot Great Blackback Gull Herring Gull Manx Shearwater (suspected)	66

Grand Colombier Island	**Leach's Storm-Petrel (100,000^{B})**	**Atlantic Puffin** **Black- Legged Kitiwake (200)** **Great Blackbacked Gull (5)** **Herring Gull (113)** **RazorBill (30-40)**	**78**
Miquelon Island (Northeast Coast)	**Red-necked Grebe (400-800 ^{W,SM})** **Common Eider (3000-4000 ^{W,SM})**	**Arctic Tern** **Common Tern** **Great Blackback Gull** **Herring Gull** **Ring-Billed Gull**	**58**
Miquelon Cape		**Black Guillemot** **Black- Legged Kitiwake (200)** **Great Blackbacked Gull** **Herring Gull** **RazorBill**	**58**

^{B} – Breeding Season ^{FM} – Fall Migration
^{S} – Summer ^{SM} – Spring Migration

Other measures to protect key habitat for marine birds will also include:

- Guarding against spills or leaks of toxic chemicals into surrounding habitats (see Section 9.2.2.5);
- Erecting siltation control measures (e.g. silt curtains) prior to beginning any activities involving disturbance of the site and work along the shoreline (see Section 9.2.2.4); and
- Ensuring that workers and contractors do not approach concentrations of seabirds, waterfowl, or shorebirds when approaching the construction site, constructing accessing the marine terminal, and have well muffled vessels.

9.5.2.2 Shipping

Maritime activities have been historically associated with a potential for loss or degradation or marine bird habitat, with factors such as pollution, oils spills, shoreline developments, and interference by fishing operations all contributing to their hardships. However, the infrequent passage (every 5-7 days) of the bulk aggregate carriers servicing the marine terminal presents a very low probability of significant interference with any marine bird colonies. In planning the proposed bulk aggregate carrier shipping route, routing has taken into account the proximity that ships will be to land and any known nesting or feeding grounds. The ships will be no closer than 3 km from shore or any identified important or sensitive marine bird nesting site, coming most proximal to the Islands of St. Pierre and Miquelon. This distance will allow for a minimal presence of the bulk aggregate carriers in proximity to marine bird habitat and ensure an adequate buffer to mitigate any adverse affects should an emergency arise on-board the ship (e.g. mechanical failure leading to grounding). Further, it is not foreseeable that ships will have any need to dump ballast of bilge in these areas, thus guarding against any marine bird habitat loss. All shipping operations will be performed by a licenced contractor who fully complies with the *Canada Shipping Act*, with specific mitigative measures to ensure the safety of the ship, as well as the environment, being outlined in Section 2.2.3 and the EPP.

To minimize the interactions of the bulk aggregate carriers with marine birds and their habitat the proposed shipping route will be maintained as far away from any identified protected bird habitats as possible. The ships will be no closer than 3 km to the nearest identified marine bird habitat (at St. Pierre Is. and Miquelon Is.), allowing for a minimal presence of the bulk aggregate carriers and ensuring a buffer to mitigate any adverse affects should an emergency arise on-board the ship (e.g. mechanical failure leading to grounding).

9.5.2.3 Noise and Blasting

Avoidance due to noise from construction and operations at the marine terminal will be localized to the immediate area. As the area has not been identified as containing any key habitat for marine birds, any avoidance of the site would not likely pose any significant stress to marine bird populations or affect their ability to maintain natural population levels. Blasting required for site access development will be small in scale, both spatial and temporal, with the charges being of minimal size and the blasting protocol designed for maximum efficiency. Mitigations to minimize the overall noise generated at the marine terminal have been included in the EPP and will also be reduced through the use of best practices pertaining to:

- The maintenance of equipment in good working order, with properly fitted noise suppression devices;
- Having those only those trained to operate and service equipment allowed to work on, or be in control of, any equipment;
- Designing blasting patterns and procedures to minimize shock or instantaneous peak noise levels and ensures that the magnitude of explosions is limited to only what is necessary (See Section 2.2.3); and
- No blasting underwater or within a waterbody.

9.5.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The level of disturbance to marine birds or their habitat at the marine terminal site or further afield on the south coast of Newfoundland is rated as Level I for the magnitude/geographic extent. The infrequent passage of the bulk aggregate carriers, their use of a predetermined shipping route, and the implementation of the mitigative measures outlined in Sections 9.5.2.1 to 9.5.2.3 allow minimal interaction between the bulk aggregate carriers and any identified marine bird colonies. Thus, the ecological effects of marine terminal operations and shipping are anticipated to be insignificant (Level I). Based on input from EC, the RAs conclude that on the basis of a Level 1 rating for magnitude/geographic extent and context, the adverse effects to the marine birds and their habitat are Non-significant.

9.6 Species at Risk

9.6.1 Background

The *Species at Risk Act* (*SARA*) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) are charged with identifying species whose populations are at risk due to anthropogenic and environmental changes. Continental Stone is committed to ensuring that the proposed quarry does not add to the difficulties facing Canada's threatened wildlife. Newfoundland is home to many species that have been listed by the SARA and COSEWIC due to their declining populations or loss of habitat. Protected species that may be affected by the quarry's construction and operation have been identified as the: North Atlantic Right Whale, Blue Whale (Atlantic population), Fin Whale, Leatherback Seaturtle, Red Crossbill (*percna* subspecies), Monarch Butterfly, Boreal Felt Lichen (Boreal population), and Harlequin Duck (eastern population). Descriptions of these species, and the reason for their population's decline, are outlined below (as outlined in EC's Species at Risk database 2006).

North Atlantic Right Whale

The North Atlantic Right Whale (*Eubalaena glacialis*) is designated as endangered under the SARA and COSEWIC. As of 2003, records indicated 402 individuals were seen in Canadian waters. This population appears to be declining as a result of several factors, including collisions with ships and entanglement with fishing gear. The International Whaling Commission recognizes two stocks of the North Atlantic Right Whale; one in the eastern and one in western North Atlantic. The Right Whale is a migratory species that will spend summers feeding in the cool temperate waters, north of its distribution range, and will winter in the subtropical waters of the southern United States.

Blue Whale

The Blue Whale (*Balaenoptera musculus*) is the largest animal to have ever existed on the planet. The biggest blue whale recorded was 29.5 m long. The blue whale is designated as endangered under the SARA and COSEWIC. Threats to the species include past commercial harvesting, collisions with ships, entanglement with fishing gear and oil spills. The blue whale is found world wide, with the Atlantic population frequenting waters off eastern Canada. During spring, summer and fall they will occur along the north shore of the Gulf of St. Lawrence and off Nova Scotia. They will normally migrate south for the winter.

Fin Whale

The Fin Whale (*Balaenoptera physalus*) is listed as Threatened under Schedule 1 of the SARA and in the Special Concern category under COSEWIC. It is the second largest whale in the world, after the blue whale. They are fast swimmers and have streamlined bodies. Adult fin whales reach physical maturity at 25 years of age, and range in size from 20-27 metres, and 60-80 tonnes, with northern hemisphere populations tending to be slightly smaller than their southern counterparts. They can live for up to 100 years, and females reproduce at two to three year intervals. They generally make seasonal migrations from low-latitude wintering areas to high-latitude summer feeding grounds. Historically their population decline was due to commercial whaling; however, today they are protected by the International Whaling Commission (1975) but still face threats from ship strikes and increasing noise levels from shipping, sonar, military operations and oil and gas exploration.

Leatherback Seaturtle

The Leatherback (*Dermochelys coriacea*) is the largest living turtle. Its bluish-black carapace (shell) is composed of skin with small bones imbedded in it and has 7 prominent ridges that run from the head region towards the tail. As is the case with all sea turtles, the front limbs are flippers and have no claws. Leatherbacks can measure up to 2.4 m in total length and 3.6 m in width; they weigh up to 725 kg. Leatherbacks are migratory sea turtles that breed in tropical or subtropical waters and move to temperate waters in search of food (chiefly jellyfish) at other times of the year. In the Atlantic, leatherbacks nest from November to April. Individual leatherbacks can nest 4 to 10 times in a season. In Canada, leatherbacks are often sighted on the east coast between June and October. It is listed as Endangered under Schedule 1 of the SARA, with the main threat to its survival being loss of beach nesting habitat due to human pollution and disruptions.

Red Crossbill

The Newfoundland subspecies of the Red Crossbill (*Loxia curvirostra percna*) is listed on Schedule 1 of the SARA and placed in the endangered category by COSEWIC. The Red Crossbill is a medium sized finch that uses its crossed mandibles to pry open conifer cones to feed on their seeds. It is a dull red colour with no white wing bars, and the bill is thicker than other North American Red Crossbills. The breeding range of this subspecies is unknown, but observations have occurred throughout much of the island, with most occurring in the older mature forests of western Newfoundland. The population is thought to have declined dramatically over the last 50 years. The limiting factors and threats to the Red Crossbill are poorly understood. Habitat loss can reduce cone crops that make up the Red Crossbill's food source, and Red Squirrels (an introduced species) may be out-competing the bird for food resources.

Monarch Butterfly

The SARA (Schedule 1) and COSEWIC have designated the Monarch Butterfly (*Danaus plexippus*) as Special Concern. The adult Monarch is a bright orange butterfly with heavy black veins and a wide black border containing two rows of white spots and has a wingspan of 10 cm. This butterfly exists primarily wherever milkweed and wildflowers grow and can include abandoned farmland, along roadsides and other open spaces. The distribution of the Monarch has gradually shifted eastward over the past century, due to a combination of clearing of deciduous forests in eastern US and southeastern Canada. Increasing use of herbicides is another significant threat.

Boreal Felt Lichen

The Boreal Felt Lichen (*Erioderma pedicellatum*) has been designated by COSEWIC as Special Concern. It is also pending public consultation for addition to Schedule 1 of the SARA. This Lichen grows on the branches or trunks of Balsam fir, Black Spruce, White Spruce and occasionally Red Maple. It is normally 2-5 cm in diameter, with the edges of the body slightly curled. Colour of the lichen is normally appears bluish grey or dark grey to grayish brown. In Canada, there are two populations of the Lichen: Newfoundland and Nova Scotia/New Brunswick. The greatest threat to the Boreal Felt Lichen is logging, followed by air pollution, pesticides and possibly climate change.

Harlequin Duck (Eastern Population)

The eastern population of the Harlequin Duck (*Histrionicus histrionicus*) is a small, subarctic, sea duck that is listed as a Special Concern on Schedule 1 of the SARA and COSEWIC. Its population has declined from historical estimates of 5000 - 10,000 to fewer than 1500 individuals. They are primarily threatened due to the destruction, alteration and contamination (e.g. marine oil spills) of their habitat. However, numbers appear to have increased over the last five years to an estimated 1800 individuals.

Harlequin Ducks winter along headlands where the surf breaks against rocks and ice buildup is minimal, feeding close to rocky shorelines. They spend most of the year in coastal marine environments, moving inland each spring to breed along fast-flowing, turbulent, rivers. Harlequin Ducks are known to migrate to sites across eastern Atlantic states and provinces, and they have been tracked to wintering sites on the east and south coasts of Newfoundland (Figures 9.18 and 9.19).

There is an active breeding population of Harlequin Ducks in insular Newfoundland with an estimated 125-150 breeding pairs on the Northern Peninsula (Gilliland and Goudie, unpublished). On the south coast of Newfoundland, there is a known breeding area on the Bay du Nord River within approximately 16 km of Chapel Island.

Red Knot

The Red Knot rufa subspecies (*Calidris canutus rufa*) is a medium-sized shorebird that breeds only in Arctic Canada and migrates thousands of kilometres between its Arctic breeding grounds and wintering areas at the tip of South America. The subspecies has shown a 70% decline in abundance over the past three generations (15 years). It is threatened by a depletion of horseshoe crab eggs, a critical food source used during northern migration. There is no potential for rescue from other populations. The rufa subspecies, which is found in Newfoundland, was designated Endangered by COSEWIC in April 2007.

Piping Plover

The melodus subspecies of the Piping Plover (*Charadrius melodus melodus*) breeds in several areas of Eastern Canada including Newfoundland. Surveys conducted since 1996 indicate that the population has remained relatively stable, but at a level far below 670 adults, a goal set by the recovery team working on this population. The number of individuals of this subspecies breeding in Canada is small. The quality of nesting habitat is decreasing, and predation and other disturbances limit reproductive success. No significant increase in numbers of breeding pairs has resulted in spite of strong conservation initiatives.

The most important limiting factor for Piping Plovers melodus subspecies is loss of habitat, mostly caused by human use of beaches (where it nests and forages), and the consequent human disturbance around nesting sites. Crows, gulls, foxes and raccoons prey on the eggs and young, as can feral dogs and cats. Changes in water levels caused by such events as seasonal storms and spring tides are also detrimental to the nesting efforts of this bird. In addition, global warming may reduce the plover's habitat by causing flooding on the Atlantic coast.

The Piping Plover species as a single unit was designated Threatened by SARA in April 1978. The status was re-examined and designated Endangered in April 1985. In May 2001, the species was re-examined and split into two groups according to subspecies. The *melodus* subspecies was designated Endangered by COSEWIC in May 2001. The Piping Plover *melodus* subspecies occurs in several national parks and historic sites where it is protected by the *Canada National Parks Act.* In addition, it is protected by the federal *Migratory Birds Convention Act*. This subspecies is also protected under the Quebec *Act Respecting Threatened or Vulnerable Species*, and the New Brunswick, Newfoundland and Labrador, and Nova Scotia *Endangered Species Acts.*

Short-eared Owl

The Short-eared Owl (*Asio flammeus*) is a medium-sized, buffy-white owl that prefers extensive stretches of relatively open habitat. It is primarily a bird of marshland and deep grass fields. It likes to hunt and roost in abandoned pastures, fields, hay meadows, grain stubble, airports, young conifer plantations and marshes in the winter. It frequents prairies, grassy plains or tundra in the summer.

The Short-eared Owl breeds or winters in a nearly global range. In Canada, it breeds in every province and territory, from the southern border to the low Arctic. In the winter it withdraws from the northern parts of its range, and remains only in the southern parts of most provinces. While 20th century population sizes were thought to have decreased in many areas, they remained stable in Newfoundland, Labrador and the Maritimes. The owl now occurs in small numbers throughout its Canadian range. Exact numbers are not known.

Large-scale destruction of native prairie grasslands has been particularly hard on this species. Natural succession, wetland drainage, urban expansion and increasingly intensive farming have contributed to its decline. The species is exposed to danger from predators and agricultural machinery since it nests on the ground. Shooting, collisions with aircraft, trains, cars, barbed wire and farm machinery are added factors. The species' attraction to open airport habitats is another problem.

The Short-eared Owl is still relatively common in Canada, but has been designated of Special Concern by COSEWIC since April 1994. It is also designated as of Special Concern under SARA. The main cause for concern is a well-documented decline resulting from loss of preferred habitat. It is not protected by the federal *Migratory Birds Convention Act*, but provincial legislation in most provinces protects it from hunting, possession and selling. Considerable sums are spent keeping this species and others away from airport runways.

Rusty Blackbird

More than 70% of the breeding range of the Rusty Blackbird (*Euphagus carolinus*) is in Canada’s boreal forest in all provinces and territories. The species has experienced a severe decline that appears to be ongoing, albeit at a slower rate. There is no evidence to suggest that this trend will be reversed. Known threats occur primarily on the winter range, and include habitat conversion and blackbird control programs in the United States. The Rusty Blackbird was designated as of Special Concern by COSEWIC in April 2006.

9.6.2 Potential Effects and Proposed Mitigations

The construction and operation of the marine terminal may potentially affect species at risk or their habitat. The marine terminal will present a physical presence in the waters of Belle Bay, causing a loss of nearshore and shoreline habitat. Once operational, it will generate noise/vibrations, dust, and has the potential to result in increased sediment/chemical-laden runoff that may negatively affect habitat. On-site accidents could also result in a degradation of habitat through the uncontrolled release of harmful substances (i.e. hydrocarbons from fuels spills, toxins from fires). Finally, the use of bulk aggregate carriers could result in collisions with migrating whales or interference/pollution of shoreline habitats along the shipping route.

9.6.2.1 Marine Terminal Construction and Operation

The Proponent and all contractors working on-site will adhere to all stipulations set out in the SARA, and will be informed that it is illegal to kill, harass, capture or harm any species listed under it. The Canadian Wildlife Service’s Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada (Lynch-Stewart 2004) outlines three hierarchical options when mitigating a project’s effect on any species; consisting of:

1. Avoidance, meaning the elimination of adverse effects (e.g., by siting, timing or design of a project)

2. Minimization, meaning the reduction or control of adverse effects through project modification or implementation under special conditions, and;

3. Compensatory mitigation, meaning the replacement of unavoidably lost habitat or residences, plants or plant communities, ecological functions, etc.

Terrestrial operations for the marine terminal's construction and operation will be minimal, with the Project only requiring the clearing of an access road and the use of the rocky shoreline. If a designated species is encountered at any stage of the Project, the Proponent will make an application to a competent Minister under Section 73

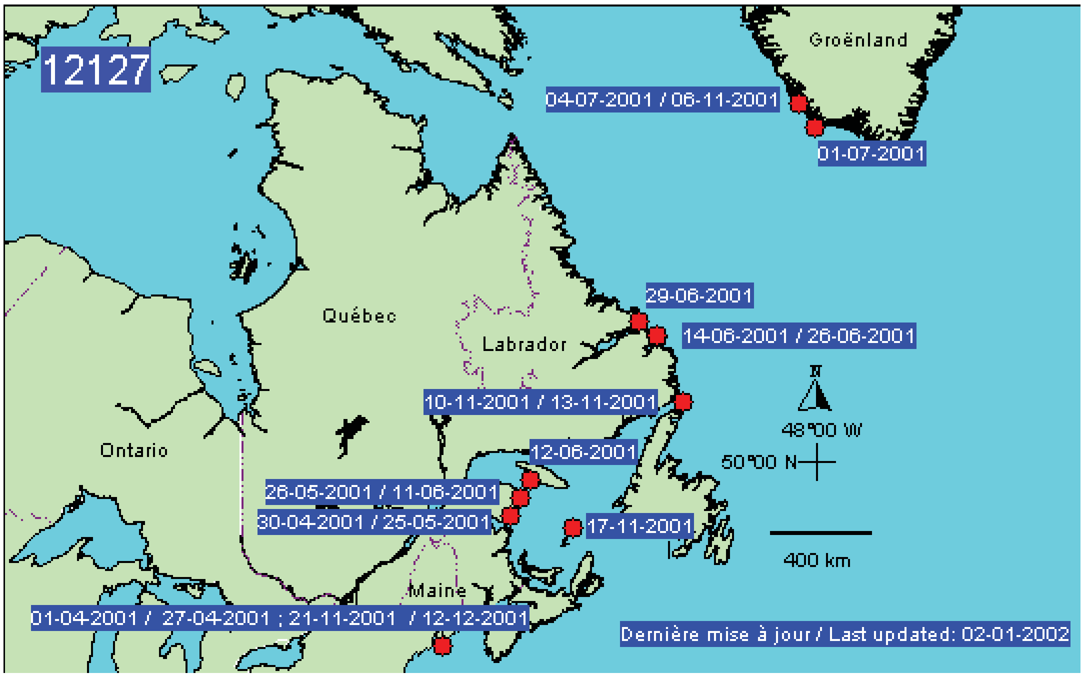

Figure 9.18 Movements of a Harlequin Duck fitted with a satellite telemeter. **(http://www.qc.ec.gc.ca/faune/sauvagine/html/hd_satellite.html).**

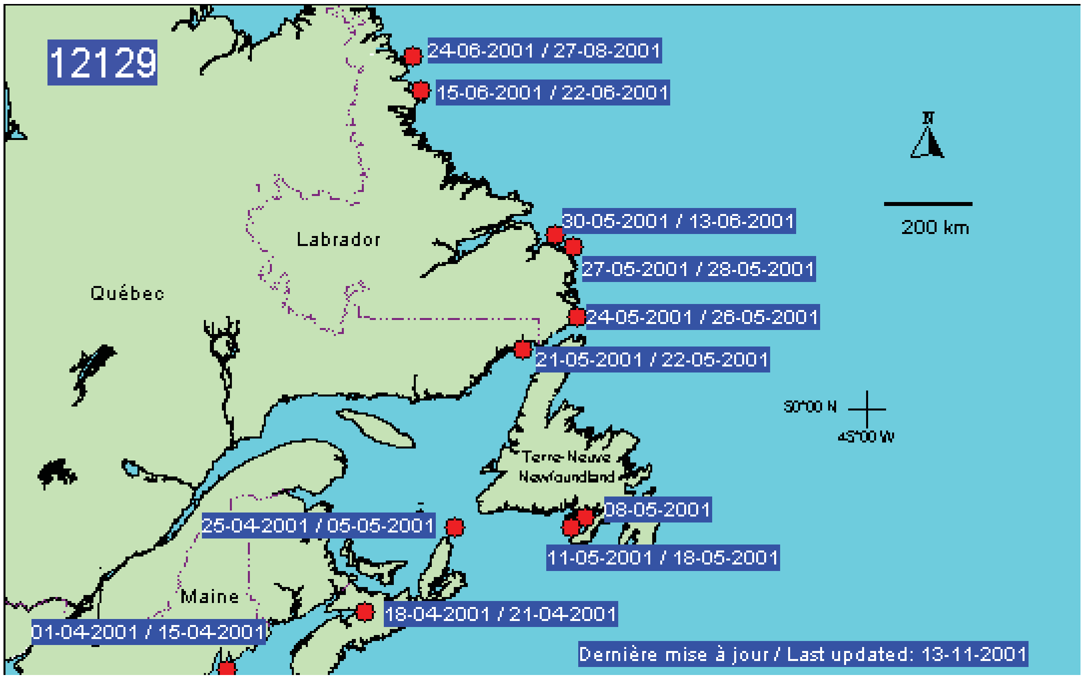

Figure 9.19 Movements of a Harlequin Duck fitted with a satellite telemeter. **(http://www.qc.ec.gc.ca/faune/sauvagine/html/hd_satellite.html). CWS 2007**

of the SARA to be granted permission to undergo an activity that affects a listed wildlife species. However, no operations will commence in the area until the proper permit is issued. The Proponent will ensure that all reasonable alternatives to the activity are considered, all feasible measures are taken to minimize the effect of the activity on the species, and the activity will not jeopardize its survival or recovery. As outlined in Section 9.2.2.1, the only species whose habitat will be lost has been determined to be that of the lobster, a species not identified as 'at risk'.

While loss of shoreline habitat is unavoidable on the marine terminal's footprint, its construction and operation will endeavor to create as little outputs to the surrounding habitat as possible. The best practices outlined in section 9.2.2.4 and 9.2.2.5 pertaining to mitigating the loss of sediments and chemicals will serve to protect both marine and terrestrial habitat against degradation. This includes ensuring that output from the site conform to the regulatory requirements of the *Environmental Control (Water and Sewage) Regulations* and the CCME limits (e.g. for metals, dissolved oxygen, hydrocarbons). Machines will be maintained in a state of good working order and regularly inspected for leaks or malfunctions. A Spill Contingency Plan has been included in the EPP and spill kits (containing such things as floating booms and absorbents) will be available at the marine terminal at all times.

9.6.2.2 Shipping Operations

A search of historical records by Laist et al. (2001) suggests that collisions of whales with ships are related to several factors, including: the speed of a ship, the number of ships in a given area and the size of the ship. The authors outline that the probability of lethal ship strikes become high in areas with a high concentration of ships of 80 m or longer traveling at speeds of at least 13 knots. However, the passage of bulk aggregate carriers to service the quarry once every 5-7 days will not greatly increase the concentration of marine traffic in the region. Further, Laist et al. (2001) noted that whales are not usually seen beforehand or are seen too late to be avoided, and suggest that a reduced speed is a beneficial way to effectively reduce lethal ship strikes with whales. Therefore, the slow speed the ships will maintain within Belle Bay, approximately 2 knots, will serve to minimize the possibility of a collision with any whales in the area. For safety and feasibility reasons the bulk aggregate carriers must travel at speeds approaching 13 knots outside of Belle Bay.

To minimize the interactions of the bulk aggregate carriers with marine birds and their habitat the proposed shipping route will be maintained as far away from any identified protected bird habitats as possible. The ships will be no closer than 3 km to the nearest identified marine bird habitat (at St. Pierre Is. and Miquelon Is.), allowing for a minimal presence of the bulk aggregate carriers and ensuring a buffer to mitigate any adverse affects should an emergency arise on-board the ship (e.g. mechanical failure leading to grounding).

All shipping operations will be performed by a licenced contractor who fully complies with the *Canada Shipping Act* and will be contractually bound to adherence with all environmental mitigation measures outlined by the Proponent. Specifically, adherence to the *Canada Shipping Act's Oil Pollution Prevention Regulations* and the *Ballast Water Control and Management Regulations* will be mandatory, with no dumping of ballast or bilge when passing protected bird areas. Further, a Ballast Water Management Plan and reporting schedule, as per Transport Canada's 'A Guide to Canada's Ballast Water Control and Management Regulations' (2006) will be made to help ensure any ship's operation leaves as little footprint to the area as possible. Ships' crews will be trained in oil spill prevention and clean-up, with spill kits on board at all times (e.g. containing absorbents, floating booms and waste containers). Mitigative measures are also outlined in Section 2.2.3 and will be included in the EPP and Contingency Plans.

9.6.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The level of disturbance to species at risk or their habitat at the marine terminal site or further afield on the south coast of Newfoundland is rated as Level 1 for the magnitude/geographic extent. The infrequent passage of the bulk aggregate carriers, their use of a predetermined shipping route, and the implementation of the mitigative measures outlined in Sections 9.5.2.1 to 9.5.2.3 allow minimal interaction between the bulk aggregate carriers and any species at risk that may be in the area. Thus, the ecological effects of marine terminal operations or shipping are anticipated to be insignificant (Level I). Based on input from EC, the RAs conclude that on the basis of a Level 1 rating for magnitude/geographic extent and context, the adverse effects to species at risk and their habitat are Non-significant.

9.7 Atmospheric Conditions

9.7.1 Background

The average daily temperature in the area ranges from a high of 18.5°C in August to -8.1°C in February. Annual precipitation is 1492 mm with June, September and November exhibiting the greatest monthly precipitation. Table 9.3 displays climatological information from Environment Canada's Canadian Climate Averages and Normals for the region (with the information obtained at the Harbour Breton weather station; 32 km West of Belleoram, averaged between 1970-2000).

Local conditions at Belleoram have a great effect on wind direction; evident in a channeling effect between Belleoram and Chapel Island, which changes winds to south-easterlies. The topography of the area also acts to shelter Belleoram and the proposed quarry site, by slowing winds (Bowyer 1995). When strong southwesterlies bring fog and high waves to Fortune Bay, Belle Bay tends to have lighter winds, with smooth, clear, conditions (Bowyer 1995). This will generally reduce the dispersion potential of airborne particles in the area.

The region within 10 km of the proposed site, and rural Newfoundland in general, experiences good air quality due to the lack of industrial emission sources (NL Community accounts mapping 2007). Climate conditions support good dispersion of airborne particles and the frequent rainfall helps dilute those particles in the air. The air quality is also enhanced by the infusion of relatively clean, oceanic air masses from the North Atlantic Ocean (Bowyer 1995). The climate is relatively wet with a winter season that typically lasts for 4 months. This snow cover results in the saturation of the surface and thus it is expected there is little background particulate matter.

9.7.2 Potential Interactions

There is a potential for the release of airborne particles in the form of dust as a result of construction (i.e. blasting) and operation of the marine terminal. Minimal blasting will be required along the shoreline of the marine terminal during the construction period which also may result in some fugitive dusting. Exhaust emissions will be generated by both gas and diesel powered equipment being used, including: excavators, loaders, and dump trucks. Further, construction and operation will generate mechanical noise which will emanate into the surrounding environment and potentially have an adverse affect of both human health and wildlife habitat. Potential effects related to alterations of the atmospheric environment include:

- Human health concerns;
- Environmental effects, including increased siltation in freshwater and marine ecosystems;
- Increased exhaust emissions; and
- Effects on air quality from potential accidents or malfunctions.

Table 9.3 Monthly average climatological information from Environment Canada's Canadian Climate Averages and Normals for the region (1970-2000). Data obtained at the Harbour Breton weather station; 32 km West of Belleoram.

PARAMETERS	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
TEMPERATURES (°C)													
Mean Daily Average	-4.2	-4.5	-2	2.6	6.4	10.1	14.1	15.8	12.9	8	3.5	-1.1	5.1
Mean Daily Maximum	-0.5	-0.9	1.4	5.6	9.9	13.5	16.9	18.5	15.7	10.8	6.4	2.1	8.3
Mean Daily Minimum	-7.9	-8.1	-5.3	-0.5	2.9	6.8	11.2	13	10	5.1	0.6	-4.3	2
Precipitation (mm)													
Total Precipitation	112	124	99	134	120	148	122	94	141	138	141	119	1492
Total Rainfall	71	93	72	126	118	148	122	94	141	138	134	87	1345
Snowfall (cm)	41	31	27	8	2	0	0	0	0	0	6	33	147
Extreme Daily Rainfall	62	101	75	81	53	115	50	61	97	74	72	44	
Extreme Daily Snowfall (cm)	21	30	35	17	12	0	0	0	0	2	13	22	
Extreme Daily Precipitation	62	101	76	81	53	115	50	61	97	74	72	44	

9.7.3 Potential Effects and Proposed Mitigations

9.7.3.1 Dust Emissions

Marine Terminal Construction and Operation

Dust emissions during the construction of the marine terminal are expected to be minimal. Infilling will utilize clean granite fill from the quarry itself, containing less than 5% fines with a low potential to release dust before being put in place. Once in place, fill will be underwater with no dusting potential. As per Section 9.2.2.4, silt curtains will serve to contain and collect any fines released so as to not increase suspended solids in the marine environment. This will also prevent fines from washing ashore, where they can dry and subsequently become airborne.

Dusting as a result of vehicles accessing the marine terminal will be largely confined to the construction stage, with large trucks transporting equipment and materials to the site. Once construction is complete, it is anticipated that only small service vehicles will be used at the terminal site. Further, the proximity of the work site to the ocean, and fact that the area consists mainly of exposed granite bedrock, makes the potential for dry, dusty, conditions to be low. However, any areas with a high dust potential will be sprayed with water to decrease the chance of particles becoming airborne.

The decision to use a marine terminal and bulk aggregate carriers, instead of dump trucks, to transport the aggregate also greatly decreases the Project's potential for dust emissions. Bulk aggregate carriers will be loaded approximately every 5-7 days via a shiploader fed by a covered conveyor belt. This allows for a single point source of dust, instead of the large number of trucks that would be required to transport the same amount of product overland. Further, the shiploader will be fitted with a luffable spout fitted with dust skirts (See Figure 2.8). Essentially, this is a rubber tube through which the aggregate will flow into the ship, allowing it to be placed as low in the ship's hold as possible. This serves to greatly reduce dust emissions from the aggregate by avoiding dropping it from a significant height, keeping the product intact and avoiding spills.

The aggregate will contain less than 5% fines at the time of shiploading, having been screened and washed prior to conveying to the marine terminal. All areas of the marine terminal will conform to the NL *Criteria for Acceptable Air Quality* which allows a total suspended particulate concentration of 80 $\mu g/m^3$ and 120 $\mu g/m^3$ for 1 hour and 24 hour exposure, respectively.

Blasting Protocol

Since the ground material in the area is predominately granite, with overburden being cleared prior to blasting, the amount of airborne particles escaping after a blast will be small and localized. Due to granite's high density, particles ejected by a blast will be restricted to the vicinity of the blast site, with very little blow-over to the neighboring land or water. Locations to be blasted will first be cleared of all overburden to reduce the potential for material to be ejected into the air. Continental Stone's blasting protocol was designed to be effective and efficient, which will help minimize dust emissions resulting from a blast.

It is anticipated that blasting along the shoreline will be required to allow for adequate access and facilitate setup of the marine terminal. These events will be minimized to only what is necessary, with blasts being much smaller than those used for quarrying operations (as set out in Section 2.2.4). Blasting will be done in accordance with the *Aggregate Operators Best Management Practices Handbook for British Columbia, Volume 2 (2002)* which will ensure a sound environmental framework is adhered to. Further, Wright and Hopky's *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (1998)* have been incorporated into the blasting protocol. These guidelines outline best-practice measures in terms of all environmental effects, including dust suppression. Continental Stone's drilling/blasting protocol (see Section 2.2.4) has incorporated dust suppression mitigations, including:

- Requiring dust suppression and/or collection equipment during drilling, such as using drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism;
- Requiring the use of blast mats if deemed necessary;
- Plugging all bore holes with 3 m collars of 20 mm, clean, crushed stone to trap gases and dust during blasting; and
- Adjusting blast timing such that every blast is as effective as possible, allowing for efficient use of explosives.

9.7.3.2 Exhaust Emissions

Exhaust from construction and operation of the quarry will be a small source of atmospheric pollution related to vehicle exhaust and diesel powered crushing/screening equipment. All construction and operation equipment will be well maintained and fitted with standard exhaust suppression devices to keep emissions at a minimum. The use of heavy equipment will peak during construction, with large trucks transporting building materials and equipment for the construction of the marine terminal. These vehicles will be mainly diesel powered, and will comply with the NL Regulation 39/04 *Air Pollution Control Regulations* 'Visible Emissions Standards'. These standards require diesel vehicles to meet SAE J1667 (Snap Acceleration Smoke Test Procedure for Heavy-Duty Diesel Vehicles; a measure of combustion efficiency) targets of visible emissions of 40% for 1991 model vehicles and newer, and 55% for 1990 model vehicles and older.

During operations, exhaust emissions at the marine terminal will be confined to well maintained, company owned, service trucks also adhering to the *Air Pollution Control Regulations* (as above). Conveying and shiploading equipment are electric, thus releasing no exhaust emissions. Electric generators and any gas powered tools required for construction and operation will be regularly maintained and in good repair to ensure exhaust emissions are minimal. Ships exhaust will also comply with the *Air Pollution*

Control Regulations as well as TC's regulation and standards for air pollution under the *Canada Shipping Act*. Ships will be in a state of good repair, with regular inspection and maintenance being performed by the assigned shipping contractor. Ships entering or leaving Belle Bay will maintain a speed no more than 2 knots which will serve to minimize exhaust emissions, with the main power plant being turned off while the ship is moored.

Garbage will be disposed of in a government approval landfill facility and not be burned or incinerated on-site. Burning of any materials will not be done without a permit, with no materials listed under Schedule E of the *Air Pollution Control Regulations* being burned on-site.

Exhaust emissions from marine vessels contribute Nitrogen Oxide (NO), Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Carbon Dioxide (CO_2) total hydrocarbons (THC), and particulate matter to the atmosphere. Previous studies conducted by Transport Canada and Environment Canada found the NO_x (mono-nitrogen oxide) emission rates from vessels varied between 12.5 to 24.8 grams per kilowatt hours (g/kW-h) under various operating conditions.

Marine vessels are responsible for a portion of man-made air pollution that contributes to global warming and local atmospheric pollution. However, the overall contribution to the overall global pollution is relatively small; approximately only 7% of the world's total NO_x emissions originate from marine vessels. Emissions from a medium size cargo ship operating in Canadian waters are shown in Table 9.4. The 60,000 DWT bulk carriers to be used for shipping aggregate will produce similar emissions.

Table 9.4 Emission Rates During Cruise Condition presented in kg/t of fuel.

Sample	Engine Operation	CO	NO_x	CO_2	PM
1	Leaving Port	6.8	94	2982	n/a
2	Low-speed Cruise	6.4	82	2932	n/a
3	Intermediate Speed	3.6	75	2951	n/a
4	Intermediate Speed	7.1	64	2927	5.79
5	Intermediate Speed	3.9	59	2918	6.02
6	High Speed	4.9	97	2902	11.2
7	High Speed	4.9	59	2902	10.5

9.7.3.3 Acoustic Disturbances

<u>Shipping</u>

Continental Stone has recognized that, while the use of bulk aggregate carriers for product transport was determined to be the most feasible option available, there is a potential interaction between this activity and the marine environment. Ship movements could result in sensory disturbance to marine mammals and wild fish. The primary result of such operations is usually a temporary avoidance of the area, with the effects being transitory and reversible (Hasting and Popper 2005). There is evidence of historical fishing in the area of the proposed marine terminal (DFO 2007), any disturbances will not adversely affect the surrounding water's productivity.

There is also concern with respect to the local aquaculture operations, with noise from ship's engines potentially disturbing farmed fish. Underwater noise has been shown to affect feeding and behaviour patterns, and subsequently decreasing growth rates (Engås et al. 1996). Mitigations to reduce the affect of noise originating from ships include:

- Having all bulk aggregate carriers travel within a predetermined pathway that will allow for both adequate passage into Belle Bay as well as maxim distance between the ship and the farms at any time;
- Restricting the bulk aggregate carrier speed to 2 knots within Belle Bay so as to not create an excessive wake or vibrations;
- Alerting fish farm operators of the arrival and departure times of the bulk aggregate carriers, and;
- Requiring all bulk aggregate carriers to turn off their engines (except for any generators required for power) when ships are docked at the marine terminal for loading to minimize exposure to mechanical noise.

Shipping will occur approximately every 5-7 days using a 60,000 tonne bulk aggregate carrier inside an identified shipping corridor (Figures 2.11 and 2.12). The corridor within Belle Bay is located at least 750 m away from the nearest aquaculture site. Due to the slow movement of the vessels, and low frequency of visits relative to other local vessel traffic, there is a low probability that fish will be affected by quarry-related shipping.

9.7.3.4 Human Health

The nearest residence to the proposed quarry is approximately 800 m away, with the centre of the Town of Belleoram being approximately 1900 m away. All residences and businesses in the area are up-wind of the quarry, making the probability of human health effects related to air quality within the town very low. Further, exhaust emissions are expected to be low, with the use of diesel powered heavy vehicles/equipment at the marine terminal largely confined to the construction phase. These machines will be maintained in good working condition and adhere to provincial and federal emissions standards (as per Section 9.7.2.2). The conveyor and ship loader will be electrically operated.

The marine terminal has a low potential to generate dust due to aggregate type, screening and washing procedures, and dust suppression measures. Nevertheless, if emissions are generated the region has low dispersion potential, making any potential atmospheric releases from the marine terminal minor. With dust suppression mitigations in place (e.g. covered conveyors, screening/washing) all areas of the marine terminal are expected to comply with the NL *Criteria for Acceptable Air Quality* (which allows a total suspended particulate concentration of 80 $\mu g/m^3$ and 120 $\mu g/m^3$ for 1 hour and 24 hour exposure, respectively). All workers will be required to wear proper dust suppressants (e.g. masks respirators) whenever hourly dust emissions exceed 80 μg/m^3 in their work areas (as per the *Canadian Environmental Protection Agency's ambient air quality guidelines*).

9.7.3.5 Accidents

While impossible to predict, the potential for accidental release of dust or other air emissions will be incorporated into a Contingency Plan as part of the EPP. This will ensure that Continental Stone adheres to the regulations pursuant to the NL *Air Pollution Control Regulations*, which state:

Where a facility has the potential for air pollution due to an unanticipated failure to operate in the normal manner due to an accident, emergency or urgent situation, a change in operating conditions, or a shut-down of a pollution control device, the owner or operator of the facility shall:

> *(a) Take immediate remedial action to reduce any emissions and provide the department with the particulars of that failure, change or shutdown; and*
>
> *(b) Provide the department in writing with the particulars of the remedial action taken under paragraph (a) and the reasons for that action as soon as it is practicable.*

The nature of the marine terminal, with its benign product, does not lend itself to a high risk of release of substantial atmospheric pollutant/particles. Fires resulting from equipment failures and accidents involving fuels or explosives are of the greatest concern with respect to accident-related emissions. These can be effectively mitigated by following all safety standards with respect to their storage, handling, and use. There will be no storage of fuels or explosives on, or within 30 m of, the marine terminal; with their handling complying with the *Storage and Handling of Gasoline and Associated Products Regulations* and the *Explosives Act*, respectively. No waste oil will be stored on-site either, with it being handled in accordance with the *Used Oil Control Regulations*, and be regularly disposed of to prevent accumulation. Any areas with temporary storage of flammable products will adhere to the fire prevention/suppression measures outlined in the NL *Occupational Health and Safety Act* to mitigate the chance that fires can spread.

All equipment and structures at the marine terminal are to adhere to the NL *Fire Prevention Smoke and Fire Alarm Regulations* under the *Fire Prevention Act*, with proper fire suppression and alarm equipment being installed in all permanent structures and equipment. Regular testing and maintenance will be done to ensure these systems are functioning properly. Employees are to be trained in fire prevention and suppression techniques, with drills being conducted on a regular basis. The Town of Belleoram's fire department can provide assistance if on-site fire suppression equipment is not sufficient. However, a large fire is unlikely, with no bulk fuel storage and mainly steel equipment. Measures to prevent forest fires shall be followed in accordance with the *Forest Fires Act*.

9.7.4 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The level of disturbance to atmospheric environment at the marine terminal is rated as Level I for the magnitude/geographic extent. While there is a low potential for the release of dust and exhaust during construction and operation, the implementation of the mitigative measures outlined in Sections 9.7.2.1 to 9.7.2.5 allow all emissions to be maintained below all relevant laws, regulations and guidelines. Given the frequency of visits to the marine terminal (1every 5-7 days), the short turnaround period (24 hours), and the absence of other emissions is considered insignificant. Thus, the ecological or socio-economic effects of dust and exhaust are anticipated to be insignificant (Level I). Based on input from EC, the RAs conclude that on the basis of a Level 1 rating for magnitude/geographic extent and context, the adverse effects to the atmospheric environment are Non-significant.

9.8 Human Health and Safety

9.8.1 Background

The proposed Project area is defined by Statistics Canada as low density, non-adjacent, rural setting with the majority of land outside of the Town being undeveloped wilderness. There is currently a small footpath that allows access to the proposed marine terminal site which is used by some residents of Belleoram for recreational hiking (personal Communication: Steward May, Mayor of Belleoram). There is very little human-generated noise in the area, with no industrial or heavy equipment operations currently underway (as indicated by NL Community Accounts 2007 mapping). The air quality in the region is good, owing to a lack of industrial emission sources, the climate supporting good particle dispersion, and through infusions of relatively clean oceanic air masses from the North Atlantic Ocean (Bowyer 1995). This good air quality leads to a low incidence of respiratory illness in the region (NL Community Accounts 2007). The highest percentage (19%) of hospital admittances during the period 1994 to 1999 for Belleoram was due to diseases of the digestive system (NL Community Accounts 2007).

According to DFO (2000), there is no concentrated fishing effort in the vicinity of the proposed marine terminal. There are, however, 4 finfish aquaculture sites near Chapel Island (with 2 proposed) all within 5 km of the Project site; the closest being approximately 2.2 km away. These farms are serviced from Belleoram Harbour by boats that make daily trips through the proposed bulk aggregate carrier shipping corridor.

9.8.2 Potential Effects and Proposed Mitigations

The marine terminal will change a currently undeveloped site into an industrial site, potentially leading to health and safety concerns within the worksite and for the surrounding residents. Potential effects include:

- Contamination of local fisheries;

- Health impacts related to industrial accidents or malfunctions, and;
- Maritime accidents.

9.8.2.1 Contamination of Local Fisheries

Construction and operation of the marine terminal has the potential to result in the release of contaminants into the marine environment that could directly, or chronically, affect the health status local wild and farmed fish population. Contamination of these species could lead to human health concerns with respect to those who consume them. However, this concern is effectively mitigated through safety measures outlined in the Section 9.2.2.5 and the EPP and contingency planning. The loss of contaminants, such as hydrocarbons, will be effectively mitigated by prohibiting the bulk storage of fuel, oils, or any other hazardous substances at the marine terminal site. Further, no refueling will be done within 30 m of the marine environment, decreasing the potential for any spills or leaks to enter the waters. Contamination from hydrocarbon and other toxic substances will be mitigated through the use of best practice techniques as outline by the manufacturer and any federal or provincial laws. Transport of these materials on-site will be performed by contracted professionals, with all operators possessing the appropriate licences with respect to transporting dangerous goods and will follow driving rules and regulations. Workers will be required to be knowledgeable of accident procedures, especially in relation to explosive-related accidents, and proper spill containment and clean-up equipment/material (e.g. absorbents, floating booms) will remain in proximity to any harmful substances at all times. Any spills will be promptly cleaned up and reported to the proper authorities.

9.8.2.2 Health Impacts Related to Industrial Accidents or Malfunctions

The potential for an accident or malfunction to occur at the marine terminal is effectively minimized through the use of preventative maintenance and ensuing proper employee safety training. The marine terminal has been engineered to operate for at least 40 years before any repairs are required and will meet all design standards required by the applicable building codes and standards (See Section 2.2.3). The robust concrete caisson type structure is designed to accommodate the anticipated operational loads, alleviating any concern regarding loss of integrity or collapse.

All machinery, equipment and vehicles will be regularly inspected and maintained to ensure a state of good repair and operated by only those employees properly trained to do so in accordance with the manufacturers' specifications. All Project activities are to comply with the provincial *Occupational Health and Safety Act* and associated regulatory requirements, with all employees receiving thorough, and regular, safety training specific to their jobs. The risk of any large scale industrial fire at the marine terminal site is low as there will be no bulk storage of fuel or oils allowed at the site, with their handling complying with the *Storage and Handling of Gasoline and Associated Products Regulations* and the *Used Oil Control Regulations*.

All structures will adhere to the NL *Fire Prevention Smoke and Fire Alarm Regulations* under the *Fire Prevention Act*, with proper fire suppression and alarm equipment being installed in all buildings and permanent equipment. Regular testing and maintenance will be performed to ensure these systems are functioning properly. Employees will be trained in fire prevention and suppression techniques, with drills being conducted on a regular basis. The Town of Belleoram's fire department can provide assistance if on-site fire suppression equipment is not sufficient. However, a large fire is unlikely, with no tall/large buildings, no bulk fuel storage, and mainly steel equipment.

Use of the existing footpath by local residents will be restricted, as the entrance to the quarry will be gated and the entire quarry off limits to non-employees. To ensure the safety of all workers and visitors, access to active job sites will be limited to only those employees properly trained in, and aware of, the dangers of the area. Signs are to be posted noting hazards during construction and operational activities, with emergency contacts and procedures clearly stated. Protective gear will be worn as required (e.g. gloves, hard hats, masks, safety goggles), and be made mandatory according to each specific task. Any and all stipulations of federal, provincial, or municipal authorities or their officers will be strictly followed.

9.8.2.3 Maritime Accidents

Environmental and navigational concerns related to the use of bulk aggregate carriers will be effectively mitigated through adherence to all procedures and protocols contained in the *Canada Shipping Act* and all other pertinent laws and legislation (See Section 2.2.3). Ships will be well maintained and regularly inspected to minimize the likelihood of a mechanical malfunction. All bulk aggregate carriers will be double hulled, with oil spill and clean up equipment (e.g. absorbents, inflatable dykes) onboard; with crew trained in their use. The risk of fires will be mitigated through adherence to the regulations set out in Transport Canada's Guide to Structural Fire Prevention (1993); a guide that clarifies the requirements for fire protection on-board ships.

Ships will travel in an identified corridor to ensure the maintenance of a maximal distance from land and other operations in the area (e.g. aquaculture sites). This will allow as much time as possible to correct or prepare for collisions should there be a loss of control of the ship. Vessels will be fitted with a variety of state-of-the-art electronic navigational aids and radar to ensure the best and most accurate pilotage while docking or departing. The Local Special Interest Committee will be consulted with respect to ship arrival and departure times to further mitigate potential interactions. The slow speed of the bulk aggregate carrier (approximately 2 knots within Belle Bay) ensures that it will not cause any significant wake; thus, alleviating safety concerns related to potential swamping of local farm, or other small boats.

As per the *Eastern Traffic Zone Regulations*, bulk aggregate carriers will be equipped with Automatic Identification System (AIS) equipment which will alert the Coast Guard their presence within the 12-mile limit, and a VHF transponder used to track the ships between 30 to 50 nautical miles from shore. Feedback from these systems will allow the bulk carriers to be directed away from other ships in the area as they service the quarry, thus effectively mitigating any interference with other marine traffic operating throughout the Fortune Bay region and the south coast of Newfoundland as a whole.

9.8.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The degree to which human health is expected to be affected by the proposed Project is rated as Level I for the magnitude/geographic extent. The Proponent considers safety a priority and has incorporated a great deal of safety measures into its Project design and operations to minimize the potential for structural failure (Section 2.2.3), contaminant release, fires, and maritime accidents. Thus, the socio-economic effects of human health related issues are anticipated to be insignificant (Level I). Based on input from HC, the RAs conclude that on the basis of a Level 1 rating for magnitude/geographic extent and context, the adverse effects to human health are Non-significant.

10.0 OTHER FACTORS

10.1 Environmental Effects of Accidents and Malfunctions

10.1.1 Background

The Proponent is committed to the sustainable development of the Connaigre Peninsula and the south coast of Newfoundland in general and has, as per section 16(1) of the *CEA Act*, assessed the potential for accidents of malfunctions related to the project. Only those accidents or malfunctions that have a reasonable probability of occurrence were considered. The Proponent has identified the following events, including:

- Spills or leaks to the marine environment;
- Incidents during shipping activities;
- Explosives accident;
- Accidental fires, and;
- Structural failures.

10.1.2 Potential Effects and Proposed Mitigations

10.1.2.1 Spills or Leaks to the Marine Environment

<u>Potential Environmental Concerns</u>

The marine terminal will be located within waters that contain known marine habitat, thus there is a potential risk of its degradation from spills or leaks during construction and operation activities. Although the risk of a major environmental event is relatively low, with no bulk storage of fuels, oils or hazardous substances onsite and availability of spill clean-up material, there is still potential for a chronic release of pollutants to accumulate in the surrounding marine habitat over time.

Design and Operational Safeguards

Construction of the terminal will require the used of heavy machinery, boats and barges, each with the potential to leak hydrocarbons into the surrounding waters. All machinery will be maintained in a state of good repair and regularly inspected to ensure maximum efficiency and to minimize the potential for a malfunction. All vehicles or machinery will be operated by only those employees properly trained to do so, with any permits being required obtained beforehand. A Spill Contingency Plan will outline appropriate responses to accidental spills (such as those resulting from collisions, fires, structural failures), and spill kits (containing such materials as floating booms and absorbants) will be available on barges and service boats and the marine terminal itself.
As outlined in 9.2.2.5, operation of the marine terminal will result in a low probability of spills or leaks to the marine environment. The electrically powered ship loader and conveyor will contain only small quantities of hydrocarbons, such as hydraulic fluid, medium oils and greases; with no storage of these materials on the marine terminal or within 30 m of any waterbody. Water quality issues associated with aggregate loading, and their mitigations, have been outlined in 9.2.2.4. Aggregate losses will be minimal; with measures such as pre-washing the product before conveying, the use of dust dampening hoods, maintaining all machinery in a state of good repair, and employees that are properly trained to operate the equipment they are assigned.

Mitigative measures are included in the EPP and outline how to deal with spills and leaks, with personnel being trained to apply these plans, and to review and exercise these plans to strengthen their effectiveness and ensure continuous improvement. Any release to the aquatic environment will comply with the *Environmental Control (Water and Sewage) Regulations* and the CCME *Canadian Guidelines for the Protection of Aquatic Life*.

Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The potential for adverse environmental effects from hydrocarbon, chemical or aggregate spills/leaks during marine terminal construction and operation is likely to be low (Level 1) provided that the Proponent undertakes all reasonable measures, as described above. Based on input from the FAs and the Proponent's use of a preventative and precautionary approach to their operations, the RAs have concluded that the potential for accidents and malfunctions to adversely affect marine water quality is Non-Significant.

10.1.2.2 Incidents during Shipping Activities

Potential Environmental Concerns

There is a potential for accidents or malfunctions involving the bulk aggregate carriers servicing the marine terminal. This include events such as collisions with other large or small marine traffic, collisions with the marine terminal, groundings and bilge or ballast water quality concerns. These events could lead to public safety issues, the release of contaminants toxic to marine life (e.g. hydrocarbons), increased sedimentation or the physical destruction of habitat and property.

Design and Operational Safeguards

Environmental and navigational concerns related to the use of bulk aggregate carriers will be effectively mitigated through adherence to all procedures and protocols contained in the *Canada Shipping Act* and all other pertinent laws and legislation (See Section 2.2.3). Ships will be well maintained and regularly inspected to mitigate the chance of spills or leaks occurring within Fortune Bay. Bilge and ballast will be regulated as per the Oil *Pollution Prevention and Ballast Water Control and Management Regulations* (*Canada Shipping Act*) so as to mitigate the potential for loss or degradation of marine habitat. All bulk aggregate carriers will be double hulled, with oil spill and clean up equipment (e.g. absorbents, inflatable dykes) onboard; with crew trained in their use. The risk of fires will be mitigated through adherence to the regulations set out in TC's Guide *to Structural Fire Prevention* (1993); a guide that clarifies the requirements for fire protection on-board ships

Ships will travel within an identified corridor to ensure the maintenance of a maximal distance from land and other operations in the area (e.g. aquaculture sites). This will allow as much time as possible to correct or prepare for collisions should there be a loss of control of the ship. Vessels will be fitted with a variety of state-of-the-art electronic navigational aids and radar to ensure the best and most accurate pilotage while docking or departing. The Local Special Interest Committee will be consulted with respect to ship arrival and departure times to further mitigate potential interactions. The slow speed of the bulk aggregate carrier (approximately 2 knots within Belle Bay) ensures that it will not cause any significant wake; thus, alleviating safety concerns related to potential swamping of local farm, or other small boats.

Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The potential for adverse environmental effects from the use of bulk aggregate carriers is likely to be low (Level 1) provided that the Proponent undertakes all reasonable measures, as described above. All shipping operations will adhere to any relevant laws and regulations including those outlined in the *Canada Shipping Act* and with the Proponent's commitment so safety and environmental compliance the potential for a maritime accident to adversely affect human health of wildlife habitat is determined to be **Non-Significant**.

10.1.2.3 Explosives Accident

Potential Environmental Concerns

The Project will utilize ammonium nitrate-based, fuel emulsion explosives, to be mixed on-site during operation. The worst-case scenario would involve an explosion that causes bodily harm. Damage to facilities and infrastructure may also occur, but will be restricted to property associated with the quarry itself and not public property.

Design and Operational Safeguards

A dedicated explosives storage and mixing area will be established. This area will be designed and located in accordance with the guidelines set out in the BMP Handbook and *Quantity-Distance Principles User's Manual* published by the Explosives Regulatory Division of NRCan with respect to the nearest inhabited building, road and blast site. No explosives will be stored on or in proximity to the marine terminal. Explosive components are not individually explosive and cannot be inadvertently detonated. Emulsion will only explode if mixed in the correct proportions, placed under certain confined conditions, and detonated with an external device. Pre-packaged explosives also require detonation. All personnel who handle explosives will have appropriate training and be made aware or the Project-specific explosives contingency plans. Any explosives use will be in accordance with the Blasting Plan and explosives safety standards outlined in the EPP and Contingency Plans.

Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The Proponent believes that by contracting an experienced explosives firm, by following the regulatory requirements, and ensuring good housekeeping in general, explosives will be well managed over the course of the Project. Further, the Proponent will develop contingency plans that outline how to deal with any explosives spill or detonation, to train personnel to apply these plans, and to review and exercise these plans to strengthen their effectiveness and ensure continuous improvement. All shipping operations will adhere to any relevant laws and regulations including those outlined in the *Canada Shipping Act.* Therefore, based on input from the FAs and the Proponent's commitment to safety and environmental compliance, the RAs have concluded that the potential for a maritime accident to adversely affect human health and wildlife habitat is Non-Significant.

10.1.2.4 Accidental Fires

Potential Environmental

Structural fires may result from equipment failures or accidents involving fuels during the marine terminal's construction or operation. These fires may result in injury to employees or loss of revenue from the inability to operate equipment necessary for loading of the final product aboard the bulk aggregate carriers.

Design and Operational Safeguards

Safety concerns related to fires will be mitigated by following all safety standards with respect to the storage, handling and use of any flammable materials as per all manufacturer's specifications and pertinent acts, regulations or guidelines. There will be no bulk storage of fuel or oils at the marine terminal site, with their handling complying with the *Storage and Handling of Gasoline and Associated Products Regulations* and the *Used Oil Control Regulations*. Any areas with temporary storage of flammable products will adhere to the fire prevention/suppression measures outlined in the *Occupational Health and Safety Act* to mitigate the chance that fires can spread. No explosives will be kept on or in proximity to the marine terminal or any potentially flammable substances.

All structures will adhere to the NL Fire *Prevention Smoke and Fire Alarm Regulations* under the *Fire Prevention Act*, with proper fire suppression and alarm equipment being installed in all buildings and permanent equipment. Regular testing and maintenance will be performed to ensure these systems are functioning properly. Employees will be trained in fire prevention and suppression techniques, with drills being conducted on a regular basis. The Town of Belleoram's fire department can provide assistance if on-site fire suppression equipment is not sufficient. However, a large fire is unlikely, with no tall/large buildings, no bulk fuel storage, and mainly steel equipment.

Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The adverse environmental effects or safety concerns resulting from accidental fires are not likely to be low (Level 1) provided that the Proponent undertakes all reasonable measures, as described above, to limit, to the extent practical, the likelihood of a fire. Further, the Proponent has included fire prevention measure in their EPP and Contingency planning; with all employees being trained in fire prevention. Based on input from FAs, the RAs have determined that the potential for adverse environmental effects or safety concerns resulting from fires is determined to be Non-Significant.

10.1.2.5 Structural Failures

Potential Environmental

The loss of structural integrity of the structures and equipment at the marine terminal site (e.g. conveyor or shiploader), or the marine terminal itself, could lead to safety concerns of cost related to repairs and loss of production of the quarry.

Design and Operational Safeguards

The marine terminal has been engineered to operate for at least 40 years before any repairs are required and will meet all design standards required by the applicable building codes and standards (See Section 2.2.3). Adherence to these standards and careful engineering ensures the structure is capable of withstanding the weather conditions at the site, including the anticipated effects of climate change and increased extreme weather frequency. The concrete caisson type structure is very robust and is designed to ensure it can accommodate the anticipated operational loads. The structure will be regularly inspected for, with any repairs being performed as needed. Similarly, all heavy equipment used on the marine terminal, such as the conveyor and shiploader, will be maintained in a state of good repair and operated by only those employees properly trained to do so in accordance with the manufacturers' specifications. All operation will be done in accordance with the requirements of the Occupational *Health and Safety Act*.

10.1.2.6 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The adverse environmental effects or safety concerns related to the structural integrity of the marine terminal and all associated structures and equipment are likely to be low (Level 1) provided that the Proponent undertakes all reasonable measures, as described above, to limit, to the extent practical, the likelihood of a structural failure. Based on input from NRCan, the RAs have determined that the potential for adverse environmental effects or safety concerns resulting from a structural failure is determined to be Non-Significant.

10.2 Capacity of Renewable Resources

10.2.1 Background

Within the scope of this CSR the only resource that may potentially be impacted is that of the American lobster. This species has been identified within the footprint of the proposed marine terminal's earthen-filled approach and it has been deemed that the construction of this structure will cause a HADD on 1578 m^2 of its habitat (Section 9.2.2.1). Marine terminal operations may also result in further degradation of lobster habitat through chemical spills or leaks, or with increased sedimentation from aggregate losses during ship loading.

10.2.2 Discussion

Based on review of the habitat information and discussions with DFO Habitat Management Program staff (January 18, 2007 and March 2, 2007) it has been determined that a HADD is likely to occur in the area of the proposed marine terminal used by adult and juvenile American lobster (*Homarus americanus*). The footprint of the earthen-fill approach from a depth of 2 m to a depth of 60 m cover approximately 2428 m^2 (Figure 9.15; Transect T-2). Habitat surveys within the footprint of the proposed earthen-filled approach indicated that from the shoreline to a distance of approximately 60 m, approximately 65% of the habitat is considered optimal for large juvenile/adult lobster (variable sized boulders with a number of crevices and substantial kelp cover). Utilizing this ratio, the construction of the terminal access will result in the HADD of approximately 1578 m^2 (nine x 200 m^2 units) of viable adult lobster habitat that will require fish habitat compensation as a condition of the *Fisheries Act* Section 35(2) Authorization.

The habitat characterization of the proposed wharf location (any waters past 75 m from shore and at depths of 14 m to 15 m) revealed an area which consisted primarily of bedrock interspersed with small amounts of fine gravel, sand, and silt. It is inferred from this habitat characterization that the area of the proposed wharf construction does not constitute fish habitat and will not result in a HADD to fish habitat. Though, dredging may be required for placement of wharf footings, this will also be limited to areas that are not fish habitat. Therefore, a HADD to fish habitat will not result from this activity.

Habitat compensation will consist of strategic placement of at least 1578 m^2 of armour stone shared between both sides of the marine terminal's earthen-filled approach. This will constitute a like-for-like habitat replacement strategy within the same ecological unit. Based on consultation with DFO's Habitat Management Program, the 1578 m^2 will include any portion of the approaches' toe slope in waters deeper than 2 m. The armour stone to be utilized will be clean (less than 5 % fines), non-acid generating granite of appropriate size obtained from the adjacent quarry. Habitat compensation also includes placement of scour protection armour stone around the bases of the concrete caissons for the marine terminal. All compensation activities and concepts will be performed in consultation and cooperation with DFO Habitat Management Program, the Town of Belleoram, and the local Belleoram Fisheries Committee.

As per Sections 9.2.2.4 and 9.2.2.5, construction and operation of the marine terminal will be in accordance with the *Fisheries Act* and *Regulations*, the *Canadian Water Quality Guidelines for the Protection of Aquatic Life*, and all associated permits and laws. This will ensure that construction or operational activities do not degrade local water quality, thus minimizing the potential for the future loss of productivity in the area. Adverse effects on water and sediment quality will be mitigated against through the use of such measures as utilizing only clean fill material (<5 % fines) for the earth filled approach, maintaining floating booms and silt curtains around all work areas and ensuring all equipment used at the marine terminal during construction and operation will be well maintained to guard against leaks or spills to the marine environment. A Spill

Contingency Plan is included in the EPP and outlines appropriate responses should an event occur, and spill kits (e.g. absorbents, floating booms, catchments) will be available at the marine terminal site and on any barges or ships while docked. Further, the timing of the marine terminal's construction (early) fall helps minimize the effect on the area's productivity. Construction will commence after the lobsters' reproductive stage (Pezzack et al. 2001), and therefore not interfere with the recruitment of lobster stocks spawning within Belle Bay.

10.2.3 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

As required by the Section 35 (2) of the *Fisheries Act*, the Proponent has worked with DFO to create a suitable compensation strategy to create a no-net-loss of fish and fish habitat. As such, they have fulfilled their commitment to maintain the sustainable development of the Project area and will further mitigate any effects on the marine environment through the use of the best practices during the construction and operation of the marine terminal. Therefore, provided that the Proponent undertakes all reasonable measures, as described within this CSR the RAs have concluded that the potential for adverse effects to the renewable resources in the area is determined to be Non-Significant.

10.3 Cumulative Effects

10.3.1 Background

Section 16(1)(a) of the *CEA Act* addresses the environmental effects that are likely to result from a project in combination with other projects or activities that have been or will be carried out, or the other activities within a project. The *CEA Act* requires an assessment of the potential cumulative effects a project may have with respect to other operations or conditions in the region. These effects include both the environmental and associated socio-economic effects that may result from a project. The various components of the project can also act in a cumulative manner to affect the environment. Within the scope of this CSR, the Project has potential cumulative effects pertaining to the use of bulk aggregate carriers to service the marine terminal, including:

- Interference of the bulk aggregate carriers with other local and regional marine traffic;
- An increase in the disturbance and potential harm to sensitive habitats and protected species; and
- Increased dust and noise in combination with the rock quarry.

Concerns about marine traffic in the waters adjacent to the marine terminal are mainly aquaculture-related, with four farms currently operating off Chapel Island, and two more proposed. Seasonal commercial fishing occurs in the area, with fishing boats operating out of Belleoram harbour generally fishing to the south of the town, towards the mouth of Fortune Bay. Few boats have been noted fishing between the Project site and Chapel Island, with none doing so on a regular basis) (Personal Communication; Cooke

Aquaculture, 2006). Localized lobster fishing does occur in the nearshore waters around Belleoram. There are no large shipping vessels currently operating near Belleoram.

The south coast of Newfoundland has seen an increase in shipping activities in recent years, due to the development of oil and gas and metal processing facilities in Placentia Bay. These include: the existing transshipment terminal at Whiffen Head, the existing Come By Chance oil refinery, the existing Hydromet demonstration plant in Argentia, the proposed crude oil refinery at Southern Head, the proposed commercial nickel processing plant at Long Harbour, and the proposed Liquefied Natural Gas (LNG) terminal at Grassy Point. Each of these operations are (or will be) located in Placentia Bay, east of Fortune Bay.

Whiffen Head currently receives about 2 million barrels of oil a week from the three shuttle tankers supporting the Hibernia and Terra Nova offshore fields (Oil and Gas Magazine 2007). From Whiffen Head oil is transported by conventional oil tankers to markets in Canada and the eastern United States. The facility handles about 300 tankers annually, with an additional 200 tankers servicing the Come By Chance oil refinery. Overall, Placentia Bay sees approximately one and a half ships moving in and out each day (Oil and Gas Magazine 2007).

The use of bulk aggregate carriers to service the proposed quarry will add to this marine traffic, leading to potential cumulative effects, including such factors as: navigational interference, increasing the potential for accidental fuel/oil spills, and interference with pleasure craft and fishing boats.

There is also concern about the increase in dust and noise as a result of operating the marine terminal in combination with quarry operations.

10.3.2 Methodology

For the purposes of this assessment, the following criteria were examined with respect to the cumulative effects of the Project and their potential to affect both environmental and human health and safety. These criteria include:

- The current and potential use of the marine waters within the scope of the Project by human and other species;
- The species present, including their locations and population status;
- Extent of the Project's effect, both spatially and temporally;
- The anticipated magnitude of its effect;
- Economic and commercial opportunities or employment, and;
- Technically and economically feasible measures that would mitigate any significant adverse effects on socio-economic conditions.

Upon examination of the above criteria, the significance of the project-related effects was determined based on the significance criteria outlined in Section 8.0

10.3.3 Potential Effects and Proposed Mitigations

10.3.3.1 Increase in Maritime Traffic

Direct interference of the bulk aggregate carriers with aquacultural and fishing operations within Belle Bay is not expected to be significant, with effects being minimized by factors such as: the infrequent passage of the ships (approximately once per week), its travel within an identified shipping corridor, the distance to the nearest fish farm (at least 750 m), its slow speed (approximately 2 knots), communicating arrival and departure information with the Local Special Interest Committee, and the low concentration of commercial fishing vessels in the area. Water quality and habitat degradation concerns will also be minimized. There will be no refueling at the marine terminal, no bulk oil/fuel transport, no bilge water discharge at the Project site or in Fortune Bay, and releases from the bulk aggregate carriers will meet all regulatory standards pursuant to the *Canada Shipping Act* (including, but not limited to the *Oil Pollution Prevention* and *Ballast Water Control and Management Regulations*). Bulk aggregate carriers will have oil spill clean up equipment (e.g. absorbents, inflatable dykes and disposal containers) on-board at all times with trained crew being trained in spill prevention and clean up techniques.

While the bulk aggregate carriers will add to the number of large ships plying the waters of southern Newfoundland, the approximately once every 5-7 day passage of these ships will not significantly increase the extent of marine traffic in the region in comparison to other operations. For instance, approximately 500 oil tankers per year service operations in Placentia Bay, with the area seeing an average of nearly 1.5 ships per day. Regardless, the bulk aggregate carriers will avoid other ships through the use of state-of-the-art radar and navigation aids such as radar and GPS systems.

As per the *Navigation Safety Regulations*, ships will be equipped with AIS equipment which will alert the Coast Guard of their presence within the 12-mile limit, and a VHF transponder used to track the ships between 30 to 50 nautical miles from shore. Bulk aggregate carriers will not operate in, or in the vicinity of, Placentia Bay and thus will have few encounters with any other large service vessels. The use of GPS and radar systems will allow ships to be alerted of other ships in the area and then make routing decisions to avoid the possibility of a near miss or collision.

10.3.3.2 Interference with Sensitive Species and their Habitat

As was outlined in sections 9.5 and 9.6, the Proponent has taken marine birds, their habitats, and species at risk into account when planning the construction and operation of the marine terminal and the accompanying shipping operations. Ships will travel within an identified corridor which will be no closer than 3 km to any identified sensitive marine bird habitat, allowing for a minimal presence of the bulk aggregate carriers and ensuring a buffer to mitigate any adverse affects should an emergency arise on-board the ship (e.g. mechanical failure leading to grounding). All shipping operations will be performed by a licenced contractor who fully complies with the *Canada Shipping Act* and will be contractually bound to adherence with all environmental mitigation measures outlined by the Proponent. Specifically, adherence to the *Canada Shipping Act's Oil Pollution Prevention Regulations* and the *Ballast Water Control and Management Regulations* will be mandatory, with no dumping of ballast or bilge when passing protected bird areas. Ships will be registered with ECRC, and crews trained in oil spill prevention and clean-up, with spill kits on board at all times (e.g. containing absorbents, floating booms and waste containers). Mitigative measures to protect against marine habitat degradation are also outlined in Section 2.2.3 and will be included in the EPP and Contingency Plans.

As was discussed in Section 9.6.2.2, the Proponent has recognized that there is potential for ship strikes with migrating whales in the waters off of southern Newfoundland. Ships will maintain a slow speed within Belle Bay, approximately 2 knots, which will help mitigate against potential collisions with any whales in the area. For safety and feasibility reasons the bulk aggregate carriers must travel at speeds approaching 13 knots outside of Belle Bay.

10.3.3.3 Increased Dust and Noise in Combination with the Rock Quarry

The proposed quarry development adjacent to the marine terminal location will generate dust and noise during blasting and crushing operations. The operation of the marine terminal also has the potential to generate dust and noise while loading the bulk carriers with aggregate. The cumulative effects of dust and noise generation at the marine terminal in combination with the quarry have been considered in this environmental assessment. Mitigation measures will also be used to minimize effects.

Limiting dust generation has been a factor in the design and proposed operations of the marine terminal and quarry. Given the aggregate type, blasting protocol, washing and screening procedures at the quarry site, along with the dust suppression measures on the ship loader, dust generation at the marine terminal in combination with potential dust generation at the quarry development site is considered to be insignificant. In addition, if a situation occurs where exposure to dust emissions are above the Canadian Environmental Protection Agency's ambient air quality guidelines limitations, workers will be required to wear protective equipment.

Noise generation during marine terminal operations will be limited because bulk carriers will be well-maintained and muffled and the diesel engines will be shut down during loading operations. Noise from loading operations will also be limited because the ship loader, which will be equipped with a flexible collar, will load into bulk carriers with less than a one-meter drop. Therefore, the generation of noise at the marine terminal is insignificant in combination with the potential noise generation at the quarry development site.

10.3.4 Conclusion on Significance of Adverse Environmental Effects after Consideration of Mitigation

The degree to which the Project may interact in a cumulative way with other projects, or proposed projects, in the region has been assessed and the level of affect that is anticipated is rated as Level I for the magnitude/geographic extent. The Proponent has considered the potential for the Project to interfere with the navigability of the region and the potential for adverse effects on sensitive marine species and has designed mitigative measures to minimize any effects, effectively reducing the ecological or socio-economic significance to a rating of Level I. Based on input from EC, NRCan, and HC, the RAs conclude that on the basis of a Level 1 rating for magnitude/geographic extent and context, the adverse effects of cumulative effects is Non-significant.

11.0 SUMMARY OF MITIGATION MEASURES

Summary of mitigative measures for each VEC scoped within Section 4.0. Significance criteria were determined as per Section 8.0.

Valued Ecosystem Component (VEC)	**Project Component /Activity**	**Description of Effect**	**Proposed Mitigation Measures**	**Residual Environmental Effect After Mitigation**
Fish and Fish Habitat	Marine Terminal Construction	Potential mortality of fish or HADD of fish habitat	• Adherence to the fish habitat compensation strategy; compensating for the 1578 m^2 of lobster habitat lost due the marine terminal's construction. • All activities will adhere to: •National Policy for the Management of Fish Habitat; •*Fisheries Act* - Habitat Protection and Pollution Prevention Provisions – Compliance and Enforcement Policy, and; •*Environmental Control Water and Sewage Regulations* under the *Water Resources Act*; •CCME guidelines, including those outlined in the Canadian Water Quality Guidelines for the Protection of Aquatic Life. •*Canada Shipping Act*; •*Storage and Handling of Gasoline and Associated Products Regulations*, and; •*Used Oil Control Regulations*. • Only clean fill will be used with less than 5% fines, non-acid generating, blasted rock from the quarry site • Prior to any works, silt curtains will be put in place around active work areas, extending from the surface to the seabed. • Infill will be dumped in place and not stockpiled along the shoreline, with placement not being conducted during period of high wind, waves or precipitation. • Armour stone will be placed progressively to minimize shoreline erosion and prevent the loss of infill material. • Dredging activities will take place within silt curtains. • Dredged material will be placed in an approved landfill site. • Caissons will be placed not drilled with any cuttings being returned to	Level I (Non-Significant)

			the surface to be settled-out in tanks onboard the barge rig. Cuttings will be disposed of either on approved site within the quarry or in a local landfill. • Water releases leaving the silt curtains, or any work area in or near the marine environment, will have suspended solids concentrations not exceeding 25 mg/L (monthly average) or 50 mg/L (grab sample) as per Section 36 of the *Fisheries Act*. • A monitoring program will be initiated if deemed necessary by the DFO Habitat Management Program. This may include such things as video and photographic surveys, visual inspections, and assessment of new habitat utilization by flora and fauna.	
	Blasting	Potential mortality of fish or HADD of fish habitat	• Blasting will occur outside of lobster spawning season. • The use of explosives near water will adhere to the guidelines of Wright and Hopky (1998) to avoid impacts to fish or fish habitat. • No blasting will occur underwater or within a waterbody. • Mitigations to minimize the overall noise generated at the marine terminal have been included in the EPP and will also be reduced through the use of best practices outlined in Section 2.2.3. • Blasting will be done in accordance with the Aggregate Operators Best Management Practices Handbook for British Columbia, Volume 2 (2002) and Wright and Hopky's Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (1998). • The drilling/blasting protocol (see Section 2.2.4) has incorporated dust suppression mitigations, including: • Requiring dust suppression and/or collection equipment during drilling, such as using drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism; • Blasting mats will be used if deemed necessary; • Plugging all bore holes with 3 m collars of 20 mm, clean, crushed stone to trap gases and dust during blasting; and • Adjusting blast timing such that every blast is as effective as possible, allowing for efficient use of explosives.	Level I (Non-Significant)
	Marine	Chemical losses affecting water	• Leaks and spills will be prevented through regular maintenance of	Level I (Non-Significant)

	Terminal Operation	and sediment quality	vehicles and equipment. • Heavy equipment (e.g. cranes dump trucks, loaders) will only be used on dry, stable, land or barges specifically designed for that purpose. Heavy equipment will operate from barges completing work above the high water mark during low tide. • No refueling or repairs will be done on the marine terminal or within 30 m of any waterbody. • Floating booms will be in place during all construction activities. • Spill kits, containing such items as absorbents capable of retaining and removing oil sheen and waste storage containers, will be available on barges and boats required for construction and the terminal itself. • Concrete forms will either be set on land and brought to the marine terminal site once dry, or wet concrete will be mixed offsite and set within leak proof forms. • Tools will not be washed in any waterbody and not within 30 m of any waterbody. • Any wooden concrete forms or any other wooden structures built on or near the marine environment will be made of wood deemed safe for use as per the Guidelines to Protect Fish and Fish Habitat From Treated Wood Used in Aquatic Environments in the Pacific Region • Fuel, and other toxic substances (as defined under Schedule 1 of the CEPA), will only be handled, stored, or disposed by persons who are trained and qualified to do so in accordance with the manufacturers' instructions (e.g. Material Safety Data Sheets) and governmental laws, acts (e.g. CEPA), and regulations (e.g. *Storage and Handling of Gasoline and Associated Products Regulations*; *Used Oil Control Regulations*). Procedures will include: • Having operators present for the duration of refueling; • Refueling equipment and vehicles at least 30 m from any water body, and over a non-permeable surface; • Having basic petroleum spill clean-up equipment on-site, with adsorbents being used to recover any hydrocarbon sheen on the water; • Promptly containing, and cleaning up, all spills or leaks on land or in water and • Reporting them to the 24-hour environmental emergencies report system (1-800-563-9089) as required by Environment Canada;	Level I (Non-Significant)

			• Allowing no on-site bulk storage of fuel or oil; • Not disposing of wastes in or near waterbodies, and; • Routine water testing as per criteria listed in Schedule A of the *Environmental Control (Water and Sewage)Regulations* (2003), under the *Water Resources Act* and ensuring any discharges from the site conform to CCME limits. • A Spill Contingency Plan and spill kits will be available on barges and service boats and the marine terminal itself. All water releases will meet the regulatory requirements of the *Environmental Control (Water and Sewage) Regulations* and the CCME limits (e.g. metals, dissolved oxygen, hydrocarbons).	Level I (Non-Significant)
	Shiploading	Potential mortality of fish or HADD of fish habitat	• Aggregate losses from spills, accidents or machinery malfunctions will be minimized by fitting all conveyors servicing the marine terminal with hoods and maintaining all ship loading equipment in a state of good repair and regularly inspected to ensure maximum efficiency and to minimize the potential for malfunction. All machinery will be operated by only those employees properly trained to do so.	Level I (Non-Significant)
	Shipping Activities	Potential mortality of fish or HADD of fish habitat	• The EPP and contingency planning outline appropriate responses to accidental spills, with spill kits (containing such things as silt curtains and floating booms) available on barges or boats servicing the marine terminal and the terminal itself. • No bilge or ballast will be discharged at the marine terminal site or outside the bounds of the *Canada Shipping Act* and associated regulations. • No refueling will be done at the marine terminal • Ships will be registered with the ECRC, and all ships will carry oil spill clean up equipment (e.g. absorbents, inflatable dykes) with trained crew members in spill prevention and clean up techniques.	
Aquaculture and	Construction	Potential loss	• Adherence to the fish habitat compensation strategy; compensating for	Level I

Commercial Fisheries	of the marine terminal	of commercial fish species or their habitat	the 1578 m^2 of lobster habitat lost due the marine terminal's construction. • Armour stone will be placed to create a like-for-like replacement of habitat lost during construction; consisting of clean (less than 5 % fines), non-acid generating granite of appropriate size obtained from the quarry itself. • All compensation activities and concepts will be performed in consultation and cooperation with DFO Habitat Management Program, the Town of Belleoram, and the local Belleoram Fisheries Committee. Monitoring will be ongoing, as needed (See Section 9.2.2.8) • Mitigations to protect aquaculture and commercial fisheries will be as per Sections 9.2.2.4 and 9.2.2.5 and the Fish and Fish Habitat portion of this table. Measure include the use of silt curtains, using clean fill, not refueling within 30 m of a water body, • Water releases will conform to the *Fisheries Act* and regulations, the Canadian Water Quality Guidelines for the Protection of Aquatic Life, and all associated permits and laws. • A Spill Contingency Plan is included in the EPP, with spill kits (e.g. absorbents, floating booms, catchments) being available at the marine terminal site and on any barges or ships while docked.	(Non-Significant)
	Shipping Activities	Potential loss of commercial fish species or their habitat	• No bilge or ballast will be discharged at the marine terminal site or outside the bounds of the *Canada Shipping Act* and associated regulations. • No refueling will be done at the marine terminal. • Ships will be registered with the ECRC, and all ships will carry oil spill clean up equipment (e.g. absorbents, inflatable dykes) with trained crew members in spill prevention and clean up techniques. • Interactions between the bulk aggregate carriers and local marine traffic will be minimized by several factors, including: the infrequent passage of the bulk aggregate carrier (every 5-7 days), its travel within an identified shipping corridor, the distance to the nearest fish farm (at least 750 m), its slow speed within Belle Bay (approximately 2 knots), communicating arrival and departure information with the Local Special Interest Committee, and finally the low concentration of	Level I (Non-Significant)

			commercial fishing vessels in the area. • All ships will be outfitted with state-of-the-art navigation, radar, and communication equipment • Details of standard mitigations with respect to shipping activities are outlined in Section 2.2.3 and are included in Continental Stone's EPP.	
Navigation and Marine Safety	Shipping Activities	Degradation or loss of fish habitat	• All ships will adhere to the mitigations and guidelines outlined in Section 2.2.3, meeting all regulatory standards pursuant to the *Canada Shipping Act*. • All bulk aggregate carriers will be double hulled, with oil spill and clean up equipment (e.g. absorbents, inflatable dykes) onboard; with crew trained in their use. • There will be no dumping of bilge or foreign ballast within the waters of Belle Bay, with all releases adhering to the regulations under the *Canada Shipping Act*. • No refueling or oil transfer will occur at the marine terminal. • Engines will be turned off (except for any generators required for power) when ships are docked at the marine terminal to minimize mechanical noise.	Level I (Non-Significant)
		Disruption of other maritime activities (e.g. aquaculture and commercial fishing	• Bulk aggregate carriers' passage will be relatively infrequent; servicing the marine terminal every 5-7 days. • Ships will travel within an identified corridor, coming no closer than 3 km to any land or sensitive habitat outside of Belle Bay, and staying at least 750 m from any aquaculture site within Belle Bay. Speeds within Belle bay will not exceed 2 knots. • The Local Special Interest Committee will be consulted with respect to ship arrival and departure times. Ships will have a 24 hour turn around time at the marine terminal. • Ships will be fitted with Automatic Identification System (AIS) equipment as per the *Eastern Traffic Zone Regulations*. • Ships entering Canadian waters will alert the Coast Guard to their presence within the 12-mile limit, maintaining VHF contact between 30	Level I (Non-Significant)

			to 50 nautical miles from shore. • Specific mitigative measures are outlined in Section 2.2.3, and have been incorporated into Continental Stone's EPP and contingency planning.	
Marine Birds	Construction of the Marine Terminal	Loss or Degradation of Habitat	• The marine terminal will not be constructed within or in proximity to any identified marine bird sanctuary, reserve or important bird area. Construction activities will commence after the breeding season (in early fall). • All activities will comply with *Migratory Birds Convention Act* and regulations. • Nests will be left undisturbed, with adequate buffers being maintained between the nest and construction activities (as per the requirements of the *Migratory Bird Convention Act* and regulations). Nests or eggs will not be moved or obstructed and no vegetation clearing in the area will take place during the breeding season until fledglings have left parental territories. • Habitat degradation will be mitigated by: • Guarding against spills or leaks of toxic chemicals into surrounding habitats (see Section 9.2.2.5); • Erecting siltation control measures (e.g. silt curtains) prior to beginning any activities involving disturbance of the site and work along the shoreline (see Section 9.2.2.4); and • Ensuring that workers and contractors do not approach concentrations of seabirds, waterfowl, or shorebirds when approaching the construction site, constructing accessing the marine terminal, and have well muffled vessels.	Level I (Non-Significant)
	Shipping Activities	Disruption of marine birds and their habitat.	• Bulk aggregate carriers will not be in proximity to known bird colonies, coming no closer than 3 km. • Passage of bulk aggregate carriers will be infrequent, approximately every 5-7 days. • Ballast or bilge will be not be dumped in proximity to sensitive bird	Level I (Non-Significant)

			areas during normal operations (non-emergency). • All shipping operations will be performed by a licenced contractor who fully complies with the *Canada Shipping Act*, with specific mitigative measures to ensure the safety of the ship, as well as the environment, being outlined in Section 2.2.3 and the EPP.	

	Blasting activities	Disruption of marine birds and their habitat	• Blasting required for access development to the marine terminal will not be constructed within or in proximity to any identified marine bird sanctuary, reserve or important bird area. Construction activities will commence after the breeding season (in early fall).
			• No blasting will occur underwater or within a waterbody.
			• The use of explosives near water will adhere to the guidelines of Wright and Hopky (1998) to avoid impacts to fish or fish habitat.
			• No blasting will occur underwater or within a waterbody.
			• Mitigations to minimize the overall noise generated at the marine terminal have been included in the EPP and will also be reduced through the use of best practices outlined in Section 2.2.3.
			• Blasting will be done in accordance with the Aggregate Operators Best Management Practices Handbook for British Columbia, Volume 2 (2002) and Wright and Hopky's Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (1998).
			• The drilling/blasting protocol (see Section 2.2.4) has incorporated dust and noise suppression mitigations, including:
			  • Requiring dust suppression and/or collection equipment during drilling, such as using drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism;
			  • Blasting mats will be used if deemed necessary;
			  • Plugging all bore holes with 3 m collars of 20 mm, clean, crushed stone to trap gases and dust during blasting; and
			  • Adjusting blast timing such that every blast is as effective as possible, allowing for efficient use of explosives.
				Level I (Non-Significant)

Species at Risk	Construction and Operation of the Marine Terminal	Disruption of protected species and their habitat	• All contractors working on-site will adhere to all stipulations set out in the *SARA*, and will be informed that it is illegal to kill, harass, capture or harm any species listed under it. • If a *SARA* species is encountered at any stage of the Project, the	Level I (Non-Significant)

			Proponent will make an application to a competent Minister under Section 73 of the SARA to be granted permission to undergo an activity that affects a listed wildlife species. No operations will commence in the area until the proper permit is issued. The Proponent will ensure that all reasonable alternatives to the activity are considered, all feasible measures are taken to minimize the effect of the activity on the species, and the activity will not jeopardize its survival or recovery. • The potential for habitat loss or degradation will be mitigated through the use of best practices; minimizing the loss of both sediment (See Section 9.2.2.4) and toxic chemical (see Section 9.2.2.5) to the marine environment. • All water releases will conform to the regulatory requirements of the *Environmental Control* (Water and Sewage) *Regulations* and the CCME limits (e.g. for metals, dissolved oxygen, hydrocarbons). • Machines will be maintained in a state of good working order and regularly inspected for leaks or malfunctions. • A Spill Contingency Plan has been included in the EPP and spill kits (containing such things as floating booms and absorbents) will be available at the marine terminal at all times.	
	Shipping Activities	Disruption of protected species and their habitat	• Passage of bulk aggregate carriers will be relatively infrequent, occurring once every 5-7 days. • Ships will travel at approximately 2 knots within belle Bay, which will serve to minimize the possibility of a collision with any whales in the area. • Ships will not pass within 3 km of any identified sensitive marine bird habitat. • Ballast or bilge will be not be dumped in proximity to sensitive bird areas during normal operations (non-emergency). • All shipping operations will be performed by a licenced contractor who fully complies with the *Canada Shipping Act*, with specific mitigative measures to ensure the safety of the ship, as well as the environment, being outlined in Section 2.2.3 and the EPP.	Level I (Non-Significant)

	Blasting	Disruption of protected species and their habitat	• Blasting required for access development to the marine terminal will not be constructed within or in proximity to any identified marine bird sanctuary, reserve or important bird area. Construction activities will commence after the breeding season (in early fall).
			• No blasting will occur underwater or within a waterbody.
			• The use of explosives near water will adhere to the guidelines of Wright and Hopky (1998) to avoid impacts to fish or fish habitat.
			• No blasting will occur underwater or within a waterbody.
			• Mitigations to minimize the overall noise generated at the marine terminal have been included in the EPP and will also be reduced through the use of best practices outlined in Section 2.2.3.
			• Blasting will be done in accordance with the Aggregate Operators Best Management Practices Handbook for British Columbia, Volume 2 (2002) and Wright and Hopky's Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (1998).
			• The drilling/blasting protocol (see Section 2.2.4) has incorporated dust and noise suppression mitigations, including:
			  • Requiring dust suppression and/or collection equipment during drilling, such as using drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism;
			  • Blasting mats will be used if deemed necessary;
			  • Plugging all bore holes with 3 m collars of 20 mm, clean, crushed stone to trap gases and dust during blasting; and
			  • Adjusting blast timing such that every blast is as effective as possible, allowing for efficient use of explosives.
				Level I
				(Non-Significant)

Atmosphere	Marine Terminal's Construction and Operation	Dust emissions affecting air quality	• Any fill placed within the marine environment will be clean granite from the quarry itself, containing less than 5% fines • Silt curtains will be put in place before any activities in or near the marine environment commence (as per Section 9.2.2.4). • Conveyors servicing the marine terminal will fitted with hood and be maintained in a state of good repair and operated by trained employees only. • The shiploader will be positioned as low as possible in the ship to avoid dropping the aggregate from a significant distance (expected to be less	Non-Significant

			than 2 m). • All areas of the marine terminal will conform to the NL Criteria for Acceptable Air Quality which allows a total suspended particulate concentration of 80 µg/m3 and 120 µg/m3 for 1 hour and 24 hour exposure, respectively.	
	Blasting	Dusting affecting air quality and the creation of noise	• Overburden will be cleared prior to blasting. • Continental Stone's blasting protocol was designed to be effective and efficient, which will help minimize dust emissions resulting from a blast. • Blasting will be done in accordance with the Aggregate Operators Best Management Practices Handbook for British Columbia, Volume 2 (2002) which will ensure a sound environmental framework is adhered to. Further, Wright and Hopky's Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (1998) have been incorporated into the blasting operations. These guidelines outline best-practice measures in terms of all environmental effects, including dust suppression. Continental Stone's drilling/blasting protocol (see Section 2.2.4) has incorporated dust suppression mitigations, including: • Requiring dust suppression and/or collection equipment during drilling, such as using drills equipped with either a vacuum dust collection system or a water injection dust suppression mechanism; • Blasting mats will be used if deemed necessary; • Plugging all bore holes with 3 m collars of 20 mm, clean, crushed stone to trap gases and dust during blasting; and • Adjusting blast timing such that every blast is as effective as possible, allowing for efficient use of explosives.	Level I (Non-Significant)
	Exhaust Emissions	Degradation of air quality	• All construction and operation equipment will be well maintained and fitted with standard exhaust suppression devices. • Diesel vehicles will comply with the NL Regulation 39/04 *Air Pollution Control Regulations* 'Visible Emissions Standards'. These standards require diesel vehicles to meet SAE J1667 (Snap Acceleration Smoke Test Procedure for Heavy-Duty Diesel Vehicles targets of visible emissions of 40% for 1991 model vehicles and newer, and 55% for 1990 model vehicles and older.	Level I (Non-Significant)

	Acoustic Disturbance from Bulk aggregate Carriers	Noise generation Affecting humans and wildlife	• Bulk aggregate carriers travel within a predetermined pathway to maximize the distance the ship will be from the farms at any time. • Bulk aggregate carriers will be restricted to 2 knots within Belle Bay. • Bulk aggregate carriers will turn off their engines while docked at the marine terminal.	Level I (Non-Significant)
	Project Related Accidents	Air Quality Concerns	• All activities will adhere to the NL *Air Pollution Control Regulations*, which state: • Where a facility has the potential for air pollution due to an unanticipated failure to operate in the normal manner due to an accident, emergency or urgent situation, a change in operating conditions, or a shut-down of a pollution control device, the owner or operator of the facility shall: (a) Take immediate remedial action to reduce any emissions and provide the department with the particulars of that failure, change or shutdown; and (b) Provide the department in writing with the particulars of the remedial action taken under paragraph (a) and the reasons for that action as soon as it is practicable. • There will be no storage of fuels or explosives on, or within 30 m of, the marine terminal; with their handling complying with the *Storage and Handling of Gasoline and Associated Products Regulations* and the *Explosives Act*, respectively. • No waste oil will be stored on-site either, with it being handled in accordance with the *Used Oil Control Regulations*, and be regularly disposed of to prevent accumulation. • Any areas with temporary storage of flammable products will adhere to the fire prevention/suppression measures outlined in the NL *Occupational Health and Safety Act* to mitigate the chance that fires can spread. • All equipment and structures at the marine terminal are to adhere to the NL *Fire Prevention Smoke and Fire Alarm Regulations* under the *Fire Prevention Act*, and fitted with proper, regularly maintained and	Level I (Non-Significant)

			inspected fire suppression and alarm equipment. • Employees are to be trained in fire prevention and suppression techniques, with drills being conducted on a regular basis.	
Human Health and Safety	Marine Terminal Construction and Operation	Contamination of Local Fisheries	• Contamination of local species will be mitigated through the measures outlined in the Section 9.2.2.5 and the EPP and contingency planning. This includes prohibiting the bulk aggregate storage of fuel, oils, or any other hazardous substances at the marine terminal site, allowing no refueling within 30 m of the marine environment. • All materials will be handled, stored and used in accordance with eh the manufacturers specifications and any federal or provincial laws. • All toxic materials will be transported by contracted professionals, with all operators possessing the appropriate licences with respect to transporting dangerous goods and will follow driving rules and regulations. • Employees will be trained in accident prevention and the use of spill containment and clean-up equipment/material (e.g. absorbents, floating booms). • Any spills will be promptly cleaned up and reported to the proper authorities.	Level I (Non-Significant)
		Health Impacts Related to Industrial Accidents or Malfunctions	• The potential for an accidents or malfunction to occur at the marine terminal is effectively minimized through the use of preventative maintenance and ensuing proper employee safety training. • The marine terminal has been engineered to meet all design standards required by the applicable building codes and standards (See Section 2.2.3). The structure will be regularly inspected and maintained. • All machinery, equipment and vehicles will be regularly inspected and maintained into a state of good repair and operated by only those employees properly trained to do so in accordance with the manufacturers' specifications. • All Project activities are to comply with the Provincial *Occupational Health and Safety Act* and associated regulatory requirements, with all employees receiving thorough, and regular, safety training specific to their jobs. • All structures will adhere to the NL *Fire Prevention Smoke and Fire*	Level I (Non-Significant)

	Shipping Activities	Navigational Interference and Maritime Accidents	*Alarm Regulations* under the *Fire Prevention Act*, with proper fire suppression and alarm equipment being installed in all buildings and permanent equipment. Regular testing and maintenance will be performed to ensure these systems are functioning properly. • Employees will be trained in fire prevention and suppression techniques, with drills being conducted on a regular basis. • Access to the Project site will restricted to employees and sings will be posted warning of any dangers. • Protective gear will be worn according to each specific (e.g. gloves, hard hats, masks, safety goggles), with any federal, provincial, or municipal safety regulations or laws being strictly followed. • Environmental and navigational concerns related to the use of bulk aggregate carriers will be effectively mitigated through adherence to all procedures and protocols contained in the *Canada Shipping Act* and all other pertinent laws and legislation (See Section 2.2.3). • Ships will be well maintained and regularly inspected. • All bulk aggregate carriers will be double hulled, with oil spill and clean up equipment (e.g. absorbents, inflatable dykes) onboard; with crew trained in their use. Ships will adhere to the regulations set out in Transport Canada's Guide to Structural Fire Prevention (1993); a guide that clarifies the requirements for fire protection on-board ships. • Ships will travel in with an identified corridor to ensure the maintenance of a maximal distance from land and other operations in the area. • Vessels will be fitted with a variety of state-of-the-art electronic navigational aids and radar to ensure the best and most accurate pilotage while docking or departing. • The Local Special Interest Committee will be consulted with respect to ship arrival and departure times to further mitigate potential interactions. • Bulk aggregate carriers will be restricted to approximately 2 knots within Belle Bay.	Level I (Non-Significant)

12.0 Follow Up Program

12.1 General

Pursuant to Section 16(2) of the *CEA Act*, the need for, and requirements of, a follow-up program must be considered during the comprehensive study process. The follow-up program should be designed to: 1) verify the accuracy of the environmental assessment for the Project; 2) to determine the effectiveness of the measures taken to mitigate the adverse environmental effects of the project; and 3) to support and verify predictions made concerning the likelihood of "no significant adverse environmental effects".

The follow-up program can also ensure that unanticipated environmental effects or effects caused by any unforeseen accidents and/or malfunctions are addressed in a timely manner and do not result in environmental degradation. Where federal regulatory processes exist for specific development activities, the mitigation measures and follow-up requirements will be specific as terms and conditions by the federal regulatory instruments (e.g., *Fisheries Act* authorization; *Navigable Waters Protection Act* authorization).

12.2 Navigable Waters Protection Act Conditions of Approval

The Navigable Waters Protection Program of Transport Canada are required to issue a authorization for the construction and operation of the marine terminal pursuant to Section 5(1) of the *Navigable Waters Protection Act*. The proponent has completed all the requirements for the Section 5(1) authorization, including a 31-day public notification period. Therefore, the Section 5(1) Authorization will be issued once the environment assessment is completed pursuant to the CEAA. A set of Conditions of Approval that the proponent is responsible to adhere to will be attached to the NWPA authorization.

The Navigable Waters Protection Program will conduct follow-up site visits to ensure that the proponent is in compliance with these Conditions of Approval. Failure to comply with the Conditions of Approval could result in legal action.

12.3 Fisheries Act

Monitoring will be required as per the conditions of the Section 35(2) *Fisheries Act* Authorization that may be issued after completion of the environmental assessment; provided that after taking into account the implementation of any mitigation measures, the project is not likely to cause significant adverse environmental effects.

12.4 Follow-Up Program

The Follow-Up Program will be developed to ensure that the Proponent has implemented all mitigation measures and that these mitigation measures are working to protect the identified Valued Ecosystem Components (VEC) from significant adverse environmental effects. Key aspects of the follow-up program will include:

- monitoring to ensure the *NWPA* Conditions of Approval are adhered to;

- monitoring to ensure conditions of the *Authorization for Works or Undertakings Affecting Fish Habitat* are implemented and to verify the effectiveness of these conditions, including the Fish Habitat Compensation Agreement.

- monitoring to ensure compliance with all applicable regulations of the *Canada Shipping Act* and relevant International Maritime Organization (IMO) Conventions including the International Convention for the Safety Of Life At Sea (SOLAS), International Convention for the Prevention of Pollution from Ships (MARPOL), and the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).

- monitoring the impacts of an accidental petroleum released in Belle Bay on marine birds and waterfowl;

- monitoring to ensure that the sedimentation control devices are installed properly and minimizing sedimentation during the construction phase of the Project; and

- monitoring of marine water quality, including sedimentation rates and temperature to protect fish and fish habitat.

12.5 Proponent Commitments and Obligations

Once designed, the Proponent is responsible for implementing the follow-up program, reporting the results to the RAs, and ensuring action is taken to mitigate for any unforeseen environmental effects.

In addition to the follow-up requirements pursuant to the *Act*, the Proponent has also developed an Environmental Protection Plan (EPP) and a Spill Contingency Plan (SCP). Both plans have been reviewed and approved by the provincial Department of Environment and Conservation.

The EPP is a field-ready document describing applicable environmental protection measures associated with construction and operation activities of the Project. The EPP provides a practical way in which the Proponent can demonstrate an understanding of environmental regulations, practices, and procedures required to reduce or eliminate the potential environmental effects associated with the Project. This EPP sets out the procedures, responsibilities, and control actions to be implemented by the Proponent in achieving the safe and environmentally sound construction and operation of the Project. The EPP is considered a "living" document and, as work proceeds, the EPP will be revised and updated.

As the Proponent conducts periodic audits to verify compliance with existing regulations and the follow-up program, the EPP will be revised, as required, and forwarded to all those involved in the work scope of the document, management personnel, and provincial and federal regulators.

A Spill Contingency Plan (SCP) has also been developed to ensure that a system is implemented in the event of an emergency spill situation for the protection of life, environment, property, and/or equipment. The SCP has identified the predetermined course of actions for accidents, system failures, or other situation resulting in an accidental spill event. The SCP contains several key elements including the notification and alerting procedures in the event of spill, contact information for spill reporting, duties and responsibilities for on-site personnel, clean-up procedures, and site rehabilitation procedures.

13.0 CONCLUSIONS

This CSR considered the potential environmental effects, including residual and cumulative effects, and accidents and malfunctions, of the development of the proposed Crushed Rock Granite Quarry at Belleoram, NL. The assessment focused on the VECs identified as within the scope of the Project that were determined to be of value to the stakeholders in the area. These include:

- Fish and fish habitat;
- Aquaculture/commercial fisheries;
- Navigation and marine safety;
- Marine birds including seabirds and sea ducks;
- Species at Risk;
- Atmospheric environment, and;
- Human health and safety.

The residual effects of the Project include the physical presence of the marine terminal's residual components if it is in fact decommissioned and dismantled, or the structure itself if it is maintained into perpetuity. Its physical presence may result in a chance or loss of fish habitat and a decrease navigability of Belle Bay. At the time of closure the DFO Habitat Management Program will be consulted as what measures may need to be taken to protect fish and fish habitat and what authorizations may be required by the Federal Minister of Fisheries and Oceans. As part of this authorization, an acceptable compensation plan will be completed.

Mitigative measures serve to eliminate or minimize the potentially significant environmental effects of the Project on each VEC. The potential for adverse residual environmental and cumulative effects were evaluated, and their significance rated, based on criteria including their temporal, spatial, synergistic and/or additive effects between Project activities and the current environmental and socio-economic condition in the area.

Based the scope of work proposed, and the current environmental conditions at the site and in the surrounding area, the Project's effect on the environment is likely **Not-Significant** taking into account the implementation of appropriate impact mitigation measures provide in this document and through the implementation of the appropriate Follow-Up and monitoring procedures.

14.0 REFERENCES AND SUPPORTING DOCUMENTATION

Bowyer, P.J. 1995. Where the wind blows: Guide to marine weather in Atlantic Canada. P.J. Bowyer (eds). Breakwater. St. John's, NL. 178 p.

Breithaupt, T., and J. Tautz. 1990. The sensitivity of crayfish mechanoreceptors to hydrodynamic and acoustic stimuli. *In*: Wiese, K., W.D. Krenz, J. Tautz, H. Reichert, and B. Mulloney (eds). Frontiers in crustacean neurobiology. Birkhäuser Verlag Basel. pp. 114-120.

Brooks, N., R. Nicholls, and J. Hall. 2006. Sea Level Rise: Coastal Impacts and Responses. Materialien, Norwich, Berlin, Germany.

Bruce, J., I. Burton, H. Martin, B. Mills, and L. Mortsch. 2000. Water sector: Vulnerability and adaptation to climate change. Report prepared for the Climate Change Action Fund, June, 2000. Wesite accessed June 7, 2007:
http:/iss.gsc.nrcan.gc.ca/cciarn/WaterResourcesImpactsworkshopreports.pdf

Canada Climate Normals or Average 1971 – 2000. Environment Canada, 2005. URL - http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html

Canadian Ice Service. 2001. Sea Ice Climatic Atlas, East coast of Canada, 1971-2000. Minister of Public Works and Government Services of Canada. 34 p.

Canadian Ice Service. 2007.

Carrera, G., and P. VanIĕek. 1988. A comparison of present sea level linear trends from the tide gauge data and radiocarbon curves in eastern Canada. Palaeogeography, Palaeoclimatology, Palaeoecology, 68: 127-134.

CCME (Canadian Council of Ministers of the Environment). 2006. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Update 6.0, July 2006.

Christian, J.C. 2003. White’s Cove Quarry Blasting: Potential Impacts on American Lobster. LGL Limited. St. John’s, NL. October 8, 2003.

Christian, J.R. 1995. Patterns of diel activity and movements of the *American lobster, Homarus americanus*, as determined by ultrasonic telemetry. M.Sc. Thesis, Memorial University of Newfoundland, St. John’s, Newfoundland. 110 p. + App.

Christian, J.R., A. Mathieu, D.H. Thomson, D. White and R.A. Buchanan. 2004. Effect of seismic energy on snow crab (*Chionoecetes opilio*) 7 November 2003. Environmental Studies Research Funds Report No. 144. Calgary. 106 p.

CICS (Canadian Institute for Climate Studies). 2003. Canadian Climate Scenarios Network. Environment Canada. Website accessed June 4, 2007: http://www.cics.uvic.ca/scenarios/

CIS – Canadian Ice Service. Environment Canada, Meteorological Service of Canada. Website accessed June 1, 2007: http://ice-glaces.ec.gc.ca/App/WsvPageDsp.cfm?ID=1&Lang=eng&Clear=true

Danard M., A. Munro, and T. Murty. 2003. Storm Surge Hazard in Canada. Natural Hazards. 28(2-3): 407-434.

DFO (Fisheries and Oceans Canada). 2000. Community-Based Coastal Resource Inventory Atlas, Newfoundland and Labrador – Bay D'Espoir/Connaigre. April 2000.

DFO (Fisheries and Oceans Canada). 1998. Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador.

DFO (Fisheries and Oceans Canada). 1993. Land Development Guidelines for the Protection of Aquatic Habitat

EC (Environment Canada). 1993. A matter of degrees: A primer on global warming. The Environmental Citizenship Series. 89 p.

EC (Environment Canada). 2003. Canadian Tropical Cyclone Statistics. Website accessed June 6, 2007: http://www.atl.ec.gc.ca/weather/hurricane/connection7.html#average

EC (Environment Canada). 2004. Atlantic Climate Centre - The Climate of Newfoundland. Website viewed on June 7, 2007: http://atlantic-web1.ns.ec.gc.ca/climatecentre/default.asp?lang=En&n=83846147-1

EC (Environment Canada). 2004. Species at Risk Database. Website viewed on January 14, 2007: http://www.speciesatrisk.gc.ca/search/default_e.cfm

EC (Environment Canada). 2007. Best Practices for the Use and Storage of Chloride-Based Dust Suppressants. Chemicals Sector Division. Gatineau, Quebec.

Engas, A. S., Lokkeborg, E., Ona, and A.V. Soldal. 1996. Effects of seismic shooting on local abundance and catch rates of cod (*Gadus morhua*) and haddock (*Melanogrammus aeglefinus*). Can. J. Aquat. Sci. 53: 2238-2249.

Fogarty, C.T. 2002. Hurricane Michael, 17-20 October 2000. Part I – Summary Report and Storm Impact on Canada. Part II – Forecast and Warning Critique. Meteorological Service of Canada, Atlantic Region Science Report Series 2002-01. June 2002.

Gilliland and Goudie. Unpublished Information.

Government of Newfoundland and Labrador, Department of Finance, Community Accounts. http://www.communityaccounts.ca

Hastings, M.C., and Popper, A.N. 2005. Effects of Sound on Fish. Technical report for Jones and Stokes to California Department of Transportation, Sacramento, CA. Available at http://www.dot.ca.gov/hq/env/bio/files/Effects_of_Sound_on_Fish23Aug05.pdf

Hawkins, A.D., and Rasmussen, K.J. 1978. The calls of gadoid fish. J. Mar. Biol. Assoc. UK 58: 891-911.

Hawkins, A.D. 1993. Underwater sound and fish behaviour. *In*: Pitcher T (eds) Behaviour of teleost fishes. Chapman & Hall, London. p.129-169.

Heinisch, P., and K. Wiese. 1987. Sensitivity to movement and vibration of water in the North Sea shrimp *Crangon crangon* L. J. Crust. Biol. 7(3): 401-413.

Hill, B.T. and S. J. Jones, 1990. The Newfoundland Ice Extent and the Solar Cycle from 1860 to 1988 JGR,95(C4),5385-5394.

Hill, B., 1999. Historical Record of sea ice and iceberg distribution around Nfld and Labrador, 1810-1958 WCRP No. 108 or WMO/TD No. 949, April/99, ACSYS, Proc. of the Workshop on Sea Ice Charts of the Arctic, Seattle, WA AU 5-7, 1998.

Hutton, K.E. and S.C. Samis. 2000. Guidelines to Protect Fish and Fish Habitat From Treated Wood Used in Aquatic Environments in the Pacific Region. DFO Canadian Technical Report of Fisheries and Aquatic Sciences 2314. Habitat and Enhancement Branch.

IC (Infrastructure Canada). 2006. Adapting Infrastructure to Climate Change in Canada's Cities and Communities: A Literature Review. Part of the Transport, Infrastructure and Communities Portfolio Research & Analysis Division. December 2006.

International Ice Patrol. Archived Data. Website accessed June 4, 2007: http://www.uscg.mil/LANTAREA/IIP/General/data_archive.shtml

Intergovernmental Panel on Climate Change (IPCC) 2007. Climate Change 2007: The Physical Science Basis. Summary for Policymakers. Contribution of Working Group Ito the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. IPCC Secretariat, c/o 8 Canada WMO, 7bis, Avenue de la Paix, C.P. N° 2300, 1211 Geneva 2, Switzerland.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet, and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science. 17(1): 35-75.

Lynch-Stewart, P. 2004. Canadian Wildlife Service's Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada (First Edition). Prepared by Lynch-Stewart & Associates for Environment Canada - Canadian Wildlife Service. Gatineau, Quebec.

NRCan (National Research Council). 2006a. The tides of change: Climate change in Atlantic Canada. Website accessed June 7, 2007:
http://adaptation.nrcan.gc.ca/posters/ac/index_e.php

NRCan (National Research Council). 2006b. Earthquake zones in Eastern Canada. Website accessed June 5, 2007:
http://earthquakescanada.nrcan.gc.ca/index_e.php

Oil and Gas Magazine. 2007. Whiffen Heads holds the oil from the Grand Banks. Issue: April 5, 2007. Mt. Pearl, NL.

Oriard, L.L. 2002. Explosives Engineering, Construction Vibrations and Geotechnology International Society of Explosives Engineers. Cleveland, Ohio.

OSB (Ocean Studies Board). 2003. Ocean noise and marine mammals. Ocean Study Board., National Research Council. Washington DC.

Pezzack, D.S., C.M. Frail, P. Lawton, D.A. Robichaud, and M.B. Strong. 2001. Update on stock status of American lobster, *Homarus americanus*, Lobster Fishing Area 34. CSAS Research Document 2001/156. 67 p.

Popper, A.N., and Fay, R.R. 1993. Sound detection and processing by fish: critical review and major research questions. Brain Behav. Evol. 41: 14-38.
Popper, A.N., and Carlson, T.J. 1998. Application of sound and other stimuli to control fish behavior. Trans Am Fish Soc 127: 673-707.

Popper, A.N., Fay, R.R., Platt C., and Sand O. 2003. Sound detection mechanisms and capabilities of teleost fishes. *In*: Colling, S.P., and Marshall, N.J. (eds). Sensory processing in aquatic environments. Springer Verlag. New York. p 3-38.

Rideout, G. and N. Meyer. 2003. Marine Vessels Exhaust Emissions Program: A Study of the Effects of Multiple Emission Reduction Technology on the Exhaust Emissions of Marine Diesel Engines. Prepared for the Transportation Development Centre, Transport Canada. 86pp.

Smith, J. B. and Lazo, J. K. 2001. A summary of climate change impact assessments from the US Country Studies Programme. Climatic Change 50, 1-29.

Snow, D.A. 1996. A Self-Driving Guide: Seabirds. NL Department of Tourism, Culture, & Recreation. Wildland Tours, Dicks & Company Ltd . St. John's, Newfoundland.

Species at Risk – Environment Canada, Canadian Wildlife Service. 2004. Species at Risk Web Mapping Application. URL – http://www.sis.ec.gc.ca/ec_species/ec_species_e.phtml

Stive, M. 2004. How important is global warming for coastal erosion? Climatic change 64: 27-39.

Sutherland, K.M. & G.S. Lines. 2001. A Further Examination of Regional Temperature Trends in Atlantic Canada, Session 14. 12th Symposium on Global Changes Studies and Climate Variations.

TC (Transport Canada) 2005. *Canada Shipping Act*, *Navigation Safety Regulations*.

TC (Transport Canada). 2006. Registration of Vessels: Ships Statistics. Ship Registration Office. January 3, 2006.

Terrestrial Ecozones of Canada, Narrative Descriptions of Terrestrial Ecozones and Ecoregions of Canada. Environment Canada, 2004 URL – http://www.ec.gc.ca/soer-ree/English/Framework/Nardesc/canada_e.cfm

Tautz, J., and D.C. Sandeman. 1980. The detection of waterborne vibration by sensory hairs on the chelae of the crayfish. J. Exp. Biol. 88: 351-356.

Walkden M.J., and J.W. Hall. 2005. A predictive mesoscale model of the erosion and profile development of soft rock shores. Coast Engineering 52: 535-563.

Wiese, K. 1976. Mechanoreceptors for near-field water displacements in crayfish. J. Neurophys. 39(4): 816-833.

Wright, D.G., and Hopky, G.E. 1998. Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters. Department of Fisheries and Oceans. Canadian Technical Report of Fisheries and Aquatic Sciences 2107.

Appendix A - Representative Photographs of the Existing Area at the Proposed Marine Terminal Site, Belleoram, NL.

Photo 1: Project area looking south to the town of Belleoram.

Photo 2: Project area looking north towards Iron Skull Head.

Photo 3. Aerial view of the Belleoram Barasway. The marine terminal is proposed to be placed along the shore at the bottom-left area of the photo.

Photo 4: Aerial view of the proposed quarry proposed looking south.

Photo 5: Shoreline conditions at the site of the proposed marine terminal at the proposed crushed granite rock quarry, Belleoram, NL.

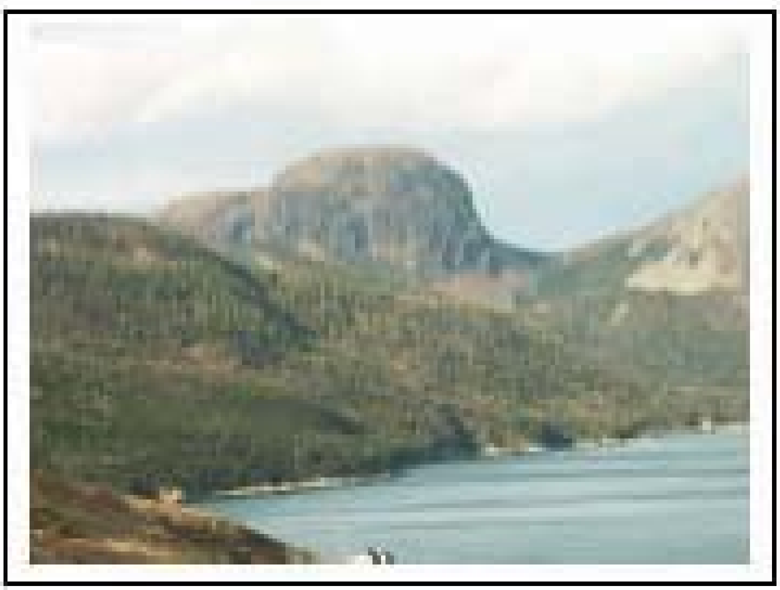

Photo 6: View of Iron Skull Head from Belleoram.

Appendix B: Geochemical Analysis of Core Samples Drilled at the Proposed Marine Terminal Site, Belleoram, NL.

Results of geochemical analysis of core samples drilled at the proposed Crushed Rock Quarry Site, Belleoram, NL.

Element	Units	CSL06-01 (50m)	CSL06-01 (10.5m)	CSL06-02 (10m)	CSL06-03 (9.5m)	CSL06-04 (50m)	CSL06-04 (10.0m)	CSL06-05 (50m)	CSL06-05 (10.5m)	CSL06-06 (10.0m)	CSL06-07 (50m)	CSL06-07 (10.0m)
Ce	ppm	115	96	95	172	179	177	120	152	150	136	133
Sr	ppm	15	11	10	11	14	12	13	17	14	29	11
Ba	ppm	23	17	14	10	15	14	14	11	18	12	11
Fe	%	1.82	1.56	1.49	1.62	1.3	1.65	1.57	1.93	1.68	2.06	1.51
P	%	0.08	0.08	0.08	0.1	0.1	0.1	0.09	0.09	0.09	0.09	0.11
Hg	ppm	1	1	1	1	1	1	1	1	1	1	1
Mg	%	0.51	0.45	0.4	0.53	0.43	0.54	0.44	0.66	0.48	0.68	0.33
As	ppm	5	5	5	5	7	5	5	5	5	5	5
V	ppm	41	36	34	36	37	36	37	39	38	39	39
Na	%	0.19	0.16	0.14	0.13	0.13	0.16	0.18	0.19	0.27	0.16	0.14
Mo	ppm	1	2	1	2	1	2	1	2	1	2	1
Al	%	0.75	0.84	0.74	0.84	0.82	0.87	0.84	0.83	0.78	0.84	0.74
Be	ppm	0.9	0.7	0.6	0.6	0.7	0.8	0.7	0.6	0.7	0.5	0.7
Ca	%	0.68	0.93	0.84	0.89	1.05	0.91	0.89	0.97	0.76	1.03	0.84
Zn	ppm	27	18	42	27	9	12	15	71	44	84	20
Cu	ppm	17	14	19	14	11	12	11	11	11	9	10
Sb	ppm	5	5	5	5	5	5	5	5	5	5	5
Ag	ppm	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pb	ppm	15	9	11	11	8	8	7	11	11	28	9
Bi	ppm	2	2	2	2	2	2	2	2	2	2	2
Ti	%	>1.00	>1.00	>1.00	0.92	0.72	0.97	>1.00	0.81	0.79	0.85	0.67
Cd	ppm	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.5
Co	ppm	7	7	6	7	6	7	6	8	6	8	5
Ni	ppm	7	7	7	8	7	7	7	7	7	7	5
W	ppm	10	10	10	10	10	10	10	10	10	10	10
La	ppm	26	25	26	27	28	30	27	24	26	16	18
K	%	0.11	0.09	0.08	0.07	0.07	0.08	0.08	0.07	0.09	0.06	0.07
Mn	ppm	194	113	93	94	95	124	109	233	116	277	103
Rb	ppm	10	10	10	10	10	10	10	10	10	10	10
Cr	ppm	100	73	75	59	63	67	78	73	106	75	64

*Acid rock generating metal.

Appendix C: Contents of the Aggregate Operators Best Management Practices (BMP) Handbook for British Columbia, Volume 1-2 (2002).

Chapter 1
INTRODUCTION

Chapter 2
COMMON COMMUNITY AND ENVIRONMENTAL CONCERNS

Chapter 3
PLAYERS, PERMITS AND LEGISLATION

Chapter 4
MINE PLANNING

Chapter 5: Planning Modules

5.1 EXTRACTION MODULE
5.2 PROCESSING MODULE
5.3 STOCKPILING MODULE
5.4 TRAFFIC MODULE
5.5 STORMWATER & EROSION MODULE
5.6 SITE LAYOUT MODULE
5.7 SITE LAYOUT MODULE
5.8 RISK MANAGEMENT MODULE
5.9 BMP MONITORING MODULE

Chapter 6
RECLAMATION

Chapter 7
BEST MANAGEMENT PRACTICES

Topic include:

Berms
Bioengineering
Buffer Zones
Check Dams
Constructed Wetlands
Ditches
Drop Height
Dust Skirts
Environmental Timing Windows
Equipment Selection
Erosion Control Blankets
Fences Tarps
Grading
Haul Roads
Lighting Management
Tillage
Oil/Water Separators
Outlet Protection
Pollution Prevention
Retention Basins
Scheduled Maintenance & Repairs
Settling Ponds
Signage
Silt Fences
Sinking the Plant
Slope Drainage
Street Cleaning
French Drain
Topsoil Management
Vegetation Cover
Material Corrals

Appendix D – Environmental Protection Plan Table of Contents for the Proposed Marine Terminal, Belleoram, NL.

Appendix E - Marine Habitat Surveys Qualitative and Quantitative Transect Observations, Marine Terminal Site, Belleoram, NL.

Table A.1 - Transect T-1, Marine Terminal Site, Belleoram, October 27, 2006.

Transect Distance (m)	Depth (m)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
0-5	0-2	Small Boulder (70%) Bedrock (20%) Large Boulder (5%) Gravel (5%)	Blue mussels (*Mytilus edulis*) (**O**) Frilled Anemone (*Metridium senile*) (**O**)	Wrack (Ascophyllum nodosum) (40%) Rockweed (*Fucus sp.*) (30%)
5-10	2	Small Boulder (70%) Bedrock (20%) Large Boulder (5%) Gravel (5%)	No Fauna Observed	Wrack (Ascophyllum nodosum) (20%) Rockweed (*Fucus sp.*) (20%)
10-15	2.5	Bedrock (75%) Small Boulder (20%) Large Boulder (5%)	Starfish (*Asterias sp.*) (**O**)	Rockweed (*Fucus sp.*) (20%) (damaged) Tubed weed (*Polysiphonia sp.*) (15%) Wrack (Ascophyllum nodosum) (10%)
15-20	4	Bedrock (50%) Small Boulder (40%) Large Boulder (5%) Gravel (5%)	Starfish (*Asterias sp.*) (**O**)	Tubed weed (*Polysiphonia sp.*) (20%) Rockweed (*Fucus sp.*) (10%) Kelp (*Laminaria sp.*) (5%) (damaged) Wrack (Ascophyllum nodosum) (5%)
20-25	4	Small Boulder (70%) Large Boulder (20%) Gravel (10%) Crevices (**O**)	Lobster *(Homerus americanus*) (**U** – 1 individual) Cunner (Tautogolabrus adspersus) (**O**)	Crustose algae *(Lithothamnium sp.*) (30%) Tubed weed (*Polysiphonia sp.*) (20%) Kelp (*Laminaria sp.*) (10%) (Damaged) Rockweed (*Fucus sp.*) (10%)
25-30	6	Small Boulder	Cunner (Tautogolabrus adspersus) (**O**)	Crustose algae *(Lithothamnium sp.*) (30%)

		(60%) Large Boulder (30%) Gravel (10%)		Tubed weed (*Polysiphonia sp.*) (15%) Kelp (*Laminaria sp.*) (2%) (Damaged) Rockweed (*Fucus sp.*) (5% (Damaged)
30-35	6	Small Boulder (60%) Large Boulder (30%) Gravel (10%)	Starfish (*Asterias sp.*) (**O**) Cunner (Tautogolabrus adspersus) (**O**)	Crustose algae *(Lithothamnium sp.*) (30%) Tubed weed (*Polysiphonia sp.*) (15%) Kelp (*Laminaria sp.*) (10%) (Damaged) Rockweed (*Fucus sp.*) (5% (Damaged
35-40	4	Small Boulder (60%) Large Boulder (30%) Gravel (10%)	Starfish (*Asterias sp.*) (**O**) Cunner (Tautogolabrus adspersus) (**O**)	Crustose algae *(Lithothamnium sp.*) (60%) Kelp (*Laminaria sp.*) (30%) (Damaged) Tubed weed (*Polysiphonia sp.*) (20%) Rockweed (*Fucus sp.*) (5%)
40-45	3.7	Small Boulder (60%) Large Boulder (40%)	Cunner (Tautogolabrus adspersus) (**O**)	Crustose algae *(Lithothamnium sp.*) (60%) Kelp (*Laminaria sp.*) (50%) (Damaged)
45-50	5	Small Boulder (50%) Large Boulder (50%)	Cunner (Tautogolabrus adspersus) (**C**) Starfish (*Asterias sp.*) (**O**) Tube worm (*Spirobis sp.*) (**O**) (on kelp blades)	Kelp (*Laminaria sp.*) (75%) (Damaged) Crustose algae *(Lithothamnium sp.*) (50%) Sour Weed (*Desmarestia sp.*) (2%)
50-55	7	Small Boulder (70%) Large Boulder (30%)	Cunner (Tautogolabrus adspersus) (**O**) Tube worm (*Spirobis sp.*) (**O**) (on kelp blades)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae *(Lithothamnium sp.*) (20%)
55-60	9	Large Boulder (40%) Small Boulder (40%) Gravel (20%)	Starfish (*Asterias sp.*) (**O**) Cunner (Tautogolabrus adspersus) (**O**) Blue mussels (*Mytilus edulis*) (**U**) Sponge (Porifera) (**U** – 1 individual)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae *(Lithothamnium sp.*) (30%); Rockweed (*Fucus sp.*) (2%) (Large boulder) Coral weed (*Corallina officinalis*) (2%) (Large boulder) Dulse (*Palmeria palmata*) (1%) (Large boulder)
60-65	10	Gravel (50%) Small Boulder (30%) Cobble (20%)	Cunner (Tautogolabrus adspersus) (**U**) Tube worm (*Spirobis sp.*) (**O**) (on kelp blades)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae *(Lithothamnium sp.*) (50%) Sea colander (*Agarum cribrosum*) (5%)

65-70	12	Gravel (50%) Small Boulder (30%) Cobble (20%)	Cunner (Tautogolabrus adspersus) (**O**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae *(Lithothamnium sp.*) (50%) Sea colander (*Agarum cribrosum*) (5%)
70-75	14	Gravel (50%) Small Boulder (30%) Cobble (20%)	Cunner (Tautogolabrus adspersus) (**O**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades)	Kelp (*Laminaria sp.*) (50%) (Damaged) Crustose algae *(Lithothamnium sp.*) (30%) Sea colander (*Agarum cribrosum*) (2%)
75-80	16	Gravel (50%) Small Boulder (30%) Cobble (20%)	Cunner (Tautogolabrus adspersus) (**O**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades)	Kelp (*Laminaria sp.*) (50%) (Damaged) Crustose algae *(Lithothamnium sp.*) (30%)
80-85	16	Gravel (50%) Small Boulder (30%) Cobble (20%)	Cunner (Tautogolabrus adspersus) (**O**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades)	Kelp (*Laminaria sp.*) (50%) (Damaged) Crustose algae *(Lithothamnium sp.*) (30%)
85-90	16	Small Boulder (60%) Large Boulder (40%)	Cunner (Tautogolabrus adspersus) (**C**) Tube worm (*Spirobis sp.*) (**O**) (on kelp blades)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae *(Lithothamnium sp.*) (30%) Coral weed (*Corallina officinalis*) (1%) (Large boulder)
90-95	18	Small Boulder (70%) Large Boulder (30%)	Cunner (Tautogolabrus adspersus) (**C**) Tube worm (*Spirobis sp.*) (**O**) (on kelp blades)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae *(Lithothamnium sp.*) (30%)
95-100	21	Large Boulder (90%) Small Boulder (10%)	Cunner (Tautogolabrus adspersus) (**C**) Tube worm (*Spirobis sp.*) (**O**) (on kelp blades) Shorthorn Sculpin (*Myoxocephalus scorpius*) (**U** - 1 individual) Sea raven (*Hemitripterus americanus*) (**U** – 1 individual)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae *(Lithothamnium sp.*) (30%)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.2 - Transect T-2, Marine Terminal Site, Belleoram, October 27, 2006.

Transect Distance (m)	Depth (m)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
0-5		Large Boulder (60%) Small Boulder (40%)	No Fauna Observed	Knotted Wrack (*Ascophyllum nodosum*) (60%) Rockweed (*Fucus sp.*) (30%) (small) Sour Weed (*Desmarestia sp.*) (10%)
5-10		Small Boulder (95%) Large Boulder (5%)	No Fauna Observed	Cord weed (*Chordaria filum*) (25%) Sour Weed (*Desmarestia sp.*) (15%) Rockweed (*Fucus sp.*) (10%) (small) Knotted Wrack (*Ascophyllum nodosum*) (10%)
10-15		Small Boulder (90%) Large Boulder (10%)	No Fauna Observed	Cord weed (*Chordaria filum*) (20%) Sour Weed (*Desmarestia sp.*) (20%) Rockweed (*Fucus sp.*) (5%) (small) Knotted Wrack (*Ascophyllum nodosum*) (5%) Edible kelp (*Alaria sp.*) (2%) (Small) Red Fern (*Ptilota serrata*) (1%)
15-20		Small Boulder (60%) Large Boulder (40%)	White crust (*Didemnum sp.*) (**U**) (On wrack) Leafy bryozoan (*Flustra foliacea*) (**U**)	Cord weed (*Chordaria filum*) (30%) Knotted Wrack (*Ascophyllum nodosum*) (10%) Tubed weed (*Polysiphonia sp.*) (5%)
20-25		Large Boulder (70%) Small Boulder (30%)	Cunner (Tautogolabrus adspersus) (**O**)	Kelp (*Laminaria sp.*) (40%) (Damaged) Crustose algae (*Lithothamnium sp.*) (15%) Rockweed (*Fucus sp.*) (5%) Edible kelp (*Alaria sp.*) (2%) (Damaged) Sour Weed (*Desmarestia sp.*) (2%)
25-30		Large Boulder (75%) Small Boulder (20%) Gravel (5%)	Cunner (Tautogolabrus adspersus) (**C**)	Kelp (*Laminaria sp.*) (20%) (Damaged) Crustose algae (*Lithothamnium sp.*) (20%) Tubed weed (*Polysiphonia sp.*) (5%)
30-35		Large Boulder (70%) Small Boulder (25%) Gravel (5%)	Cunner (Tautogolabrus adspersus) (**O**)	Kelp (*Laminaria sp.*) (30%) (Damaged) Crustose algae *Lithothamnium sp.* (10%) Edible kelp (*Alaria sp.*) (5%) (Damaged)

35-40		Large Boulder (55%) Small Boulder (40%) Gravel (5%)	Blue mussels (*Mytilus edulis*) (**U**) Ocean pout (Macrozoarces americanus) (**U**) Cod (Gadus morhua) (**U**) Starfish (*Asterias sp.*) (**U**) White crust (*Didemnum sp.*) (**C**) (On kelp)	Kelp (*Laminaria sp.*) (30%) (Damaged) Crustose algae *Lithothamnium sp.* (20%) Sour Weed (*Desmarestia sp.*) (2%) Sea colander (*Agarum cribrosum*) (2%) Knotted Wrack (*Ascophyllum nodosum*) (2%)
40-45		Small Boulder (55%) Large Boulder (40%) Gravel (5%)	No Fauna Observed	Kelp (*Laminaria sp.*) (40%) (Damaged) Crustose algae *Lithothamnium sp.* (5%) Sea colander (*Agarum cribrosum*) (2%) Sour Weed (*Desmarestia sp.*) (1%)
45-50		Small Boulder (90%) Large Boulder (10%)	Cunner (Tautogolabrus adspersus) (**U**)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae *Lithothamnium sp.* (20%) Sea colander (*Agarum cribrosum*) (2%)
50-55		Small Boulder (90%) Large Boulder (5%) Gravel (5%)	Cunner (Tautogolabrus adspersus) (**C**)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae *Lithothamnium sp.* (40%)
55-60		Small Boulder (65%) Large Boulder (20%) Gravel (10%) Silt (5%)	Cunner (Tautogolabrus adspersus) (**C**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades) Starfish (*Asterias sp.*) (**O**)	Kelp (*Laminaria sp.*) (50%) (Damaged) Crustose algae *Lithothamnium sp.* (20%) Sea colander (*Agarum cribrosum*) (5%) Sour Weed (*Desmarestia sp.*) (2%)
60-65		Gravel (85%) Silt (5%) Large Boulder (5%) Small Boulder (5%)	Cunner (Tautogolabrus adspersus) (**C**) Frilled anemone (*Metridium senile*) (**U**)	Crustose algae *Lithothamnium sp.* (5%) Kelp (*Laminaria sp.*) (2%) (Damaged) Sea colander (*Agarum cribrosum*) (2%)
65-70		Gravel (90%) Silt (10%)	Cunner (Tautogolabrus adspersus) (**U**)	Kelp (*Laminaria sp.*) (5%) (Damaged)
70-75		Gravel (90%) Silt (10%)	Cunner (Tautogolabrus adspersus) (**O**)	Kelp (*Laminaria sp.*) (20%) (Damaged)
75-80		Gravel (88%) Large Boulder (2%) Silt (10%)	Cunner (Tautogolabrus adspersus) (**O**)	Kelp (*Laminaria sp.*) (30%) (Damaged)
80-85		Gravel (65%) Bedrock (30%) Silt (5%)	Cunner (Tautogolabrus adspersus) (**C**)	Kelp (*Laminaria sp.*) (40%) (Damaged) Sea colander (*Agarum cribrosum*) (2%)
85-90		Bedrock (70%) Gravel (20%) Silt (5%)	Cunner (Tautogolabrus adspersus) (**C**)	Kelp (*Laminaria sp.*) (60%) (Damaged)

		Sand (5%)		
90-95		Bedrock (50%) Gravel (30%) Sand (10%) Silt (5%) Small Boulder (5%)	Cunner (Tautogolabrus adspersus) (**C**)	Kelp (*Laminaria sp.*) (60%) (Damaged)
95-100	15	Bedrock (40%) Sand (30%) Gravel (15%) Silt (10%) Small Boulder (5%)	Cunner (Tautogolabrus adspersus) (**O**)	Kelp (*Laminaria sp.*) (20%) (Damaged)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.3 - Transect T-3, Marine Terminal Site, Belleoram, October 27, 2006.

Transect Distance (m)	Depth (m)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
0-5		Small Boulder (90%) Large Boulder (10%)	Periwinkle (*Littorina sp.*) (**O**)	Knotted Wrack (*Ascophyllum nodosum*) (50%) Crustose algae (*Lithothamnium sp.*) (10%) Kelp (*Laminaria sp.*) (5%) (Damaged) Rockweed (*Fucus sp.*) (10%)
5-10		Small Boulder (90%) Large Boulder (10%)	Periwinkle (*Littorina sp.*) (**O**) Sea Urchins (Strongylocentrotus droebachiensis) (**O**) Tube worm (*Spirobis sp.*) (**U**) (on kelp blades)	Knotted Wrack (*Ascophyllum nodosum*) (30%) Crustose algae (*Lithothamnium sp.*) (10%) Kelp (*Laminaria sp.*) (5%) (Damaged) Sea lettuce *(Ulva lactuca*) (5%) Rockweed (*Fucus sp.*) (5%) Dulse (Palmeria palmata) (1%) Irish Moss (*Chondrus crispus*) (1%)
10-15		Small Boulder (90%) Large Boulder (10%)	Periwinkle (*Littorina sp.*) (**O**) Sea Urchins (Strongylocentrotus droebachiensis) (**O**)	Sour Weed (*Desmarestia sp.*) (2%) Rockweed *(Fucus sp.*) (10%) (small damaged) Coral Weed (Corallina officinalis) (5%)
15-20		Small Boulder (80%) Large Boulder (20%)	Cunner (Tautogolabrus adspersus) (**O**) Sea Urchins (Strongylocentrotus droebachiensis) (**O**) Leafy bryozoan (*Flustra foliacea*) (**U** – 1 individual)	Crustose algae (*Lithothamnium sp.*) (20%) Kelp (*Laminaria sp.*) (5%) (Damaged) Sea lettuce *(Ulva lactuca*) (3%) Knotted Wrack (*Ascophyllum nodosum*) (2%) Rockweed (*Fucus sp.*) (2%) Edible Kelp (*Alaria sp.*) (1%) (Damaged) Sausage weed (Scytosiphon lomentaria) (1%) Sour Weed (*Desmarestia sp.*) (1%)
20-25		Small Boulder (90%) Large Boulder (10%)	Periwinkle (*Littorina sp.*) (**O**) Sea Urchins (Strongylocentrotus droebachiensis) (**O**)	Sour Weed (Desmarestia sp.) (2%) Rockweed (*Fucus sp.)* (10%) (small damaged) Coral Weed (Corallina officinalis) (5%)
25-30		Small Boulder (80%) Large Boulder (20%)	Cunner (Tautogolabrus adspersus) (**O**) Sea Urchins (Strongylocentrotus droebachiensis) (**O**) Leafy bryozoan (*Flustra foliacea*) (**U** – 1 individual)	Crustose algae (*Lithothamnium sp.*) (20%) Kelp (*Laminaria sp.*) (5%) (Damaged) Sea lettuce *(Ulva lactuca*) (3%) Knotted Wrack (*Ascophyllum nodosum*) (2%) Rockweed (*Fucus sp.*) (2%) Edible Kelp (*Alaria sp.*) (1%) (Damaged)

				Sausage weed (Scytosiphon lomentaria) (1%) Sour Weed (*Desmarestia sp.*) (1%)
30-35		Small Boulder (80%) Large Boulder (20%)	Cunner (Tautogolabrus adspersus) (**O**)	Crustose algae (*Lithothamnium sp.*) (20%) Kelp (*Laminaria sp.*) (5%) (Damaged) Sea lettuce (*Ulva lactuca*) (3%)
35-40		Small Boulder (90%) Large Boulder (10%)	Cunner (Tautogolabrus adspersus) (**O**) Sea Urchins (Strongylocentrotus droebachiensis) (**O**)	Crustose algae (*Lithothamnium sp.*) (20%) Kelp (*Laminaria sp.*) (5%) (Damaged) Knotted Wrack (*Ascophyllum nodosum*) (5%)
40-45		Small Boulder (80%) Large Boulder (20%)	Cunner (Tautogolabrus adspersus) (**O**) Sea Urchins (Strongylocentrotus droebachiensis) (**O**)	Crustose algae (*Lithothamnium sp.*) (10%) Sour Weed (*Desmarestia sp.*) (10%) Knotted Wrack (*Ascophyllum nodosum*) (5%) Kelp (*Laminaria sp.*) (5%) (Damaged) Rockweed (*Fucus sp.*) (3%) Sea lettuce (*Ulva lactuca*) (2%) Edible Kelp (*Alaria sp.*) (2%) (Damaged) Sausage weed (Scytosiphon lomentaria) (1%)
45-50		Small Boulder (70%) Large Boulder (30%)	Cunner (Tautogolabrus adspersus) (**O**) Sea Urchins (Strongylocentrotus droebachiensis) (**O**)	Crustose algae (*Lithothamnium sp.*) (10%) Kelp (*Laminaria sp.*) (5%) (Damaged) Sour Weed (*Desmarestia sp.*) (10%) Edible Kelp (*Alaria sp.*) (2%) (Damaged)
50-55		Small Boulder (55%) Large Boulder (40%) Gravel (5%)	Cunner (Tautogolabrus adspersus) (**O**)	Crustose algae (*Lithothamnium sp.*) (10%) Kelp (*Laminaria sp.*) (5%) (Damaged) Edible Kelp (*Alaria sp.*) (2%) (Damaged)
55-60		Small Boulder (55%) Large Boulder (40%) Gravel (5%)	Cunner (Tautogolabrus adspersus) (**O**) Starfish (*Asterias sp.*) (**O**)	Tubed weed (*Polysiphonia sp.*) (60%) Crustose algae (*Lithothamnium sp.*) (10%) Kelp (*Laminaria sp.*) (5%) (Damaged) Edible Kelp (*Alaria sp.*) (2%) (Damaged) Sea lettuce (*Ulva lactuca*) (2%)
60-65		Small Boulder (85%) Gravel (10%) Large Boulder (5%) Crevices	Blue mussels (*Mytilus edulis*) (**U**) Starfish (*Asterias sp.*) (**O**)	Kelp (*Laminaria sp.*) (50%) (Large Stipes, Damaged) Crustose algae (*Lithothamnium sp.*) (50%) Tubed weed (*Polysiphonia sp.*) (5%) Sea colander (*Agarum cribrosum*) (2%)
65-70		Small Boulder (80%) Bedrock (10%) Large Boulder (10%)	No Fauna Observed	Kelp (*Laminaria sp.*) (50%) (Large Stipes, Damaged) Crustose algae (*Lithothamnium sp.*) (50%)
70-75		Small Boulder (60%) Bedrock (30%)	No Fauna Observed	Kelp (*Laminaria sp.*) (20%) (Damaged)

		Large Boulder (10%)		
75-80		Bedrock (70%) Small Boulder (20%) Large Boulder (10%)	No Fauna Observed	Kelp (*Laminaria sp.*) (20%) (Damaged)
80-85		Small Boulder (70%) Large Boulder (20%) Bedrock (100%)	Cunner (Tautogolabrus adspersus) (**O**)	Kelp (*Laminaria sp.*) (50%) (Damaged)
85-90		Small Boulder (80%) Large Boulder (20%	Cunner (Tautogolabrus adspersus) (**O**) Blue mussels (*Mytilus edulis*) (**U**)	Kelp (*Laminaria sp.*) (60%) (Damaged) Sea colander (*Agarum cribrosum*) (2%)
90-95		Large Boulder (70%) Small Boulder (30%)	Cunner (Tautogolabrus adspersus) (**C**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades) Starfish (*Asterias sp.*) (**O**)	Kelp (*Laminaria sp.*) (60%) (Damaged) Crustose algae (*Lithothamnium sp.*) (60%) Sea colander (*Agarum cribrosum*) (2%) Sour Weed (*Desmarestia sp.*) (1%)
95-100	13	Large Boulder (80%) Small Boulder (20%)	Cunner (Tautogolabrus adspersus) (**O**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades)	Kelp (*Laminaria sp.*) (60%) (Damaged) Crustose algae (*Lithothamnium sp.*) (60%) Sea colander (*Agarum cribrosum*) (2%)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon

Table A.4 - Transect T-4, Marine Terminal Site, Belleoram, October 27, 2006.

Transect Distance (m)	Depth (m)	Substrate Type (% Coverage)	Macrofaunal Life (Estimated Abundances)	Macrofloral Life (Estimated % Coverage)
0-5	0-2	Small Boulder (90%) Large Boulder (10%)	No Fauna Observed	Knotted Wrack (*Ascophyllum nodosum*) (40%) Sour Weed (*Desmarestia sp.*) (20%) Rockweed (*Fucus sp.*) (20%) (small) Edible kelp (*Alaria sp.*) (2%) (Small) Red Fern (*Ptilota serrata*) (1%)
5-10	3	Small Boulder (60%) Large Boulder (40%)	Cunner (Tautogolabrus adspersus) (**C**) Starfish (*Asterias sp.*) (**U**)	Knotted Wrack (*Ascophyllum nodosum*) (10%) Rockweed (*Fucus sp.*) (5%) (small) Tubed weed (*Polysiphonia sp.*) (5%)
10-15	3	Large Boulder (60%) Small Boulder (40%)	Cunner (Tautogolabrus adspersus) (**O**)	Crustose algae (*Lithothamnium sp.*) (40%) Edible kelp (*Alaria sp.*) (2%) (Small) Kelp (*Laminaria sp.*) (5%) (Damaged)
15-20	7	Large Boulder (80%) Small Boulder (20%)	Cunner (Tautogolabrus adspersus) (**C**) Starfish (*Asterias sp.*) (**U**) Frilly anemone (*Metridium senile*) (**U**)	Crustose algae (*Lithothamnium sp.*) (50%) Kelp (*Laminaria sp.*) (5%) (Damaged)
20-25	12	Large Boulder (80%) Small Boulder (20%)	Cunner (Tautogolabrus adspersus) (**C**) Starfish (*Asterias sp.*) (**O**)	Crustose algae (*Lithothamnium sp.*) (40%) Kelp (*Laminaria sp.*) (30%) (Damaged) Sour Weed (*Desmarestia sp.*) (30%) Tubed weed (*Polysiphonia sp.*) (20%) Sea lettuce (*Ulva lactuca*) (2%)
25-30	12	Large Boulder (80%) Small Boulder (20%)	Cunner (Tautogolabrus adspersus) (**C**) Starfish (*Asterias sp.*) (**O**) Tube worm (*Spirobis sp.*) (**O**) (on kelp blades)	Crustose algae (*Lithothamnium sp.*) (50%) Kelp (*Laminaria sp.*) (30%) (Damaged) Sour Weed (*Desmarestia sp.*) (2%) Dulse (Palmeria palmata) (2%)
30-35	13	Large Boulder (60%) Small Boulder (30%) Gravel (10%) Crevices	Cunner (Tautogolabrus adspersus) (**O**) Starfish (*Asterias sp.*) (**O**)	Kelp (*Laminaria sp.*) (40%) (Damaged) Crustose algae (*Lithothamnium sp.*) (30%) Coral weed (Corallina officinalis) (2%)
35-40	13	Large Boulder (50%) Small Boulder (40%)	Cunner (Tautogolabrus adspersus) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae (*Lithothamnium sp.*) (50%)

		Gravel (10%) Crevices		
40-45	14	Small Boulder (60%) Large Boulder (30%) Gravel (10%)	Cunner (Tautogolabrus adspersus) (**C**) Periwinkle (*Littorina sp.*) (**C**)	Kelp (*Laminaria sp.*) (80%) (Damaged) Crustose algae (*Lithothamnium sp.*) (5%)
45-50	14	Small Boulder (50%) Large Boulder (30%) Gravel (20%)	Cunner (Tautogolabrus adspersus) (**O**) Periwinkle (*Littorina sp.*) (**O**) Scallop (*Placopecten magellanicus*) (**U** – 1 individual)	Kelp (*Laminaria sp.*) (80%) (Damaged) Sea colander (*Agarum cribrosum*) (2%)
50-55	14	Small Boulder (70%) Large Boulder (30%)	Cunner (Tautogolabrus adspersus) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Kelp (*Laminaria sp.*) (80%) (Damaged) Sea colander (*Agarum cribrosum*) (2%)
55-60	15	Small Boulder (70%) Large Boulder (30%)	Cunner (Tautogolabrus adspersus) (**C**) Periwinkle (*Littorina sp.*) (**O**)	Kelp (*Laminaria sp.*) (80%) (Damaged)
60-65	15	Large Boulder (70%) Small Boulder (30%)	Cunner (Tautogolabrus adspersus) (**O**) Periwinkle (*Littorina sp.*) (**C**)	Kelp (*Laminaria sp.*) (80%) (Damaged) Sea colander (*Agarum cribrosum*) (2%) Crustose algae (*Lithothamnium sp.*) (2%)
65-70	15	Large Boulder (90%) Small Boulder (10%)	Cunner (Tautogolabrus adspersus) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae (*Lithothamnium sp.*) (5%)
70-75	17	Large Boulder (90%) Small Boulder (10%)	Cunner (Tautogolabrus adspersus) (**O**) Periwinkle (*Littorina sp.*) (**O**)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae (*Lithothamnium sp.*) (5%)
75-80	20	Large Boulder (100%)	Cunner (Tautogolabrus adspersus) (**O**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades) Periwinkle (*Littorina sp.*) (**O**)	Kelp (*Laminaria sp.*) (80%) (Damaged) Crustose algae (*Lithothamnium sp.*) (5%
80-85	19	Large Boulder (100%)	Cunner (Tautogolabrus adspersus) (**O**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae (*Lithothamnium sp.*) (10%) Sea colander (*Agarum cribrosum*) (2%)
85-90	19	Large Boulder (90%) Gravel (5%) Silt/Fines (5%)	Cunner (Tautogolabrus adspersus) (**O**) Tube worm (*Spirobis sp.*) (**C**) (on kelp blades)	Kelp (*Laminaria sp.*) (70%) (Damaged) Crustose algae (*Lithothamnium sp.*) (15%) Rockweed (*Fucus sp.*) (2%)
90-95	24	Silt/Fines (60%) Gravel (40%)	Cunner (Tautogolabrus adspersus) (**C**)	Kelp (*Laminaria sp.*) (10%) (Damaged)
95-100	24	Silt/Fines (60%) Gravel (40%	Cunner (Tautogolabrus adspersus) (**U**)	Kelp (*Laminaria sp.*) (10%) (Damaged)

A = Abundant, **C** = Common, **O** = Occasional, **U** = Uncommon