VALE

Long Harbour
Processing Plant

Environmental Protection Plan for Construction

Vale Newfoundland & Labrador Limited

December 2010

Vale Newfoundland & Labrador Limited
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Environmental Protection Plan – Construction Phase

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1. Preface

1.1 Maintenance of the Environmental Protection Plan (EPP)

The EPP is a directive document, which gives detailed steps to avoid or minimize negative impacts on the environment for all the work elements involved in the construction of the Project. The responsibilities and procedures presented herein are designed to ensure the effectiveness of the plan and to provide for ongoing improvement to the plan to address any deficiencies, inadequacies or potential improvements that may become apparent from time to time. This preface covers the following:

- EPP Responsibilities.
- EPP Revision Procedures.

1.1.1 EPP Responsibilities

Vale Newfoundland & Labrador Limited (Vale NL) shall:

- Provide approval for final issued version of the EPP and subsequent revisions.
- Inspect and monitor all activities during site construction.
- Conduct a review of the EPP on an as needed basis.
- Liaise with relevant government agencies and community interest groups as required.

The Vale NL Project Environmental, Health and Safety Manager (EHSM), or their designated representative(s) shall:

- Be responsible for EPP implementation.
- Monitor the effectiveness of the EPP.
- Review and approve revision requests.
- Conduct a review of the EPP on an as needed basis.
- Maintain Document Control.
- Make sure that EPP holders and their staff are familiar with the EPP and its procedures.
- Strive for compliance with all permits, approvals and authorizations; and make sure that a designated Site Environmental Superintendent (SES) is resident on site during all construction activities.

The Engineering, Procurement, and Construction Management (EPCM) Site Environmental Manager, or their designate (SEM) shall:

- Distribute revisions to EPP holders.
- Be familiar with all aspects of the EPP.
- Confirm that all activities are conducted in accordance with the EPP.
- Hold an environmental awareness session for each Contractor and its personnel, and other personnel to be involved in the Project during site orientation.
- Report on the effectiveness of the EPP.
- Attend weekly contractor meetings.
- Identify any deficiencies or gaps in the plan and propose changes to address these deficiencies.
- Direct appropriate contingency actions and enact external notification procedures in the event of an incident.
- In his or her absence, designate an alternate SEM.
- Manage the environmental inspection and monitoring needed to meet the requirements of this EPP and reporting requirements of Vale NL.

EPP holders shall:

- Keep copy current and enter all revisions on the revision control record.
- Familiarize themselves and their personnel with the EPP and any revisions.
- Initiate changes to improve the quality of the plan.

Contractors, Subcontractors and Site Personnel shall:

- Become familiar with the EPP.
- Become knowledgeable of reporting procedures.
- Comply with the EPP, all requirements of the contract and all applicable laws and regulations.
- Obtain all applicable permits, approvals and authorizations in coordination with the EPCM, SEM and Vale NL Environment Health and Safety Group.
- Attend all required environment, health and safety trainings and orientation programs as per current site policy.
- Report all incidents of non-compliance with the EPP.

1.1.2 EPP Revision Procedures

The EPP is a controlled document and revisions may only be made with the approval of Vale NL. EPP holders and readers/reviewers may initiate proposed revisions by forwarding recommended revisions to the Vale NL Project Environmental Superintendent (VPES) using the Revision Request Initiation Form. The VPES, or designate, will then prepare, where appropriate, a proposed revision for approval by Vale NL.

The Project Environment, Health and Safety Manager or the designated representative must review and approve the revision request. When the VPES obtains the approved Revision, it will be issued to all holders of controlled copies of the EPP. Each revision will be accompanied by a Revision Control Record that:

- Provides revision instructions.
- Lists the sections being superseded.

An updated table of contents will be included with each revision. This table of contents will indicate current status of each section contained in the plan.

When the EPP holders receive a revision within two working days they will:

- Read the text of the revision.
- Check the Revision Control Record to confirm that all the listed pages have been received.
- Remove and destroy the superseded pages.
- Insert the revised pages in the proper place.
- Page check the plan, using the updated table of contents to confirm the plan is complete and current.
- Enter the revision number and date on the Revision Control Record.
- Incorporate the revision into the area of responsibility, as appropriate.
- Confirm that their personnel are familiar with the revisions.

Environmental Protection Plan

Revision Request Initiation Form

SECTION TO BE REVISED:

NATURE OF REVISION:

RATIONALE FOR REVISION:

(i.e., environment/worker safety, etc.)

SUBMISSION:

Please submit request to the directly to the SEM or the SES.

Environmental Protection Plan

Revision Control Record

Revision Number	EPP Section	Revision Date	Description	EPP Holder's Signature

List of Acronyms

AEPR	Annual Environmental Performance Review
ANFO	Ammonium Nitrate Fuel Oil
ATV	All-terrain Vehicles
CCME	Canadian Council of Ministers of the Environment
CNPP	Commercial Nickel Processing Plant
CWTM	Contractor's Weekly Tool-box Meetings
DFO	Fisheries and Oceans Canada
DOEC	Department of Environment and Conservation, Government of Newfoundland and Labrador
DSTI	Daily Safe Task Instruction
EH&S	Environment, Health and Safety
EHSM	Vale Project Environment, Health and Safety Manager
EIS	Environmental Impact Statement
EMP	Environmental Monitoring Plan for Construction, 2010 - 2013
EPCM	Engineering, Procurement, and Construction Management
EPP	Environmental Protection Plan
ERP	Emergency Response Plan
HADD	Harmful Alteration, Disruption or Destruction of Fish Habitat
HSE	Health, Safety and Environmental
HSES	Health, Safety, Environment and Security
IC	Incident Commander
JEA	Job Environmental Analysis
NLDGS	Newfoundland and Labrador Department of Government Services
NLDNR	Newfoundland and Labrador Department of Natural Resources
NOS	DFO National Operational Statement
NOx	Nitrogen Oxides
PAO	Department of Tourism, Culture and Recreation, Provincial Archaeology Office
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
RCMP	Royal Canadian Mounted Police
SARA	Species at Risk Act
SEM	EPCM Site Environmental Manager
SES	Vale NL Site Environmental Superintendent
TSS	Total Suspended Sediment

TPH	Total Petroleum Hydrocarbon
VEC	Valued Ecosystem Components
VPES	Vale NL Project Environment Superintendent
WHIMS	Workplace Hazardous Materials Information System

1. Introduction

1.1 Vale NL Health, Safety and Environmental Management System

Vale Newfoundland and Labrador Limited (Vale NL) has defined a Health, Safety and Environmental (HSE) policy to present the Company's overall intentions related to its performance and has set its objectives and targets within this policy.

Vale NL is committed to:

- Comply with applicable legal and other requirements,
- Pollution Prevention,
- Eliminate or minimize risks to personnel and other interested parties who could be exposed to occupational health and safety hazards associated with the Company's activities, and
- Implement, maintain and continually improve its management system.

Vale NL also supports sustainable development, which seeks to enhance society through economic development and environmental responsibility. Vale NL believes that mineral products are essential for the development of a sustainable economy, and that the protection of worker health and safety, as well as the health of surrounding communities and the environment, are essential considerations in the management of its business. These beliefs are also reflected in the Vale NL HSE Policy (Figure 1.2).

Vale NL believes that all accidents are preventable. Safety targets are set because excellence can be achieved only with effort and by motivating the entire workforce to make safety a top priority. Through a variety of safety initiatives and a program of continuous improvement, the Company is committed to achieve a goal of zero accidents. All employees are responsible for accident prevention within Vale NL facilities. Ten safety principles define the Company's commitment to achieving an injury-free and safe work environment:

- Everyone has the right to a safe environment.
- Safety will not take second place to any other management responsibility.
- Management is directly responsible for preventing injuries and occupational illness.
- Working safely is a condition of employment.
- All accidents can be prevented.
- All employees must be involved and supportive of the safety program.
- Training is an essential element for safe workplaces.
- Management must personally audit safety performance in the workplace.
- Safe work practices should be reinforced, and all unsafe acts and unsafe conditions must be corrected promptly.
- It is essential to investigate injuries and occupational illnesses, as well as incidents with the potential for injury.

1.1.1 Roles and Responsibilities

This section outlines the roles and responsibilities of all project personnel, including Vale NL company personnel and contractor personnel, with respect to environmental management of this project.

Vale NL Project Director: The Vale NL Project Director is responsible for the development of the Long Harbour Processing Plant.

Vale NL Project Environment, Health and Safety Manager: The Vale NL Manager, Environment, Health and Safety (EH&S) is responsible for the implementation of Vale NL's EH&S Management System, as well as the company's environmental policies and plans, including EPPs.

Vale NL Construction Manager: The Vale NL Construction Manager is responsible for overseeing the EPCM Contractor and all activities at the site. The Vale NL Construction Manager reports directly to the Vale NL Project Director.

Vale NL Project Environment Superintendent (VPES): is the senior, Vale Environmental representative, reporting to the Manager, Environment, Health and Safety. The VPES is responsible for:

- Communication with the public and government on environmental matters.
- Overview of the work being carried out by the EPCM contractor, through the SES.
- Make sure that public concerns, and concerns of government monitoring agencies are addressed in a timely manner.
- Reviewing environmental monitoring data, and providing direction to the EPCM contractor on responding to anomalous results.

Vale NL Site Environmental Superintendent (SES): is responsible for providing support to the VPES in the day to day project activities, gathering information required for reports to regulators, managing site visits by regulatory agencies, receiving and responding to questions and concerns raised by local residents and auditing activities of the EPCM Contractor.

Vale NL Site Environmental Coordinators: report directly to the SES and interact with regulatory agencies, as directed. They liaise with the VPES as required for regulatory reporting, coordination of site visits and information transfer. They are responsible for daily, weekly and monthly site environmental audits of EPCM and general site contractors.

EPCM Project Director: The EPCM Project Director is based in St. John's, and reports directly to the Vale NL Project Director.

EPCM Site Manager (Construction): The EPCM Site Manager (Construction) is located at the Project site, and is responsible for overseeing construction management and project development. The EPCM Site Manager (Construction) reports directly to the EPCM Project Manager in St. John's, and communicates directly with the Vale NL Construction Manager.

EPCM Construction Managers: Are responsible for all activities undertaken at the project site within their designated areas.

EPCM Site Environmental Manager (SEM): reports to the SES and EPCM Construction Manager, and is responsible for:

- Coordination and direction of environmental inspection and monitoring, reporting to the EPCM Construction Manager and the SES.

- Review of all EPPs and environmental plans submitted by contractors.
- Review of all environmental monitoring reports for submission to Vale NL.
- Advising EPCM Construction Manager of actions needed where Contractors are not in compliance with the EPP, environmental requirements, and/or monitoring indicates environmental parameters are not being met.
- Conducting or delegating environmental orientation of new personnel.

EPCM Environmental Monitor: reports to the SEM and is responsible to:

- Maintain water sampling equipment.
- Collect, preserve and label all water quality samples under the direction of the SEM.
- Undertake on-site analyses, and send samples for off-site analyses.
- Prepare and send all blanks, splits and spiked samples for Quality Assurance/Quality Control (QA/QC) purposes.
- Review all water quality data, including test results, schedules and logs, and submit water quality reports to the SEM.
- If necessary, initiate actions to resolve water quality issues.
- Maintain database of water quality data and flow data.
- Review air quality data provided by Air Quality contractor.
- Assist the SEM with reporting, provision of training materials, orientation of on-site staff and reporting on contractor environmental training.

EPCM Environmental Coordinators: report to the SEM and are responsible for:

- Reviewing contractors EPPs and providing comment to the SEM.
- Under the direction of the SEM coordinate all on-site inspection of protection measures, including silt management systems, marking of protected areas, management of fuels, chemicals and waste materials. Providing reports and photographic record of environmental protection measures in place prior to construction.
- Responding to any reports of wildlife identified on-site, and determining appropriate action required to mitigate effects of disturbance.
- During construction activities, monitoring the performance of protection measures, identifying areas where changes are needed and advising the SEM accordingly. The performance of the environmental protection measures will be documented, including photographs, sampling of discharges and/or spills, and observations of downstream/downwind impacts.

Contractors: will undertake the construction of the Project. The contractors are responsible for implementing environmental procedures as outlined in the Client and Contractor EPPs, regulations, guidelines, permits, approvals and authorizations. The EPP will be one of several Project documents that will be used to evaluate the Contractors' EH&S performance.

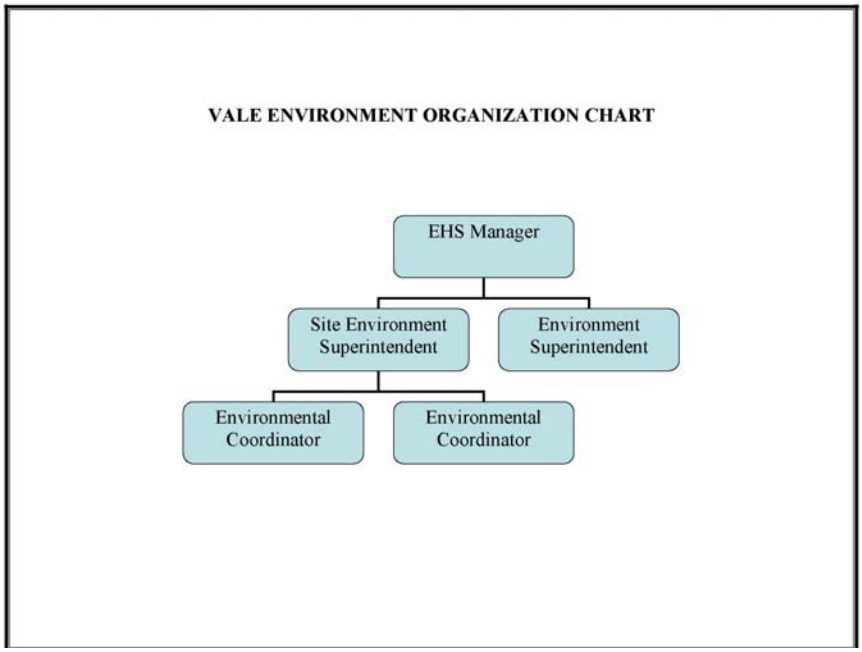
Contractors Environmental Representatives: will be the persons within the contractors organizations responsible for coordinating environmental requirements and for liaison with the EPCM

Environmental Coordinators. The Contractors Environmental Representative may be full-time or part-time depending on the size and potential environmental impact of the contract.

All Company and Contractor Personnel: All personnel on site are responsible for carrying out their activities in accordance with the EPP and to report to the environmental coordinators any events that they consider need a response to mitigate adverse impact.

1.1.2 Organization Charts

The reporting structure for environmental matters during construction is indicated in Figure 1-1, below.



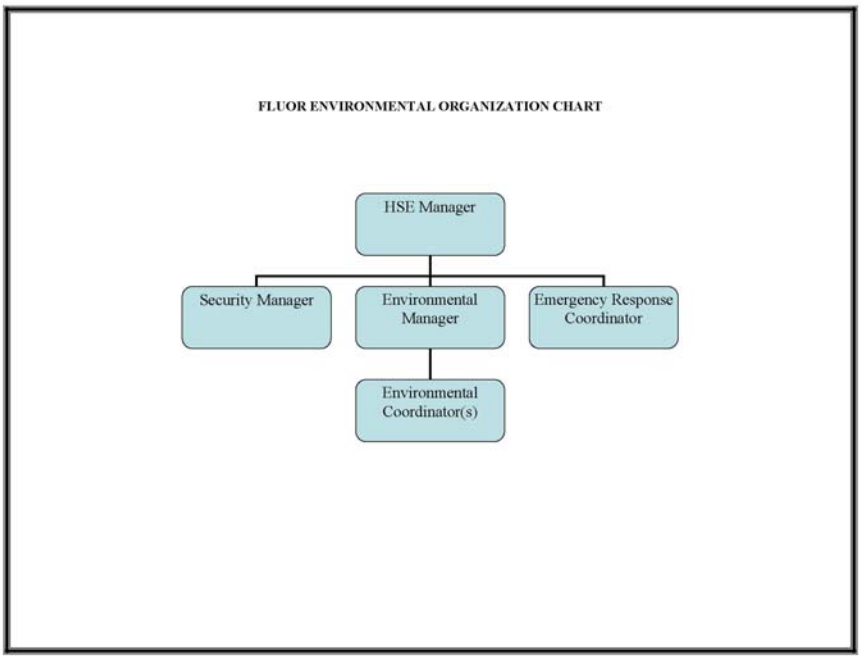


Figure 1-1: Project Environmental Team Organization Charts

1.1.3 EPP for Construction – Development Strategy

As described in the Environmental Impact Statement for this Project, and as required to comply with the Vale Health, Safety and Environmental Management System, the actions required to protect the environment during the construction phase are described in this EPP and the following other plans:

- Waste Management Plan – Construction Phase (69-131-010-LRT-0003).
- Construction Emergency Response Plan (69-010-010-XPL-1002).
- Environmental Monitoring Plan for Construction, 2010 – 2013 (69-9250-010-LRT-1001).
- Site Health, Safety, Environment and Security Manual (69-010-010-GMN-1002).

Occupational Health and Safety measures are described in a separate plan, and additional environmental plans will be developed for other phases of the Project.

This EPP Construction Phase, addresses the scope of anticipated activities during the construction phase of the Long Harbour Processing Plant. Construction and site development activities are described in Section 1.6 of this EPP.

The content of this EPP addresses several key commitments and considerations including:

Review and Acceptance of the EPP: Environmental Management Agencies need to review key environmental planning documents for the Project, including EPPs.

Engineering Design and Construction Methods: At this stage of the construction, there is more certainty around the facility design, construction methods and scheduling of activities.

Environmental Performance: Focusing on early construction activities provides an opportunity for critical early monitoring of the EPP and overall environmental performance at the work site. During this period the effectiveness of environmental protection measures can be monitored and evaluated, and modifications or improvements to mitigative measures can be assessed, or construction methods evaluated as necessary, to improve environmental performance.

1.2 Purpose of the Environmental Protection Plan

The Environmental Protection Plan (EPP) is an important component of overall project planning and implementation. For environmental protection during accidental events the Emergency Response Plan should be consulted.

This EPP addresses the environmental requirements and detailed procedures for all activities associated with the construction phase of this Project. Project personnel in the field and at the corporate level will use this EPP to make sure that commitments made in policy statements are implemented and monitored. The EPP helps to:

- Provide compliance with permits, authorizations and approvals anticipated for project activities and processes;
- Identify mitigation measures that either avoid potential adverse environmental effects or reduce potential adverse environmental effects to acceptable levels; and
- Put these important aspects of pollution prevention and environmental performance into a functional management framework.

The monitoring requirements needed to support the environmental management of construction are detailed in the Environmental Monitoring Plan for Construction, 2010-2013 (EMP).

In summary, this EPP:

- Defines actions needed to meet Vale NL commitments to reduce environmental effects.
- Documents environmental concerns and appropriate protection measures.
- Provides a reference document for personnel when planning and/or conducting specific activities.
- Communicates changes in the plan through the revision process.
- Provides a reference to and instructions for applicable legal and other requirements.
- Includes a reference for both project personnel and regulators to monitor compliance and recommend improvements.
- Provides direction at the corporate level to make sure commitments made in policy statements are implemented and monitored.

1.3 Owner's Policy

Vale NL endorses the principle of sustainable development. It is recognized that sustainable development includes commitments to health, safety and the environment through a balanced approach to economic, technical and social issues.

Vale NL is committed to protecting its employees, contractors, communities and the environment from detrimental effects that may result from the Company's business activities. Minimizing the risk to all stakeholders will be given top priority in Company plans, procedures, programs and training activities.

Vale NL's Health, Safety and Environmental (HSE) Policy is implemented to achieve and maintain high health, safety and environment management standards. This policy is the driver for implementing and improving the Company's management systems. Vale NL assesses plans, constructs, operates and decommissions all projects and facilities in compliance with this policy.

VALE

Safety, Health and Environmental Policy

Vale Newfoundland & Labrador (Vale NL) is committed to carrying out its business activities in a sustainable manner. This Policy sets forth Vale NL's commitment to protecting the safety, health and environment of our employees and contractors, the communities in which we operate and to the customers of our products. It also sets forth our commitment to social responsibility. The Policy applies to all Vale NL activities from exploration, mining, processing, refining, marketing through decommissioning and post-closure.

To implement this Policy, Vale NL will:

- Integrate sustainable development considerations into our business decision-making processes.
- Implement and maintain ethical business practices and sound systems of company governance.
- Uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities.
- Actively participate in the social, economic and institutional development of the communities in which we operate.
- Provide development opportunities for employees and encourage their participation in the continual improvement of our safety, health, environment and social performance.
- Comply with regulatory requirements and company safety, health, environment and social responsibility management systems, standards, codes of practice and guidelines.
- Work together with stakeholders to:
  - improve our knowledge of the social and environmental impacts of our business activities
  - share and adopt improved technologies and best practices to prevent and minimize undesirable impacts through the life cycle of our products
  - assess risks and implement risk management strategies based on social concerns, valid data and sound science.
- Through our product stewardship commitment, facilitate and encourage responsible design, use, re-use, recycling and disposal of our products and by-products.
- Contribute to the enhancement of the environment through activities such as the protection and improvement of biodiversity and responsible land use planning.
- Engage our stakeholders through open and transparent communication and verifiable reporting.

Tom Paddon, *General Manager*
Vale Newfoundland & Labrador

May 2010

Growing Together.

Figure 1-2: Vale NL Health, Safety and Environmental Policy.

1.4 Organization of the EPP

This EPP provides instructions to confirm that Project personnel understand and implement environmental protection procedures for both routine activities and unplanned events associated with the construction of the Project.

The EPP comprises the following sections:

a) The Preface describes the distribution of the EPP, and outlines its maintenance (roles and responsibilities), revision and document control procedures.

b) Section 1 provides an introduction to the EPP; including an overview of the Vale NL HSE Management System, Vale NL HSE policy, the purpose of the EPP, the organization of the EPP, development and implementation of the EPP, environmental orientation and project description.

c) Section 2 describes the environmental concerns associated with the construction phase of the planned Project.

d) Section 3 contains the Environmental Protection Procedures to be implemented during the construction phase. It provides summaries of the various construction activities, identifies potential environmental concerns and proposes appropriate mitigation to eliminate or reduce potential environmental impacts organized by activity.

e) Section 4 provides contingency plans for potential unplanned and accidental events such as spills of fuel or other hazardous material, wildlife encounters, the discovery of historic resources, the discovery of contaminated or hazardous material. Response to vessel accidents and fires and explosions and extreme weather are located in the Emergency Response Plan.

f) Section 5 outlines the legislation, the required permits, approvals and authorizations for all aspects of the construction phase.

g) Section 6 contains the emergency, advisory and other contact information.

h) Section 7 includes other environmental protection resource material.

i) Section 8 provides environmental protection data for specific sites such as port area, residue disposal site and plant area, with reference to the relevant sections of this document.

1.5 Development and Implementation of the EPP

The focus of this EPP is on the construction of the Long Harbour Processing Plant. The EPP will be revised as necessary to meet the requirements of reviewers, and to meet the Terms and Conditions of environmental approvals.

EPPs typically undergo continuous revision to reflect new and site-specific construction sequences and work methods and environmental protection requirements and responsibilities. This EPP is structured to allow for updates and revisions as work continues.

1.5.1 Mechanisms for Implementation

The effectiveness of the EPP depends largely on the avenues by which appropriate application of EPP guidelines can be applied. Adequate communication between construction personnel and site environmental staff is necessary to confirm that work tasks that have the potential to cause environmental impact are identified. Mechanisms currently used to confirm conformance and dissemination of EPP guidelines and information include:

- Inclusion of EPP in Contract Documents.
- Annual Environmental Performance Review.
- Job Hazard Analysis.
- Daily Safe Task Instruction.
- Contractors Weekly Toolbox Meetings.
- Environmental Action Meetings.
- Environmental Orientation.

1.5.1.1 Inclusion of EPP in Contract Documents

All contracts that are released to bidders will contain a copy of the Environmental Protection Plan for the project as an appendix. After award of all contracts, a controlled copy of the document will be issued to the successful bidder, as noted in the Preface to this document.

The following list defines how EPP measures will be identified on the issued for construction drawings:

- Key aspects of any EPP measures or relevant section of the EPP will be placed on relevant drawings issued for construction by engineering.
- The Environmental Engineer will review and approve all drawings issued for construction.
- The Environmental Engineer will review all applications or permits, authorizations and approvals as well as the conditions and clauses contained in any such permits, authorizations and approvals.
- Changes in EPP procedures and practices, whether required by Vale NL Project Team, Vale NL Corporate, Vale Limited or to reflect the current conditions and clauses contained in any existing or new permits, authorizations and approvals will be provided to engineering by the Environmental Engineer, to be transferred to updated drawings issued for construction by engineering.
- Any changes to the EPP or documents issued for construction will be communicated through the existing Revision Control Record and procedures.

1.5.1.2 Annual Environmental Performance Review (AEPR).

At the end of each construction year Vale NL and site contractors will conduct an environmental performance review workshop to review all work activity as it relates to environmental concerns, issues and/or mitigations. The review process will allow all parties an opportunity to evaluate overall environmental performance and compliance with government regulations, permitting conditions and EPP procedures. Recommendations will be drawn from the review to facilitate a process of continuous improvement in environmental performance.

1.5.1.3 Job Hazard Analysis (JHA)

For each new job task that has potential for environmental impact an in-depth analysis will be conducted on each step in the job procedure prior to the work commencing. The intent of the JHA is to identify all potential environmental hazards, and to provide appropriate mitigative measures as provided in Section 3. The initial JHA will be the responsibility of the individual contractor performing the work. A formal review of each JHA shall be conducted with participants to include the contractor, environmental site manager and also the Vale NL Project Environment Superintendent (or designate).

This review will also provide an avenue for discussion of previous JHAs and their effectiveness in mitigation. This is completed concurrent with the Job Safety Analysis process discussed in the Project Safety Management Plan.

1.5.1.4 Daily Safe Task Instruction (DSTI)

Daily Safe Task Instruction also known as Field Level Risk Assessment will be implemented in the following manner:

- Assessing the risk prior to work commencing, in order to communicate the risks to the employees involved in the tasks to be carried out.
- To confirm that on completion of the daily work, the area is left safe and without risk to employees entering that work area.
- DSTI should be conducted before and on completion of every shift.
- If the scope of work or job changes, the DSTI is revised and the changes communicated before commencing the changed job.

The DSTI is to be carried out at the work area by the Construction Supervisors and Team Leaders in the following manner:

- The Supervisor is to review the work to be carried out for the day, from which he must identify the hazard, assess the risk and decide on a methodology to minimize or mitigate those hazards and risks.
- The hazards and risks are to be written into the DSTI form and the controls are to be listed.
- Once the DSTI form is complete, the Supervisor is to communicate the hazards and risks to the workforce and discuss how they can be minimized and/or mitigated.
- At the end of shift the Construction Supervisor/Team Leader is to use the DSTI Close-out form, to confirm that on completion of work the area is left free of hazards and risks to employees entering the area.
- The DSTI should be signed by all team members acknowledging the items were discussed.
- The Contractor's Safety Officer should also sign all DSTIs in every work area.

1.5.1.5 Contractor's Weekly Tool-box Meetings (CWTM)

Each Contractor will hold tool-box meetings at weekly intervals. All site personnel will attend a weekly tool-box meeting. Health, Safety, Environment and Security (HSES) issues, both positive and negative, will be communicated. Tool-box meetings will focus discussion on hazards specific to the relevant area of the Project as well as any recent incidents in the workplace. EPCM Contractor will supply material for review and each meeting. This is in addition to the Contractor provided material. Meetings will be minuted, attendance taken and forward to the EPCM Contractor for filing.

Members of the Project's Construction Management Team will periodically attend Contractor's tool-box meetings to reinforce commitment to HSES, provide an opportunity for direct contact with personnel and monitor that the quality of the meetings is adequate. Contractor's senior site and offsite management are expected to attend these meetings on a weekly basis.

1.5.1.6 Environmental Action Meetings

Environmental Action Meetings centre on an issue that requires action and is manageable within a group's area of responsibility. A project leader would call the team together, state the purpose of the gathering, outline the facts of the specific issue and give a problem-solving question for discussion. The group then brainstorms ideas, selects actions and decides responsibilities and timing. A problem-solving question starts with phrases like 'What can we…?' or 'How can we…?' and is answerable in 20 to 30 minutes. Outcomes will be documented and signed by participants.

1.5.1.7 Environmental Orientation

Vale NL is committed to developing and implementing an environmental orientation and awareness program that will be ongoing throughout the construction of the Project. In support of this commitment, Vale NL will identify the awareness, knowledge, understanding and skills required by any person with the responsibility and authority to perform tasks on its behalf. Vale NL will make sure that all Project personnel are competent to do their jobs properly.

It will be mandatory for all persons working on the site to receive environmental orientation sessions prior to their employment for the construction phase of the Project and thereafter on an as-needed basis. All persons will be made aware of their roles and responsibilities, the HSE policy, management systems and the environmental aspects of the overall Project and their specific work activities. They will also be made familiar with this EPP and the environmental protection procedures described herein. These training sessions will be provided by the EPCM Contractor at a designated location in the Town of Long Harbour, or on site. Vale NL will also require that contractors working on its behalf are able to demonstrate that their employees have the requisite competence and/or appropriate training.

The following will be included in the environmental orientation and training program:

- Communication on Vale NL HSE management systems, HSE policy and obligations to the EPP.
- Roles and responsibilities, including emergency preparedness.
- Work description with discussion of the relevant individual activities and the particular environmental concerns associated with those activities.
- Orientation to sensitive environmental features on site.
- Instruction on the specific environmental protection procedures for the work, including applicable documentation, and mitigation measures that must be implemented when carrying out their activities.
- Communication procedures to report any unplanned events requiring immediate response.
- Maintenance of the EPP.
- Enforcement and importance of complying with the EPP.

Records of all environmental training sessions, including attendee names, dates and the information presented will be maintained.

1.6 Project Description

The Long Harbour Processing Plant (the Project) will be located in the Town of Long Harbour & Mount Arlington Heights, Placentia Bay, in the Province of Newfoundland and Labrador (Figure 1-3). A general Project layout is shown in Figure 1-4 showing the major components of the Project.

Figure 1-3: Project Location

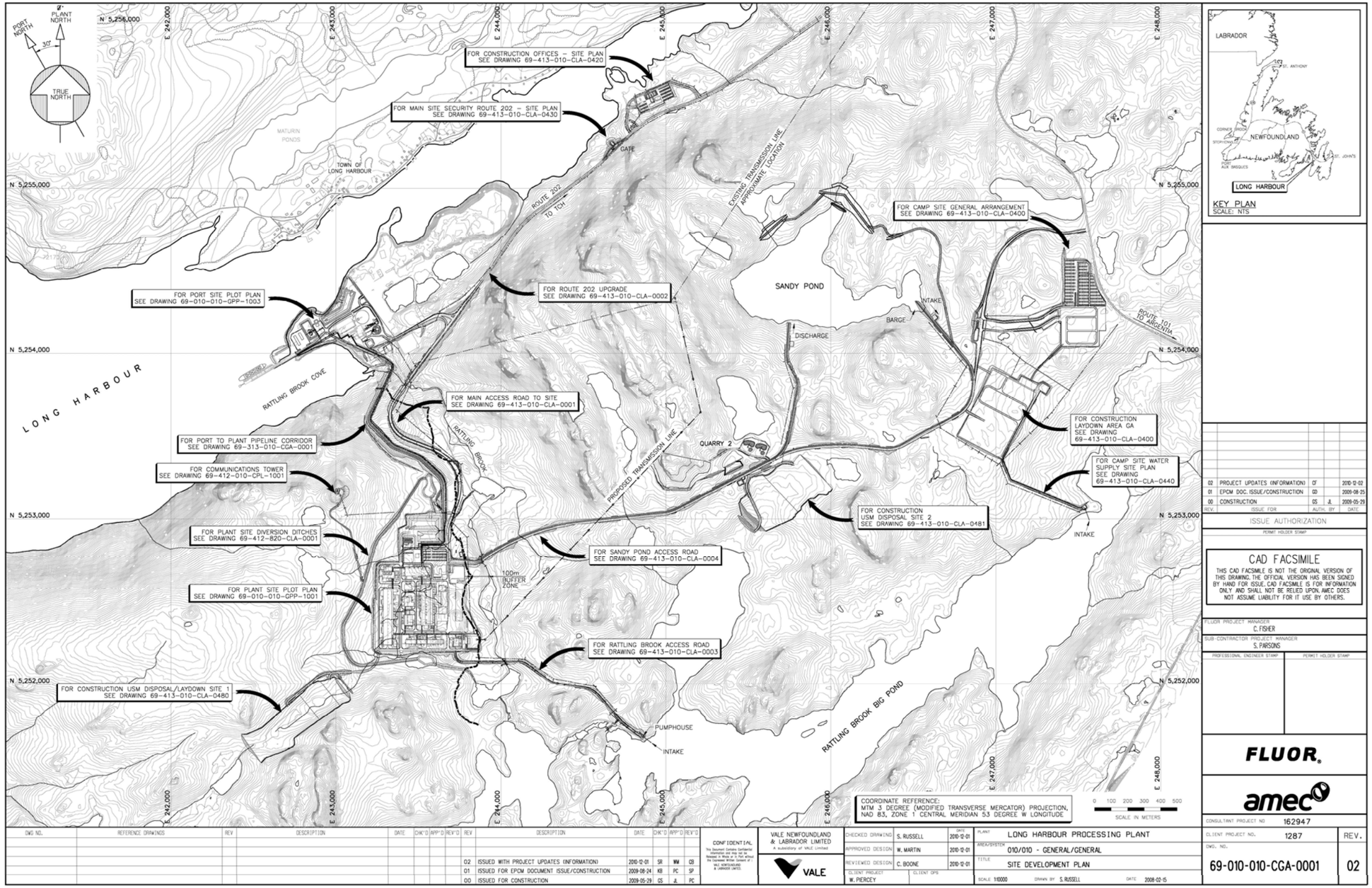


Figure 1-4: Overall Project Site Development Plan (Drawing #69-010-010-CGA-0001)

Construction and site development for the Project will include the following items:

- Building a construction camp including all required utilities.
- Enlarging the existing wharf, dredging the berthing area, installing a Roll on Roll off facility, and demolishing non-essential buildings and infrastructure at Tier 1.
- Pre-stripping, clearing, excavation, and site grading.
- Preparing drainage works.
- Constructing Plant buildings and installing of all the necessary process equipment.
- Constructing roads, storm water, water and sewage systems, and residue and raw material pipelines.
- Constructing a water control structure to control the level of Rattling Brook Big Pond for water supply.
- Constructing dams to raise the level of Sandy Pond for underwater residue storage.
- Installing a marine outfall.
- Building a construction office complex.

Construction accommodations will house workers who do not commute from nearby communities, and will be located about adjacent to Highway 101 on the east side of the Project site.

At the Port Site, dredging will provide adequate water depth for the concentrate carrier and other vessels. The wharf will be widened and expanded to accommodate conveyor systems. Much of the site preparation and infrastructure establishment will involve conventional heavy civil construction activities, all of which will be carried out in accordance with this Environmental Protection Plan.

2. Environmental Practices

2.1 Construction Activity Environmental Practice

Vale NL has identified those environmental aspects associated with construction activities that are within the scope of its environmental management system, in order to determine the environmental impacts of significance. Normal and abnormal conditions and foreseeable emergency situations are also considered during the identification process.

The Project has been planned to integrate environmental considerations (“designed-in” mitigation) in all aspects of the decision-making processes from pre-feasibility studies through design, construction, operation, decommissioning and closure. Key environmental principles considered in each phase of the Project include:

- Keeping Project boundaries as small as possible and controlling watershed use.
- Reducing the size and extent of physical disturbance.
- Increasing the amount of recycling of resources such as water.
- Reducing the number of release points (such as water discharges).
- Identifying environmentally sensitive areas and avoiding disturbance of these areas when possible.
- Planning all aspects of the Project for eventual closure.

The following best environmental practices will be implemented throughout the construction phase of the Project:

- Construction practices and scheduling will minimize stockpiling of materials to reduce fugitive dust emissions.
- Buffer zones will be established and flagged prior to any disturbance activities.
- Natural vegetation will be left in place wherever possible.
- A dedicated survey will be completed to identify trees that host the boreal felt lichen, a rare lichen listed as critically endangered by the International Union for the Conservation of Nature. Wherever possible, trees will be left in place. Where not possible, specimens will be relocated ahead of any site activity.
- Trees larger than 80 mm diameter will be salvaged prior to site clearing.
- Temporary diesel generators and other equipment required during construction will be muffled to control noise.
- Fuel storage and distribution areas will be centralized and graded to direct storm water runoff to an oil-water separator before being sent to a storm water management pond.
- Drainage from areas of exposed material will be controlled by grade or ditching and directed away from natural watercourses wherever possible. Surface water will be directed away from work areas by ditching. Runoff from these areas will have silt removed by settling, filtration, or other suitable methods. The requirement for ditch blocks/check dams or sediment traps to intercept runoff will be established during design and confirmed in the field prior to construction, and appropriate action taken.
- Preventative measures such as silt curtains will be in place to reduce suspended sediment entry and dispersion in water bodies.
- Regular monitoring of construction activities will be undertaken for leaks and spills.
- Stream crossings will be protected according to terms and conditions of provincial permits as well as guidelines issued by Fisheries and Oceans Canada (DFO). Construction of stream crossings will follow accepted engineering and construction practices. Culverts will be sized to handle a 25-year return period flood and installed in accordance with known best practices so that there is minimal disruption to substrate or flow characteristics. Crossings of Rattling Brook will be designed for a 100 year return period flood.
- Dams will be designed according to the Canadian Dam Association Guidelines and constructed to prevent their failure.
- Blasting activities will be in accordance with applicable guidelines for the protection of fauna and habitat.

3. Environmental Protection Procedures

Environmental protection procedures are given in this section for each of the identified construction activities. As the work progresses, these procedures may be modified or new procedures added, to account for new activities, site conditions, changes in engineering design or construction work

methods, and/or lessons learned from the work carried out to date. Specifically this initial document does not include commissioning activities.

In order that the individual environmental protection actions associated with each construction activity can be carried out efficiently and effectively certain support actions are needed. Environmental support activities comprise maintaining an up to date map and supporting documentation showing all buffer zones, including protection of any ecologically sensitive areas. This would include but not necessarily be limited to buffer zones around water courses and ponds, zones around trees containing boreal felt lichen, and any sites identified as requiring short or long term protection.

When required, this EPP will be revised to include new or amended environmental protection procedures to make sure that activities conducted are completed properly and that the site's significant environmental attributes are well managed.

3.1 General Clearing, Grubbing and Removal of Related Debris

3.1.1 Environmental Concerns

The removal of any trees and vegetation from the proposed Project site and pipeline right of way will be required to facilitate construction and site preparation activities for work areas, lay down areas, roads, transmission line installation, etc.

The principal concerns associated with vegetation clearing, grubbing and disposal of related debris are the potential adverse effects of erosion on marine and freshwater ecosystems and water quality through the release of sediment into watercourses. These concerns relate to the migration of sediment-laden water through direct runoff.

Other concerns are the potential for disturbing historic resources, damaging vegetation in or near watercourses, disturbance of migratory birds and nests and generation of dust during clearing and grubbing operations. Contaminated or hazardous material may also be encountered during clearing, grubbing and removal of related debris.

A concern specific to clearing on this site is disturbance of trees that contain the Boreal Felt Lichen (see Section 3.32).

3.1.2 Environmental Protection Procedures

The following environmental protection procedures shall be implemented to minimize these potential impacts:

1. All vegetation clearing, grubbing and disposal of related materials will adhere to all relevant regulatory requirements.
2. Measures will be implemented to reduce and control runoff of sediment-laden water during grubbing, and the re-spreading and stockpiling of grubbed materials. Where grubbed materials are re-spread or stockpiled, as many stumps and roots as possible will be left on the ground surface to maintain soil cohesion, to dissipate the energy of runoff, and promote natural re-vegetation. Erosion control measures will be implemented in areas prone to soil loss.
3. A cutting permit will be obtained prior to the start of any site clearing.
4. Clearing or removal of trees will be restricted to the minimum areas needed for access, site development and utility installation. Limits of clearing will be shown on drawings Issued for Construction.

5. Prior to clearing an area, all trees greater than 80 mm diameter will be cut, branches removed and stockpiled at a location determined by Vale NL.
6. Clearing will consist of cutting to within 20 cm of the ground and disposing of all standing trees, as well as the removal of all shrubs, debris and other perishable materials from the area. The Environmental Protection Guidelines for Ecologically Based Forest Resource Management (Newfoundland and Labrador Department of Forest Resources and Agrifoods (NLDFRA) 1998) will be adhered to.
7. Grubbing of the organic vegetation mat and/or the upper soil horizons will be minimized. Organic vegetation mat and upper soil horizon material which has been grubbed will be used to cover inactive exposed areas.
8. Grubbing activities will adhere to the buffer zone requirements outlined in Section 3.16 of this EPP.
9. A survey of soil stability and erodibility will be conducted to determine any unstable areas and to help develop appropriate erosion control measures. Grubbing of unstable or erodible soil will be limited to that necessary to satisfy the project engineering requirements. Where construction can be completed without grubbing, no grubbing shall be done. Erosion control techniques and devices will be used to stabilize easily eroded areas.
10. The use of mechanical clearing methods, such as a bulldozer, shall be acceptable except where the resulting terrain disturbance and erosion will result in the loss of topsoil or sediment into watercourses and water bodies. Chain saws or other hand-held equipment will be used in clearing vegetation except where alternative methods or equipment are approved by Vale NL. The use of mechanical clearing methods, such as heavy equipment, will not occur except where it can be demonstrated that there is no merchantable timber, and where the resulting terrain disturbance and erosion will not result in the loss of topsoil or the sedimentation of nearby watercourses and water bodies. All chainsaw operators will be equipped with an adequate fire extinguisher during the fire season, as well as shovels and axes.
11. Runoff of sediment-laden water during grubbing will be minimized by using such measures as settling ponds, ditch blocks, interception ditches and filter fabrics. Erosion control measures such as rip rap, filter fabrics, drainage channels and gravel or wood chip mulches will be implemented in areas prone to soil loss.
12. Grubbed materials and debris will not be pushed into areas that are to be left undisturbed.
13. All vegetation debris and grubbed materials will be stockpiled and used for reclamation and re-vegetation or will be disposed of in designated spoil areas, away from wetlands/watercourses or other environmentally sensitive areas.
14. Re-vegetation of any disturbed ground surface that is not part of an access road, laydown area or erection pad shall be undertaken by the Contractor in order to prevent soil erosion. Re-vegetation will only use locally occurring natural vegetation.
15. Where appropriate, overburden and vegetation shall be recycled and used as a weighting berm and a break against erosion along the sides of access roads and erection pads.
16. Dust control is to be provided during clearing and grubbing operations as outlined in Section 3.13, Dust Control.

17. Should hazardous or contaminated material be encountered or suspected during clearing, grubbing and removal of related debris, Environmental Protection Procedures for Discovery of Contaminated or Hazardous Material outlined in Section 4.5 will be followed.
18. If the nest of any migratory bird is encountered during vegetation clearing:
    - The nest site and neighbouring vegetation will be left undisturbed until nesting is completed.
    - Construction activities will be minimized in the immediate area until nesting is completed.
19. All activities associated with the disposal of non-woody debris are subject to the requirements of the Waste Management Regulations, under the Environmental Protection Act. The Contractor shall be responsible for acquiring all associated permits and approvals and adhere to all requirements set forth in those permits and approvals. Copies of those documents shall be provided to Vale NL in a timely manner.
20. Slash and any other construction material or debris will not be permitted to enter any watercourse and will be piled above spring flood levels.
21. Where possible, timber will be felled inward toward the work area to avoid damaging any standing trees within the immediate work area.
22. Any surplus material will be stored or stockpiled for site rehabilitation and re-vegetation purposes. The location of stockpiles will be recorded and accessible for future rehabilitation purposes.
23. Historic resources and features will not be disturbed during grubbing. Any historic resource discoveries will be reported to the Provincial Archaeology Office and Vale NL.
24. Public roads and existing access tracks will be used when possible to minimize disturbance of vegetation.
25. Removal of mature trees is to be avoided wherever possible.
26. Before clearing of vegetation, all litter and non-organic material will be removed from the area to be cleared.
27. Vegetation clearing shall take place in a phased manner in order to retain vegetation cover for as long as possible.
28. Vegetation clearing in watercourses and wetland areas shall be conducted by hand. No heavy machinery shall be permitted in watercourses to clear vegetation. Vegetation cleared from watercourses shall be removed from the watercourse immediately to prevent flooding.
29. All plant material removed from cleared areas shall be stockpiled for mulching.
30. Topsoil from all areas subject to construction activities, including temporary activities such as storage and stockpiling, will be removed.
31. Stripped topsoil shall be stockpiled for later use in re-vegetation and shall be adequately protected.
32. Stockpiles shall be shaped so that no surface water ponding can take place.
33. Topsoil stockpiles shall be protected from erosion by wind and rain by providing suitable storm water and cut off drains and/or by establishing suitable temporary vegetation.
34. Stockpiles shall not be covered with materials such as plastic that may cause it to become anaerobic.

35. Topsoil stockpiles will not be subject to compaction.
36. Soil disturbance will be minimized by limiting the area exposed at any one time, stabilizing exposed soil with anti-erosion devices (i.e., riprap, filter fabrics, gravel, or wood chips) and re-vegetation of disturbed areas as soon as possible.
37. Grubbing of the organic vegetation mat and/or the upper soil horizons will be restricted to the minimum area required. The organic vegetation mat and upper soil horizon material between construction areas outside the Project site will be maintained.
38. If active birds nests are encountered, refer to Section 4.3 of this plan.
39. Contractors are responsible, prior to any clearing, to confirm with the SEM whether a Boreal Felt Lichen survey is required. This confirmation and the survey, if deemed necessary, are required prior to commencing any clearing or cutting activity.

3.2 General Cutting and Filling

3.2.1 Environmental Concerns

Environmental concerns associated with cutting and filling activities are the potential impacts on marine and freshwater ecosystems and water quality through siltation or erosion. These concerns relate to the migration of sediment-laden water through direct runoff or by entering the existing site storm sewer system.

Another concern is generation of dust during cutting and filling operations. Contaminated or hazardous material may be encountered during general cutting and filling operations.

3.2.2 Environmental Protection Procedures

1. Cutting and filling will be done only upon completion of grubbing as outlined in Section 3.1, General Clearing, Grubbing and Removal of Related Debris.
2. A survey of soil stability and erodability will be conducted to determine any unstable areas and to help develop appropriate erosion control measures. Erosion control measures such as rip rap, filter fabrics, drainage channels and gravel or wood chip mulches will be implemented to stabilize easily eroded areas.
3. Runoff of sediment-laden water during cutting and filling operations will be minimized by using such measures as settling ponds, ditch blocks, interception ditches and filter fabrics.
4. Dust control is to be provided during cutting and filling operations as outlined in Section 3.13, Dust Control.
5. Should hazardous or contaminated material be encountered or suspected during general cutting and filling operations, the Environmental Protection Procedures outlined in Section 4.5, Discovery of Contaminated or Hazardous Material will be followed.

3.3 Storage, Transportation and Handling of Fuel and Other Hazardous Materials

3.3.1 Environmental Concerns

A variety of fuels, lubricants and other potentially hazardous materials will be used during Project construction activities. The primary concern regarding the use of these hazardous materials is their uncontrolled release into the environment through leakage or accidental spillage and subsequent adverse effects on the terrestrial and aquatic habitat and species, soil, surface and groundwater quality

and human health and safety. Uncontrolled hazardous waste can be toxic to vegetation, fish and wildlife if absorbed in sufficient quantities.

Typical hazardous materials that may be used on site during construction activities include, but are not necessarily limited to:

- Petroleum, oil and lubricants.
- Chlorinated and non-chlorinated solvents (e.g., cleaner-degreasers).
- Flammable gases (e.g., acetylene).
- Waste petroleum products (e.g., used engine/motor oil).
- Corrosives (e.g., sulphuric acid).
- Glycol (e.g., antifreeze).
- Paints.
- Epoxies.
- Concrete additives.
- Explosives for site work.

The following procedures will be implemented to reduce the likelihood of accidental events that result in impacts to the environment.

3.3.2 Environmental Protection Procedures

1. A copy of plans respecting the handling of fuels and other hazardous materials as well as contingency plans for handling spills will be present at receiving, storage, transfer and disposal areas.
2. Transportation, storage and use of fuels at the construction site will be conducted in compliance with all relevant laws and regulations.
3. Smoking will be permitted in designated areas only within the Project area and not within 10 m of fuel or hazardous material storage areas. This policy will be strictly enforced.
4. A complete inventory of the hazardous materials on the job site shall be maintained according to the Workplace Hazardous Materials Information System (WHMIS) Regulations. This inventory shall be made available to regulatory agencies upon request, and shall be kept readily available in case of any emergency.
5. All contractors will be required to observe strict compliance with the requirements of WHMIS regarding employee training, use, handling, storage, and disposal of hazardous materials and regarding labeling and provision of Material Safety Data Sheets as required by WHMIS legislation.
6. All contractors will be required to observe strict compliance with the requirements of the most recent version of the Transportation of Dangerous Goods Act.
7. The transport of fuel and other hazardous materials will be undertaken in compliance with the Transportation of Dangerous Goods Act (1992) and Dangerous Goods Transportation Act (2006). All vehicles entering the site will be inspected at the gate to confirm that the appropriate placards are in place and the security of the product is assured. All drivers must show proof of certification

that they are trained in the transportation of dangerous goods as required under the Transportation of Dangerous Goods Act (1992) and Dangerous Goods Transportation Act (2006).

8. Contracted fuel suppliers will, before transporting or positioning fuel at the project site, provide a copy of their fuel and hazardous materials spills contingency plan. This plan must be acceptable to Vale NL.
9. Hazardous materials are to be packaged and shipped in strict compliance with the requirements of the regulations.
10. All trucks delivering dangerous goods to the site shall comply with Canadian Standards Association B-620 standards.
11. All persons handling dangerous goods must show proof of certification of training in the transportation of dangerous goods as required under the Transportation of Dangerous Goods Act (1992) and Dangerous Goods Transportation Act (2006). Contractor staff will be trained in the requirements of the Acts.
12. Material Safety Data Sheets will be submitted on delivery of materials.
13. Before installing fuel storage tanks, the necessary approvals and permits under The Storage and Handling of Gasoline and Associated Products Regulations (58/03) will be obtained. All fuel and hazardous material storage will be at locations approved by Vale NL.
14. All bulk storage of fuel products and other hazardous materials on site will be stored in above-ground, self-dyked tanks in compliance with The Storage and Handling of Gasoline and Associated Products Regulations (58/03).
15. All storage facilities will be located away from construction activity, with secondary containment, and inspected on a regular basis in compliance with government laws and regulations.
16. Contractors are required to confirm that fuels and other hazardous materials are only handled by persons who are trained and qualified in handling these materials in accordance with government laws and regulations, and in conformance with the Vale NL Environmental Protection Plan and Waste Management Plan. WHMIS will be implemented to achieve proper handling and storage. In all cases, transfer to storage tanks will be attended by a qualified person for the duration of the operation. This person will be trained in proper fuel handling procedures to minimize the risk of an unattended spill. The attendant will be trained in the requirements of the spill contingency plan and WHMIS.
17. Exposed pipelines will be protected from vehicular collision damage by the installation of guard rails.
18. Tanks for fuels and other hazardous materials will be self-dyked or will be positioned over an impervious mat, surrounded by an impervious dyke of sufficient height to contain:
    - Where a dyked area contains only one storage tank, the dyked area will retain not less than 110% of the capacity of the tank; and
    - Where a dyked area contains more than one storage tank, the dyked area will retain not less than 110% of the capacity of the largest tank or 100% of the capacity of the largest tank plus 10% of the aggregate capacity of all the other tanks, whichever is greater.
19. Tanks on dyked areas will be located in areas where spills, should they occur, are not likely to flow directly to watercourses, water bodies, feeder streams, ditches or the ocean.

20. Any dykes of earthwork construction will have a flat top not less than 0.6 m wide, and be constructed and maintained to be liquid-tight to a permeability of 25 L/m²/day. The distance between a storage tank shell and the center line of a dyke will be at least one half the tank height. Dykes will be fenced.

21. Drums of fuel oil, hydraulic fluids and other chemicals (e.g. concrete additives), if required at site, will be tightly sealed to prevent corrosion and rust. Quantities on-site during construction will be limited to that required for the current activity and minor equipment maintenance. Drums shall be stored on an impermeable pad with curb or in secondary containment to retain any leak. Any water overflow will be directed to an oil-water separator. The pad shall have a roof to protect the area from rainwater and snow. Dangerous goods received in drums must be in compliance with Part 5 of the Transportation of Dangerous Goods Regulations.

22. Drainage control devices such as sediment traps and settling ponds will be equipped with underflow baffles to retain any floating oil for recovery and disposal.

23. Mounted dispensing equipment will include:

    - Meters attached to steel brackets so that the meter and hose are isolated from the system by a steel valve;
    - Dispensers bolted to the deck or frame; and
    - Hoses placed on proper reels and hanging brackets.

24. Oils, grease, gasoline, diesel or other fuels or any material deemed to be hazardous will be stored in secondary containment at least 100 m from any watercourse.

25. Fuel and other hazardous materials storage areas and non-portable transfer lines will be clearly marked or barricaded to protect against damage by moving vehicles. The markers will be visible under all weather conditions. Barriers will be constructed in compliance with the provincial Storage and Handling of Gasoline and Associated Product Regulations (58/03).

26. Storage areas will be equipped with appropriate firefighting equipment.

27. Waste oils, oil filters, lubricants and other used oil shall be retained in a tank or closed container with secondary containment and will be disposed of regularly under contract with a licensed used oil collector in accordance with the Used Oil Control Regulations (82/02). If required by the Minister, a certificate of approvals and permits for the collection, storage and transportation of used oil will be obtained. Waste oil will be collected separately and offered for recycling or stored for collection by an approved special waste collection and disposal company.

28. Greasy or oily rags or other materials at risk of spontaneous combustion shall be deposited and stored in an appropriate receptacle. This material shall be removed from the work site on a regular basis and shall be disposed of in an approved existing waste disposal facility. Removal of these materials from the job site is regulated under the Transportation of Dangerous Goods Act.

29. All waste oils and hazardous materials shall be stored with secondary containment and properly signed.

30. All hazardous materials will be handled according to the provincial Environmental Protection Act (2006) and disposed of in accordance with government laws and regulations at an approved off-site hazardous waste disposal facility.

31. All storage tank systems will be inspected on a regular basis in accordance with the Storage and Handling of Gasoline and Associated Products Regulations (58/03). This involves, but is not limited to, gauging or dipping and the keeping of reconciliation records for the duration of their use. Bulk fuel storage facilities will be dipped on a regular basis in order to accurately gauge fuel consumption. These consumption rates will allow for visually undetectable sources of contamination to be identified and corrected.

32. Regular inspections of hydraulic and fuel systems on machinery shall be done, and leaks shall be repaired immediately upon detection.

33. Worn or damaged hoses, seals and fittings shall be promptly repaired or replaced.

34. Hot Work Permits will be required before undertaking welding or torch cutting at a fuel storage area.

35. Fuelling, routine maintenance activities and lubrication of vehicle and mobile equipment shall occur in designated and approved locations. Fuelling and lubrication of equipment will occur in such a manner as to minimize the possibility of contamination to soil or water.

36. See Section 3.16 for Buffer Zones required for fuelling activities.

37. When refuelling equipment, operators will:

    - Be in attendance for the duration of the operation.
    - Use leak-free containers and reinforced rip and puncture-proof hoses and nozzles.
    - Use hoses that have a design pressure rating of at least 150% of the maximum head of the system.
    - Lock out all tank nozzle valves except the valve currently in use.
    - Seal all storage container outlets except the outlet currently in use.

38. Fuel unloading facilities will be equipped with drip pans to collect hose drainage and drips. Hoses or pipes used for fuel transfer will be equipped with properly functioning and approved check valves, spaced to prevent backflow of fuel in the case of failures. In the event a drip pan cannot be used during the fueling process a spill pad will be used by the operator to ensure the hose drainage and drips are captured.

39. Within 30 days of known decommissioning of a storage tank system, the Contractor will empty the system of all products, remove the tank and associated piping from the ground, remove any contaminated soil, clean the area and restore the site. All tanks must be cleaned and purged of dangerous goods prior to transport, in accordance with the Transportation of Dangerous Goods Act.

40. Contractors are responsible for any soil contaminated by small leaks of fuel, oil or grease from equipment. Any soil contamination by small leaks of fuel, oil or grease from equipment will be cleaned up and disposed of in accordance with the applicable regulations, under the provincial Environmental Protection Act (2006) and Used Oil Control Regulation (82/02). The Used Oil Control Regulation (82/02) will be used as a guideline to the DOEC requirements for such disposal. The contractor is responsible for ensuring that all contaminated soil is sent to a waste disposal contractor for disposal.

41. All necessary precautions will be implemented to prevent the spillage, misplacement, loss of fuels and other hazardous materials used during the construction phase.

42. A fuel and other hazardous materials spill contingency plan, and appropriate emergency spill equipment, will be in place on site (see Section 4.2 of this EPP, in addition to contingency plans required by fuel suppliers).
43. All spills of fuel and hazardous materials will be reported immediately to the SEM, or designate, and the Contractor as outlined in Section 4.2 of this EPP. Any spill to the marine or freshwater environment and spills of 70 L or more on land will be reported immediately in accordance with provincial regulation.
44. There will be appropriate emergency spill response equipment on site for all phases of the Project. A complete list of the emergency spill response equipment will be available on site and kept up to date.
45. Storage tanks will be equipped with spill kits and additional spill kits will be available at a designated central storage location. All fuel transfer vehicles will be equipped with spill kits. All fuel handling personnel and other designated personnel will be trained in the use of spill kits and all training will be documented.
46. Inventory of spill kits will be checked and verified to include required equipment as per document "Emergency Spill Reporting and Response Procedure" 69-010-010-GPR-1009, Rev 00. Contractor to assess requirements for number of spill kits to maintain at site and present to SEM for approval.
47. Any spill on land regardless of size that may enter a waterbody frequented by fish must be reported immediately to Canadian Coast Guard Environmental Emergencies: (709) 772-2083 or 1-800-563-9089; as required by the Fisheries Act. All such spills shall also be reported immediately to the SEM and SES.
48. The use of chemical dispersants to treat oil slicks will take place only under the authorization of Environment Canada, Environmental Protection Branch (Newfoundland & Labrador).
49. Small quantities of hazardous material (drums, cans and other containers under 20 L volume) will be stored in secondary containment, in a secure location protected from weather and freezing, as well as from vehicle traffic.
50. Where hazardous materials are to be stored outdoors, a designated area will be established, graded and fitted with an impermeable membrane covered with local soil and surrounded by an earth berm.
51. If required, a hazardous waste storage area will be constructed in compliance with all applicable federal and provincial legislation.

3.4 Petroleum Product Transfer

3.4.1 Environmental Concerns

Petroleum products could potentially be released into the environment during product transfer.

3.4.2 Environmental Protection Procedures

1. Transportation and handling of petroleum products will be carried out in strict conformance with Section 3.3, Storage, Transportation and Handling of Fuel and Other Hazardous Materials.
2. All vehicles entering the site will be inspected at the gate to confirm that the appropriate placards are in place and the security of the product is assured.
3. All drivers must show proof of certification that they are trained in the Transportation of Dangerous Goods Act (1992) and Dangerous Goods Transportation Act (2006) as required under the Acts.

4. All fuel will be delivered to the site in conventional fuel tanker trucks, operated by licensed oil distributors. In all cases, transfer of fuel will be attended by a qualified person for the duration of the operation.

5. Drip pans will be used to collect fuel dripping during the process. Where drip pans cannot be used a spill pad will be used to collect drips.

3.5 Sewage Disposal

3.5.1 Environmental Concerns

The release of untreated sewage is a concern to human health, drinking water quality, marine and freshwater ecosystems.

Before completion of the onsite treatment plant, significant quantities of sewage will be generated.

3.5.2 Environmental Protection Procedures

1. Facilities for water and sewer services are to be provided for all workers on-site during construction.

2. Sewage will be handled by temporary portable toilets located around the construction site, and by holding tanks for the construction support trailers.

3. Vale NL will only use waste transporters who hold an appropriate waste disposal license.

4. Vale NL will confirm that all road vehicles carrying waste material will use closed tanks and the records of waste volumes and disposal locations will be kept properly.

5. Sanitary wastes at the site and accommodations will be disposed of through an approved on-site sewage treatment system or trucked off-site by a licensed waste management firm for treatment and disposal.

6. All temporary sewage disposal systems used during construction of the Project shall comply with all health and safety regulations, the Department of Health guidelines, the Environmental Protection Act (2006), and Environmental Control Water and Sewage Regulations, 2003 (65/03). Sewage will be stored in holding tanks and disposed off site in an approved manner.

7. All septic tanks will have the appropriate permits.

8. Any septic waste that will be transported off site and disposed in an approved disposal site by a licensed contractor.

9. Sewage sludge from the treatment plant will be removed by an approved waste-disposal contractor for appropriate disposal.

3.6 Storage, Handling and Disposal of Solid Waste

3.6.1 Environmental Concerns

The release of solid waste is a concern to human health, drinking water quality, aquatic, and terrestrial ecosystems.

Solid waste will be generated during construction activities. Solid waste (e.g. domestic waste, paper, cardboard, wood, metals etc.), if not properly controlled and disposed of, will be unsightly and may cause human safety and health concerns. It could also attract wildlife leading to the potential for human-wildlife conflicts.

3.6.2 Environmental Protection Procedures

1. All activities associated with the undertaking are subject to the Waste Management Regulations (59/03), under the Environmental Protection Act (2006) and all solid waste will be handled according to this *Act*. Waste generated during construction will be handled, stored, transported and disposed of in a government approved site in accordance with all applicable acts, regulations and guidelines and in accordance with the Vale NL Waste Management Plan for this project.
2. A 3-R program of waste reduction, reuse and recycling will be implemented at all construction site facilities.
3. Materials such as paper, cardboard, wood, scrap steel and metal, will be collected in segregated containers, and offered for recycling. These recyclable materials will be collected and transported to a licensed recycling facility using services authorized by the EPCM Contractor.
4. All materials not able to be recycled will be disposed of in an approved facility.
5. Waste accumulated on site prior to disposal shall be confined so that it does not pose an environmental or health hazard. Waste receptacles shall be installed at all active work areas for use by workers. Waste receptacles will be covered to prevent the escape of windblown debris and will be clearly labeled, and secured to prevent movement under severe weather conditions.
6. Recyclable containers will be deposited into specifically marked recycling bins. This recyclable material will be delivered to the local recycling facility.
7. All domestic solid waste will be collected, properly stored, removed and disposed of at an approved, licensed off-site disposal facility in accordance with regulatory requirements.
8. Work areas will be kept clear of debris, waste and litter to reduce the potential for attracting wildlife and reducing potential interactions with wildlife (see procedures in Section 4.3 for handling wildlife encounters).
9. Construction and demolition debris are to be covered to prevent blowing dust and debris. All construction waste and any other refuse associated with the Project will be segregated as recyclable and non-recyclable.
10. Demolition and construction waste contaminated by asbestos or other hazardous material shall be removed, packaged and disposed of in accordance with the relevant regulatory requirements, by qualified personnel.
11. No waste material shall be deposited in or within 100 m of a watercourse.
12. Burning of waste is not permitted.
13. Putrescible waste will be removed from site daily.
14. Any vehicles carrying waste offsite shall be secured to prevent windblow or other loss of load during transportation.
15. Regular inspections of the work site will be undertaken to confirm it is left rubbish free at all times.

3.7 Blasting

3.7.1 Environmental Concerns

The general environmental concerns associated with on-land blasting include:

- Destruction of vegetation outside construction zone.

- Noise disturbances to wildlife, including otters and red crossbills.
- Effects on fish and aquatic animals.
- Disturbance of historic resources.
- Dust generation.
- The potential introduction of silt and nitrogenous compounds into water bodies.
- Releasing existing contaminants.

3.7.2 Environmental Protection Procedures

3.7.2.1 General Blasting

1. All blasting work will be conducted in compliance with the appropriate permits and/or approvals and authorizations.
2. The handling, transportation, storage and use of explosives will be conducted in compliance with all applicable laws, regulations, orders of the Newfoundland and Labrador Department of Government Services (NLDGS) and Newfoundland and Labrador Department of Natural Resources (NLDNR), and the Dangerous Goods Transportation Act (2006).
3. All personnel must comply with safe blasting procedures approved by the EPCM Contractor.
4. Blasting activities will be coordinated and scheduled to minimize the number of blasts required. In order to minimize the seismic effect, blasting patterns and procedures will be used to reduce the shock wave and noise.
5. Blasting will not occur in the vicinity of fuel storage facilities.
6. Blasting will not occur in the vicinity of the Long Harbour Hazardous Waste Site.
7. Use of explosives will be restricted to authorized personnel who have been trained in their use.
8. If required, there will be separate magazines on site for explosives and for dynamite blasting caps.
9. Where necessary, runoff from blasted areas will be monitored at discharge sites for pH, total suspended sediment (TSS), total petroleum hydrocarbon (TPH), ammonia and iron, as required by the Department of Environment and Conservation, Pollution Prevention Division Certificate of Approval. Discharge will be treated, if required, prior to entering a water body.
10. Explosives and auxiliary materials will be stored by each contractor as stipulated in relevant legislation and in compliance with their operations permit and this EPP. Licensed blasters under direct supervision of a professional engineer will undertake blasting.
11. Explosives will be used in a manner that will minimize damage or defacement of landscape features, trees and other surrounding objects by controlling through the best methods possible (including time-delay blast cycles) the scatter of blasted material beyond the limits of activity.
12. Historic resources and features will not be disturbed during blasting. Any historic resource discoveries will be reported to the Department of Tourism, Culture and Recreation, Provincial Archaeology Office (PAO).
13. Areas that may be potentially disturbed will be identified prior to blasting and where necessary charge size and location will be adjusted.

3.7.2.2 Blasting in Close Proximity to Water Bodies

1. Blasting will not occur in marine areas during any phase of the Project.
2. Where blasting activities will take place all blasting activities shall follow the "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters" (Wright and Hopky, 1999), included in Appendix C of this document.
3. If on-land blasts are required nearer to the watercourse the following additional mitigative measures will be initiated, as appropriate:
    - Installation of bubble/air curtains to disrupt the shockwave. When bubble curtains are used, the curtain will surround the blast site and be started up only after fish have been moved outside the surrounded area.
    - Blasting will be undertaken at the time of least biological activity or biological sensitivity.
    - Isolation of the work area from fish movement.
    - Detonation of small scaring charges set off one minute prior to the main charge to scare fish away from the site.
    - The use of noise generators to move fish out of the area.
4. Blasting mats will be placed over the area being blasted to minimize the scattering of blast debris during critical blasting activities (i.e. areas near structures, roadways, power lines, etc.).
5. Ammonium nitrate based explosives (i.e., Ammonium Nitrate Fuel Oil mixtures or ANFO) will not be used in or near water due to the production of toxic by-products (ammonia).
6. All blasting and other associated equipment and products will be removed from the blast area, including any debris that may have entered the aquatic environment.

3.8 Quarrying and Aggregate Removal

3.8.1 Environmental Concerns

The principal concerns for quarry development and associated aggregate removal include the potential for sedimentation of marine and freshwater systems and loss of terrestrial habitat and land use.

3.8.2 Environmental Protection Procedures

The following measures shall be implemented to minimize the potential impacts of quarrying activities and subsequent aggregate removal:

1. Quarry activity shall adhere to all relevant Federal, Provincial and Municipal laws and regulations, and shall be undertaken in strict compliance with quarry requirements from the Department of Natural Resources – Mineral Lands, Quarry Materials Act (1998).
2. Quarry permits are required for material taken outside of road right of way for purposes of road construction.
3. Quarry areas shall be developed in a controlled manner so as to minimize potential environmental effects. The following protection procedures shall be implemented to minimize disturbance and facilitate rehabilitation:
    - A buffer zone of undisturbed vegetation shall be maintained between quarries and watercourses, water bodies and ecologically sensitive areas. See Section 3.16: Buffer Zones for additional information.

- The development area, stockpile area and limits of clearing shall be staked and/or flagged to prevent over-extension of the development, thereby minimizing the extent of the operation.
- The area to be excavated shall be cleared of all vegetation prior to any grubbing, excavation or removal of any material.
- All stumps, organic matter and topsoil shall be stripped from the area to be excavated and stockpiled at least 5 m from uncleared areas; stockpiled stripping shall be kept at least 10 m from the area of excavation; separate overburden piles shall be developed for stripped material present; topsoil and the underlying overburden shall not be mixed.
- Upon completion of excavation of a quarry, no cliff faces in rock shall be left at a height of greater than 6 m. Where benching is required, bench height will not exceed 5 m. Overburden will be graded to less than 30^{o} slope. Available material, left over from quarrying and stockpiled overburden shall be used to minimize slopes and face heights.
- Following grading, the topsoil and any organic materials shall be spread over the disturbed area to promote natural re-vegetation by adjacent seed sources.

4. Any drainage into the quarry area will be diverted away from the quarry site.
5. A settling pond shall be established for all quarry runoff and, if required, cleaned on a regular basis so that the retention capacity is maintained at all times.
6. Dust from aggregate storage and handling shall be controlled with water as required.
7. Aggregates containing sand sized and smaller fractions shall be stored in such a way as to prevent their erosion.
8. The contractor shall be responsible for obtaining all permits and approvals required for carrying out any quarry operations. Copies of any such permits or approvals shall be provided to Vale NL.
9. Aggregates, expected to be provided from existing off-site quarries, will be stockpiled in approved locations with provision for control of silt laden run-off water, and dust generation.
10. Transportation of fill and aggregates will be done in accordance with Section 3.9 Site Access. Fill and aggregates will be stored and handled in strict compliance with Section 3.14 Dust Control.
11. Refer to Section 4.4 of this EPP for information on historic/archaeological issues and procedures pertaining to construction activities.

3.9 Site Access

3.9.1 Environmental Concerns

Project construction will result in a significant increase in passenger vehicles as well as heavy truck traffic on the site access road. Major environmental concerns relating to site access are as follows:

- Vehicles and equipment traveling to and from the site may impact the terrestrial ecosystem outside the work site.
- Construction traffic can also affect surrounding land uses through noise and dust emissions.
- Traffic hazards may result from increased vehicle movements.

3.9.2 Environmental Protection Procedures

The following procedures will be implemented to help minimize dust, noise, potential effects to wildlife and socio-economic effects associated with construction traffic:

1. Vehicles and equipment shall follow established routes when traveling to or from the site.
2. The two entrances and exits from the Project construction area will be designed so that incoming and outgoing vehicles may merge safely with other traffic.
3. Construction equipment will be confined to the Project site.
4. If noise issues arise due to Project-related construction truck traffic in the area, noise levels will be monitored during a typical day as requested, and if necessary changes made to reduce noise impact by, for example, rescheduling, modifying vehicles, or adjusting speeds.
5. If dust/mud tracking from the construction site becomes a problem, a tire wash down or vehicle wet down area will be established for vehicles exiting the site.
6. Fine-grained soils and granular materials will be transported in covered trailers or trucks to reduce air borne particulates.
7. Project traffic will adhere to posted speed limits to reduce potential for collisions with wildlife such as mammals and birds.
8. Trucks will operate only with registered allowable loads, unless over size and over weight permits are obtained from applicable regulatory agencies.
9. All loads will be secured in accordance with the Load Security Regulations.
10. Car pooling will be encouraged to reduce the number of workers' vehicles using the road system. Shuttles will be provided from the accommodations complex to the work site.
11. All roads will be graded regularly to limit erosion.

3.10 Equipment Use and Maintenance

3.10.1 Environmental Concerns

A variety of vehicles and heavy equipment will be used throughout the Project construction. Environmental concerns associated with the operation and use of construction equipment includes atmospheric emissions, noise, accidental spills and chronic leaks of fuels and lubricating oils which may contaminate local water bodies and water supplies. Emissions from construction equipment include CO, NO_x, unburned hydrocarbons, and particulates. Moreover, direct physical disturbances as a result of equipment movements can adversely affect terrestrial and aquatic environments.

3.10.2 Environmental Protection Procedures

The following procedures shall be used to minimize the potential environmental effects associated with the equipment use and maintenance activities:

1. Construction equipment will be delivered to the worksite in good operating condition, free of leaks and with all appropriate emission filters.
2. All equipment is to be kept clean and in proper operating condition.
3. Equipment will be routinely inspected for leaks and mechanical conditions which might result in spills of fuel, lubricating oils or hazardous materials.

4. Fuelling and routine maintenance operations will be conducted in accordance with appropriate standards and guidelines as described in Section 3.3, Storage, Transportation and Handling of Fuel and Other Hazardous Material and Section 3.11, Marshalling Yards for Equipment and Supplies.
5. Equipment maintenance and fuelling activities shall only be performed by a qualified person at a designated site located away from any water body or wetland in compliance with applicable regulations.
6. Equipment use will be limited to approved locations, e.g., the worksite and established transportation routes.
7. Fuel shall not be stored near generators or located adjacent to water bodies.
8. Drip pans shall be placed underneath all pumps and generators.
9. Hoses and connections on equipment shall be inspected routinely for leaks and drips.
10. All leaks shall be repaired and reported immediately to the SEM and SES.
11. Spill kits will be maintained on site as described in Section 3.4 Storage, Transportation and Handling of Fuel and Other Hazardous Materials.
12. Equipment and vehicles shall only operate on the access road, laydown area and cleared areas designated for construction activities except for those vehicles used in the clearing and transmission line construction.
13. Vehicles are not to travel through water bodies unless given authority by the EPCM Contractor. Fording will only occur once all the proper permits have been acquired. Vehicles are to travel in single file as much as is possible. Existing paths are to be used as much as possible.
14. Soil erosion control measures shall be monitored during construction activities by the environmental coordinators. If excessive sediment is detected, the Contractor will be directed to immediately correct the situation.
15. In addition to spill kits located at fuel storage tanks additional spill kits will be located at designated central storage location(s). Personnel who deal with fuelling, fuel transfer and pumps and generators will be trained in the use of the kits.
16. All vehicles and generators will have exhaust systems regularly inspected and mufflers are required to be effective and in good condition at all times.
17. Maintenance and inspections will be documented and records stored on site.

3.11 Marshalling Yards for Equipment and Supplies

3.11.1 Environmental Concerns

Environmental concerns relating to marshalling yards include:

- The danger of spillage of hydrocarbons or other hazardous products during equipment assembly or repair.
- The physical disturbance of the terrestrial environment during vehicle movements or equipment assembly.

Areas will be required for storing and maintaining equipment and supplies through to the operation phase of the Project. Erosion and run-off of sediment into nearby water bodies will be prevented.

3.11.2 Environmental Protection Procedures

1. Equipment and material storage shall be located at least 30 m from the marine and freshwater environment or from any storm sewer inlet.
2. Vehicles and equipment being moved shall follow established routes to the marshalling area.
3. The site for equipment marshalling shall be located in a previously disturbed area or in an area that is to be graded as part of the construction process. In the case of the latter, organic material will be stripped and stockpiled for future use.
4. The site for equipment marshalling will be located to minimize potential traffic hazards and enable incoming and outgoing vehicles to merge safely.
5. Vehicles coming to and leaving the Project site will be able to merge safely with other traffic.
6. During assembly, disassembly, servicing or maintenance of equipment in marshalling yards, drip pans shall be used to collect seepage or leakage of fuels or lubricants at connection points or other points of potential leakage.
7. Establishing any new marshalling or storage areas will follow the procedures for vegetation clearing, grubbing and debris disposal, and erosion prevention (Refer to Section 3.1).
8. External storage areas will be placed on level terrain and kept free of ponding or run-off.
9. Drainage from areas of exposed fill will be controlled by grading or ditching to direct run-off away from water bodies, and by sediment settling basins, as appropriate.
10. Marshalling and storage areas not required during operations will be rehabilitated as soon as possible once they are no longer needed (Refer to Section 3.30).

3.12 Dam Construction

3.12.1 Environmental Concerns

Dams proposed for the site include both in-stream dams and saddle dams. Concerns with the latter are the same as for any other earthworks activity, with the exception that cut-off excavation may require excavating below the water table. Primary concerns are:

1. Management of sediment runoff from the clearing, pumped water from any excavation, and during the placing of fill.
2. Design to avoid leakage of any contained contaminated water.
3. The associated excavation and transportation to the dam of fill material including quarrying for various grades of material, and temporary access road construction and closure.

For in-stream dams the above concerns apply but additional concerns include:

1. Diversion of the water course, disrupting fish passage.
2. In stream construction generating excessive sediment loading.
3. Increased upstream water levels arising from temporary flow restrictions.
4. Obstruction of waterway to other users.

The above concerns are applicable to the actual construction. In addition any permanent change in flow conditions downstream and water levels upstream must be considered in the design and operation of

the dam and associated control structures. Such concerns are not addressed in this EPP for construction, but must form an integral part of the dam design.

3.12.2 Environmental Protection Procedures

1. Nothing in this Section is intended to replace protection requirements listed in other parts of this document, which will still apply to work whether or not associated with dam construction.
2. Temporary access road routing will be selected to avoid old growth forest or other sensitive areas.
3. Access routes will be selected to minimize the extent of clearing of timber, and the overall footprint area.
4. All topsoil will be retained from the temporary access routes for use during restoration.
5. The procedures elaborated in Sections 3.1.2, 3.1.18 and 3.2.2 any other activity-specific procedures as are relevant, will be followed for clearing, excavation and filling.
6. Where practical, fill material will be quarried from the head-pond area.
7. All dams will be designed in accordance with the Canadian Dam Association Guidelines.
8. Upon completion of the dam, all temporary access routes and other disturbed areas will be graded so as to avoid ponding and keep the maximum slope less than 2:1. Replace topsoil and re-vegetate in accordance with the rehabilitation plan.
9. Prior to undertaking any site work, a detailed construction plan will be prepared showing the sequence of construction including all diversions and cofferdam works and including a schedule for the various components. All dewatering and water treatment arrangements will be included.
10. All dam construction, including excavation of cut-off trenches and foundations will be carried out in the dry behind cofferdams.
11. Filtration or other suitable measures, such as settling ponds, silt fences and dykes, shall be implemented for sediment removal and turbidity reduction of water pumped from work areas before discharging (Refer to Section 3.17 - Erosion Prevention).
12. Prior to using the dam or part thereof to pass the stream flow, all necessary downstream erosion protection will be in place.
13. Discharged water shall be encouraged to follow natural surface drainage patterns.
14. Diversion channels will be designed to maintain similar hydraulic flow conditions as the original stream, and to maintain a similar stream bed morphology. Obstructions to fish passage will be avoided. Measures shall be employed to minimize the alteration, disruption and destruction of fish habitat.
15. Any temporary stream crossings established for construction will be designed and constructed to allow fish passage and to preserve aquatic habitat.
16. Any temporary culverts installed will be in accordance with good engineering and environmental practices and in adherence with all terms and conditions issued by regulatory bodies as more particularly described in Section 3.20.2 of this document
17. Fill material shall not be removed from streambeds or banks, except for material removed to provide room for construction in the stream-bed.

18. The use of heavy equipment in and near watercourses will be minimized and restricted; where possible. An excavator will be used from shore rather than a bulldozer in the watercourse. Where it is absolutely necessary to do so, in-stream work will be performed by rubber-tired vehicles only, and will only be done in compliance with DOEC and DFO guidelines/conditions.
19. Cofferdams shall be removed upon completion of construction and the streambed returned as closely as possible to its original condition.
20. Areas of spawning habitat will be avoided where practical. Habitat lost as a result of construction will be compensated for under the Fisheries and Oceans Authorization for Works or Undertakings Affecting Fish Habitat.
21. All equipment shall be mechanically sound to avoid leaks of oil, fuel and hydraulic fluids.
22. No servicing or washing of heavy equipment will occur adjacent to watercourses; temporary fuelling, servicing or washing of equipment in areas other than the main fuel storage site shall not be allowed within 30 m of a watercourse. All waste oil, filters, containers or other such debris will be removed from the work area and properly disposed of in an approved waste disposal site.
23. Construction of cofferdams and closures for diversion purposes shall be done during low flows, during the period from June 1 to September 1.
24. Concrete will be placed in the dry, and no wet concrete or concrete contaminated wash water will be discharged to the stream and more generally in accordance with Section 3.29.2 of this document.

3.13 Noise Control

3.13.1 Environmental Concerns

Construction activities have the potential to create a wide variety of noise from the use of equipment and from the transport, handling and erection of various construction materials, and can cause a nuisance to nearby residents. The noises associated with heavy construction activity can also cause negative effects on wildlife distribution and abundance.

3.13.2 Environmental Protection Procedures

All Contractors working on the site shall endeavour to keep noise generating activities to a minimum. Disturbance of the residents in the vicinity of the construction area will be taken into account during the construction period. The following procedures shall be implemented wherever possible to minimize potential impacts arising from a variety of noise sources:

1. All Contractors working on the site will adhere to all permits and approvals and be responsible for compliance with the relevant legislation with respect to noise.
2. All vehicles and generators will have exhaust systems regularly inspected and mufflers will be operating properly.
3. All heavy machinery used on the project will have noise abatement equipment, in good working order.
4. All equipment will be fitted with standard and well-maintained noise suppression devices.
5. Acoustic treatment of jackhammers will include silencers on the exhausts.
6. Concrete mixers will be sited to minimize the impact on nearby residents.

7. All vehicles shall follow a designated project route and shall be properly maintained to minimize noise. The routing of truck traffic through residential areas will be controlled during the maximum period of activity. Arriving and departing traffic, loading and unloading of equipment and materials; and day-to-day operations will be scheduled to keep night-time traffic in residential areas to a minimum.
8. All materials handling will be carried out in such a way as to avoid unnecessary generation of noise.
9. Noise monitoring will be undertaken in Long Harbour, to determine the incremental noise levels arising from the Project. In the event of the noise exceeding nuisance values, efforts will be made to modify the activities to reduce the noise generation of particular concern.
10. Vale NL shall advise, through local community newspaper or radio, the schedule for any proposed blasting or other major noise generating activities. All Contractors will be required to provide a schedule of any such activities to the SEM at least two weeks in advance of work commencing.
11. Any major noise generating activities shall be limited to between the hours of 7:00 am and 10:00 pm.
12. Blasting plans shall be developed and wildlife surveillance undertaken prior to blasting, as required.
13. Idling of construction vehicles will be kept to a minimum.

3.14 Dust Control

3.14.1 Environmental Concerns

The environmental concerns related to dust include human health effects and potential impacts on marine and freshwater ecosystems and vegetation.

During dry conditions, excessive dust may be generated from the work sites and access roads. This may have a detrimental impact on the local environment, construction safety or integrity, and may also cause disruption to the normal activities of nearby residents.

3.14.2 Environmental Protection Procedures

The following measures will be implemented to maintain acceptable air quality in the vicinity of the works in regards to dust generation and the movement of dust:

1. Dry material will be moisture conditioned or covered to prevent blowing dust.
2. Dust control is to be provided for unsealed roads, construction activities and open soil areas, primarily by using fresh water. A Water Use licence may be required from the Department of Environment and Conservation – Water Resources Division for water used for dust control.
3. Particular care will be taken to maintain dust suppression near sensitive areas including boreal felt lichen sites.
4. Waste oil or other petroleum products, will not be used for dust control under any circumstances. Where and when applicable (e.g., during a dry summer), other agents such as calcium chloride may be used for dust suppression. The use of calcium chloride will be in accordance with the guidelines outlined in Environment Canada's Best Practices for the Use and Storage of Chloride-Based Dust Suppressants, referring to how, when and quantity to apply.
5. All dust control agents shall be stored in areas away from water bodies and contained, to prevent any entry into water bodies.

6. Efforts will be made to minimize fugitive dust emissions; specific types and frequency of dust control measures will be determined by site conditions and specific request from regulatory officials and/or members of the public. Where nuisance dust levels are identified by air quality monitoring or by the public, the Contractor will be directed to remedy the situation.
7. Locations where water is to be applied, the amount of water to be applied and the times at which it will be applied will be determined by the Contractor, so as to avoid dust generation.
8. Water will not be applied in situations where surface water could freeze and create a potential traffic hazard.
9. Water will be applied by means of a pressure type distributor equipped with a spray system of nozzles to provide a uniform application of water. Minimal amounts of water required to control dust will be applied such that surface runoff of sediment is avoided.
10. Monitoring of particulate matter in Long Harbour is ongoing on a continuous basis to assess compliance with identified air quality goals and commitments. Refer to the Environmental Monitoring Plan for Construction, 2010 - 2013 for air monitoring procedures.
11. The SEM, with support from the VPES and SES, will be responsible for identifying and instructing the responsible Contractor(s) to resolve air quality issues, including, but not limited to, public complaints about dust generation.
12. Vale NL will consult with local road authorities prior to application of dust suppressants on any public access roads.
13. If dirt tracking from the construction site becomes a problem, a tire wash down or vehicle wet down area will be established for vehicles exiting the site.
14. Fine-grained soils and granular materials will be transported in covered trailers or trucks to reduce air-borne particulates.
15. Dust will be controlled by retaining, where possible, existing trees and shrubs to act as windbreaks and natural erosion prevention. The amount of vegetation to be cleared will be minimized.
16. Exposed soil and material stockpiles shall be protected against wind erosion and the location of stockpiles shall take into consideration the prevailing wind directions and locations of sensitive receptors.
17. Weather conditions where high dust level episodes are probable (such as strong winds in dry weather) will be taken into account. Weather forecasts/conditions will be monitored for periods of high wind and dust suppression measures and/or control of activities will be implemented to mitigate excess dust generation.

3.15 Work In or Around Marine Environment

3.15.1 Environmental Concerns

The principal environmental concerns arising from marine construction include noise and the disturbance to fish and fish habitat, including wolffish. Marine construction activities can also disturb near shore terrestrial habitat and cause seabirds, waterfowl and marine mammals to avoid the area. Given previous activities on site there is also potential for release of contaminants during the dredging of the disposal/storage of the dredged spoils.

3.15.2 Environmental Protection Procedures

1. Infilling will be conducted in strict compliance with the Authorization for Works or Undertakings Affecting Fish Habitat, issued by DFO under the Fisheries Act, and the Permit to Alter a Body of Water under the Newfoundland and Labrador Water Resources Act (2004). Infilling will be done in compliance with the Navigable Waters Protection Act (2004) authorization.
2. Clean quarried rock having a minimum of fines (<5%) will be used for infilling. Armor stone protection will be placed progressively to minimize erosion and to prevent the loss of infill material.
3. All equipment will have muffled exhausts to minimize noise.
4. All land-based equipment will be serviced and fuelled on land at least 100 m from the marine environment or in designated areas designed for spill containment.
5. Regular mechanical inspections for leaks on all equipment will be made and repairs undertaken immediately.
6. A Fuel or Hazardous Material Spill Contingency Plan (Section 4.2) will be in place and appropriate emergency spill equipment available onsite.
7. Dredged materials from marine construction activities will be contained and tested prior to disposal in accordance with the DOEC Guidance Documents titled Dredge Spoils Disposal GD-PPD-028-1 and Leachable Toxic Waste, Testing and Disposal GD-PPD-026-1. The removal and disposal of dredge spoils from within the marine/freshwater environment requires testing as per GD-PPD-026-1 and approval from the Government Services Centre.
8. There will be no side-casting of dredged materials. Material will be removed from the marine environment as per the conditions of regulatory approvals.
9. Any disturbed areas along the shoreline will be immediately stabilized to prevent erosion.
10. Dredging will be carried out using equipment designed and operated to limit the re-suspension of solids.
11. All water decanted from dredged spoils will be tested and discharged only when meeting acceptable standards.
12. A silt curtain will be used to limit any spread of the turbidity plume beyond the dredged area.
13. Floating booms will be deployed around any area where heavy equipment is being used.
14. Water quality will be monitored to confirm that total suspended solid levels and contaminant concentrations in the water column are within limits prescribed by the Canadian Council of Ministers of the Environment (CCME) Environmental Quality Guidelines for the protection of aquatic life (http://www.ccme.ca/publications/ceqg_rcqe.html) when considered in conjunction with existing ambient water quality and site-specific factors.
15. Further mitigative actions will be taken as necessary based on monitoring results.
16. A portion of the dredge spoils may contain contaminants; hence provision will be made for characterization of in-situ material and for proper handling and disposal of any contaminated material. All dredge spoils will be disposed on land in accordance with regulatory requirements. The material encapsulated in the existing dock will not be disturbed.
17. Shore protection will be provided by riprap (armor stone) and filter stone.

18. Scour protection to control erosion at the seabed from propeller wash will be provided by riprap and filter stone.

19. Refer to Section 4.4 of this EPP for information on historic/archaeological issues and procedures pertaining to construction activities.

3.16 Buffer Zones

3.16.1 Environmental Concerns

Major environmental concerns are the potential for erosion and resulting damage to water quality, fish and fish habitat during construction of the Project. Buffer zones are undisturbed natural vegetation boundaries maintained along water bodies and around other sensitive areas. Without adequate buffer zone vegetation, streams, ponds and lakes can become laden with silt from runoff. Vegetation also provides cover for fish.

3.16.2 Environmental Protection Procedures

Buffer zones will be provided around protected areas to eliminate or minimize potential environmental effects resulting from construction activities of the Project.

1. Buffer zones of undisturbed natural vegetation will be maintained between construction areas and all water bodies and watercourses, and ecologically sensitive areas.

2. Silt runoff control fences will be constructed upstream of the buffer zone when required to control runoff from areas of exposed soils towards the buffer zone.

3. The Environmental Coordinators will inspect silt fences and buffer strips on a regular basis and where sediment is migrating into or through the buffer zone, the Contractor will be directed to undertake mitigation.

4. Any accumulations of silt observed will be removed and disposed of in an area where it will not re-enter any water body. Repairs and replacement of damaged silt fences will be addressed immediately.

5. The width of buffer zone to be established during design and used during construction will be based on the following guidelines:

    - Where not constrained a buffer zone width of 100 m will be adopted.

    - Where this is not possible the buffer zone will meet a guideline of 65 m or where the slope exceeds 30% the greater of 100 m or (20 + 1.5*Slope in %) (Gosse *et al.* (1998 – Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador).

    - An absolute criteria for the minimum buffer width is 15 m except for works that must be closer, such as stream crossings, or port facilities.

    - Where the buffer is less than 65 m additional care will be incorporated in the works to divert accumulated water away from the edge of construction adjacent to the buffer zone, and to remove silt without relying on the natural vegetation. Additional protective works, including slope stabilization and riprap will be used when required, to prevent erosion of silt to the waterway.

    - All work within 15 m of a body of water will require a permit under section 48 of the Water Resources Act.

6. Temporary fuelling or servicing of mobile equipment will not be allowed within 100 m of watercourses, water bodies, drainage systems or ecologically sensitive areas.
7. For equipment of limited mobility where the 100 m buffer zone cannot be practically achieved, adequate drip and spill containment will be provided during the refueling operation and will be subject to the approval of the SEM. The specific procedures to be used, including the sizing of the containment, will be developed in advance by the Contractor and approved by the SEM.
8. See Section 4.4: Discovery of Historic Resources, for buffer zone requirements and mitigative measures for any historic resources found in the Project area.
9. Any construction activity that must be carried out within the buffer areas, including docks, berthing area and other marine works, stream crossings, infilling, storm drainage works, must be approved by the Water Resources Management Division of DOEC.
10. See Section 3.32: Protection of Rare and at-risk Plants for Buffer Zone requirements related to Boreal Felt Lichen.

3.17 Erosion Prevention

3.17.1 Environmental Concerns

Vehicular movement and shoreline construction activity have the potential to cause surface soil erosion, which could ultimately result in the deposition of fines into the freshwater or marine environment. Erosion causes siltation in water bodies and, consequently, decreases suitable habitat for marine, aquatic and terrestrial animals.

3.17.2 Environmental Protection Procedures

The following measures will be implemented to provide adequate erosion and sediment control:

1. The Contractor shall submit plans for sediment control to the EPCM Contractor for approval in advance of the need to proceed.
2. All work to be carried out will be conducted according to the conditions set out in the permits and/or approvals and authorizations.
3. Vehicle and equipment movement will be restricted on the Project site to approved roadways and designated construction areas. Appropriate drainage and erosion control techniques will be implemented. All work will be performed in such a manner that deleterious substances including, but not limited to, materials such as sediment, fuel, and oil do not enter water bodies adjacent to the development site.
4. Erosion control techniques and devices will be used to stabilize easily eroded areas.
5. Topsoil and excavated overburden will be stored in separate stockpiles for later use.
6. Runoff of sediment-laden water during grubbing will be minimized by using measures such as settling ponds, ditch blocks, interception ditches and filter fabrics. Erosion control measures such as rip-rap, filter fabrics, drainage channels, and gravel or wood chip mulches will be implemented in areas prone to soil loss.
7. Siltation control structures (i.e., silt curtains, cofferdams, and/or sediment fences) will be constructed prior to beginning any activities involving disturbance of the soil, work along the shoreline or near areas of high runoff potential. Construction activities will be coordinated to avoid

periods of extreme precipitation and not coincide with sensitive periods for fish as identified by DFO.

8. Where terrain stabilization measures are required to protect marine and freshwater habitat from sedimentation, appropriate erosion control techniques will be implemented to mitigate the problem and provide siltation control. These may include, but are not limited to:
    - Spreading a thin layer of brush or slash over disturbed areas.
    - The installation of sediment control devices equipped with underflow baffles at appropriate intervals within the area of disturbance, which would hold back any floating oil, for recovery and disposal.
    - The installation of drainage collection across disturbed areas to channel drainage into vegetated areas.
    - The rerouting of drainage around the disturbance and redirecting it into its natural course.
    - The stabilization of exposed soils with appropriate rip-rap, filter fabric, or any other erosion technique deemed appropriate.
9. For any work with the potential to significantly affect fish habitat, Vale NL will complete a Request for Project Review and submit it to the Department of Fisheries and Oceans.
10. Further mitigation measures will be implemented if an environmental inspection reveals that silt is entering a water body. These include measures such as temporary drainage ditches, siltation settling ponds, ditch blocks/check dams or sediment dam traps, to intercept runoff or grading surfaces to remove erosion channels. The necessary and appropriate measures will be determined on site.
11. All work and marshalling and storage areas will be monitored for erosion and appropriate repair action taken as necessary.
12. Siltation control structures will be monitored by the Site Environmental Coordinators for excessive accumulation of sediment. Accumulated sediment will be removed from control structures to maintain the effectiveness of the systems.
13. Excess water will be removed from siltation control systems prior to excavation of sediment. Trucks will be equipped with liners to prevent loss of wet sediment during transport.
14. Vehicle movement, vegetation clearance and construction activities within 100 m proximity of watercourses, will be minimized where practicable.
15. Vehicle washdown water will be disposed of to a settling pond and checked for oil sheen prior to disposal.
16. Inspections and maintenance of erosion and sediment controls will be undertaken at least once a week and following significant rain events.

3.18 Excavations, Embankment and Grading

3.18.1 Environmental Concerns

The principal environmental concerns associated with excavation, embankment and grading are potential effects on water quality, fish and fish habitat, terrestrial habitat and historic resources due to ground disturbance. These activities also increase the potential for soil erosion and the associated effects of runoff containing high sediment loads on nearby water quality, aquatic ecosystems and

environmentally sensitive areas. Exposing sulphide containing rock to the atmosphere can result in acid generation, with subsequent metal dissolution and depressed pH in receiving waters.

3.18.2 Environmental Protection Procedures

All work shall be conducted in a manner which controls potential sedimentation of watercourses and water bodies in or adjacent to the work areas as outlined in the following procedures:

1. Excavation, embankment and grading shall be done only upon completion of grubbing and stripping. Where engineering requirements do not require grubbing and stripping (e.g., within the buffer zone of a stream crossing), filling shall occur without any disturbance of the vegetation mat or the upper soil horizons. Prior to excavation or filling, all sediment control measures will be checked and repaired or upgraded as necessary.
2. Excavation, embankment, and grading in the vicinity of stream crossings will be done in a manner so that erosion and sedimentation of watercourses and water bodies is minimized and is done in strict compliance with the NL Department of Environment and Conservation and DFO guidelines and requirements. All stream bank sections that contain loose or erodible materials are to be stabilized. No material is to be deposited within the watercourse.
3. Mitigative measure will be implemented prior to grubbing or excavation to direct natural drainage around work areas (e.g., silt curtains, cofferdams, and sediment fences).
4. Soil disturbance will be minimized by limiting the area exposed at any one time, stabilizing exposed soil with anti-erosion devices (e.g., riprap, filter fabrics, gravel, or wood chips), and re-vegetating disturbed areas as necessary.
5. The use of heavy equipment near watercourses will be minimized and not permitted within a waterbody.
6. Construction activities will be coordinated where possible to not coincide with sensitive periods for fish (e.g., spawning).
7. A buffer zone of undisturbed vegetation shall be maintained between construction areas and all watercourses, water bodies and ecologically sensitive areas. See Section 3.16: Buffer Zones.
8. Refer to Section 4.4 of this EPP for information on historic/archaeological issues and procedures pertaining to construction activities.
9. Where appropriate, efforts shall be made to use excavated waste as fill material.
10. Excavated waste material shall be disposed of in the spoil areas designated by Vale NL.
11. Rock to be exposed and exposed faces will be examined, and if necessary samples tested for acid producing potential. Testing of drainage water will include pH testing, and where the pH from newly exposed areas decreases significantly, the exposed rock will be further examined to determine any Acid Rock Drainage (ARD) potential.

3.19 Trenching

3.19.1 Environmental Concerns

Where excavation for the construction of water lines or any other infrastructure is undertaken, potential runoff of sediment-laden water can result in sedimentation of fish habitat, lower water quality and destruction of historic resources. Contaminated or hazardous material may be encountered during trenching operations.

3.19.2 Environmental Protection Procedures

The following measures will be implemented to minimize the potential effects of trenching:

1. Where possible, topsoil and excavated overburden and bedrock will be stored in separate stockpiles for later use during rehabilitation.
2. Any unsuitable material will be disposed of in a disposal area approved by the Construction Manager.
3. Rock will be evaluated for the presence of sulphides, as necessary.
4. Dewatering of trenches will make use of measures to minimize and control the release of sediment-laden water through the use of settling ponds, straw bales, geotexiles or other devices.
5. Should hazardous or contaminated material be encountered or suspected during trenching operations, the Environmental Protection Procedures outlined in Section 4.5, Discovery of Contaminated or Hazardous Material will be followed.
6. All trenches will be filled as soon as possible, and the retained topsoil used to assist in re-vegetation of the disturbed area.
7. Refer to Section 4.4 of this EPP for information on historic/archaeological issues and procedures pertaining to construction activities.

3.20 Dewatering – Work Areas

3.20.1 Environmental Concerns

The major concerns associated with dewatering are sedimentation and direct fish mortality and/or habitat destruction for freshwater and marine fish species.

3.20.2 Environmental Protection Procedures

1. Prior to undertaking any site dewatering the Contractor shall provide to Vale NL a dewatering protocol including specific discharge management procedures.
2. Filtration or other suitable measures, such as settling ponds, silt fences and dykes, shall be implemented for sediment removal and turbidity reduction of water pumped from work areas before discharging (Refer to Section 3.16 Erosion Prevention).
3. Where possible, clean water shall be discharged to vegetated areas to further reduce any potential effects on watercourses. Additionally, mechanisms for energy dissipation shall be implemented to prevent scouring and erosion of the discharge location (impervious geotextile mats, perforated end of pipe, discharge to small settling sump, etc.).
4. The size of sedimentation ponds shall be designed to accommodate the anticipated volume of collected water and meet discharge criteria for water quality.
5. Discharged water shall be encouraged to follow natural surface drainage patterns.
6. Measures shall be employed to prevent the alteration, disruption and destruction of fish habitat.
7. Any water directed out of the Project site shall be tested for total suspended solids and hydrocarbons (if there are visible signs of hydrocarbon contamination) before being discharged to any watercourse, waterbody or other ecological sensitive area.

8. Prior to periods of anticipated high rainfall, settling ponds will be lowered to the extent possible, and erosion and sediment management measures will be checked for adequacy and to make sure they are all properly secured.

9. Where pump discharges are to a vegetated areas to trap sediment, these discharge locations will be checked during periods of high flow and adjusted or stopped if they are not effective.

10. Adequate materials, including silt fencing, hay bales riprap filter frabric will be available to maintain silt control measures under adverse whether conditions.

3.21 Stream Crossings

3.21.1 Environmental Concerns

The environmental concerns associated with watercourse crossing and culvert installations include direct disturbances to or mortality of fish, disturbance of waterfowl, loss of fish habitat resulting from sedimentation and removal of substrate and stream bank vegetation. Specific erosion stabilization methods and effective sedimentation control practices will be developed on a site-specific basis.

3.21.2 Environmental Protection Procedures

1. There will be four road crossings of Rattling Brook, one a multi-plate bottomless arch, two culvert installations and a bailey bridge. All stream crossings will be designed and constructed to allow fish passage and to preserve aquatic habitat. All culvert installations on Rattling Brook will be sized for the 1:100 year flood.

2. Culverts will be installed in accordance with good engineering and environmental practices and in adherence with all terms and conditions issued by regulatory bodies.

3. Unless otherwise indicated, all work shall take place in dry conditions using cofferdams or diversions, as appropriate.

4. Cylindrical culvert inverts shall be set below the bed where necessary to protect fish habitat such that the culvert invert is 1/3 the diameter below the streambed in the case of culverts less than 750 mm outside diameter. For culverts greater than 750 mm outside diameter, the culvert invert shall be installed a minimum of 300 mm below the streambed.

5. In multiple (gang) culvert installations, one culvert shall be installed as described in 4 with the other culverts at higher levels.

6. Culvert design will maintain the natural low flow regime of the watercourse as far as possible.

7. Outlets and inlets of stream crossing will be stabilized wingwalls and/or riprap to prevent erosion of fill slopes.

8. Fill used above culverts shall be engineered to prevent washout of embankment material into the waterway.

9. Fill and construction debris from the culvert area will be removed to a location above the peak flow level to prevent its entry into the stream.

10. Construction activity shall be confined to the immediate area of the culvert.

11. Fill material shall not be removed from streambeds or banks, except for material removed to provide room for the culvert pipe and bedding.

12. The use of heavy equipment in and near watercourses will be minimized and restricted; where possible. An excavator will be used from shore rather than a bulldozer in the watercourse. Where it is absolutely necessary to do so, in-stream work will be performed by rubber-tired vehicles only, and will only be done in compliance with the Department of Environment and Conservation (DOEC) and Fisheries and Oceans Canada (DFO) guidelines/conditions.
13. Where required, cofferdams of non-erodible material shall be used to separate work areas from the watercourse when excavating for culverts and footings.
14. Cofferdams shall be removed upon completion of construction and the streambed returned as closely as possible to its original condition.
15. If fording any watercourse, the Environmental Guidelines for Fording from DOEC, Water Resources Division, and the DFO National Operational Statement (NOS) on Temporary Stream Crossings will be applied in conjunction with the following:
    - Areas of spawning habitat will be avoided.
    - Crossings shall be restricted to a single location with crossings made at right angles to the watercourse, at a location where the streambed is not erodible.
    - Equipment activity within the watercourse shall be minimized by limiting the number of times the crossing is used.
    - All equipment shall be mechanically sound to avoid leaks of oil, fuel and hydraulic fluids.
16. No servicing or washing of heavy equipment will occur adjacent to watercourses; temporary fuelling, services or washing of equipment in areas other than the main fuel storage site shall not be allowed within 30 m of a watercourse. All waste oil, filters, containers or other such debris will be removed from the work area and properly disposed of in an approved waste disposal site.
17. The entire fording area will be stabilized using vegetation mats, corduroy roads or coarse material (125 mm diameter or greater) when such material is available from a reasonably close location within the right-of-way, and the ford area is not natural bedrock, or is easily disturbed by fording. When the substrate of the ford area is not subject to easy disturbance by fording, or coarse material is not easily available within the right-of-way, fording under existing substrate conditions may occur with the approval of and under the direction of the SEM.
18. Fording activities shall not decrease the depth of the watercourses to less than 20 cm; where the existing depth is less than 20 cm, that depth shall be maintained.
19. Fording activities will only occur during low flows, and may be stopped by the SEM if excessive disturbance is observed.
20. All bank sections that contain loose or erodible materials must be stabilized prior to fording. If banks must be sloped for stabilization, no material shall be deposited within the watercourse; sloping shall be accomplished by back-blading and the material removed shall be deposited above the high water mark of the watercourse.
21. All fording activities will comply with the required approvals from the DOEC and DFO guidelines (as per the DFO Factsheet on Fording).

3.22 Water Supply

3.22.1 Environmental Concerns

Construction of water supply intake structures within water bodies has the potential to cause entrainment of fish. Construction of groundwater wells can lead to a negative impact on the surrounding groundwater.

3.22.2 Environmental Protection Procedures

1. Water will be supplied by either wells or surface water intakes to be constructed along Rattling Brook. The flow regime in Rattling Brook will be maintained at a level adequate to protect fish habitat as described in the EIS.
2. Vale NL will confirm that potable water meets all the Guidelines for Canadian Drinking Water Quality. Potable water will also be provided through a local water supply contract and distributed to key points around the site as construction evolves.
3. At all stages during construction the flow downstream of the work will be maintained.

3.23 Surveying

3.23.1 Environmental Concerns

Any required site surveying activities for construction of the Project shall be conducted primarily on disturbed land. Surveying activities may disturb wildlife species, vegetation and historic resources. The surveying activities that may be required include:

- Vegetation removal.
- Traversing.
- Establishing permanent benchmarks.

3.23.2 Environmental Protection Procedures

3.23.2.1 Vegetation Removal

1. Width of survey lines shall be limited to that which is absolutely necessary for line of sight and unobstructed passage.
2. Whenever possible, cutting lines to the boundary between treed and open areas will be avoided.
3. No attempt to disturb or harass wildlife shall be made by any person.
4. Vehicles shall yield the right-of-way to wildlife.
5. Archaeological sites and features shall not be disturbed during survey work. Any discovered sites shall be reported to the Historic Resources Division, in accordance with Section 4.4 of the Environmental Protection Plan.
6. Trees and shrubs will be cut flush with the ground wherever possible.
7. Cutting of survey lines will be kept to a minimum. Where possible, alternate areas not requiring cut lines will be used.
8. All trees not exactly on transit lines will be left standing.

3.23.2.2 Traversing

1. All-terrain Vehicles (ATVs) will not be allowed off the right-of-way except as approved by the Construction Manager. The use of ATVs will be restricted to designated trails, thus minimizing ground disturbance. ATV use will comply with the Motorized Snow Mobile and All-Terrain Vehicle Regulations, 1996 under the Motorized Snow Mobile and All-Terrain Vehicle Act and the Environmental Guidelines for Stream Crossings by All- Terrain Vehicles issued by the DOEC. No ATVs are to operate in bog.
2. No motorized vehicles will enter the areas designated as sensitive without notification and approval of the SEM.

3.23.2.3 Establishing Permanent Benchmarks

1. A driven T-bar, well embedded to readily identify each benchmark location shall be used so as to pose no hazard to persons or animals.
2. No attempt to disturb or harass wildlife shall be made by any person.
3. Standard iron bars and sledgehammers are to be used to establish benchmarks.
4. Vehicles shall yield the right-of-way to wildlife.
5. Any archaeological sites and features that are encountered shall not be disturbed. Any discovered sites shall be reported to the Historic Resources Division and to Vale NL (Refer to Section 4.4).
6. Walking in ecologically sensitive areas shall be restricted to established walking paths, if available.
7. Access to ecologically sensitive areas is to be approved by the Vale NL Project Environment Superintendent.

3.24 Drilling – Geotechnical/Water Well

Drilling will be required on land during geotechnical investigations to recover soil samples and to meet project water requirements.

3.24.1 Environmental Concerns

The environmental concerns associated with drilling on land are surface disturbances, disposal of drilling fluids and cuttings, generation of dust, noise, and the potential effects on terrestrial habitats, historic resources, air quality and aquatic ecosystems.

3.24.2 Environmental Protection Procedures

Potential drilling sites in sensitive areas shall be inspected by the SEM and Environmental Coordinators.

1. Drilling sites shall be cleared of vegetation following the procedures detailed in Section 3.1.
2. Disposal of all drilling materials and associated solid wastes shall be undertaken in accordance with the procedures in Section 3.6.
3. Fuel shall be stored, handled and transported according to Section 3.3.
4. Water applications shall be used to control dust, where necessary and the source of water shall be approved for use. The use of water for dust control or lubrication during drilling shall be undertaken in a manner which prevents runoff from entering watercourses.
5. Drilling equipment shall have muffled exhaust to minimize generated noise.

6. Drilling of water wells shall be conducted in compliance with the Water Resources Act and the Well Drilling Regulations.

3.25 Drilling – Geotechnical Drilling in the Marine Environment

Marine drilling will be required during geotechnical investigations to determine foundation conditions - assess stability, and underlying rock type for project infrastructure.

3.25.1 Environmental Concerns

The environmental concerns associated with this type of geotechnical drilling in a marine environment include marine pollution from the release of drill cuttings and other drilling related debris, fuel or other hazardous material; noise generated by drill operations; and disturbance of aquatic ecosystems (marine communities and/or individual species such as wolffish) caused by increased turbidity near the ocean floor in the area proximal to the drill collar location.

3.25.2 Environmental Protection Procedures

1. All drilling activity shall utilize best environmental techniques and environmental products possible, such as biodegradable or water-based drilling fluids.
2. Barges used to support drilling during ice free conditions shall be inspected for sea worthiness prior to mounting the drill onto the barge. The drill crew shall also keep a daily log of inspections for sea worthiness and mechanical soundness of barge and drill.
3. Following the initial inspection and prior to each drill mobilization, the drill rig and barge shall be inspected by the Environmental Coordinator for potential environmental risks.
4. All fuel, lubricants and other hydrocarbons shall be stored, handled and transported according to Section 3.3 - Storage, Handling and Transfer of Fuel and Other Hazardous Materials. Only necessary quantities are to be stored on the drill rig at any time.
5. Disposal of drilling materials and all solid wastes shall be undertaken according to Section 3.6 with no disposal to the marine environment.
6. Drilling equipment shall have muffled exhaust to minimize generated noise.
7. Operations shall be suspended when weather conditions exceed the capabilities of the drill, moorings and boom to operate in a safe and effective manner.
8. All drill workers will be familiar with oil spill response procedures. Spill response equipment will be on the barge at all times. See Section 4.2 - Fuel or Hazardous Materials Spills for additional information. Fuel spills will be handled as per the ERP.
9. In the event of a spill, all drilling activity must cease until clean up is performed. Priority in the event of a spill will be the safety of all crew members.

3.26 Pumps and Generators

3.26.1 Environmental Concerns

A variety of water pumps, hoses and generators may be in frequent use at the construction site. Environmental concerns associated with the operation and use of such equipment include accidental spills of the fuel or lubricating oil and chronic leaks, which may contaminate local water bodies and surface soils.

3.26.2 Environmental Protection Procedures

1. Contractors shall report all generators to the SEM prior to mobilization of the equipment at site.
2. All generators must be registered with DOEC as per the Approval of Diesel Generators Guidance Document (GD-PPD-061).
3. Fuel shall not be stored near generators or located adjacent to water bodies.
4. Drip pans shall be placed underneath pumps and generators.
5. Hoses and connections on all equipment, especially equipment located near water bodies, shall be inspected daily for leaks and drips.
6. All leaks shall be reported immediately to the Environmental Coordinator and as per the Incident/Injury Reporting Procedures in the Construction Emergency Response Plan (69-010-010-XPL-1002).
7. Refueling and routine maintenance activities will be carried out in accordance with Section 3.3 Storage, Transportation and Handling of Fuel and Other Hazardous Materials, and Section 3.10 Equipment Use and Maintenance.
8. In addition to spill kits located at fuel storage tanks additional spill kits will be located at designated central storage location(s). Personnel who deal with fuelling, fuel transfer and pumps and generators will be trained in the use of the kits.

3.27 Installation of Effluent Pipe

3.27.1 Environmental Concerns

The treated effluent from the plant will be discharged through a pipeline at the north end of the plant site, extending from a location to a diffuser at the discharge point. The diffuser location has not yet been finalized, but the pipe length is expected to be between 5 and 6 kilometres. Pipeline construction will be maximized on land to the greatest lengths possible and then fused together. The line will be fitted with weighted collars, moved into the final location on the surface, and then using controlled flooding of the pipe, sunk to the bed, where the pipe will rest on the bottom.

The Environmental concerns during construction are:

- Limiting access to the work area for fishing vessels during construction,
- Potential interference with fishing gear after the pipe is placed on the bed,
- Disturbance to the bottom habitat.

3.27.2 Environmental Protective Procedures

1. Minimizing the impact on fishing operations requires keeping the period of occupation of areas used for fishing, or access to fishing, to a minimum, preferably not more than 3 months. Final selection of the construction methods, particularly the assembly and welding of the sections of pipe will take into account the need to keep the occupation period of areas used by fishers to a minimum.
2. Consistent with safe construction and protection of the line as it is being built, it will be kept clear of the areas of concern, until ready for final location and sinking of the fully assembled line. The Contractors EPP will be reviewed taking into account the methods they propose to minimize this impact.

3. The proposed line will not be buried, except for a section close to the shore, minimizing the disruption of habitat, except for the actual area covered by the pipe. A compensation plan developed in conjunction with the Department of Fisheries and Oceans, will be implemented to provide habitat benefits of at least equal value to those lost.
4. The final design of the pipe collars and diffuser will take into account the need to avoid protuberances and sharp edges that would increase the risk of damage to fishing gear.
5. The working area will be clearly marked, and advertised, with access to the area prohibited, to avoid risk of conflict between fishing activities and construction work.
6. Vale NL will have a project Fisheries and Aquaculture Liaison Committee (FALC) established to consult with area fishers and the aquaculture operator on all aspects of marine facilities construction. This will help to address and avoid or reduce any potential negative effects.
7. A Construction Safety Zone will be established in consultation with the FALC, and it will be clearly marked. The size will be restricted to allow as much use of the established fishing grounds as possible, within the constraints of safety.
8. Refer to Section 4.4 of this EPP for information on historic/archaeological issues and procedures pertaining to construction activities.

3.28 Marine Traffic

3.28.1 Environmental Concerns

Project construction vessel traffic may interfere with local fishing boats and other vessel traffic. The potential exists for vessels to collide, run aground and/or sink. Such events may lead to the accidental release of fuel and other hazardous materials to the marine environment. The release of ballast or bilge water could also introduce non-indigenous species or deleterious substances into Long Harbour.

Equipment, supplies, materials and plant components may also be delivered by marine transport. Marine traffic has the potential to disturb fish habitat through physical presence, noise, prop wash and discharges.

3.28.2 Environmental Protective Procedures

Marine vessel traffic will be a short-term concern associated with a construction zone near the wharf. Vale NL will participate actively in efforts to reduce potential congestion and improve marine safety.

1. All ships used for Project-related shipping will comply with applicable shipping regulations. Vale NL will require strict compliance with all environmental legislation and all vessels will operate in strict compliance with the Placentia Bay Vessel Traffic Management System.
2. To minimize interference with other marine traffic, Notices to shipping for surveys, hazards, etc. will be issued by the Canadian Coast Guard.
3. All hazardous materials or liquids shall be stored on-board and off-loaded in a safe manner to minimize any risk of spills.
4. If liquids are being transferred, spill containment and abatement will be available on-site as well as personnel trained in the deployment of this equipment.

3.29 Vehicular Traffic

3.29.1 Environmental Concerns

During any construction related operations, the level of activity involving equipment movement, types of equipment and supply, require various infrastructure such as roads, to conduct the work efficiently and in an environmentally acceptable manner. Typically, resource road construction is supported by vehicles ranging in size from all terrain vehicles (ATVs) to heavy equipment, all of which can result in ground disturbance.

Direct physical disturbances from vehicular movements can adversely affect air quality, both terrestrial and aquatic environments, as well as historic resources.

Vale NL is committed to the proper operation and maintenance of all Project vehicles to reduce environmental effects.

3.29.2 Environmental Protection Procedures

1. ATVs shall not be allowed on the site except as required in the performance of the work.
2. Where possible, the use of ATVs shall be restricted to designated trails and roadways, within and between work, marshalling, maintenance and storage areas, thus minimizing ground disturbance. ATV use shall comply with the appropriate legislation and the Environmental Guidelines for Stream Crossings by All-Terrain Vehicles.
3. The use of heavy equipment in and near watercourses shall be minimized and restricted; where possible an excavator shall be used from shore rather than a bulldozer in the watercourse. Where it is absolutely necessary to do so, in-stream work shall be performed by rubber tired vehicles only, and shall only be done in compliance with permits and approvals. Copies of such permits and approvals shall be provided.
4. Appropriate speed limits and road signage will be established and enforced to minimize environmental disturbance and accidents.
5. Equipment and vehicles will yield the right of way to wildlife. Any wildlife encounters will be dealt with as described in Section 4.3 of this EPP.
6. All Project vehicles will be properly inspected and maintained in good working order including all exhaust systems, mufflers and any other pollution control devices to meet emission standards.
7. Travel in areas outside designated work areas will not be permitted.
8. Site roads will be graded regularly and monitored for signs of erosion and appropriate action will be taken to repair roads, when necessary.

3.30 Concrete Handling and Placing

3.30.1 Environmental Concerns

Substantial quantities of concrete will be required for the construction phase of the Project. Cement, concrete additives, agents and aggregates will be used in the production of concrete. A concrete batch plant will be located at the Construction Laydown area.

The major concern relating to concrete production activities is the effects of wash water released to the environment. Although cured concrete has little effect on water quality, fresh concrete and concrete products may raise the pH in receiving waters to potentially toxic levels (i.e., well above pH 9).

Cement is very alkaline and wash water from spoiled concrete or from the cleaning of the batch plant mixers and mixer trucks, conveyors and pipe delivery systems can be expected to have very high pH, which may even after dilution exceed the acceptable limit, as determined by the provincial regulation of discharges to a body of water. Similarly, spoiled concrete or wash water would contain concrete additives and agents, some of which are toxic to aquatic species. Aggregates, particularly the finer sand fractions, can be expected to be washed from spoiled concrete or discharged in wash water. Uncontrolled release of such wash water, chemicals and sediments can adversely affect aquatic life and aquatic habitat.

3.30.2 Environmental Protection Procedures

The following measures will be implemented to minimize the potential impacts from concrete production or placement:

1. All chemical additives, agents and other potential hazardous materials will be transported, stored and handled in strict accordance with Section 3.3 Storage, Transportation and Handling of Fuels and Other Hazardous Materials.
2. Dust control measures specified in Section 3.14, Dust Control, will be adhered to with respect to the stockpiling and storage of aggregates and the handling of cement.
3. All equipment will be equipped with the required dust and emission control filters as specified in Section 3.10 Equipment Use and Maintenance. The batch plants shall not be operated without the dust control equipment on the silos being fully functional, with no visible dust emissions from the baghouse.
4. Granular materials shall be transported as specified in Section 3.9, Site Access.
5. Material stockpiles shall be maintained as specified in Section 3.14: Dust Control.
6. Mixing of concrete will take place at least 100 m from any watercourse.
7. Cement or fresh concrete shall not enter any watercourse or water body. Dumping of concrete or washing of tools and equipment in any body of water is strictly prohibited.
8. All fresh concrete and concrete product waste to be disposed of on site shall be disposed of in the concrete waste pond. Concrete trucks shall not be cleaned at any other location on site.
9. Wash water from the cleaning of mixers and concrete trucks will be discharged either at the concrete manufacturer's place of business, or to a closed system rinsing / settling basin constructed on-site, to a design and at a location approved by Vale NL.
10. Hand tools and concrete truck chutes may be cleaned at the delivery location. Cleaning of hand tools and concrete truck chutes shall not be conducted within the buffer zone of water bodies and watercourses or other ecological sensitive areas.
11. Before water from the closed rinsing / settling system is released, it will be tested, prior to release, for total suspended solids, pH and for parameters related to any concrete additives to be used in the production of concrete. Water released will meet the limits specified by DOEC, and will adhere to those portions of the Fisheries Act that relate to fish habitat protection and pollution prevention. Monitoring and reporting will be done in accordance to the Environmental Monitoring Plan for Construction.
12. If water to be released does not meet discharge criteria, it shall be further tested until the discharge criteria have been met.

13. The settling basin will be adequately sized to maintain the retention capacity at all times. The setting basin shall be cleaned out, as required, to ensure the retention and setting capacity are maintained at all times.

14. Solids recovered from the setting basins may be put to beneficial use at the site. In the event that solids recovered from the setting basins cannot be beneficially used, they shall be disposed of at an approved disposal site by a licensed contractor.

15. Concrete additives and form release agents will be stored in approved containers and transferred and used so as to avoid loss of material to the environment.

3.31 Reclamation of Land

3.31.1 Environmental Concerns

Activities during construction could potentially destroy wildlife habitat, destabilize erodible soils, and reduce the aesthetic appeal of the area. Therefore, an active program of re-vegetation and reclamation of lands will be undertaken by Vale NL as areas are no longer needed for construction. This will be performed in order to mitigate impacts in those areas, which might have been affected by construction activities, but will not be required during the operational phase of the project.

3.31.2 Environmental Protection Procedures

1. Drainage patterns will be established to avoid future erosion or flooding of settling ponds.

2. The SEM will identify areas requiring immediate planting or seeding to stabilize the surface.

    - Areas adjacent to watercourses where erodible soil has been exposed and where mechanical stabilization techniques are not judged to be sufficient to guarantee stability or prevent uncontrolled introduction of sediment into watercourses.

    - Areas adjacent to existing roads where erodible soil has been exposed.

    - Any other areas judged by the SEM to require quick re-vegetation.

3. Seeding and planting requirements for each site identified will be determined based upon soil analysis of each site. The amount of fertilization, liming, and the seed mixture or seedling requirements will be decided on a site-specific basis.

4. A rehabilitation plan will be developed, to provide guidance for rehabilitation of those areas that will no longer be required when construction is completed. This plan will include methods of restoration that will encourage the re-colonization by native species.

5. Reclamation of those lands disturbed during construction, that are no longer required will commence as soon as possible after they are no longer needed and the weather is suitable. The reclamation will follow the rehabilitation plan noted above, utilizing the topsoil and grubbings previously saved from clearing operations to establish a suitable base.

6. The areas subject to reclamation activities will be visually inspected by the SEM periodically to confirm adequate results. Additional reclamation activities will be performed as deemed appropriate by the SEM.

3.32 Protection of Rare and at-risk Plants

3.32.1 Environmental Concerns

Rare and at-risk plants occur in the Long Harbour study area. These species can be negatively affected due to: (i) direct habitat loss during site preparation (vegetation removal, grubbing, removal of over-burden and dumping/disposal), and right-of-way and construction area clearing and preparation and/or (ii) deterioration of habitat quality by increased exposure when sites are cleared and/or grubbed. Effects to habitat quality may manifest as increased exposure to wind and sunlight as well as effects from increased run-off, changes in the water table, siltation and erosion. Air quality can be affected by increased dust and other project-related airborne compounds, such as vehicular exhaust.

The at-risk boreal felt lichen (*Erioderma pedicellatum*) (BFL) has been located in low density on balsam fir (*Abies balsamea*) trees in the Long Harbour project area. Factors affecting this globally-rare species are hypothesized to include air-borne pollutants and acid rain, and its survival appears dependent on intact mature softwood forests. Lichens are recognized as being very sensitive to air quality and forest habitat structure, and different lichen species exhibit differential sensitivity to perturbations. This property makes lichens well-suited as biological indicators for monitoring environmental quality, and two species are being monitored in the Long Harbour study area, namely *Erioderma pedicellatum* and the textured lungwort (*Lobaria scrobiculata*). Two species of rare flowering plants (round-leaf orchid (*Habernaria orbiculata*) and giant leaf orchid (*Platanthera macrophylla*)) have also been discovered in the study area.

3.32.2 Environmental Protection Procedures

- Prior to undertaking work on the site, surveys will be carried out at the site, with particular emphasis in the general vicinity of planned construction works. Search procedures for detection of BFL will be carried out by an experienced, qualified observer. Locations of trees containing BFL thalli identified during these surveys will then be examined and where practical, adjustments made to the planned activities to avoid going closer than 20 m to any identified trees.
- After making whatever adjustments are practical to the project, to minimize the number of impacted trees, all of the trees will be classified into three types as follows.
  - Trees which are at least 20 m from any disturbed area.
  - Trees which are within the area to be disturbed.
  - Trees within the zone between 0 and 20 m of any area that will be disturbed.
- For those trees at least 20 m from a disturbed area, the coordinates will be recorded and the tree or groups of trees will be included in exclusion zones which will be marked on site and included as part of this plan, amended as may be required, based on any changes to the project footprint or discovery of additional BFL. Buffering requirements for sensitive sites may be increased to reflect more landscape level objectives (e.g. forest stand) alluded to in the Boreal Felt Lichen Management Plan by the Department of Environment and Conservation.
- For those trees within the area to be disturbed (campsite and plant site), all of the healthy thalli identified will be transplanted to other balsam fir trees located clear of any proposed activity, but in the general vicinity (2-3 km) of their original location. Sites selected to receive transplants will generally be located in areas already having BFL occurrences, to increase the chance of a successful transplant. Nevertheless, Vale NL may propose some concepts for research and development in order to improve the scientific understanding of the habitat use of this enigmatic species.

- For the remaining intermediate trees between 0-20 m from an area to be disturbed, each tree will be individually reviewed taking into account:
  - The proximity of the tree to the disturbed area.
  - The type of disturbance and whether this is likely to impact viability of the host tree (by for example disrupting the root system).
  - Whether the disturbance will be short term and minor (such as alongside a road used only occasionally), or long-term (such as adjacent to the final plant site).
  - Whether after completion of the work the area will be exposed to significantly different microhabitat features, such as increased sunlight, wind or air quality regimes.
- The end result of the review will be a decision to either:
  - leave the thallus/thalli in place and accept a reduced buffer distance, or
  - transplant the thallus/thalli.
- Where these intermediate zone trees are left in place, they will be marked and the modified buffer zone marked around each one, using a 20 m clearance except in that part where the area to be disturbed is to be closer.
- During clearing care will be taken to avoid disturbance and infringement of the buffer area (for example, by dropping of material or trees into the buffer zone).
- All of the thalli transplanted or retained with a reduced buffer will be monitored as described in the Environmental Monitoring Plan (EMP). The monitoring includes a selected control group outside of the acquisition area and allows for comparisons of survival within and outside of various size buffer zones. The overall study design is a Before-After-Control-Impact (BACI) considered an optimal study design to determine environmental effects because parameters are assessed in the control and experimental area before and after project initiation. The results of this monitoring program will be made available to the Department of Environment and Conservation, so that the information will be available for future planning of BFL protection programs.
- Immediately prior to and following clearing, before the onsite earthworks, the Environmental Coordinators will check that all of the buffer zones are clearly marked and the site markings of the area to be protected from disturbance are consistent with the site area as shown on the drawings.
- No other areas except those shown on the drawings as being disturbed, shall be cleared, or otherwise disturbed, without being approved by the Site Environmental Manager (SEM). Any changes to affected areas will require additional surveys for BFL, or for other species, if the habitat is suitable. The Environmental Inspectors working on site will be trained to identify BFL and other rare and at risk species occurring in the site area, and will be available at all times during construction.
- Care will be taken to minimize dust and other air-borne compounds that could affect the air quality of forested habitat containing rare plants adjacent to the construction sites, particularly adjacent to flagged buffer zones. Refer to section 3.14 for dust control procedures.
- Appropriate precautions will be implemented to direct run-off and siltation from construction areas away from forested habitat containing rare plants adjacent to the construction sites. The Environmental Coordinators will review all proposed and actual silt control measures to confirm that they will comply with this requirement.

- Exclusion zones will also be established for the two rare species of orchid, and any other species that may be identified as rare or endangered. A map of exclusion zones will be maintained and controlled as part of this EPP, and be available when selecting areas for any future ongoing activities. All exclusion zones will be clearly demarked on the ground using a consistent marking protocol in order to simplify field recognition for contractors. Contractors will be thoroughly debriefed on all marking protocols.

4. Contingency Plans

4.1 Introduction

Contingency plans to address incidents and unplanned situations that could possibly occur during construction phase of the Project have been developed, and will be modified as required throughout the Project. A separate Emergency Response Plan (69-010-010-GPL-0022) has been prepared for the project to address the actions to be taken in response to accidents and this Emergency Response Plan (ERP) is the first point of reference for emergency responders in the case of an emergency on site. Information provided in this Section is meant to support that document and be available as additional reference.

The main objectives of these plans are to minimize the following:

- Danger to persons.
- Pollution to watercourses.
- Area affected by an incident.
- Degree of disturbance to the area and watercourses during clean-up.
- Degree of disturbance to wildlife.

Not withstanding contingency plans, Vale NL will adopt a policy to implement preventative measures as the first line of defence against the possibility of incidents.

Vale NL has established a series of contingency plan processes that apply to this EPP. The contingency plans that have been developed for the potential accidental and unplanned situations are as follows:

- Fuel or Hazardous Material Spills (Section 4.2).
- Wildlife Encounters (Section 4.3).
- Discovery of Historic Resources (Section 4.4).
- Discovery of Contaminated or Hazardous Material (Section 4.5).
- Vessel Accidents (Section 4.6).
- Fires and Explosions (Section 4.7).
- Extreme Weather (Section 4.8).

4.1.1 Incident Reporting

The following incident reporting procedures are more fully described in the Health, Safety, Environment and Community, CNPP Safety Management Plan and will be followed:

- All incidents involving personal injury, third-party liability, fire or explosions, or incidents that have the potential to cause serious bodily harm or major equipment damage, must be reported immediately to the Safety Manager and Construction Manager.
- The Safety Manager will be responsible to make sure that an Incident Report Form is completed and submitted to the Project Manager and the Construction Manager.
- Incidents of a less severe nature must be reported to the HSE manager within 24 hours of the incident.

- The paper copy of the report will be kept at the site and a computerized report will be forwarded to Vale NL for review by appropriate personnel.
- Any communication of incidents to the media will be only conducted by the appropriate Vale NL employee after consulting with representatives from the Company HSE and Public Affairs departments. All information given to the media will be recorded and logged.

4.1.2 Communications Planning

Communication is important to effectively implement the EPP. It is an essential component of Project development. It will make sure that the appropriate information is distributed to those potentially affected by Project activities, including but not limited to local fishing groups, vessel traffic, local labour unions, emergency responders and the general public.

Vale NL has established a procedure for communication within the scope of the Company's management systems and identified conditions for:

- Communication among the various levels and functions.
- Receiving, documenting, and responding to communication from external interested parties.

This EPP addresses the necessary communication with public authorities regarding emergency planning and other relevant issues.

4.1.3 Complaints and Environmental Incidents

Any complaints received from the community will be directed to the Vale NL (See Section 6 for Emergency, Advisory and Other Contact Numbers). All complaints received will be investigated and an initial response (even if pending further investigation) is to be given to the complainant within 2 business days.

All environmental incidents occurring on the site will be recorded. The following information will also be provided:

- Time, date, location and nature of the incident.
- Actions taken and by whom.

4.2 Fuel or Hazardous Material Spills

4.2.1 Environmental Concerns

Fuel and hazardous materials can be damaging to vegetation, soil, surface water, groundwater, wildlife, marine organisms, historic resources and human health and safety.

4.2.2 Response Actions

In the event of a fuel spill, the following procedures will apply. The ERP should be the main reference document in case of emergency and should be referred to for further information.

1. The WHMIS program shall be implemented throughout the job site in accordance with the Newfoundland Occupational Health and Safety Act and regulation governed by the Workplace Health, Safety and Compensation Commission of Newfoundland.
2. All employees involved with hazardous materials shall be appropriately trained.

3. Fuel storage on the work site shall be undertaken in compliance with applicable provincial and federal regulations, codes and guidelines.
4. The individual who discovers the leak or spill will make a reasonable attempt to immediately stop the leakage and contain the flow.
5. Spill location, type of fuel, volume and terrain condition at the spill site will be determined and reported immediately to the SEM and SES.
6. Personnel will not be allowed to approach the spill area without appropriate Personal Protective Equipment until the appropriate authority has cleared the area.
7. Any spill or leak of fuel in the marine environment or that may enter the marine environment, or, 70 L or more on land will be reported immediately to the Canadian Coast Guard spill report number (709) 772-2083 or 1-800-563-9089. Required pertinent information includes:
    - Name of reporter and phone number.
    - Time of spill or leak.
    - Time of detection of spill or leak.
    - Type of product spilled or leaked.
    - Amount of product spilled or leaked.
    - Location of spill or leak.
    - Source of spill or leak.
    - Type of accident (collision, rupture, overflow, other).
    - Owner of product and phone number.
    - If the spill or leak is still occurring.
    - If the spill or leaked product is contained, and if not, where it is flowing:
        - Wind velocity and direction.
        - Temperature.
        - Proximity to water bodies, water intakes, and facilities.
        - Snow cover and depth, terrain, and soil conditions.
8. The Incident Commander (IC) has been trained in spill clean-up procedures and how to mobilize the clean-up equipment. The overall responsibility of coordinating a clean-up and maintaining this contingency plan current and up-to-date will be the responsibility of the IC. The IC has full authority to take necessary and appropriate action without unnecessary delay.
9. In reaching decisions on containment and clean-up procedures, the following criteria will be applied:
    - Minimize danger to persons.
    - Protect water supplies.
    - Minimize pollution of watercourses.

- Minimize area affected by spill.
- Minimize the degree of disturbance to the area and watercourses during cleanup.

10. The IC will act in consultation with the regulating authorities to:
    - Assess site conditions and environmental impacts of various cleanup procedures.
    - Assess potential for fuel recovery versus burning.
    - Deploy on-site staff to mobilize pumps and empty 215 L drums, or other appropriate storage containers, to the spill site.
    - Deploy on-site staff to build containment dykes and commence pumping collected liquid into drums.
    - Apply absorbent as necessary.
    - Remove and dispose of all contaminated soil.
    - Dispose of all contaminated debris; cleaning materials and absorbent by placing it in an approved land-fill site.
    - Take all necessary precautions to prevent a reoccurrence of the incident.
11. The IC will be responsible for the preparation of a written report which will be sent (as soon as possible and no later than 30 days after the spill) to the Manager, Environment Health and Safety, Vale NL, who will forward it to the appropriate agencies or departments.

4.3 Wildlife Encounters

4.3.1 Environmental Concerns

Wildlife encounters pose a risk of stress or injury to both the wildlife and site personnel. Control measures and environmental protection procedures have been put in place to minimize this risk to wildlife and humans. Construction activities can damage or destroy rare or endangered species, directly or by loss of habitat.

4.3.2 Response Actions

All project personnel will abide by the following rules in cases of wildlife encounters.

1. Site and working areas shall be kept clean of food scraps and garbage. Waste shall be collected for disposal at an approved landfill site.
2. No attempt to chase, catch, divert, follow or otherwise harass wildlife by vehicle or on foot will be made by any person at the project site.
3. Equipment and vehicles will yield the right-of-way to wildlife.
4. No personal pets, domestic or wild, will be allowed on the site.
5. All personnel should be aware of any potential for encounters with animals prevalent in the area and will be instructed to immediately report all sightings to the SEM. At the discretion of the coordinator a representative of the Wildlife Division will be notified.
6. When animals are identified in the area, the SES will be responsible for all subsequent actions.

7. All active bird nests found on site are to be immediately reported to the SEM. A decision on appropriate action will depend on the species, status of nesting and construction activities. In the case of rare or endangered species, a protective zone will established until the nesting cycle is completed.
8. To avoid increased pressure on fish and wildlife populations through hunting, trapping and angling, these activities shall be banned on site. In addition, firearms shall be prohibited on-site.

4.3.3 Species at Risk Act

It is prohibited under SARA to:

1. Kill, harm, harass, capture or take individuals of extirpated, endangered or threatened species.
2. possess, collect, buy, sell or trade individuals or parts of them.
3. damage or destroy an individual's residence.
4. destroy any part of the species' legally identified critical habitat.

SARA prohibitions apply to species covered by the Federal Fisheries Act and the Migratory Birds Convention Act where ever they occur.

4.4 Discovery of Historic Resources

This contingency plan focuses on the procedures to be implemented in the case of a suspected archaeological or heritage resource discovery.

4.4.1 Environmental Concerns

Heritage and archaeological resources such as structures, tools, butchered animal bones, graves, pottery, shipwrecks or other features, may be disturbed or discovered during construction activity. These features represent a valuable cultural resource, and uncontrolled disturbance could result in loss or damage to these resources and the information represented by them.

4.4.2 Response Actions

Prior to construction, all personnel working on the site will be informed of their responsibility to report any unusual findings, and to leave such findings undisturbed.

1. In the event of the discovery of a historic or prehistoric artifact or archaeological site, the procedures outlined below will apply.
    - Work in the immediate area will be suspended and the Construction Manager and SEM will be notified immediately.
    - The HSE Manager will contact the Department of Tourism, Culture and Recreation, Provincial Archaeology Office (PAO).
    - The site area will be flagged for protection and avoidance, with an appropriate buffer zone determined in consultation with the PAO.
    - An Incident Report Form will be filed with the Project Manager.
    - In the event that the PAO determines the find is an archaeological deposit, the Company and its contractors will take direction from the PAO regarding further contacts and required actions.

- The Company will take all reasonable precautions to prevent employees or other persons from removing or damaging any such articles or sites until they have been assessed.
- A qualified archaeologist will conduct an archaeological assessment of the resource and report the resource to the PAO. No work at that particular location will continue until the qualified archaeologist, in consultation with the PAO authorizes renewal of the work.

2. In the event of the discovery of suspected human remains or a burial site, the procedures outlined below will apply.
   - Work in the immediate area will be suspended and the Construction Manager and Vale NL Project Manager will be notified immediately.
   - If remains are found during operations by heavy equipment, the equipment will not be moved by the Contractor, as physical evidence may be destroyed.
   - The site, including heavy equipment, if necessary, will be secured by the Contractor with flagging tape or some other appropriate means. The suspected remains will be covered with a tarp.
   - Vale NL will contact the local Royal Canadian Mounted Police (RCMP) detachment.
   - If the RCMP determines that the remains are associated with a historic burial, the Company will contact the PAO to obtain guidance on further actions.

4.5 Discovery of Contaminated or Hazardous Material

4.5.1 Environmental Concerns

Discovery of contaminated or hazardous material could pose a risk to human health and the terrestrial, freshwater or marine environments. In addition to normal industrial wastes, this site does have PCB equipment, and may have residual elemental phosphorus.

4.5.2 Response Actions

All project personnel shall abide by the following rules in the event of the discovery of potentially contaminated or hazardous material. In the event of discovery or release of hazardous material refer to the Emergency Response Plan (ERP) (69-010-010-GLP-0022) for the appropriate actions.

1. Should any member of the project personnel collapse as a result of the suspected emission of contaminated or hazardous vapours, no person will approach the person or area without Personal Protective Equipment (PPE). Actions to be followed are included in the ERP. The Emergency First Responder and medical centre will be notified immediately. The Incident Commander (IC) will contact external emergency services, as required.
2. Work will immediately cease in the area of the discovery and personnel will evacuate to an area upwind of the discovery.
3. Any sealed or opened containers will not be opened or otherwise investigated.
4. The IC will be responsible for all subsequent actions and will arrange for an investigation and, if necessary, disposal of the suspect material by appropriate personnel.
5. The suspected area will not be approached until the area has been cleared by the applicable authority.

4.6 Vessel Accidents

This section of the EPP contains contingency procedures to be implemented in the event of an incident to minimize environmental damage and risk to human safety.

4.6.1 Environmental Concerns

Marine vessels involved in construction activities could potentially run aground, collide with each other or with other vessels, or sink. Of particular concern are Project-related vessel collisions resulting in the release of oil or other deleterious substances. In the event of an accident, crew safety is the foremost concern.

4.6.2 Response Actions

1. See Emergency Response Plan (69-010-010-GPL-0022) for actions required if an accident occurs.
2. All stationary hazards, such as moored platforms or vessels, will be marked in accordance with the Canada Shipping Act.
3. Placentia Traffic will issue Notices to Shipping in the area and Notices to Mariners, giving information about all aspects of safety in the harbour.
4. All vessels will be subject to applicable standards and regulations and will have the necessary safety and spill response equipment.
5. All crew members will be familiar with emergency procedures for both life-threatening and potentially polluting situations.

4.7 Fires and Explosions

4.7.1 Environmental Concerns

Activities related to the construction of the Project could cause a fire, which could spread to the surrounding area. Alternatively, a forest fire started offsite could spread to the Project area. This contingency plan contains procedures for fire prevention as well as response action plans for non-forest fires (e.g., localized fires, such as equipment) and forest fires.

Fires could result in terrestrial habitat alteration, wetland habitat loss and direct mortality of wildlife. Fire fighting chemicals and any spilled materials could enter the freshwater and marine environments and adversely affect biota and habitat if allowed to disperse and persist. Fires also have the potential for adverse effects on air quality and could pose risks to human health and safety. Actions required in the case of fire are contained in the ERP in more detail.

4.7.2 Response Actions

The fire prevention and fire-fighting procedures described below will be followed. Vale NL will take all precautions necessary to prevent fire hazards when working at the site. These include but are not limited to:

1. All flammable waste will be disposed of on a regular basis.
2. Smoking will be permitted in designated areas only.
3. Personnel trained in fire prevention and response will be available on-site.
4. Vale NL will make available, in proper operating condition, sufficient fire fighting equipment to suit its labour force and fire hazards. Such equipment will comply with, and be maintained to the manufacturer’s standards.

5. The IC will act as the On-Scene-Commander for the purpose of fighting any fires.
6. All Project personnel shall abide by the following rules in the event of a fire.
    - Take immediate steps to contain or extinguish the fire.
    - Fires will be reported immediately to the IC, Placentia Fire Department and the nearest Forest Management Unit office. Long Harbour Fire Department will be notified if required. The following information will be provided:
        - Name of the reporter and phone number.
        - Time of detection of the fire.
        - Size of the fire.
        - Location of the fire.

4.8 Extreme Weather

4.8.1 Environmental Concerns

Extreme weather events, specifically severe winter storms, bring heavy snow, ice, strong winds and freezing rain. An event of this type can disrupt unsecured construction materials and could impact environmental protection such as silt curtains. Large amounts of rain could cause holding ponds to overtop.

4.8.2 Response Actions

The Emergency Response Plan (ERP) (69-010-010-GPL-0022) includes an action guide for responding to an emergency arising from extreme weather. If a severe weather event is anticipated or actually occurs, Vale NL will take precautions to secure the site against adverse impacts to the environment, including, but not limited to:

1. Reducing pond levels to provide sufficient room for expected precipitation.
2. Securing loose materials, coverings and containers.
3. Confirm all vessels and marine equipment are securely moored or anchored.
4. Clearing culverts, inlets and catch basins of debris.
5. Clear debris out of drainage channels, and make sure that waste material is collected and secured in the containers provided. Secure all waste containers and covers.
6. Collect any free product from drip pans or dyked pads.
7. Close any drainage valves in storage tank dykes, after draining down any clean water and clearing out snow or ice.
8. Check that sedimentation control structures are secure and functional, and prepared to handle the anticipated flow.

In the event of any emergency including spills, flooding or failure of protective equipment, the first responder should refer to the ERP.

Following a severe weather event all protective measures shall be checked and if necessary repaired as soon as conditions allow, and before any work takes place behind the protection provided.

5. Legislation, Permits, Authorizations

Vale NL has identified the applicable legal requirements and other requirements to which the Company subscribes related to the Project's environmental aspects. These requirements include:

- National and international legal requirements.
- State/provincial/departmental legal requirements.
- Local governmental legal requirements.

The other requirements to which the Company subscribes include:

- Agreements with public authorities.
- Agreements with customers.
- Non-regulatory guidelines.
- Voluntary principles or codes of practice.
- Voluntary environmental labelling or product stewardship commitments.
- Requirements of trade associations.
- Agreements with community groups or non-governmental organizations.
- Public commitments.
- Company requirements.

5.1 Legislation

Table 5-1 details the Federal legislation:

Table 5-1: Federal Legislation

Government of Canada	
Administering Department	**Legislation**
Environment Canada	Canadian Environmental Assessment Act
	Canadian Environmental Protection Act
Fisheries and Oceans Canada	Fisheries Act
Environment Canada, and Fisheries and Oceans Canada	Species at Risk Act
Transport Canada	Canada Shipping Act
	Navigable Waters Protection Act
	Transportation of Dangerous Goods Act

Table 5-2 details the Provincial legislation:

Table 5-2: Provincial Legislation

Government of Newfoundland and Labrador	
Administering Department	**Legislation**
Environment and Conservation	Dangerous Goods Transportation Act
	Endangered Species Act
	Environmental Protection Act
	Lands Act

Government of Newfoundland and Labrador	
Administering Department	**Legislation**
	Waste Management Act
	Water Resources Act
	Wild Life Act
Government Services	Occupational Health and Safety Act
	Public Safety Act
Municipal Affairs	Municipalities Act
	Urban and Rural Planning Act
Natural Resources	Forestry Act
	Quarry Materials Act
Tourism, Culture and Recreation	Historic Resources Act

5.2 Permits and Authorizations

Compliance monitoring requirements in the form of permits, approvals and authorizations are listed in Table 5-3.

Table 5-3: Applicable Permits and Authorizations

Applicable Permits and Authorizations	
Permit Title	**Administering Body**
Federal	
Application for Authorization for Works or Undertakings Affecting Fish Habitat (HADD)	Department of Fisheries and Oceans
Assessments/Approvals under the Navigable Waters Protection Act	Transport Canada
Notification to Handle or Transport Dangerous Goods	Transport Canada
Transportation of Dangerous Goods	Transport Canada
Provincial	
Certificate of Approval for any Industrial Processing Facility	Department of Environment and Conservation – Pollution Prevention Division
Certificate for Environmental Approval for any Alteration to a Body of Water	Department of Environment and Conservation – Water Resources Division
Letter of Advice of New Construction Project or Industrial Enterprise	Department of Government Services – Occupational Health and Safety Division
Application for Permit for Water and Sewage Works	Department of Government Services
Permit for Access off any Highway	Department of Government Services
Quarry Permit	Department of Natural Resources – Mineral Lands
Commercial Cutting Permit	Department of Natural Resources – Forest Resources Branch
Operating Permit/Fire Season	Department of Natural Resources – Forest Resources Branch
Certificate of Approval for Storage and Handling of Gasoline and Associated Products	Department of Government Services
Certificate of Approval – Septic System (>4546 L/day)	Department of Government Services
Review of Building Fire and Life Safety and Accessibility	Department of Government Services
Fuel Storage Tank Registrations and Waste Oil Storage	Department of Government Services
Application for Archaeological Research Permit	Department of Tourism, Culture and Recreation – Provincial Archaeology Office
Municipal	
Approval for Demolition, Construction, Renovation or Occupancy of Buildings and associated works	Town of Long Harbour – Mount Arlington Heights
Approval for Construction/Use of Water/Sewage Systems	Town of Long Harbour – Mount Arlington Heights
Approval for Storm Sewer Systems	Town of Long Harbour – Mount Arlington Heights

Applicable Permits and Authorizations	
Permit Title	**Administering Body**
Approval to Erect Signs within a municipality	Applicable Municipality

6. Contact List

6.1 Emergency, Advisory and Other Contact Numbers

The EPCM Project Manager will make sure that the Contact List is completed and posted in central, visible locations as appropriate. The Contact List will be kept up to date, and all contacts on the list will be made aware of their expected role in an emergency.

Contact names and numbers are provided in Table 6.1 to enable appropriate Company personnel to be reached at any time. A list of key personnel, aid agencies and government agencies, including contact names and phone numbers, are also provided for each area of responsibility, should a need arise. Project communications protocols must be observed as defined in specific procedures.

Table 6-1: Emergency, Advisory and Other Contact Numbers

Vale NL Long Harbour Processing Plant		
Contact	**Name**	**Contact Number**
Vale NL Project Director	Rinaldo Stefan	Office (St. John's) (709) 758-8940
Vale NL Project Environment, Health and Safety Manager	Grant Gaudet	Office (St. John's) (709) 758-3325 Cell (709) 691-6748
Vale NL Construction Manager	Dan Donnelly	Office (St. John's) (709) 758-8919 Cell (709) 687-8589
Vale NL Project Site Environmental Superintendent	Craig Hollett	Office (Long Harbour) (709) 758-8739 Cell (709) 631-3279
Vale NL Project Environment Superintendent	Brenda Brown	Office (St. John's) (709) 758-8835 Cell (709) 693-3055
Vale NL Project Site Safety Superintendent	Craig Ryan	Office (Long Harbour) (709) 758-8720 Cell (709) 687-6729
EPCM Project Manager	Keith Stein	Office (St. John's) (709) 758-3399
EPCM Site Manager (Construction)	Rick Hepp	Office (709) 758-8791 Cell (709) 690-9077
EPCM HSE Manager	Kevin McDonald	Office (Long Harbour) (709) 758-8819 Cell (709) 691-4785
EPCM Site Environmental Manager	Matt Hynes	Office (Long Harbour) (709) 758-8855 Cell (709) 682-1644
EPCM Site Emergency Response Coordinator	Wayne Power	Office (Long Harbour) (709) 758-8787 Cell (709) 728-6483
Site Medical Office		(709) 758-8899
Oil and Chemical Spills (24 Hour Environmental Emergencies Line)	Canadian Coast Guard, Traffic Centre	1-800-563-9089

Vale NL Long Harbour Processing Plant		
Contact	**Name**	**Contact Number**
Fire (Placentia)		(709) 227-3200
Forest Fire	Department of Natural Resources – Forestry Services Branch	1-866-709-FIRE (3473)
RCMP (Placentia – Whitbourne District)	Placentia	(709) 227-2000
	Whitbourne	(709) 759-2600
RCMP (24-hr. Province Wide Emergency)		1-800-709-7267
Ambulance Emergency Calls (Placentia)		(709) 227-3808
Health Sciences Center (St. John's)		(709) 777-6300
Wildlife Encounters	Department of Natural Resources – District Forestry & Wildlife Office - Paddy's Pond	(709) 729-4180
	Department of Natural Resources – Satellite Forestry & Wildlife Office - Whitbourne	(709) 759-2712
Discovery of Contaminated or Hazardous Material	Environmental Protection Officer Government Service Centre, St. John's	(709) 729-4167
Discovery of Historic Resources	Martha Drake Department of Tourism, Culture and Recreation - Historic Resources Division	(709) 729-2462
Serious Workplace Accident (24 Hour Accident Reporting Line)	Department of Government Services – Occupational Health & Safety Branch	(709) 729-4444

7. Other Environmental Protection Resource Plans

Information documents referenced in this EPP can be found at the EPCM Site Project Office or in the Vale NL Project Office in St. John's.

7.1 Key Reference Material

7.1.1 Project Documents

Listed in Table 7-1 below are a number of environmentally related studies which have previously been undertaken for this project.

Table 7-1: Project Environmental Reference Documents

Report Name	Summary	Release Date
Historic Resource Component Study Gerald Penny Associates Limited, 2006	This study identified historical resources potential within the project area and provided a regional context for archaeological resources.	February 05, 2007
Socio-economic Component Study Jacques Whitford Limited, 2007	This study examines: health services and infrastructure, economy, business, training and employment, and recreation activities data in the Project and surrounding area. It provides a baseline analysis for subsequent studies of the Project and the Town of Long Harbour-Mount Arlington Heights and surrounding communities.	April 01, 2007
Marine Environment Component Study LGL Limited, 2007	This study examines the climate and oceanography, marine ecology, commercial fisheries and aquaculture, avifauna and river otters. This study provides a baseline analysis for subsequent studies of the Project and the marine environment.	July 23, 2007
Terrestrial Environment Component Study Jacques Whitford Limited, 2007	This study determines the potential physical disturbance due to the Project construction, operation and decommissioning. This study also conducted vegetation mapping to identify vegetation communities. An avifauna survey was also conducted on raptors, waterfowl, landbirds and gamebirds. A wildlife survey was also conducted. This information provides a baseline for future follow-up reports and monitoring.	August 28, 2007
Freshwater Environmental Component Study AMEC Earth & Environmental, 2007	This study determines the surface water, groundwater, and sediment quality in specific watersheds. Fish and benthic invertebrate metal body burden was determined. Fish habitat classification and quantification was conducted.	August 31, 2007
Human Health Component Study Human Research Unit, Faculty of Medicine, Memorial University, 2007	This study documents the health status of the town of Long Harbour and surrounding areas. This information provides a baseline for the health status of the residents of the town of Long Harbour-Mount Arlington Heights and the surrounding area, that would be potentially impacted by Plant construction and operations.	May 11, 2007

Report Name	Summary	Release Date
Construction Emergency Response Plan (69-010-010-XPL-1002) Fluor	This report details the emergency procedures to be implemented in response to any situation that may endanger the safety and/or health of individuals; the environment; property and/or equipment	June 9, 2010
Waste Management Plan for Construction (69-131-010-LRT-0003) Vale Inco Newfoundland and Labrador Limited	This report details the procedures to be implemented to manage all solid waste, hazardous and non-hazardous, generated during the construction of the Project.	December 9, 2008
Environmental Monitoring Plan for Construction, 2010 - 2013 (69-9250-010-LRT-1001) Vale Inco Newfoundland and Labrador Limited	This report details the air, water, noise and terrestrial habitat (e.g. Erioderma) monitoring and reporting procedures to be implemented throughout the entire construction phase of the Project.	June 2010
Rehabilitation and Closure Plan (69-010-010-GRT-0108) Vale Inco Newfoundland and Labrador Limited	The Rehabilitation and Closure Plan outlines the basic elements to be used to restore, to an acceptable state, the biological, chemical and physical quality of the environmental resources affected by the operation and development of the Long Harbour Processing Plant.	November 12, 2009
Freshwater Fish Habitat Compensation Plan for Facility Footprint (69-9250-010-LPL-1002) AMEC Earth & Environmental Limited	This plan is the Vale NL Long Harbour Processing Plant Freshwater Fish Habitat Compensation Plan for the facility footprint as required under Section 35 of the Fisheries Act.	July 17, 2009
Marine Fish Habitat Compensation Plan (69-9250-010-LPL-1003) LGL Limited	This plan is the Vale NL Long Harbour Processing Plant Marine Fish Habitat Compensation Plan for the facility footprint as required under Section 35 of the Fisheries Act.	December 2009

7.1.2 DFO Factsheets

DFO Factsheet references are noted in Table 7-2, below. The factsheets are published in Appendix A of this document, for reference. DFO has also published National Operational Statements (NOS). They can be referenced at:

http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/nl/index_e.asp

The NOS that may be applicable to this project are also referenced in Table 7-2. In the case of a discrepancy between the requirements of the Factsheet and the NOS, the NOS will be considered the acceptable reference.

Table 7-2: Department of Fisheries and Oceans Factsheets

Document	Title
Factsheet #1	Effects of Silt on Fish and Fish Habitat
Factsheet #2	Blasting – Fish and Fish Habitat Protection
Factsheet #3	Ditching
Factsheet #4	Temporary Fording Sites
Factsheet #5	Forwarder Trails
Factsheet #6	Filter Fabric
Factsheet #7	Rock Check Dam
Factsheet #8	Temporary Bridges

Document	Title
Factsheet #9	Resource Road Construction
Factsheet #10	Instream Work in the Dry – Cofferdams
Factsheet #11	Streambank Stabilization
Factsheet #12	Instream Work in the Dry – Temporary Diversion
Factsheet #13	Instream Work in the Dry – Elevated Pipes
Factsheet #14	Culvert Stabilization
Factsheet #15	Storm Drain Outlets
Factsheet #16	Highway Construction Low Point Protection
Factsheet #17	Temporary Settling Basins
Factsheet #18	Bridge Construction/Demolition
Factsheet #19	Freshwater Salmonid Habitat Requirements
Factsheet #20	Highway Construction/Upgrading – Infilling, Stabilization and No-Grub Zones
Factsheet #21	Freshwater Intake End-of-Pipe Fish Screen
Factsheet #23	Stream Clean-up
Factsheet #24	Timber Crib
Factsheet #25	Water and Sewer Installation – Stream Crossings
Factsheet #26	Culvert Installations
NOS	Clear Span Bridges
NOS	Culvert Maintenance
NOS	Maintenance of Riparian Vegetation in Existing Rights-of-Way
NOS	Moorings
NOS	Overhead Line Construction
NOS	Temporary Stream Crossing

7.1.3 Navigable Waters Protection Act Minor Works Policies

Transport Canada has published several Navigable Waters Protection Act Minor Works Policies. These reference documents are noted in Table 7-3, below. These brochures are published in Appendix B of this document, for reference.

Table 7-3: Navigable Waters Protection Act Minor Works Policies

Document	Title
TP 14594E	Navigable Waters Protection Act Minor Works Policy for Erosion Protection Works
TP 14597E	Navigable Waters Protection Act Minor Works Policy for Dredging

8. Site Specific Environmental Protection Plans

In addition to the general environmental protection procedures provided in Section 3, this EPP also provides site-specific EPPs in relation to primary work areas and components associated with the Project construction. As detailed Project engineering design, work methods and overall schedule progress and information becomes available, site-specific EPPs will be updated.

The initial site-specific EPPs focusing mainly on activities to be undertaken during the first two years of construction are given for the following areas:

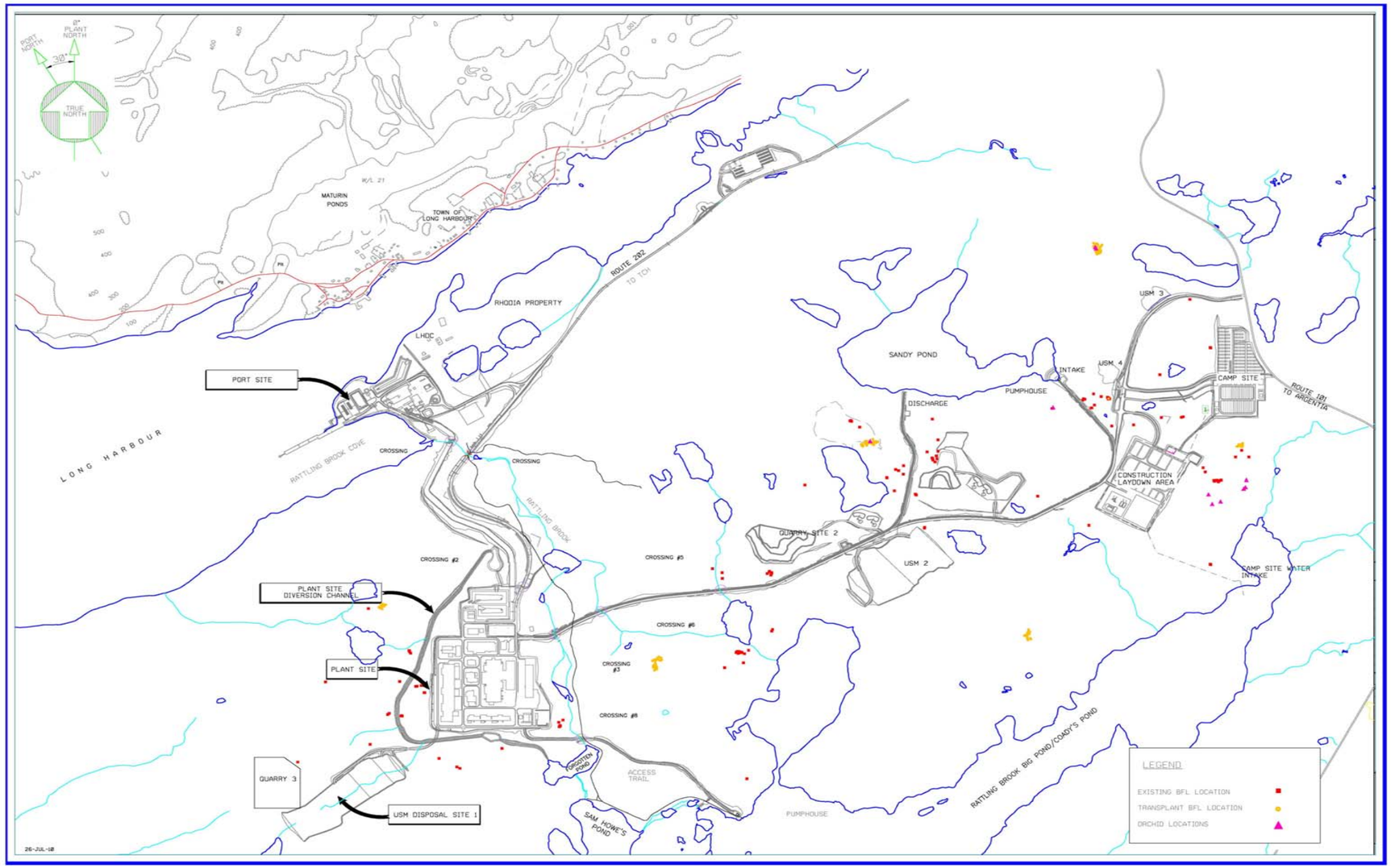
- Port Area.
- Plant Area.
- Roads, Pipelines and Utilidors.

- Residue Disposal Site (not scheduled to start until 2010).
- Camp Site, Quarries and Laydown Areas.

These site-specific EPPs provide information on: planned Project components and activities; general environmental issues and concerns; sensitive areas and periods; an overview of planned work activities during the construction phase of the Project; general environmental protection procedures applicable to the site; site-specific environmental protection measures; relevant drawings and documents; a listing of applicable permits, approvals and authorizations; and associated compliance monitoring requirements.

Figure 1-4 shows the overall relationship of these areas.

Figure 8-1 is a sensitive areas map which shows the site restricted areas.



Environmental Sensitivity Map

Figure 8-1: Environmental Sensitivity Map

8.1 Port Area

The Port Area, used for storing and loading concentrate and offloading and marshalling materials and supplies from ships and barges, will be constructed approximately 400 m across the harbour from the Town of Long Harbour-Mount Arlington Heights and 8 km from the Town of Long Harbour – Mount Arlington Heights by road.

Site development work will take place in 2009, including dredging, shoreline protection and wharf expansion.

8.1.1 Environmental Issues

8.1.1.1 General

General environmental issues that may be associated with the development of the Port Area include:

- Generation and dispersion of sediment during dredging.
- Release of contaminant into the marine environment during dredging.
- Potential leakage or spills of fuel or other hazardous materials.
- Noise, dust and emissions associated with equipment movement and use.

8.1.1.2 Sensitive Areas/Periods

There is encapsulated elemental phosphorus within one of the concrete caissons of the existing wharf.

Area just outside the Port Site boundary is an existing Hazardous Waste area.

To the extent possible, work will not occur in the marine environment at times that conflict with active fishing periods. Timing to be addressed as park of the Project Fisheries and Aquaculture Liaison Committee discussions.

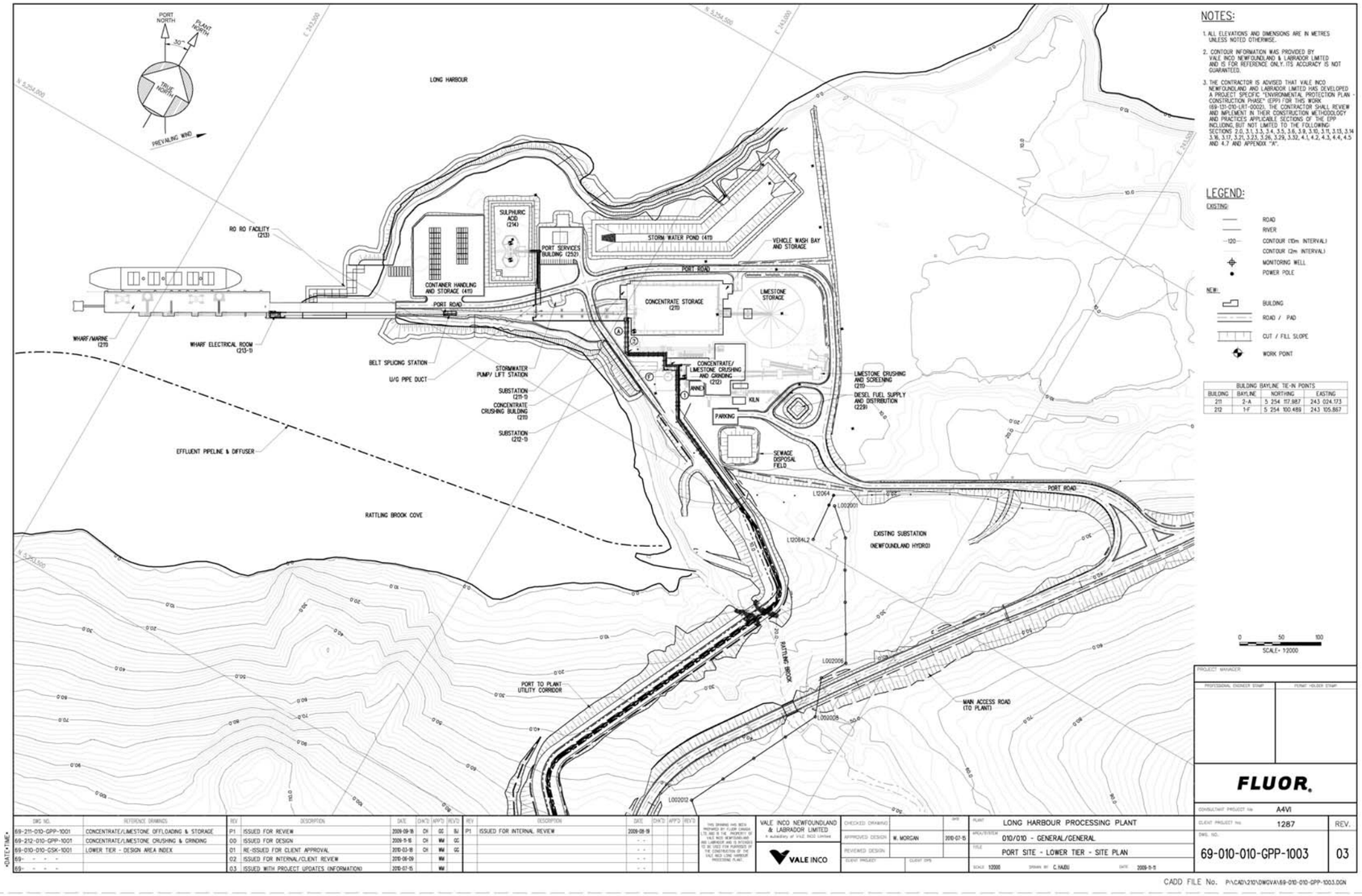


Figure 8-2: Port Site Layout

8.1.2 Environmental Protection Procedures

General environmental procedures relevant to the construction of the Port Area are listed in Table 8.1 and presented in detail in Section 3.

Table 8-1: Environmental Protection Procedures Related to Port Area Construction Activities

General Environmental Protection Procedures (Section 3.0)		Relevance to Port Area
3.1	General Clearing, Grubbing and Removal of Related Debris	
3.2	General Cutting and Filling	■
3.3	Storage, Transportation and Handling of Fuel and Other Hazardous Materials	■
3.4	Petroleum Product Transfer	■
3.5	Sewage Disposal	
3.6	Storage, Handling and Disposal of Solid Waste	■
3.7	Blasting	■
3.8	Quarrying and Aggregate Removal	
3.9	Site Access	■
3.10	Equipment Use and Maintenance	■
3.11	Marshalling Yards for Equipment and Supplies	■
3.12	Noise Control	■
3.13	Dust Control	■
3.14	Work In or Around Marine Environment	■
3.15	Buffer Zones	
3.16	Erosion Protection	■
3.17	Excavations, Embankment, and Grading	■
3.18	Trenching	■
3.19	Dewatering - Work Areas	
3.20	Stream Crossings	
3.21	Water Supply	
3.22	Surveying	
3.23	Drilling - Geotechnical/Well Water	
3.24	Drilling - Geotechnical Drilling in the Marine Environment	■
3.25	Pumps and Generators	■
3.26	Installation of Effluent Pipe	■
3.27	Marine Traffic	■
3.28	Vehicular Traffic	■
3.29	Concrete Handling and Placing	■
3.30	Reclamation of Land	
3.31	Boreal Felt Lichen	

Section 7 of this EPP lists various other relevant references for environmental information.

8.1.3 Relevant Documents

Documents relevant to construction activities at the Port Area are:

- Construction Emergency Response Plan (69-010-010-XPL-1002)
- Site Health, Safety, Environment and Security Manual (69-010-010-GMN-1002)
- Waste Management Plan - Construction Phase (69-131-010-LRT-0003)
- Environmental Monitoring Plan for Construction, 2010 – 2013 (69-9250-010-LRT-1001)

8.1.4 Permits, Approvals, Authorizations

Table 8-2 provides a summary of the various permits, approval and authorizations that pertain to the construction of the Port Area at Long Harbour. This list will be updated as permit requirements change with development progress.

Table 8-2: Permits, Approvals and Authorizations – Port Area

Permit Name	Government Department
Application for Authorization for Works or Undertakings Affecting Fish Habitat (HADD)	Department of Fisheries and Oceans Canada
Assessment/Approval under the Navigable Waters Protection Act – Port Area	Transport Canada
Assessment/Approval under the Navigable Waters Protection Act – Outfall Pipe	Transport Canada
Permit to Alter a Body of Water	Department of Environment and Conservation – Water Resources Division
Permit for Water and Sewage Works	Department of Environment and Conservation – Water Resources Division
Building Accessibility Design Registration	Department of Government Services
Fire and Life Safety Plan Review	Department of Government Services
Certificate of Approval for Construction	Department of Environment and Conservation – Pollution Prevention Division

8.1.5 Compliance Monitoring Requirements

Regulatory compliance monitoring applicable to the Port Area construction includes:

- Noise Monitoring.
- Air Quality Monitoring.
- Water Quality Monitoring.
- Monitoring associated with any conditions of the Section 35(2) Fisheries Act Authorization.
- Additional monitoring requirements of applicable permits will be included as permit conditions are received.

Refer to the EMP for detailed monitoring requirements.

8.2 Plant Area

The Plant Area is where the Commercial Nickel Processing Plant will be built. This facility will produce commercial grade nickel, cobalt and copper. It is located approximately 2 km southeast of the Port Site and at approximately 100 m above sea level. The overall layout is provided in Figure 8-3. The primary components of the plant are:

- Electrowinning facility.
- Solvent extraction.
- Neutralization building.
- Grinding facility.
- Pressurized oxidative leaching facility.
- Water and effluent treatment building.

Site development work started in April 2009.

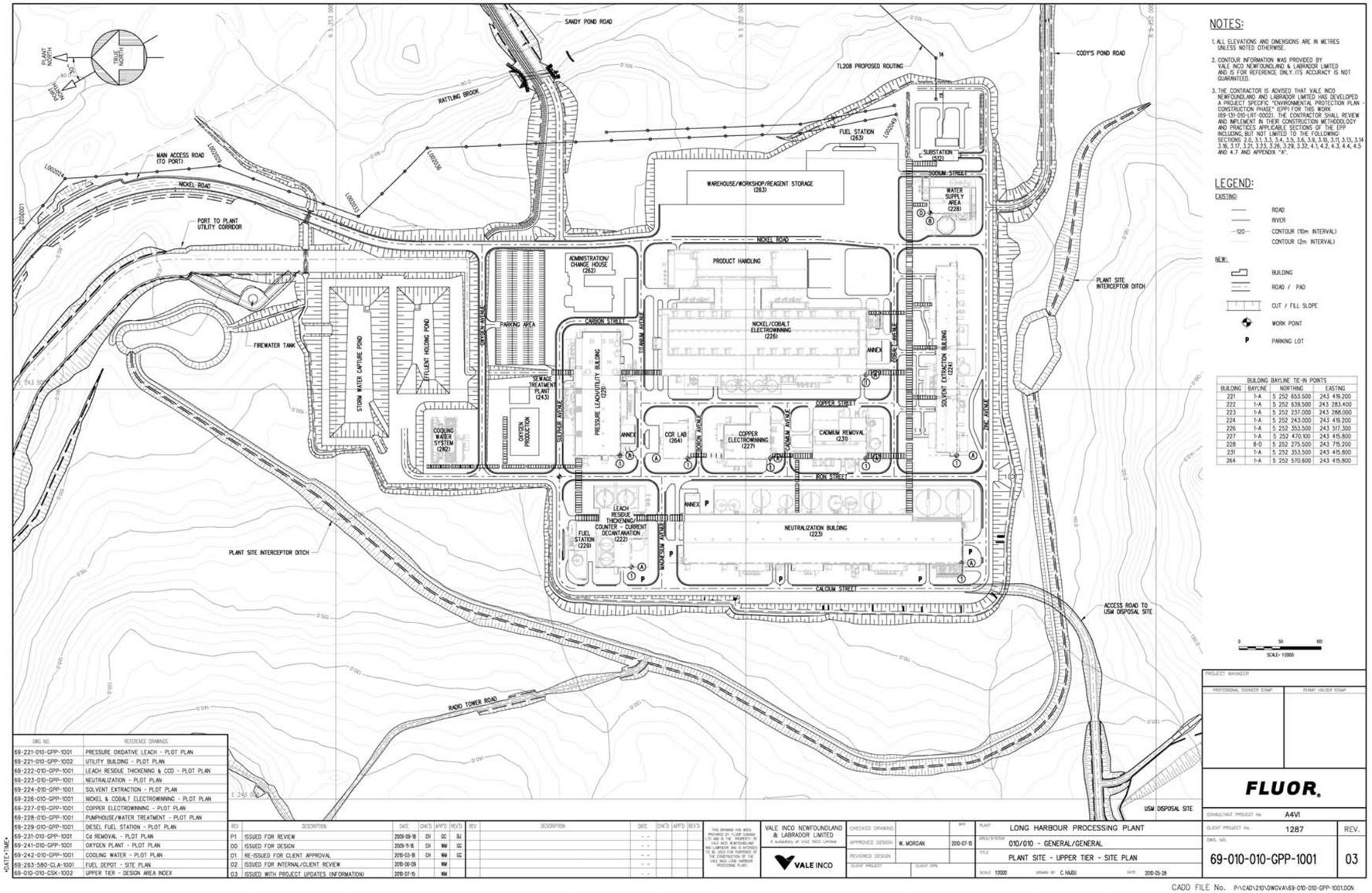


Figure 8-3: Plant Site Layout

8.2.1 Environmental Issues

8.2.1.1 General

General environmental issues that may be associated with the development of the Plant Area include:

- Water quality, particularly sedimentation.
- Soil erosion.
- Disturbance of fish habitat.
- Disturbance of wildlife habitat.
- Potential leakage or spills of fuel or other hazardous materials.
- Noise, dust and emissions associated with equipment movement and use.

8.2.1.2 Sensitive Areas/Periods

Boreal Felt Lichen has been identified in this area and actions will be taken to protect or transplant the lichen prior to initiating tree clearing.

Rattling Brook passes 100 m along the east side of the site. Drainage from the site enters Rattling Brook and tight control of sediment will be needed to prevent sedimentation of the ponds along the brook and the brook itself.

Disturbance of Rattling Brook should not occur between October 1st and May 31st unless authorized by DFO.

8.2.2 Environmental Protection Procedures

General environmental procedures relevant to the construction of the Plant Area are listed in Table 8-3 and presented in detail in Section 3.

Table 8-3: Environmental Protection Procedures Related to Plant Area Construction Activities

General Environmental Protection Procedures (Section 3.0)		Relevance to Plant Area
3.1	General Clearing, Grubbing and Removal of Related Debris	■
3.2	General Cutting and Filling	■
3.3	Storage, Transportation and Handling of Fuel and Other Hazardous Materials	■
3.4	Petroleum Product Transfer	■
3.5	Sewage Disposal	■
3.6	Storage, Handling and Disposal of Solid Waste	■
3.7	Blasting	■
3.8	Quarring and Aggregate Removal	
3.9	Site Access	■
3.10	Equipment Use and Maintenance	■
3.11	Marshalling Yards for Equipment and Supplies	■
3.12	Noise Control	■
3.13	Dust Control	■
3.14	Work In or Around Marine Environment	
3.15	Buffer Zones	■
3.16	Erosion Protection	■
3.17	Excavations, Embankment, and Grading	■
3.18	Trenching	■
3.19	Dewatering - Work Areas	■
3.20	Stream Crossings	■
3.21	Water Supply	■
3.22	Surveying	■
3.23	Drilling - Geotechnical/Well Water	
3.24	Drilling - Geotechnical Drilling in the Marine Environment	
3.25	Pumps and Generators	■
3.26	Installation of Effluent Pipe	
3.27	Marine Traffic	
3.28	Vehicular Traffic	■
3.29	Concrete Handling and Placing	■
3.30	Reclamation of Land	■
3.31	Boreal Felt Lichen	■

Section 7 of this EPP lists various other relevant references for environmental information.

8.2.3 Relevant Documents

Documents relevant to construction activities at the Plant Area are:

- Construction Emergency Response Plan (69-010-010-XPL-1002)
- Site Health, Safety, Environment and Security Manual (69-010-010-GMN-1002)
- Waste Management Plan – Construction Phase (69-131-010-LRT-0003)

- Environmental Monitoring Plan for Construction, 2010 – 2013 (69-9250-010-LRT-1001)

8.2.4 Permits, Approvals and Authorizations

Table 8-4 provides a summary of the various permits, approval and authorizations that pertain to the construction of the Plant Area at Long Harbour. This list will be updated as permit requirements change with development progress.

Table 8-4: Permits, Approvals and Authorizations – Plant Area

Permit Name	Government Department
Application for Authorization for Works or Undertakings Affecting Fish Habitat (HADD)	Department of Fisheries and Oceans Canada
Assessment/Approval under the Navigable Waters Protection Act – Rattling Brook Crossings	Transport Canada
DFO Request for Project Review	Department of Fisheries and Oceans Canada
Permit to Alter a Body of Water	Department of Environment and Conservation – Water Resources Division
Application for Water Use Licence	Department of Environment and Conservation – Water Resources Division
Application for Permit Water and Sewage Works	Department of Government Services
Commercial Cutting Permit	Department of Natural Resources – Forest Resources Branch
Commercial Operating Permit (Forest Fire Season)	Department of Natural Resources – Forest Resources Branch
Diesel Generator Registration	Department of Environment and Conservation – Pollution Prevention Division
Building Accessibility Design Review	Department of Government Services
Fire and Life Safety Plan Review	Department of Government Services
Certificate of Approval for Construction	Department of Environment and Conservation – Pollution Prevention Division

8.2.5 Compliance Monitoring Requirements

Regulatory compliance monitoring applicable to the Plant Area construction includes:

- Noise Monitoring.
- Air Quality Monitoring.
- Water Quality Monitoring.
- Endangered Species Monitoring.
- Monitoring associated with any conditions of the Section 35(2) Fisheries Act Authorization.
- Additional monitoring requirements of applicable permits will be included as permit conditions are received.

Refer to the EMP for detailed monitoring requirements.

8.3 Roads, Pipelines and Utilidors

The roads, pipelines and utilidors span the entire Project Area providing access, power, water supply and sewage removal to buildings. The overall layout is provided in Figure 1.4. Primary component include:

- The roads include the main access road (from Highway 202 to Plant Site).
- Sandy Pond access road (from Plant Site to Sandy Pond and Camp Site).
- Port access road (from Main Access Road to Port Site).
- Pipelines include piping from port site to plant site.
- Plant site to Sandy Pond.
- Pumphouse to treatment plants.

Site development work will take place starting in April 2009.

8.3.1 Environmental Issues

8.3.1.1 General

General environmental issues that may be associated with the development of the roads, pipelines and utilidors include:

- Water quality, particularly sedimentation.
- Soil erosion.
- Disturbance of fish habitat at stream crossings.
- Disturbance of wildlife habitat.
- Potential leakage or spills of fuel or other hazardous materials.
- Noise, dust and emissions associated with equipment movement and use.

8.3.1.2 Sensitive Areas/Periods

From October 1st to May 31st is a sensitive period for fish species in Rattling Brook and other water bodies in the area.

8.3.2 Environmental Protection Procedures

General environmental procedures relevant to the construction of the Roads, Pipelines and Utilidors are listed in Table 8-5 and presented in detail in Section 3.

Table 8-5: Environmental Protection Procedures Related to Roads, Pipelines and Utilidors

General Environmental Protection Procedures (Section 3.0)		Relevance to Roads, Pipelines and Utilidors
3.1	General Clearing, Grubbing and Removal of Related Debris	■
3.2	General Cutting and Filling	■
3.3	Storage, Transportation and Handling of Fuel and Other Hazardous Materials	■
3.4	Petroleum Product Transfer	■
3.5	Sewage Disposal	
3.6	Storage, Handling and Disposal of Solid Waste	■
3.7	Blasting	■

General Environmental Protection Procedures (Section 3.0)		Relevance to Roads, Pipelines and Utilidors
3.8	Quarrying and Aggregate Removal	
3.9	Site Access	■
3.10	Equipment Use and Maintenance	■
3.11	Marshalling Yards for Equipment and Supplies	■
3.12	Noise Control	■
3.13	Dust Control	■
3.14	Work In or Around Marine Environment	
3.15	Buffer Zones	■
3.16	Erosion Protection	■
3.17	Excavations, Embankment and Grading	■
3.18	Trenching	■
3.19	Dewatering - Work Areas	■
3.20	Stream Crossings	■
3.21	Water Supply	
3.22	Surveying	■
3.23	Drilling - Geotechnical/Water Well	
3.24	Drilling - Geotechnical Drilling in the Marine Environment	
3.25	Pumps and Generators	■
3.26	Installation of Effluent Pipe	
3.27	Marine Traffic	
3.28	Vehicular Traffic	■
3.29	Concrete Handling and Placing	
3.30	Reclamation of Land	■
3.31	Boreal Felt Lichen	■

Section 7 of this EPP lists various other relevant references for environmental information.

8.3.3 Relevant Documents

Documents relevant to construction activities related to Roads, Pipelines and Utilidors are:

- Construction Emergency Response Plan (69-010-010-XPL-1002)
- Site Health, Safety, Environment and Security Manual (69-010-010-GMN-1002)
- Waste Management Plan – Construction Phase (69-131-010-LRT-0003)
- Environmental Monitoring Plan for Construction, 2010 – 2013 (69-9250-010-LRT-1001)

8.3.4 Permits, Approvals and Authorizations

Table 8-6 provides a summary of the various permits, approval and authorizations that pertain to the construction of the Roads, Pipelines and Utilidors for the Project. This list will be updated as permit requirements change with development progress.

Table 8-6: Permits, Approvals and Authorizations – Roads, Pipelines and Utilidors

Permit Name	Government Department
Application for Authorization for Works or Undertakings Affecting Fish Habitat (HADD)	Department of Fisheries and Oceans Canada
Assessment/Approval under the Navigable Waters Protection Act – Rattling Brook Crossings	Transport Canada
DFO Request for Project Review	Department of Fisheries and Oceans Canada
Permit to Alter a Body of Water	Department of Environment and Conservation – Water Resources Division

Permit Name	Government Department
Commercial Cutting Permit	Department of Natural Resources – Forest Resources Branch
Commercial Operating Permit (Forest Fire Season)	Department of Natural Resources – Forest Resources Branch
Diesel Generator Registration	Department of Environment and Conservation – Pollution Prevention Division
Certificate of Approval for Construction	Department of Environment and Conservation – Pollution Prevention Division

8.3.5 Compliance Monitoring Requirements

Regulatory compliance monitoring applicable to the Roads, Pipelines and Utilidors construction includes:

- Noise Monitoring.
- Air Quality Monitoring.
- Water Quality Monitoring.
- Groundwater Quality Monitoring.
- Endangered Species Monitoring.
- Monitoring associated with any conditions of the Section 35(2) Fisheries Act Authorization.
- Additional monitoring requirements of applicable permits will be included as permit conditions are received.

Refer to the EMP for detailed monitoring requirements.

8.4 Residue Disposal Site

Sandy Pond is to be used for the waste disposal of the residue from the hydrometallurgical process. Sandy Pond is located on the east side of the project area, approximately 1 kilometre away from Highway 101. The overall layout is provided in Figure 1-4. Primary components include:

- Three Earth Dams.
- Discharge Effluent Pipe.
- Pumphouse and Water Supply Line.

Site development work will take place starting in May 2010.

8.4.1 Environmental Issues

8.4.1.1 General

General environmental issues that may be associated with the development of the Residue Disposal Site include:

- Water quality degradation.
- Disturbance of fish habitat.
- Potential leakage or spills of fuel or other hazardous materials.

- Noise, dust and emissions associated with equipment movement and use.

8.4.1.2 Sensitive Areas/Periods

Sandy Pond contains a fish population. A Habitat Compensation Plan is being prepared by Vale NL for DFO approval. It will address issues related to the use of Sandy Pond and impacts on this fish population.

8.4.2 Environmental Protection Procedures

General environmental procedures relevant to the construction of residue disposal site are listed in Table 8-7 and presented in detail in Section 3.

Table 8-7: Environmental Protection Procedures Related to the Residue Disposal Site Construction Activities

General Environmental Protection Procedures (Section 3.0)		Relevance to Residue Disposal Site
3.1	General Clearing, Grubbing and Removal of Related Debris	■
3.2	General Cutting and Filling	■
3.3	Storage, Transportation and Handling of Fuel and Other Hazardous Materials	■
3.4	Petroleum Product Transfer	
3.5	Sewage Disposal	
3.6	Storage, Handling and Disposal of Solid Waste	■
3.7	Blasting	■
3.8	Quarrying and Aggregate Removal	
3.9	Site Access	■
3.10	Equipment Use and Maintenance	■
3.11	Marshalling Yards for Equipment and Supplies	■
3.12	Noise Control	■
3.13	Dust Control	■
3.14	Work In or Around Marine Environment	
3.15	Buffer Zones	■
3.16	Erosion Protection	■
3.17	Excavations, Embankment, and Grading	■
3.18	Trenching	■
3.19	Dewatering - Work Areas	■
3.20	Stream Crossings	
3.21	Water Supply	■
3.22	Surveying	■
3.23	Drilling - Geotechnical/Well Water	
3.24	Drilling - Geotechnical Drilling in the Marine Environment	
3.25	Pumps and Generators	■
3.26	Installation of Effluent Pipe	■
3.27	Marine Traffic	
3.28	Vehicular Traffic	■
3.29	Concrete Handling and Placing	■
3.30	Reclamation of Land	
3.31	Boreal Felt Lichen	■

Section 7 of this EPP lists various other relevant references for environmental information.

8.4.3 Relevant Documents

Documents relevant to construction activities related to the Residue Disposal Site are:

- Construction Emergency Response Plan (69-010-010-XPL-1002)
- Site Health, Safety, Environment and Security Manual (69-010-010-GMN-1002)
- Waste Management Plan - Construction Phase (69-131-010-LRT-0003)
- Environmental Monitoring Plan for Construction, 2010 – 2013 (69-9250-010-LRT-1001)

8.4.4 Permits, Approvals and Authorizations

Table 8-8 provides a summary of the various permits, approval and authorizations that pertain to the construction of the Residue Disposal Site. This list will be updated as permit requirements change with development progress.

Table 8-8: Permits, Approvals and Authorizations – Residue Disposal Site

Permit Name	Government Department
Application for Authorization for Works or Undertakings Affecting Fish Habitat (HADD)	Department of Fisheries and Oceans Canada
Assessment/Approval under the Navigable Waters Protection Act – Dams on Sandy Pond	Transport Canada
DFO Request for Project Review	Department of Fisheries and Oceans Canada
Permit to Alter a Body of Water	Department of Environment and Conservation – Water Resources Division
Commercial Cutting Permit	Department of Natural Resources – Forest Resources Branch
Commercial Operating Permit (Forest Fire Season)	Department of Natural Resources – Forest Resources Branch
Diesel Generator Registration	Department of Environment and Conservation – Pollution Prevention Division
Certificate of Approval for Construction	Department of Environment and Conservation – Pollution Prevention Division

8.4.5 Compliance Monitoring Requirements

Regulatory compliance monitoring applicable to the Residue Disposal Site construction includes:

- Noise Monitoring.
- Air Quality Monitoring.
- Water Quality Monitoring.
- Groundwater Quality Monitoring.
- Monitoring associated with any conditions of the Section 35(2) Fisheries Act Authorization.
- Additional monitoring requirements of applicable permits will be included as permit conditions are received.

Refer to the EMP for detailed monitoring requirements.

8.5 Camp Site, Quarries, Laydown Areas and Spoils Areas

Camp Site, Quarries, Laydown Areas and Spoils Areas are all temporary facilities to be used during construction. The location of the camp site and other temporary facilities are identified on Figure 1-4. The camp site is located approximately 13.5 km from the Town of Long Harbour-Mount Arlington

Heights by road, and the quarry is located approximately 12.5 km away from the Town of Long Harbour-Mount Arlington Heights by road. Primary components include:

- Temporary Camp Site.
- Quarry.
- Concrete Batch Plant.
- Laydown Area.
- Spoils Areas.

Site development work will take place starting in April 2009.

8.5.1 Environmental Issues

8.5.1.1 General

General environmental issues that may be associated with the development of the Camp Site, Quarries, Laydown Areas and Spoils Area include:

- Water quality degradation.
- Soil erosion.
- Disturbance of fish habitat.
- Disturbance of terrestrial habitat (e.g., vegetation, wildlife).
- Potential leakage or spills of fuel or other hazardous materials.
- Noise, dust and emissions associated with equipment movement and use.
- Close-out including re-vegetation at the end of construction.

8.5.1.2 Sensitive Areas/Periods

Boreal Felt Lichen has been identified in this area and actions will be taken to protect or transplant the lichen prior to initiating tree clearing.

Rattling Brook Big Pond is located near the camp site. Drainage from the site enters Rattling Brook Big Pond and tight control of sediment will be needed to prevent sedimentation of the pond.

8.5.2 Environmental Protection Procedures

General environmental procedures relevant to the construction of camp site quarries, laydown areas and spoils areas are listed in Table 8-9 and presented in detail in Section 3.

Table 8-9: Environmental Protection Procedures Related to Construction of Camp Site, Quarries, Laydown Areas and Spoils Areas

General Environmental Protection Procedures (Section 3.0)		Relevance to Temporary Facilities
3.1	General Clearing, Grubbing and Removal of Related Debris	■
3.2	General Cutting and Filling	■
3.3	Storage, Transportation and Handling of Fuel and Other Hazardous Materials	■
3.4	Petroleum Product Transfer	■

General Environmental Protection Procedures (Section 3.0)		Relevance to Temporary Facilities
3.5	Sewage Disposal	■
3.6	Storage, Handling and Disposal of Solid Waste	■
3.7	Blasting	■
3.8	Quarrying and Aggregate Removal	■
3.9	Site Access	■
3.10	Equipment Use and Maintenance	■
3.11	Marshalling Yards for Equipment and Supplies	■
3.12	Noise Control	■
3.13	Dust Control	■
3.14	Work In or Around Marine Environment	■
3.15	Buffer Zones	■
3.16	Erosion Protection	■
3.17	Excavations, Embankment, and Grading	■
3.18	Trenching	■
3.19	Dewatering - Work Areas	■
3.20	Stream Crossings	■
3.21	Water Supply	■
3.22	Surveying	■
3.23	Drilling - Geotechnical/Water Well	■
3.24	Drilling - Geotechnical Drilling in the Marine Environment	
3.25	Pumps and Generators	■
3.26	Installation of Effluent Pipe	■
3.27	Marine Traffic	■
3.28	Vehicular Traffic	■
3.29	Concrete Handling and Placing	■
3.30	Reclamation of Land	■
3.31	Boreal Felt Lichen	■

Section 7 of this EPP lists various other relevant references for environmental information.

8.5.3 Relevant Documents

Documents relevant to construction activities related to the Camp Site, Quarries, Laydown Areas and Spoils Areas are:

- Construction Emergency Response Plan (69-010-010-XPL-1002)
- Site Health, Safety, Environment and Security Manual (69-010-010-GMN-1002)
- Waste Management Plan – Construction Phase (69-131-010-LRT-0003)
- Environmental Monitoring Plan for Construction, 2010 – 2013 (69-9250-010-LRT-1001)

8.5.4 Permits, Approvals and Authorizations

Table 8-10 provides a summary of the various permits, approval and authorizations that pertain to the construction of the Camp Site, Quarries, Laydown Areas and Spoils Areas. This list will be updated as permit requirements change with development progress.

Table 8-20: Permits, Approvals and Authorizations – Camp Site, Quarries, Laydown Areas and Spoils Areas

Permit Name	Government Department
Assessment/Approval under the Navigable Waters Protection Act	Transport Canada

Permit Name	Government Department
– Rattling Brook Crossings	
DFO Request for Project Review	Department of Fisheries and Oceans Canada
Permit to Alter a Body of Water	Department of Environment and Conservation – Water Resources Division
Application for Permit Water and Sewage Works	Department of Government Services
Application for Permit to Construct a Non-Domestic Well	Department of Environment and Conservation – Water Resources Division
Application for Water Use License	Department of Environment and Conservation – Water Resources Division
Commercial Cutting Permit	Department of Natural Resources – Forest Resources Branch
Commercial Operating Permit (Forest Fire Season)	Department of Natural Resources – Forest Resources Branch
Application for Quarry Permit	Department of Natural Resources – Mineral Lands
Diesel Generator Registration	Department of Environment and Conservation – Pollution Prevention Division
Food Establishment Licence	Department of Government Services
Building Accessibility Design Registration	Department of Government Services
Fire and Life Safety Plan Review	Department of Government Services
Certificate of Approval for Construction	Department of Environment and Conservation – Pollution Prevention Division

8.5.5 Compliance Monitoring

Regulatory compliance monitoring applicable to the construction of the Camp Site, Quarries and Laydown Areas and Spoils Areas includes:

- Noise monitoring.
- Air Quality monitoring.
- Water Quality monitoring.
- Boreal Felt Lichen monitoring.

Appendix A

Department of Fisheries and Oceans Factsheets

FACTSHEET

Effects of Silt on Fish and Fish Habitat

Department of Fisheries and Oceans

Silt refers to the fine grained sediment particles which are sometimes transported in the water column. Turbidity is a term used to refer to the "cloudiness" created in the water column by the suspended sediment (silt) particles.

Some of the adverse impacts of suspended sediment include:

- Abrasion of gill membranes.
- Impairment of feeding due to increased turbidity (salmon and trout are visual feeders).
- Fatal impacts to small aquatic animals which are food organisms for trout and salmon.

Some effects of deposited silt particles include:

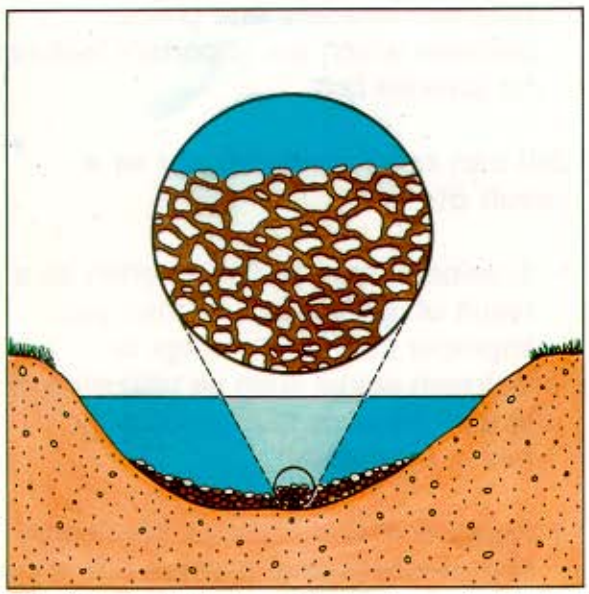
- Clogging of small spaces between gravel particles preventing the free flow of oxygenated water and removal of waste products from developing eggs deposited in the gravels. This often causes suffocation and egg mortalities and may leave such gravel beds unsuitable for future deposition of eggs.
- Destruction of the habitat of small stream bottom dwelling animals that provide food for trout and salmon.
- Elimination of sheltered areas between boulders and gravel particles which are important features for juvenile fish.

Silt can enter a waterbody as a result of:

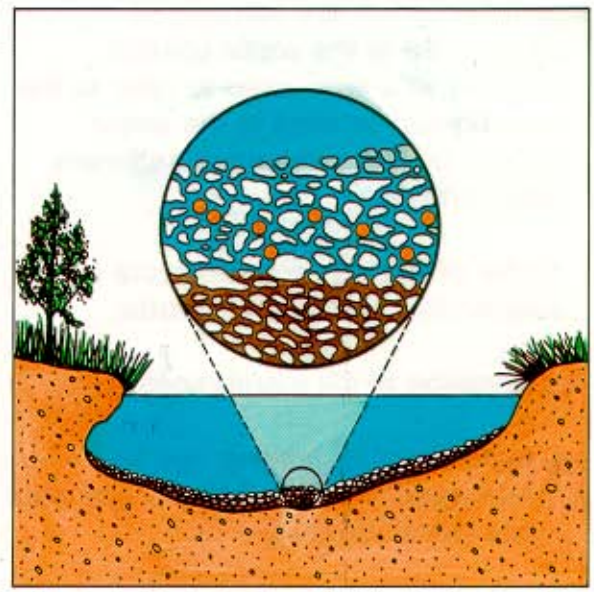
- Erosion of exposed soils, often as a result of disturbance by man (eg. improper stream crossings or instream works such as utilization of stream beds as traffic routes by heavy equipment).
- Release of fine particles from some sort of mechanical process (i.e. mine tailings or rock crushing).

Effects of Silt on Fish and Fish Habitat

For most construction or development projects which cause production of silt, there are methods which are effective for removing suspended sediment from site water and preventing it from entering streams or lakes. Specific methods are outlined in other DFO fact sheets in this series.



Silted gravel stream bottom.



Clean gravel stream bottom.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

Fisheries and Oceans Pêches et Océans

Canada

FACTSHEET

Blasting - Fish and Fish Habitat Protection

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Fish and fish habitat protection should be provided for blasting activities that are planned in or near a freshwater or marine waterbody. Blasting in or near water produces shock waves that can damage a fish swim bladder and rupture internal organs. Blasting vibrations may also kill or damage fish eggs or larvae.

CONSIDERATIONS

- Blasting plans should be developed such that the weight of charge (in kilograms (kg)) to be detonated at any precise moment is small.
- For multiple charges, time-delay detonators (eg., blasting caps) should be used to reduce the overall detonation to a series of single explosions separated by a minimum 25 milliseconds (1/1000 seconds) delay (see Figure 1).
- Large charges should be subdivided into a series of smaller charges (ie. decking) in blast holes with a minimum 25 millisecond delay between charge detonations (see Figure 1).
- The on-land set-back distance from the blast site to the waterbody or the set-back distance (zone) around the blast site in the waterbody are based on the maximum weight of charge to be detonated at one instant in time (see Table 1) and the type of fish and fish habitat in the area of the blast.
- Blast holes should be back-filled (stemmed) with sand or gravel to grade or to streambed/water interface to confine the blast.
- Blasting mats should be placed atop the holes to minimize scattering of blast debris around the area.
- Ammonium nitrate based explosives must not be used in or near water due to the production of toxic by-products.
- Blasting activities are not to be carried out in the marine environment within 500m of marine mammals (additional mitigative measures may also be necessary).

IMPLEMENTATION PROCEDURES

- Blasting activities are to take place at a set-back distance from the waterbody as indicated on Table 1. If on-land blasts are required nearer to the waterbody than indicated on Table 1, then additional mitigative measures should be put in place.

Blasting - Fish and Fish Habitat Protection

Mitigative measures for blasting in or near a waterbody may include, but are not limited to; installation of bubble/air curtains (ie. a column of bubbled water extending from the substrate to the water surface as generated by forcing large volumes of air through a perforated pipe/hose) to disrupt the shock wave, blasting during less sensitive fishery periods, isolation of the work area from fish movement, detonation of small scaring charges (ie., detonator caps or short lengths of detonating cord) set off one minute prior to the main charge to scare fish away from the site or the use of noise generators to move fish out of the area. When a bubble curtain is used, it should surround the blast site and be started-up only after fish have been moved outside of the surrounded area.

DFO should be contacted regarding the proposed blasting program prior to start-up.

MAINTENANCE / ABANDONMENT

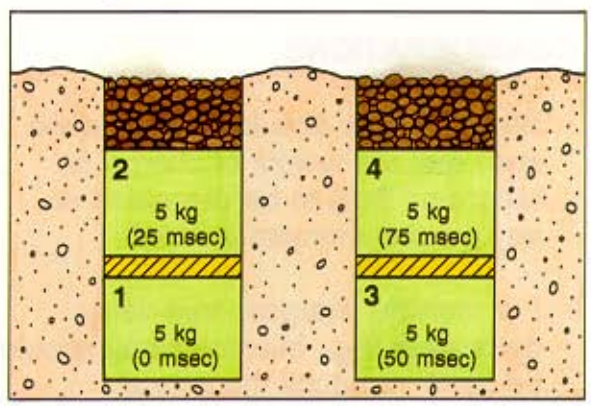
- All blasting debris and other associated equipment/products are to be removed from the blast area, including any debris that may have entered the freshwater or marine waterbodies.

Table 1. Set-back Distance in Metres (m) from Blast Site to Fish Habitat for Rock Removal*

	Weight of Explosive Charge(kg)					
Habitat	0.5	1	5	10	25	50
H1	7	10	15	20	35	50
H2	15	20	45	65	100	143

** Set-back distances may vary slightly depending upon specific circumstances. Habitat H1 includes rearing/general fish habitat. H2 includes spawning habitat where eggs or early fish development are occuring.*

Figure 1. Sample Blasting Arrangement



Per Fig. 1: 20 kg total weight of charge; 25 msecs delay between charges and blast holes; and decking of charges within holes. As per Table 1, for Fig. 1 example, for a 5 kg weight of charge a 15 m set-back from rearing habitat and a 45 m set-back from spawning habitat should be provided.

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For more information contact the nearest Department of Fisheries and Oceans office.

Fisheries and Oceans Pêches et Océans

Canada

FACTSHEET

Ditching

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

All roads require proper drainage in order to support traffic. The manner in which ditching is carried out not only affects drainage, but fish habitat as well.

CONSIDERATIONS

- Roadside ditches, particularly new ditches, can transport large volumes of silt and sediment. If this material is discharged into streams it adversely affects fish and other aquatic life.

IMPLEMENTATION PROCEDURES

In order to avoid damage to fish habitat, the following measures should be implemented:

- Cross drainage culverts and take-off ditches should be incorporated to carry water away from the road and into the surrounding vegetation, where sediments can be filtered from the water.
- In addition to take-off ditches, road side ditches with long slopes may require checkdams to reduce flow velocity, control erosion, and prevent siltation of nearby streams.
- Where the topography does not permit the construction of take-off ditches, settling basins should be used to trap silt before it enters nearby streams.
- Where ditches have been excavated in areas with erosion prone soils, the ditches should be immediately lined with non-erodible material.

MAINTENANCE

- Maintenance of drainage ditches includes regular inspection and the removal of accumulated sediments.

REFERENCES

Anon. 1988. Erosion and Sediment Control - Handbook for Construction Sites. N.S. Dept. of the Environment.

Anon. 1990. Environmental Guidelines for Access Roads and Water Crossings. Ontario Ministry of Natural Resources. 64p.

McCubbin, R.N. et al. 1990.(Revised) Resource Road Construction - Fish Habitat Protection Guidelines. DFO. 78p.

FACTSHEET

Temporary Fording Sites

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Where there is a need for infrequent crossings and a suitable site exists, fording or travelling through a water course, may be an acceptable method of crossing streams.

CONSIDERATIONS

- Approaches to the crossing site should be stable and have low slope.
- The streambed at the proposed crossing site should consist of bedrock or large rubble material. Known spawning areas must be avoided.
- All activity must be conducted in such a manner that silt does not enter streams.
- Equipment must be mechanically sound to avoid leaks of oil, gas and/or hydraulic fluids.
- Crossings should be restricted to a single location.
- Fords should be constructed and used during the driest time of the year.

IMPLEMENTATION PROCEDURES

- Crossings should be at right angles to the stream.
- Approaches may be stabilized by using non-erodable materials, such as corduroy, brush mats, or clean stone materials.

MAINTENANCE

- The fording site should be monitored to ensure that the approaches to the site are not eroding. If erosion is taking place the appropriate corrective action should be taken.

Temporary Fording Sites

ABANDONMENT

- When the fording site is no longer required, the stream channel and banks should be restored to their original condition. Any wheel ruts or other damage that may cause siltation in the stream must also be repaired to prevent silt from being discharged into the stream.

REFERENCES

Anon. 1990. Environmental Guidelines for Access Roads and Water Crossings. Ontario Ministry of Natural Resources. 64p.

McCubbin, R.N. et al. 1990.(Revised) Resource Road Construction - Fish Habitat Protection Guidelines. DFO. 78p.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

FACTSHEET

Forwarder Trails

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Forwarder trails are utilized to transport timber to roadside. The mitigations outlined in this fact sheet can be used on all forwarding operations, and may be modified to work on skidding operations.

CONSIDERATIONS

- When the forest floor is compacted by machinery operating on trails, the natural filtering action of the soil is destroyed. Surface water is no longer absorbed, but is collected by wheel ruts which act as drainage ditches. As the water flows in these ruts, it erodes the soil and can discharge large volumes of silt into nearby streams, damaging fish habitat and aquatic life.

IMPLEMENTATION PROCEDURES

- The location of forwarder trails should be planned in advance to minimize the number of stream crossings.
- To ensure that sediment laden water does not collect in wheel ruts and discharge into streams, mudlogs should be installed across trails before ruts develop. The mudlogs should be installed close to where the water is entering the forwarder trail and the ground slopes to one side. A small earthen dam is pushed up with the forwarder blade on an angle across the trail, and a 30 cm (12 inch) diameter log is placed immediately in front of the dam, on the uphill side. If conditions are extremely wet, several of these may have to be placed along the trail.

Wheel ruts act as drainage ditches to transport sediment laden water.

Mudlogs deflect water off the forwarder trail and unto the forest floor.

Forwarder Trails

- Where stream crossings are necessary, temporary bridges should be installed.

Portable bridges are economical, easy to install, and protect fish habitat.

MAINTENANCE

- If mudlogs become compacted into the ground and are no longer effective, new mudlogs should be installed along the trail.

ABANDONMENT

- Mudlogs should be maintained in place to ensure that surface water is intercepted and deflected into the surrounding vegetation.

- Approaches to stream crossings should be stabilized with slash.

- Temporary bridges can be removed to be used at the next harvesting site.

- These measures may also be employed on abandoned skidder trails.

REFERENCES

Anon. 1990. Environmental Guidelines for Access Roads and Water Crossings. Ontario Ministry of Natural Resources. 64p.

Brathwaite, Glen C. 1992. Woodlot Roads Stream Crossings. Canada\N.S. Cooperation Agreement for Forestry Development. 34p.

McCubbin, R.N. et al. 1990.(Revised) Resource Road Construction - Fish Habitat Protection Guidelines. DFO. 78p.

FACTSHEET

Filter Fabric

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

This type of temporary barrier is commonly referred to as a silt fence or filter fabric dam. Its purpose is to prevent silt from entering waterbodies. These structures are not designed for long term control of siltation. Filter fabric should not be used in natural watercourse. It can be used in ditches and to surround a disturbed site to control site water runoff.

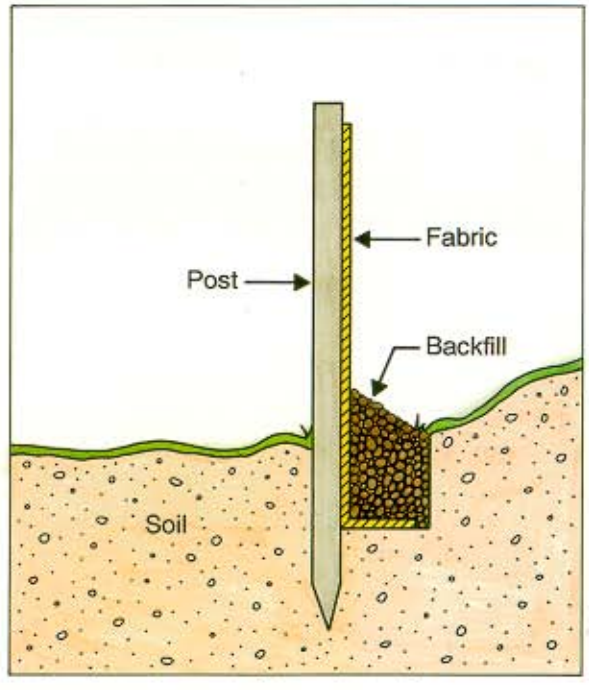
CONSIDERATIONS

- More than one filter fabric dam may be required.
- Filter fabric is designed for temporary use only.
- Further stabilization of disturbed areas may be required prior to filter fabric removal.

IMPLEMENTATION PROCEDURES

- For ditch installations filter fabric should be keyed in to the ditch bottom and sides a minimum of four inches.
- Keying in may be accomplished by excavating a minimum 4" x 4" trench in the ditch bottom and sides.

Wooden stakes should be installed a maximum of 1m apart on the downstream side of the trench and filter fabric attached to the upstream side of the stakes. The trench should then be backfilled. Installation for other disturbed areas should be similar with respect to trenching, stakes and backfilling.



MAINTENANCE

- Clean out accumulated silt at regular intervals as required and dispose of material so that it cannot subequently run into any waterbodies containing fish.

Filter Fabric

- Repair or replace any damaged section(s) of fabric as well as any undercut or end flow areas where water flows freely around the filter fabric.

ABANDONMENT

- Filter fabric should not be removed until all site work has been completed and disturbed areas stabilized.
- Ensure all accumulated silt is removed and disposed of in an appropriate manner prior to removing fabric.
- All materials should be disposed of at an approved dumpsite.

Failure to key the dam into the ditch sides allowed water to wash around the dam.

REFERENCES

Anon. 1988. Erosion and Sediment Control - Handbook for Construction Sites. N.S. Dept. of the Environment.

FACTSHEET

Rock Check Dam

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

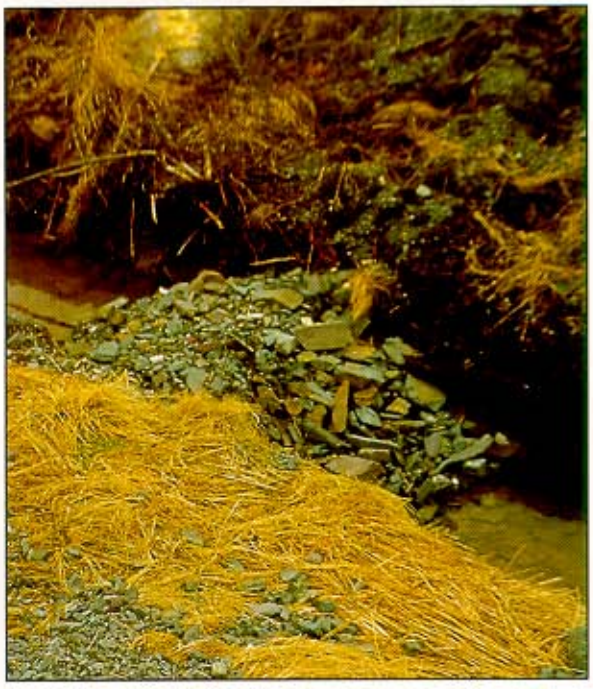
Rock check dams can be used to prevent erosion and control siltation arising from roadside ditches.

CONSIDERATIONS

- These structures must never be used in natural watercourses.
- They can be constructed of locally available materials.
- Rock dams are relatively easy and economical to construct.
- If only larger stones are available, the dam should be lined with impermeable material.
- More than one dam may be necessary.

IMPLEMENTATION PROCEDURES

- Where drainage areas are larger and/or slopes are greater, 100 - 150 mm (4-6in) stones should be used to protect the back and sides of the dam.
- The center of the dam must be lower than the sides.
- The ends of the dam should be stabilized with rip-rap.



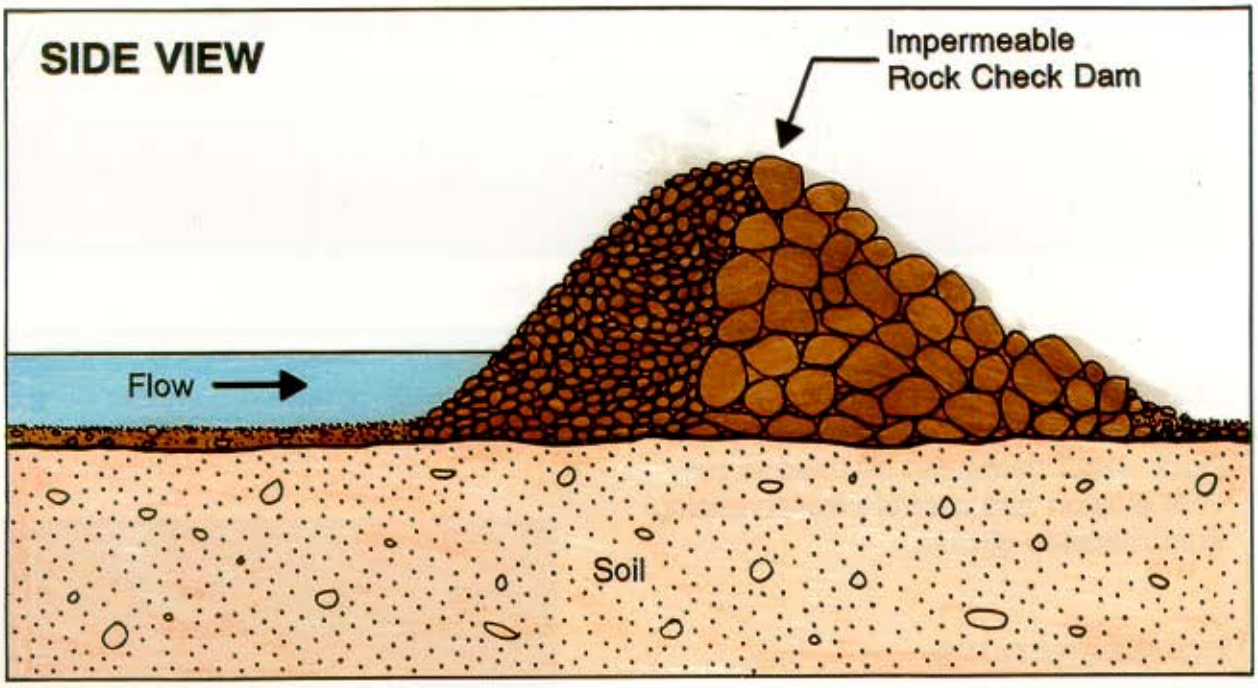
MAINTENANCE

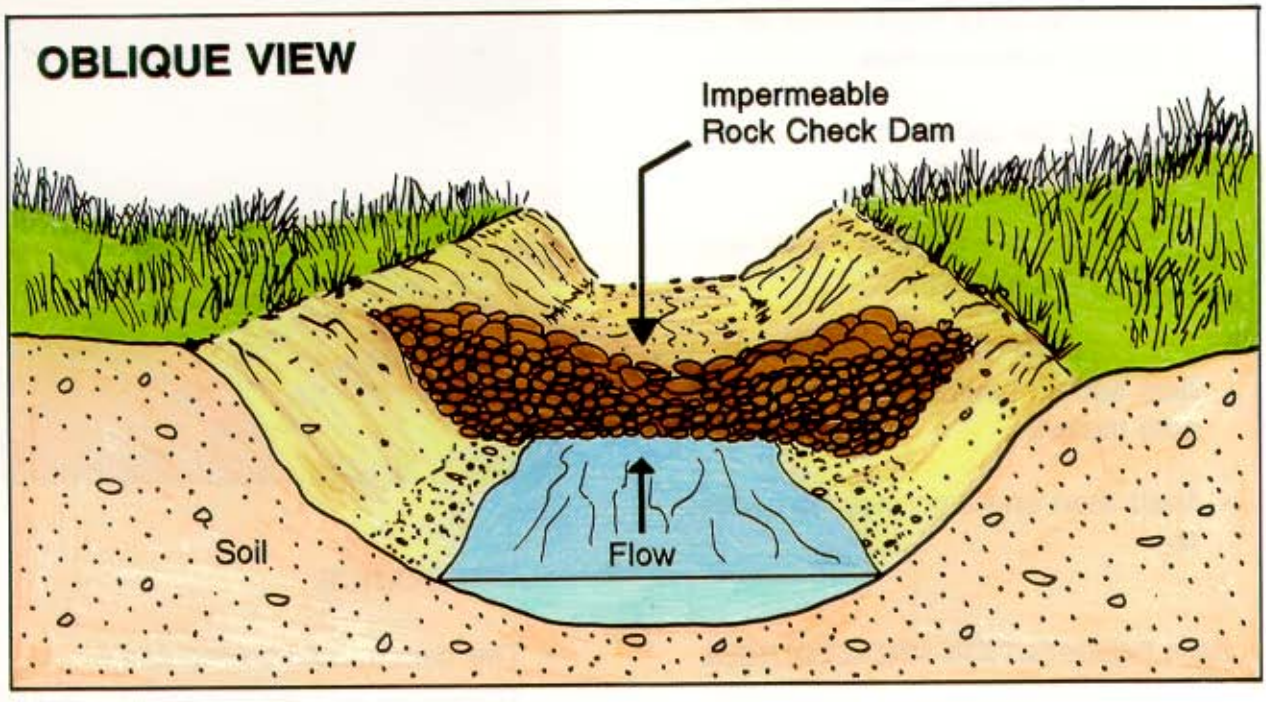
- The dam should be regularly inspected, and accumulations of sediment removed.

REFERENCES

Anon. 1988. Erosion and Sediment Control - Handbook for Construction Sites. N.S. Dept. of the Environment.

Rock Check Dam





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FACTSHEET

Temporary Bridges

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Temporary bridges are constructed to cross waterways on a short term basis, primarily for forestry and mineral exploration, where more permanent structures cannot be justified.

CONSIDERATIONS

- Construction must be carried out in such a manner that silt does not enter the stream.
- The instream use of heavy equipment should be avoided.
- Bridges can be installed where the stream banks are stable and have low slope.

IMPLEMENTATION PROCEDURES

- Bridges are constructed of two sets of 5 meter long logs (3 - 5 in a set), and two bedlogs.
- The logs in each section are lashed together on the ends with chain.
- In preparation for the installation, some brush may have to be removed from the crossing site.
- A forwarder transports the bridge to the site, and installs the bridge by:

1. Placing the bedlogs on the stream banks, parallel to the stream.

2. Placing each section of the bridge.

Temporary Bridges

3. Stabilizing the approaches with slash.

MAINTENANCE

- Approaches to the bridge should be maintained regularly by placing additional slash to prevent erosion.

ABANDONMENT

- When the bridge is no longer required, the bridge sections are removed. The bedlogs are maintained in place to prevent further disruption of the stream banks.
- When the structure is removed, wheel ruts and any other damage that may cause siltation in the stream should be repaired.

REFERENCES

Anon. 1990. Environmental Guidelines for Access Roads and Water Crossings. Ontario Ministry of Natural Resources. 64p.

Brathwaite, Glen C. 1992. Woodlot Roads Stream Crossings. Canada/N.S. Cooperation Agreement for Forestry Development. 34p.

McCubbin, R.N. et al. 1990. (Revised) Resource Road Construction - Fish Habitat Protection Guidelines. DFO. 78p.

FACTSHEET

Resource Road Construction

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Resource access roads are constructed to provide access to forestry or mineral resources.

CONSIDERATIONS

- Resource roads should be located and built in an environmentally sound manner. The implications of such roads on fish habitat should be considered.
- The road layout should be planned such that the number of stream crossings is minimized.

IMPLEMENTATION PROCEDURES

- Where road construction takes place adjacent to a watercourse, a buffer zone of undisturbed vegetation should be maintained between the road and the stream.
- Aggregate materials for road building must not be removed from any stream.
- Side casting should be carried out in such a manner that sediment does not enter any stream.
- Roadside ditches should end blindly in vegetated areas, never directly into a stream.

- Right-of-ways should not be grubbed within 30 metres of stream crossings.
- Siltation control measures, such as sediment traps and check dams should be installed.

MAINTENANCE

The level of maintenance required for resource roads is dependent on the road's use at any given time.

- Regular inspections should be carried out to ensure that culverts and take-off ditches are maintaining proper drainage.
- Roads should be graded and properly crowned to shed water.

Resource Road Construction

- Sediment control measures should receive regular maintenance.

ABANDONMENT

- Consideration should be given to regeneration of the road right-of-way to make the area productive for growing trees and to prevent erosion.
- Surface erosion can be controlled with water bars or transverse ditches excavated across the road surface. These ditches intercept surface run-off and deflect it off the road surface and into the surrounding vegetation.
- Bridges and culverts that require ongoing maintenance should be removed when the road is abandoned. Permanent maintenance free structures should be left in place.

REFERENCES

Anon. 1990. Environmental Guidelines for Access Road Construction and Water Crossings. Ontario Ministry of Natural Resources. 64p.

Brathwaite, Glen C. 1992. Woodlot Roads Stream Crossings. Canada/N.S. Cooperation Agreement for Forestry Development. 34p.

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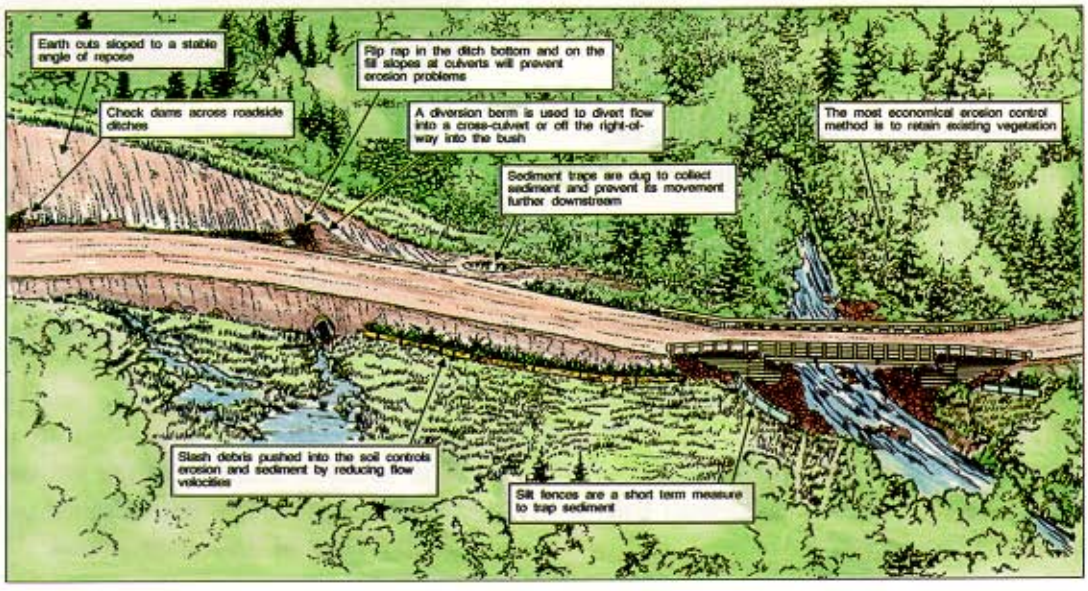

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Fisheries and Oceans Pêches et Océans

Canada

FACTSHEET

Instream Work in the Dry
Cofferdams

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

A cofferdam usually consists of a double row of sand bags with plastic placed between the rows. They are used to isolate stream sections from stream flow to carry out work under dry conditions. Cofferdams can be used alone (for example to isolate work areas along stream margins from stream flow) or in conjunction with pumps to conduct work(s) within stream channels. If possible, cofferdams should only be used in streams during periods when streamflow is low.

CONSIDERATIONS

- Cofferdams sometimes leak, allowing water to enter work areas. In these circumstances the use of a pump to remove silted water contained within cofferdams is necessary to prevent siltation of downstream areas.
- Cofferdams should be sufficiently high to prevent overtopping in the event of sudden increases in water levels.
- Cofferdams should be removed from streams when no longer required.
- If pumps are used to route streams around cofferdams for more than one day their operation should be monitored during periods when no work is occurring at worksites.

Instream work in the dry using cofferdams.

Cofferdam isolating stream margin work area from stream flow.

Instream Work in the Dry - Cofferdams

IMPLEMENTATION PROCEDURES

- In cases where it is necessary to carry out work within a stream channel a cofferdam should be first placed into the stream at or above the upstream limit of the work area. A pump should be placed upstream of this cofferdam to pump streamflow around the work area and back into the stream. A second cofferdam can then be placed into the stream at or below the downstream limit of the work area, thereby isolating the work area from streamflow and permitting work to be carried out in the dry.

- In order to prevent silt from entering the stream a second pump is used to remove silted water from the work area inside the cofferdams. This silted water should be treated by discharging to settling basins, vegetated areas or sediment traps prior to release to streams.

MAINTENANCE

- Sand bags damaged during the course of a work should be replaced.

- Care should be taken to seal leaks in cofferdams.

ABANDONMENT

- Cofferdams should not be removed from streams until instream work areas have been fully stabilized.

- All cofferdam materials should be removed from the stream and disposed of at an approved dump area.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

FACTSHEET

Streambank Stabilization

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Streambank stabilization is appropriate where:

- An area of streambank is undergoing "natural" erosion and causing deposition of sediments in spawning and rearing habitat downstream.
- An area of streambank has been disrupted or destroyed during the conduct of a work or undertaking and the area in question requires "rebuilding".

Stream bank stabilization using rip rap and hydroseed.

CONSIDERATIONS

- Rip rap, the usual material type employed for riverbank stabilization, should be clean, free of fine materials, and of sufficient size to resist displacement during peak flood events.
- Stream banks to be stabilized or rebuilt should be shaped so that they are at a stable slope.
- Gabion baskets can be used as an alternative to rip rap where bank slopes are not at a stable angle of repose.
- Streambank stabilization should not result in a decrease in the cross sectional width of streams.

Rebuilt stream banks - rip rap, sod and natural vegetation.

Streambank Stabilization

IMPLEMENTATION PROCEDURES

- Rip rap or gabion basket placement should be carried out in the dry (e.g. using cofferdams consisting of double walls of sand bags with plastic placed between the walls to isolate streambank areas from streamflow) The planting of trees (e.g. alders, willows) and other vegetation (for example grass, small shrubs, etc.) on streambanks can enhance stabilization measures.
- Stabilization materials used should be placed from the toe of the bank slope to a height on the streambanks equal to the anticipated high water level or to the top of the bank slope, as appropriate.
- The effectiveness of streambank stabilization can be increased if the top of bank slopes are seeded, sodded, or hydroseeded in conjunction with the placement of rock, rip rap, or gabions.
- In river sections where the stream channel meanders particular care should be exercised in stabilizing the outside bends of meanders since such areas are subject to increased erosion pressures.

MAINTENANCE

- Once stream banks have been properly restored maintenance is not often required.

ABANDONMENT

- Excess materials left over from stream bank rehabilitation and cofferdam materials, etc. should be disposed of at an approved dump site.

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For more information contact the nearest Department of Fisheries and Oceans office.

FACTSHEET

Instream Work in the Dry
Temporary Diversion

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

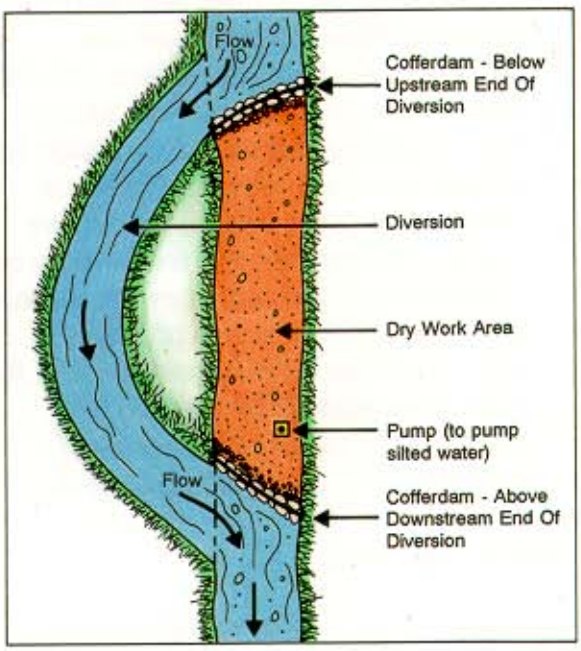
A temporary diversion is used to conduct instream work in the dry. This method is usually limited only by the availability of space within which to construct a diversion.

CONSIDERATIONS

- Constant maintenance of diversion channels may be required.
- Care must be exercised in the excavation of the diversion channel to ensure that it is capable of accommodating peak flows from the stream which is being diverted.
- A pump is usually required to remove silted site water arising in dewatered work areas.

IMPLEMENTATION PROCEDURES

- Temporary diversions should be excavated from the downstream end toward the upstream point of diversion, where a "plug" of earth should be left to prevent the entry of streamflow into the diversion channel before it is stabilized. Strong plastic sheathing can be used to line the channel bottom and slopes. This sheathing should be weighted down with crushed stone and staked into the top of the channel slopes. Once



Temporary diversion.

Temporary diversion - channel liner.

Instream Work in the Dry - Temporary Diversion

the channel has been lined and the lining secured, the "plug" of earth referred to earlier can be removed.

- A cofferdam (recommended double walls of sand bags with plastic placed between the walls) should then be placed immediately below the upstream point of diversion to re-route the flow of water into the diversion. Another cofferdam should then be placed immediately above the downstream point of diversion to isolate the work area and prevent silted water from escaping into the stream. In this manner the work area is effectively isolated from the stream and instream work can proceed in the dry. Silted water arising within the work area should be treated by discharging to vegetated areas, sediment traps or settling basins.

MAINTENANCE

- Plastic used to line the diversion must be kept in a good state of repair.

- Care must be exercised to ensure that streamflow does not get under or behind the channel liner and cause erosion of the channel banks and subsequent downstream siltation.

- At increased water levels and velocities it may be necessary to further secure the channel liner.

ABANDONMENT

- The diversion should be filled in and stabilized when no longer in use.

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For more information contact the nearest Department of Fisheries and Oceans office.

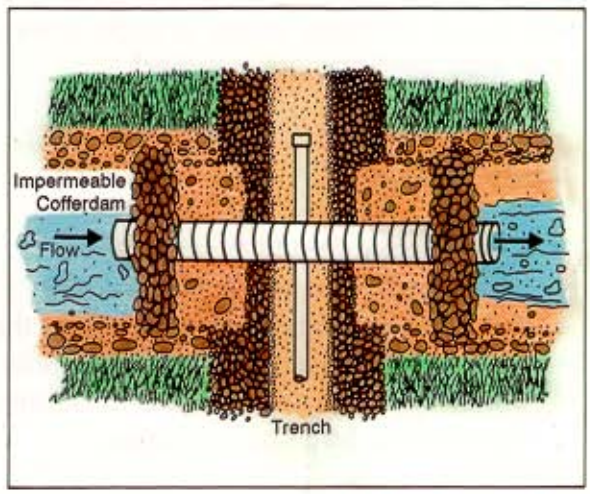
FACTSHEET

Instream Work in the Dry
Elevated Pipes

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

This method can be used to carry out instream work in the dry as an alternative to the use of cofferdams (and pumps) or in circumstances where site constraints preclude the construction of a temporary diversion. The use of elevated pipes should be restricted to times of year when streamflows are low and fish species are not undergoing spawning migrations (elevated pipes can impede the migration of fish).



Stream crossing dewatered by means of an elevated pipe.

CONSIDERATIONS

- It will usually be necessary to have completed instream work and have elevated pipes removed prior to migration periods.
- Elevated pipes should be of a size capable of accommodating sudden increases in streamflow to prevent flooding of work sites.
- It may be necessary to pump streamflow around work sites in cases where the capacity of elevated pipes is exceeded and flooding of work sites is imminent.

Elevated pipe.

IMPLEMENTATION PROCEDURES

- The inlet and outlet of an elevated pipe is usually seated on cofferdams (e.g. double walls of sandbags with

Instream Work in the Dry - Elevated Pipes

plastic placed between the walls). Upstream and downstream cofferdams should be placed into the stream and the pipe placed onto the cofferdams. Additional sandbags should then be placed on top of the pipe inlet and outlet to hold it in place. If more than one pipe section is necessary to carry streamflow over the instream work area then consideration should be given to the impermeability of the area(s) where the pipe sections are coupled.

MAINTENANCE

- Cofferdams should be checked periodically to ensure that water is not leaking through them and into the work area or from the work area into the stream. Any such leaks should be repaired as soon as possible.

ABANDONMENT

- The instream work area should be fully stabilized and brought back to grade prior to removing the elevated pipe.
- Sand bags, pipe sections, etc. should be removed upon project completion.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

Fisheries and Oceans Pêches et Océans

Canada

FACTSHEET

Culvert Stabilization

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Stabilization of culvert inlets and outlets should be undertaken when culverts are installed. This prevents the erosion of materials from around culverts and subsequent downstream siltation and possible loss of the culverts due to washouts.

Culvert rip rap stabilization.

CONSIDERATIONS

- Materials used for stabilization purposes should be clean and non erodible (e.g. blasted rock, or rip rap, or gabion baskets).
- Materials used for stabilization should completely cover unstabilized materials (e.g. road fill, gravel) at culvert inlets and outlets.
- Fill slopes should be stable to ensure that roadbed materials do not enter watercourses.

Stabilization of culvert outlets - rip rap.

IMPLEMENTATION PROCEDURES

- When a culvert has been installed gabions, rip rap, or large, clean rock should be placed at the culvert inlets and outlets. All materials used for stabilization should be of sufficient size to prevent erosion under anticipated operating levels for the culvert.

Culvert Stabilization

MAINTENANCE

- Culverts should be inspected regularly to assess the adequacy of stabilization measures. Areas from which stabilization materials have become dislodged should be repaired.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

Fisheries and Oceans Pêches et Océans

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FACTSHEET

Storm Drain Outlets

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

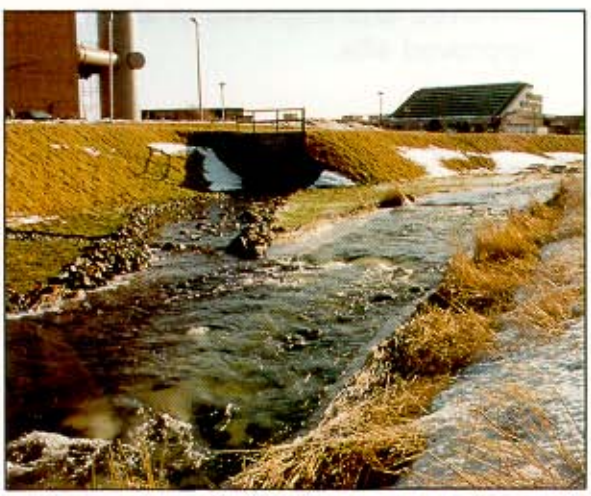
Storm drain outlets are used to conduct storm water away from developed lots, buildings, housing developments, etc. and usually discharge into the nearest stream.

CONSIDERATIONS

- Storm drainage channels should be of a size capable of accommodating peak storm events.
- Storm drainage outlet structures should not be constructed directly on stream banks, but should be constructed some distance back and a channel excavated from the outlet structure to the stream.

IMPLEMENTATION PROCEDURES

- Storm drain outlet structures should be constructed after excavating a channel to the stream; this channel should be constructed so that it is generally oriented parallel to the direction of flow of the receiving stream. This channel should be lined with clean stones to reduce the velocity of water exiting the outlet structure before the water enters the stream in order to avoid streambed and stream bank erosion. The channel should be fully stabilized prior to the entry of storm water into it to prevent erosion and consequent downstream siltation.



Storm drain outlet - orientation to stream-flow.

Storm drain outlet channel - stabilization.

Storm Drain Outlets

MAINTENANCE

- Once storm drain outlets have been properly constructed and stabilized regular maintenance is usually not required.

ABANDONMENT

- All excess materials resulting from excavation of the storm drainage channel and construction of the storm water outlet structure should be removed and disposed of at an approved site.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

Fisheries and Oceans Pêches et Océans

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FACTSHEET

Highway Construction Low Point Protection

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Low point protection is advisable where a stream or drainage into a watercourse on a highway construction project is situated so that it receives sediment bearing drainage from disturbed areas uphill on both sides of the low point.

Highway low point (centre).

CONSIDERATIONS

- If filter fabric is used for low point protection it should be installed properly to maximize its efficiency.
- Ditch blocks consisting of materials such as crushed stone, brush, etc. can be used in place of filter fabric and require much less maintenance.
- A series of siltation control structures is recommended for the proper treatment of sediment bearing water.
- Ditch blocks, etc. are temporary measures put in place until drainage ditches and associated disturbed areas have been fully stabilized; such areas should be stabilized as soon as possible after having been disturbed and normally within the same construction season.

Filter fabric used for low point protection.

Ditch block (rock dam) used for low point protection.

Highway Construction - Low Point Protection

IMPLEMENTATION PROCEDURES

- If drainage ditches are being excavated from disturbed areas toward the low point, siltation control structures (e.g., ditch blocks, etc.) should be installed before the ditch terminates some distance from the low point, preferably in a vegetated area. Where road ditches already exist, siltation control devices should be installed before the commencement of construction activities.

MAINTENANCE

- If filter fabric dams are used to protect low points from siltation, these filter fabric dams should be maintained in good operating condition.

- It will be necessary to remove sediment accumulated behind ditch blocks periodically.

ABANDONMENT

- Ditches and adjacent disturbed areas should be stabilized as soon as possible after they have been excavated/disturbed, normally within the same construction season.

- Filter fabrics, if used, should be removed and disposed of at an approved site when no longer required.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

Fisheries and Oceans Pêches et Océans

Canada

FACTSHEET

Temporary Settling (Detention) Basins

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

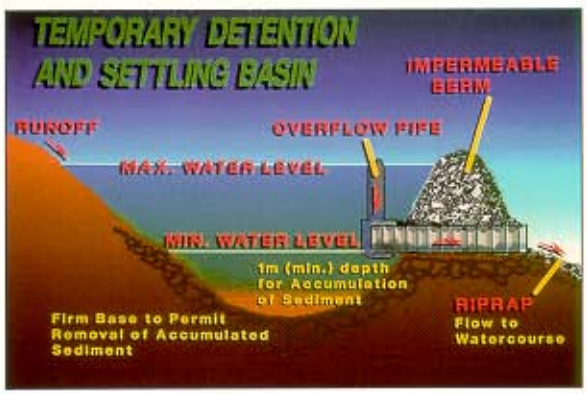
These basins are used (on a relatively short term basis) for the treatment of silted water prior to release to watercourses.

CONSIDERATIONS

- These basins are often most effective when they are constructed so that their length is four times their width.
- The bottoms of settling basins should be lined (e.g. with plastic).
- Settling basins are often most effective when several are used in series.

IMPLEMENTATION PROCEDURES

- A pipe should be installed near the top of a settling basin in such a manner that it discharges water from the top of the water column. There are a number of alternatives to this method of settling basin construction involving the use of various detention devices such as pre-cast manholes, and utilizing natural topographic features.



Settling basin construction details.

Settling basin lined with plastic.

Temporary Settling (Detention) Basins

MAINTENANCE

- It may be necessary to remove and dispose of accumulated sediment from settling basins in order to maintain their operating capacity.

ABANDONMENT

- Settling basins should be filled in and stabilized when no longer required.

Series of rough settling basins intended for short term use.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

FACTSHEET

Bridge Construction / Demolition

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

The construction of permanent bridge structures is the preferred method for stream crossings, especially for crossings of large streams or rivers. Demolition of old existing bridges in sensitive areas should be carried out so as to minimize impacts on fish and fish habitat.

CONSIDERATIONS

- All instream works should be carried out in the dry (see Factsheets # 10, 12, and 13 regarding mitigations for instream work in the dry) and in such a manner that no silt enters watercourses / waterbodies (see Factsheets # 6, 7, 10, and 17 regarding measures to control siltation).

IMPLEMENTATION PROCEDURES

Construction

- Bridges should be constructed at right angles to waterways and on straight stretches of watercourses.
- Bridge abutments should be located outside the normal wetted stream perimeter.
- Gabions, or wing walls, should be used to prevent the erosion of road/ road shoulder materials into watercourses.
- "False Work," if used to support concrete bridge decking while the

Bridge construction.

Bridge abutments outside wetted stream perimeter.

"False Work" to support concrete bridge decking.

Bridge Construction / Demolition

decking "cures," should allow for fish passage at all times.

- Every precaution is to be taken to prevent the entry into watercourses/ waterbodies of chemicals, such as lime and cement, which could be very toxic to aquatic life.

MAINTENANCE

- Routine abutment and deck maintenance is usually required where bridges have been properly constructed. Standard procedures to protect fish and fish habitat should be followed.

DEMOLITION

- Where it becomes necessary to demolish or remove a bridge every effort should be made to avoid "dropping the bridge" into rivers/ streams. This could be done by "sawing" appropriate sections of the bridge and using cranes to lift these sections.

- Where the only alternative is "dropping" a bridge into a river, and depending upon the fish habitat in the affected area, it may be necessary to construct a platform onto which the bridge could be dropped.

- If a new bridge is not to be constructed in the area, as much as possible of the abutments and wing walls should be left in place in order to prevent the slippage of unstable materials into watercourses. Failing this, unstable materials on both sides of the bridge approaches should be removed prior to abutment removal, and the disturbed areas stabilized to prevent erosion. (See Factsheet # 11 regarding streambank stabilization.)

ABANDONMENT

- All excess materials should be removed and disposed of at an approved dump site.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

FACTSHEET

Freshwater Salmonid Habitat Requirements

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Fish habitat is defined as those parts of the environment on which fish depend, directly or indirectly, in order to carry out their life processes. This includes spawning grounds, rearing habitat, migration and feeding areas.

SPAWNING AREAS

Salmonids require a stretch of stream with clean gravel and good water flow. This type of habitat is most often found in headwater areas (the uppermost stream reaches), where there is typically finer substrates and relatively stable water flows. However, salmonids also spawn in the lower reaches of streams. For successful spawning, salmonids require clean, stable gravel of 1 cm to 15 cm in diameter depending on fish size. These stream conditions provide a stable supply of clean, cool, well oxygenated water for the successful incubation of eggs deposited in the gravels, and rearing of young.

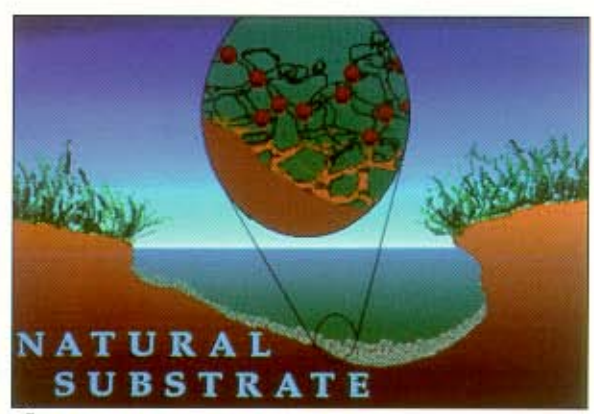
Spawning habitat.

REARING AREAS

Rearing habitat varies from areas of low stream velocity and small substrate to areas of larger (cobble/boulder) substrate and higher velocities. Streams supporting successful salmonid populations are usually associated with a high proportion of riffles and pools, thus offering a variety of habitat cover types. Shelter is provided by undercut banks, deep pools, turbulence, rocky areas, instream debris, and overhanging (riparian) vegetation.

MIGRATION AREAS

Migration areas consist of stream reaches that provide corridors for fish movement from one area of the watershed to another or, for anadromous (sea-run) salmonids, access to and from the sea. Migration areas must permit fish movement to critical habitats. The lack of barriers to migration in the main stream and tributaries, as well as adequate water flow are essential.



Spawning gravels.

Freshwater Salmonid Habitat Requirements

FEEDING AREAS

Insect life is the major food supply for salmonids. The available food supply of a stream depends on clean, cool, well oxygenated water flowing over a clean bottom of gravel, cobble or boulders.

Salmonids are primarily sight feeders and water clarity influences feeding ability. Streams must be clear enough to permit sunlight to penetrate and permit adequate algal growth which, in turn, maintain a healthy aquatic insect population as a food supply for fish. Beneath the surface of a stream, among the rocks and boulders, there is an abundance of insects in their immature forms. A variety of stream bottom materials is required for production of aquatic insects. Insects falling into the stream from overhanging vegetation also provide food for salmonids.

Riffle area containing rearing, spawning and feeding habitat.

Optimum fish production is contingent upon a combination of a variety of conditions, including adequate food supply, suitable dissolved oxygen levels, cool stream temperatures, shelter (cover), and clear, clean water.

The above factors combine to make salmon and trout very sensitive to various environmental changes. These factors are all necessary to support a productive salmonid population. Loss of any one of these critical habitat components usually results in severe reductions or total loss of salmonid stocks from a given area.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

Fisheries and Oceans Pêches et Océans

Canada

FACTSHEET

Highway Construction / Upgrading

Infilling, Stabilization & No-grub Zones

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

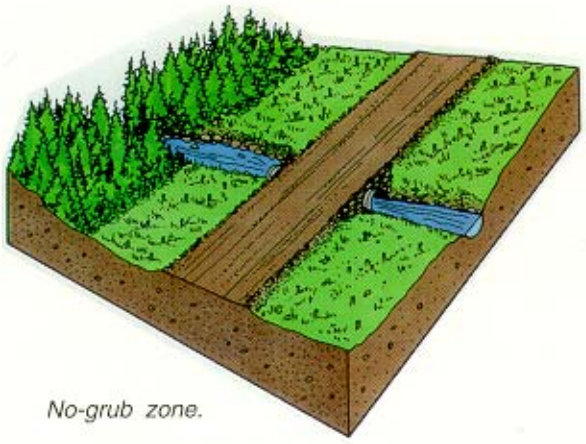
The following mitigation options are recommended wherever highways are being constructed or upgraded across watercourses and across or through small ponds.

CONSIDERATIONS

- Construction/upgrading should be carried out in such a manner that silt does not enter watercourses/ waterbodies (see Factsheets # 6, 7, 10 and 17 regarding measures to control siltation).
- Instream works associated with highway construction/upgrading should be carried out in the dry (see Factsheets # 10, 12 and 13 regarding instream work in the dry).

IMPLEMENTATION PROCEDURES

- A no-grub buffer zone (recommend 30 metres) should be maintained adjacent to all watercourses in crossing areas; there should be no grubbing within this zone except for road approaches. Grubbing for road approaches should only be done immediately prior to subgrade construction.



No-grub zone.

- Where infilling of small gullies or small ponds cannot be avoided by adjusting road alignments, then such waterbodies should be isolated from streamflow (recommend using cofferdams and pumps - see Factsheet # 10). Water can be pumped from these waterbodies until they are dry. In situations where only a portion of a waterbody is to be infilled, attempts should be made to isolate the infill area from the rest of that waterbody while infilling is ongoing (e.g., geotextile materials, plastic, rock berms, etc.).
- Only clean, non-erodible materials should be used for infilling waterbodies (e.g., blasted rock containing no, or a minimum of, fines).
- Stabilization of stream crossing areas should be carried out as soon as possible after the crossing structure has been installed and certainly within the same construction season (see Factsheet # 11 regarding stream bank stabilization).
- Disturbed areas along highway right-of-ways, which could lead to ongoing siltation to watercourses/ waterbodies, should be stabilized or re-vegetated as soon as possible after they have been disturbed and

Highway Construction / Upgrading

certainly within the same construction season.

Stabilization.

- It is recommended that DFO be contacted prior to the onset of construction/upgrading regarding appropriate approvals of works or undertakings which may impact on fish and fish habitat.

MAINTENANCE

- Stabilization failures at stream crossing areas or along right-of-ways should be re-stabilized as quickly as possible.

ABANDONMENT

- Once construction has been completed and before contractors abandon construction sites all excess materials should be removed so as not to enter adjacent watercourses/ waterbodies.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

FACTSHEET

Freshwater Intake End-Of-Pipe Fish Screen

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Fish protection should be provided for activities involving extraction of fresh water. An intake should be screened to prevent potential losses of fish due to entrainment or impingement. Entrainment occurs when an organism is drawn into a water intake and cannot escape. Impingement occurs when an entrapped organism is held in contact with the intake screen and is unable to free itself.

CONSIDERATIONS

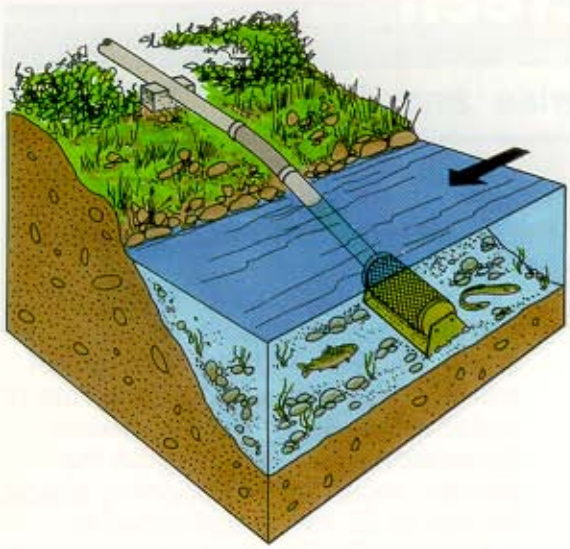
- For small permanent and temporary freshwater withdrawals up to 125 litres/second (L/s) (2000 US gallons per minute (gpm)), associated with irrigation, construction, small municipal and private water supplies, etc., end-of-pipe intake screen designs are often used for the protection of fish.
- Open screen area requirements for freshwater intake end-of-pipe fish screens differ depending upon swimming mode (i.e., subcarangiform - fish that swim like trout/salmon; or anguilliform - fish that swim like an eel).
- Freshwater fish of 25 mm (i.e., fry stage) or more in length should be protected from entrainment and impingement due to water extraction activities, unless site-specific circumstances, as addressed with DFO, indicate otherwise.

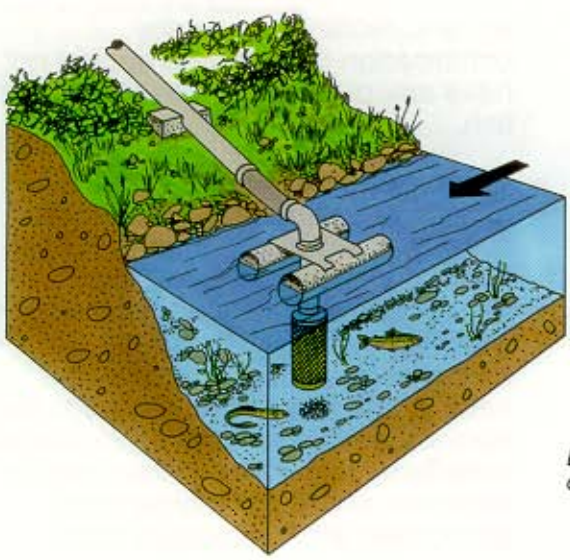
IMPLEMENTATION PROCEDURES

- The required screen area (i.e., the area of all open spaces on the screen available for the free flow of water) varies depending upon rate of water withdrawal. The narrowest dimension of any opening on the screen, regardless of opening shape, for fish of 25 mm is estimated at 2.54 mm. DFO should be contacted regarding specific requirements.
- Screen openings may be round, square, rectangular, or any combination thereof, and should not have any protrusions that could injure fish.
- Where possible, screens should be located in areas and depths of water with low concentrations of fish throughout the year, away from natural or constructed structures which may attract fish that are migrating/spawning or in rearing habitat, and at a minimum of 300 mm above the bottom of the watercourse/ waterbody to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
- The screen face should be oriented in the same direction as the flow.
- Flow should be evenly distributed over the screen surface.
- Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially in areas of debris movement.

Freshwater Intake End-Of-Pipe Fish Screen

- DFO should be contacted regarding proposed water withdrawal activities prior to start-up.





Examples of typical applications and features of end-of-pipe screens.

MAINTENANCE

- Regular maintenance should be provided, including the removal, inspection, and cleaning of screens to prevent debris fouling and impingement of fish.
- Pumps should be shutdown when fish screens are removed for inspection and cleaning.

ABANDONMENT

- Consideration should be given to the removal of the intake screen and associated infrastructure.

For more specific technical information refer to:

Department of Fisheries and Oceans. 1995. Freshwater Intake End-of-Pipe Fish Screen Guideline. Communications Directorate, Department of Fisheries and Oceans.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

FACTSHEET

Stream Clean-up

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Stream clean-up is sometimes required in streams that have had man made materials introduced into them from various activities/sources. These materials could cause the following problems:

- obstructions to fish migration
- scouring of the natural stream bottom sometimes removing spawning gravels or causing siltation of spawning gravels downstream
- alteration of the natural flow of a stream resulting in streambank erosion or excessive water velocities preventing fish migration
- filling in of the natural bottom substrate resulting in the loss of access to suitable fish spawning/rearing habitat.

Instream barriers to fish migration.

CONSIDERATIONS

- Trees, bushes, shrubs, weeds or tall grasses should not be removed along any streambank. In addition, mats of floating algae or vegetation should not be removed from any section of the stream. These important habitat features provide shade and cover for fish, keeping water temperatures cool, providing insect food for fish and offering protection from predators.
- Woody debris which is not causing any apparent damage to the bottom substrate may be left in place as it provides cover for fish. As woody debris decomposes it becomes a food source for small microorganisms and invertebrates which, in turn, are eaten by trout and young salmon. Decomposition also renews the energy cycle with nutrients.

Overhanging vegetation should not be removed.

- Activities associated with stream clean-up must not alter the flow characteristics of the stream as this may cause streambank erosion, bottom scouring and possible downstream deposition of sediments.

Stream Clean-up

In addition, increased water velocities may act as a barrier to fish migration.

- Streambanks must not be disturbed such that underlying soils are exposed. This could cause silt to enter the stream resulting in a loss of fish habitat. Any streambank that is disturbed should be immediately stabilized by re-vegetating. (See Factsheet # 11 regarding streambank stabilization).

IMPLEMENTATION PROCEDURES

- Instream activity should be scheduled to take place between June 1 and September 30, in order to reduce impacts to fish habitat during fish spawning and incubation periods.
- Instream debris should be removed by hand. Heavy equipment should not be used instream.
- All necessary measures must be taken to avoid the release of silt into the stream. (See Factsheets # 6, 7, 10 and 17 regarding measures to control silt).
- The natural stream bottom substrate must not be altered or disturbed in any way.
- Instream clean-up activities should be carried out during times of low flow.
- All surplus or waste material should be removed from the project area and disposed of at an approved dump-site.
- DFO should be consulted regarding any stream clean-up project prior to start-up.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

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FACTSHEET

Timber Crib

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Timber cribs are utilized as a component of marine infrastructure (wharves, slipways, sea walls, etc.) and sometimes as erosion control structures in inland waterways (i.e., abutments).

CONSIDERATIONS

- Construction of timber crib structures, if done improperly, can result in degradation of fish habitat. If improper fill of ballast material is used, silt can be released into waterbodies/watercourses, resulting in potential negative impacts on fish and fish habitat. The location of timber cribs could also result in the physical disturbance or loss of fish habitat.

IMPLEMENTATION PROCEDURES

In order to avoid damage to fish habitat, the following measures should be implemented:

- Any material used to fill a submerged timber crib structure should be free of fines or sediment (e.g., material such as blasted rock or boulders) to a level above the extent of highest normal water levels.

- Material designated as ballast to fill any timber crib structure should never be removed directly from any watercourse or waterbody, from any shoreline below the high water mark, or from any streambank area.

- During all construction and associated activities, the alteration, disruption or destruction of fish habitat (e.g., removal of bottom substrate) in any waterbody should be avoided and siltation kept to an absolute minimum (see Factsheets # 6, 7, 10 and 17 regarding measures to control siltation).

- Shoreline or streambank disturbance should be restricted to the immediate work area. Disturbed shorelines or streambanks must be stabilized by the use of rip-rap, seeding or sodding (see Factsheet # 11 regarding stream bank stabilization in freshwater environments).

- Untreated wood or pressure treated wood is recommended for use in or near freshwater and marine environments. Manually applied wood treatments may also be utilized. Preservatives such as pentachlorophenol (PCP) should not be used in freshwater or marine

Infill materials for timber cribs.

Timber Crib

environments; Creosote should not be used in freshwater but may be used in marine environments; chromium copper arsenate (CCA) can be used in freshwater. Freshly treated preserved wood should be avoided. Environment Canada should be contacted regarding wood preservatives, weathering, and the location of treatment sites for manually applied preservatives.

MAINTENANCE

- Regular maintenance must be carried out on timber cribs to prevent collapsing and possible shifting of the crib or ballast. Any timber crib material moved by ice or wave action should be recovered by the owner.

Timber crib construction: untreated/pressure treated wood.

Timber crib construction for marine environment.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

FACTSHEET

Water & Sewer Installation Stream Crossings

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

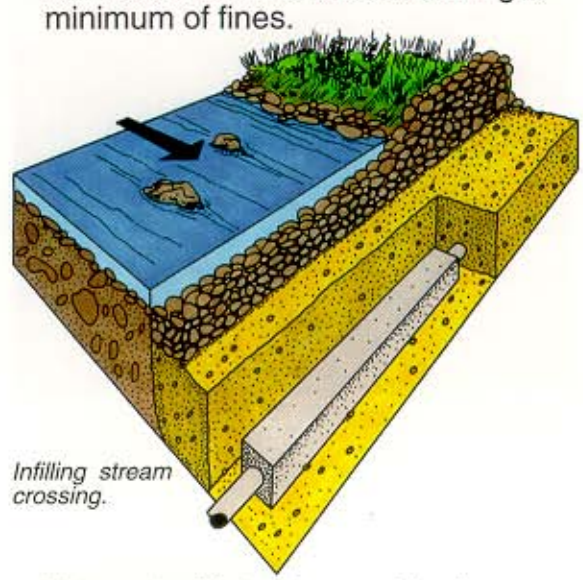
The following mitigation procedures/ options are recommended wherever lines or pipes of any sort (water lines, sewer lines, communications or power cables, etc.) are to be installed under the substrate of any watercourse.

CONSIDERATIONS

- Instream works associated with these types of activities must be carried out in the dry (see Factsheets # 10, 12 and 13 regarding instream work in the dry).
- Silted water arising within work areas should be treated to remove silt prior to release into watercourses/ waterbodies. (See Factsheets # 6, 7, 10, and 17 regarding measures to control siltation).
- Stream banks and approaches to or from crossing areas disturbed as a result of these activities should be stabilized immediately after the crossing has been completed (see Factsheet # 11 regarding stream bank stabilization).

IMPLEMENTATION PROCEDURES

- Once the pipe installation has been completed, the "trench" created in the stream bed should be partially filled with suitable materials; these materials can then be compacted and the stream bed brought back to its previous elevation and grade using a 15-20 cm topping of clean non-erodible materials containing a minimum of fines.



Infilling stream crossing.

- The materials to be used for the "topping" in the crossing area should be consistent with the material substrate of the stream in this area and should be large enough to resist displacement by peak flows.

Instream excavation for stream crossing.

Water & Sewer Installation - Stream Crossings

MAINTENANCE

- Once the stream crossing has been properly completed and the crossing area sufficiently stabilized, regular maintenance is usually not required unless site specific problems arise; any subsequent requirements for excavation should be carried out as noted.

ABANDONMENT

- Excess materials resulting from stream bed/stream bank excavation, mitigation procedures, etc., should be disposed of or stockpiled so as to prevent their entry into any watercourse/ waterbody.

Stream bed restored.

Stream crossing completed.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office.

Fisheries and Oceans Pêches et Océans

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FACTSHEET

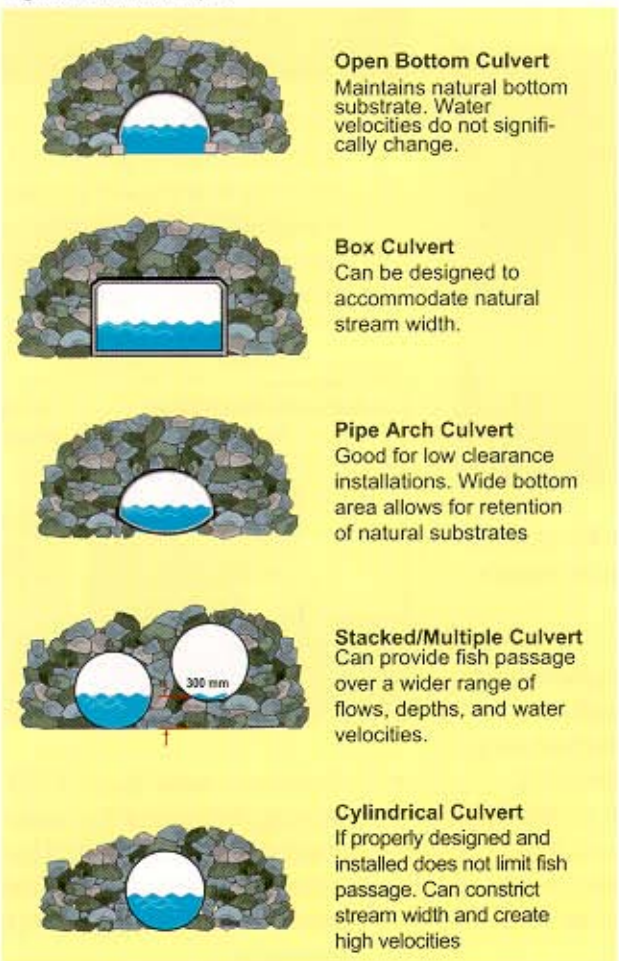
Culvert Installations

Department of Fisheries and Oceans

CONDITIONS WHERE APPLICABLE

Culverts are the most commonly used method for providing access over a watercourse, and particularly for small and medium sized streams. Several types of culverts are used including; open bottom/bottomless arch, pipe arch, box, and circular/cylindrical. Box type culverts are generally made from wood or concrete while other types are made from plastic, concrete or, most commonly, corrugated steel. Figure 1 identifies various culvert shapes.

Figure 1 Culvert Shapes



Open Bottom Culvert
Maintains natural bottom substrate. Water velocities do not signifi-cally change.

Box Culvert
Can be designed to accommodate natural stream width.

Pipe Arch Culvert
Good for low clearance installations. Wide bottom area allows for retention of natural substrates

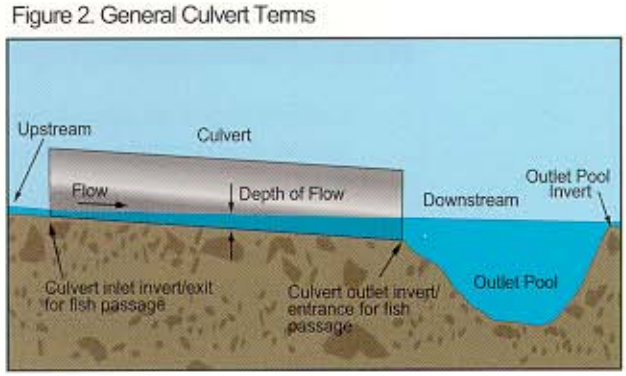
Stacked/Multiple Culvert
Can provide fish passage over a wider range of flows, depths, and water velocities.

Cylindrical Culvert
If properly designed and installed does not limit fish passage. Can constrict stream width and create high velocities

CONSIDERATIONS

- Sufficient depth of flow and appropriate water velocities for fish passage should be provided in culvert installations.
- Culvert size should be based on the capacity to handle peak flows. It may be necessary to have a hydrologic and hydraulic analysis performed in order to determine the correct size of the culvert to be used. The hydrologic analysis is used to determine the peak flow and the hydraulic analysis is used to calculate the capacity of the culvert to adequately pass the peak flows.
- The type of culvert selected and installed should minimize potential impacts on fish habitat, maintain fish passage, and sufficiently accommodate watercourse flows. To the extent possible, natural stream conditions (i.e., widths, habitat, etc.) should be maintained. Figure 2 illustrates some common terms associated with culvert crossings.

Figure 2. General Culvert Terms



- Natural bottom substrate and hydraulic capacity of watercourses are best maintained using open bottom/bottomless arch culverts; these are the preferred type of culvert crossings.

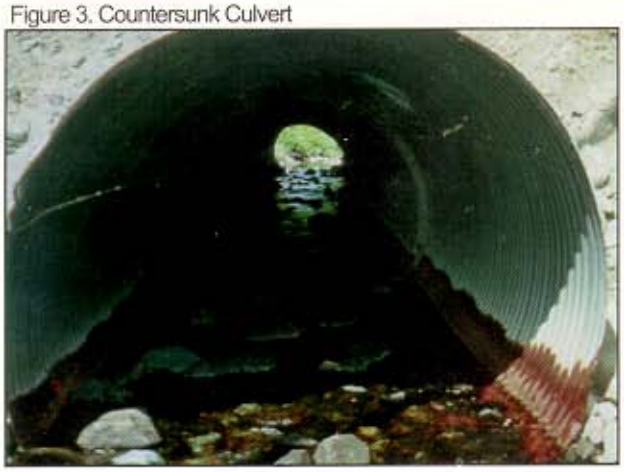
Culvert Installations

- Footings for open bottom culverts should be installed outside the normal wetted perimeter of the watercourse and tied into the bedrock or sufficiently stabilized to prevent erosion around the footing or undermining.

- For installation of cylindrical culverts in fish bearing streams, a minimum culvert diameter of 1000 mm should be provided and designed/sized according to site specific considerations.

- Cylindrical culverts should be installed to simulate open bottom or pipe arch culverts. Culverts up to 2000 mm in diameter should be countersunk a depth of 300 mm below the streambed elevation. Culverts with diameters exceeding 2000 mm should be countersunk a minimum of 15% of the diameter below the streambed elevation. Note: Countersinking reduces the hydraulic capacity of the culvert, therefore the required diameter of the culvert must be adjusted accordingly (Figure 3).

Figure 3. Countersunk Culvert



- Culverts should be aligned parallel to the existing natural channel and located on a straight stream section of uniform gradient.

- The culvert should be placed on firm ground and be countersunk to the appropriate depth. In sites where soft foundations are present the unsuitable material should be removed and replaced by clean granular material to prevent the culvert from sagging. Water movement under or around a culvert installation should be prevented through the use of headwalls, or other means, as necessary.

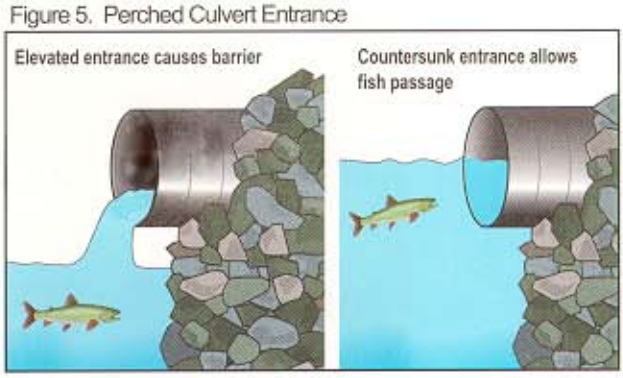
- A culvert should extend beyond the upstream and downstream toe of the fill (eg., a minimum of 300 mm, see Figure 7).

- For multiple culvert installations the culvert intended to provide fish passage should be placed in the deepest part of the channel and be countersunk to the required depth. The remaining culvert(s) should be placed a minimum of 300 mm above the invert of the fish passage culvert. (Figure 4).

Figure 4. Multiple Culvert Installation

- Culverts should be sufficiently sized and installed such that scouring of the outlet streambed does not occur as a result of increased water velocities in the culvert. Elevated culvert entrances can cause scouring which may create an obstruction for migrating fish (Figure 5).

Figure 5. Perched Culvert Entrance



- A minimum water depth of 200 mm should be provided throughout the culvert length. To maintain this water depth at low flow periods an entrance/ downstream pool can be constructed. In some cases, an upstream pool may also be necessary.

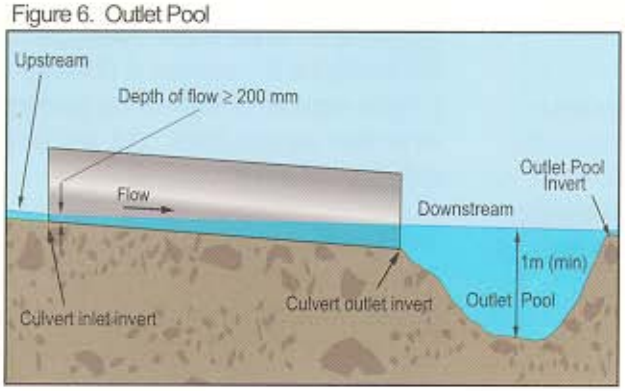
Culvert Installations

- The invert of the pool outlet should be at an elevation that maintains a minimum of 200 mm of water depth up to the inlet or upstream end of the culvert (Figure 6).

- The culvert slope should follow the existing streambed slope where possible. Excessive culvert slope, reduced culvert capacity due to countersinking and maintenance of the 200 mm minimum depth of flow, and back watering due to the creation of an outlet pool should be considered when selecting the required culvert diameter to allow fish passage and pass peak flows.

- Pools should be designed so that there is a smooth transition of flow from the culvert to the natural stream width.

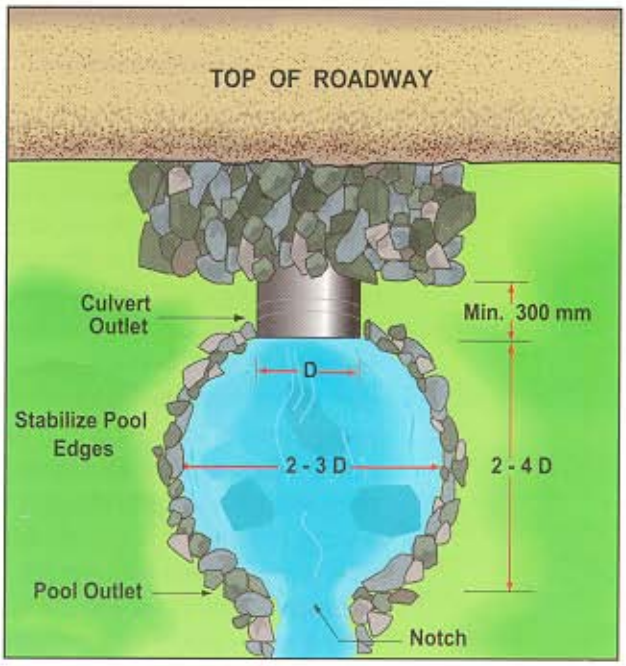
Figure 6. Outlet Pool



- The natural streambed elevation should be used as the pool outlet invert; however, depending on site specific conditions, a pool outlet may need to be constructed. It is essential that the invert elevation of the pool outlet be stable and, if necessary, well maintained to ensure a minimum water level in the culvert. Clean, non-erodible riprap or gabions should be used to stabilize the pool. The pool outlet may need to be v-notched to enable fish passage at low flow periods. More than one pool may be required.

- Pools should be pear shaped and sized such that: pool length = 2 to 4 times culvert diameter; pool width = 2 to 3 times culvert diameter; pool depth = 0.5 times the culvert diameter, 1 metre minimum. (Figure 7). The culvert diameter referred to the above is that of the fish passage culvert.

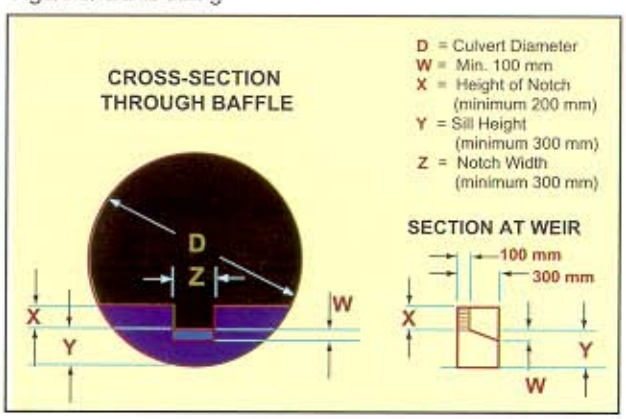
Figure 7. Pool Sizing



- For stacked/multiple culverts, pools should be installed with the fish passage culvert orientated to the centre of the pool to allow for a smooth transition of water from the culvert to the watercourse.

- Depending on site-specific conditions (eg., steep slopes, long crossings, constricted streams resulting in high water velocities, etc.), baffles/weirs may need to be installed in the fish passage culvert. Baffles/weirs can provide an adequate depth of flow and reduce the water velocity in the culvert in order to facilitate fish passage. Baffle dimensions should be provided as per Figure 8.

Figure 8. Baffle Sizing



Culvert Installations

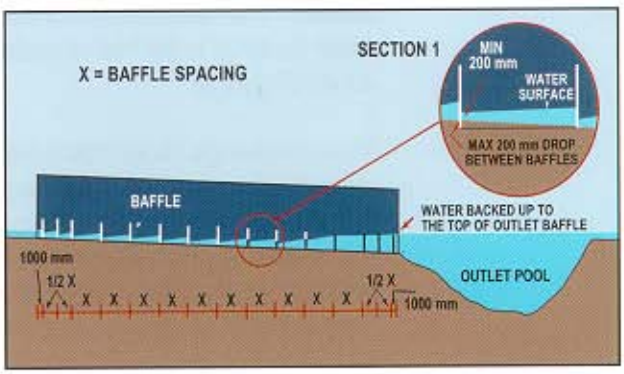
- A minimum depth of flow of 200 mm should be provided throughout the culvert and baffled sections. The drops between adjacent baffles should be a maximum of 200 mm.

- Baffles should be placed approximately 1 metre from the inlet and outlet ends of the culvert, the next baffles should be placed at 1/2 the baffle spacing. The remaining baffle spacing should be determined by using the low flow (flow at the time of fish migration, i.e., lesser of flow at 90% exceedance via flow duration analysis or the 7 day, 10 year low flow) as a basis for meeting the above depth of flow and drop between baffles criteria. Baffle spacing should also provide a pool volume large enough to dissipate the kinetic energy produced by the water falling over the weir; and consider high flows (i.e., 10% exceedence based on flow duration) during the fish migration period. Baffle spacing is illustrated in Figure 9.

- The invert elevation of the outlet pool should be set to back water up to the top of the outlet baffle.

- The upstream culvert invert, in some site specific situations, can be countersunk to facilitate depth of flow provided that the head differential is accounted for.

Figure 9. Culvert Baffle Spacing Requirements



Maintenance

Culvert installations should be suitably stabilized to prevent erosion, seepage, and undermining and maintained in good repair and operating condition.

Special Considerations

Modifications of the above criteria/guidance in consultation with the Department of Fisheries and Oceans may be required to address the passage of fish species other than salmon, brook trout, and brown trout in culvert installations.

This factsheet concerning culvert installations is generic and has been developed to apply to a variety of different circumstances. Some site specific situations may warrant modification of the above guidance, as deemed appropriate and in consultation with the appropriate Area Habitat Biologist. In some site specific situations, a professional engineer and/or biologist should be consulted.

This Fact Sheet does not constitute DFO approval; other mitigative strategies may be required. The proponent is advised to contact all other appropriate regulatory agencies.

For more information contact the nearest Department of Fisheries and Oceans office

CLEAR SPAN BRIDGES

Fisheries and Oceans Canada
Newfoundland and Labrador Operational Statement

Version 3.0

This Operational Statement applies to the construction of small-scale bridge structures that completely span a watercourse without altering the stream bed or bank, and that are a maximum of two lanes wide. The bridge structure (including bridge approaches, abutments, footings, and armouring) is built entirely above the high water mark (HWM). A clear-span bridge is preferred to a culvert as no structures are placed on the stream bed and therefore there is no alteration of natural channel processes.

Clear-span bridge construction has the potential to negatively affect riparian habitat. Riparian vegetation occurs adjacent to the watercourse and directly contributes to fish habitat by providing shade, cover and areas for spawning and food production. Only the vegetation required to accommodate operational and safety concerns for the crossing structure and approaches, within the right-of-way, should be removed. Stormwater run-off and the use of machinery can introduce deleterious substances to the water body and result in erosion and sedimentation.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the Fisheries Act no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the Fisheries Act.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat and maintain passage of fish. You may proceed with your clear-span bridge project without a DFO review when you meet the following conditions:

- the bridge is placed entirely above the high water mark (HWM) **(For lakes - HWM is the highest water level that has been maintained for a sufficient period of time to leave evidence upon the landscape; For rivers and streams – HWM is the elevation of the top of the channel bank – i.e. in many cases this is delineated by the presence of permanent vegetation),**
- the bridge is not located on meander bends, braided streams, alluvial fans, active flood plains, or any other area that is inherently unstable and may result in the alteration of natural steam functions or erosion and scouring of the bridge structure,
- the bridge is no greater than two lanes in width and does not encroach on the natural channel width by the placement of abutments, footings or rock armouring below the HWM,
- the work does not include realigning the watercourse,
- there is no alteration of the stream bed or banks or infilling of the channel, and
- you incorporate the *Measures to Protect Fish and Fish Habitat* when *Constructing Clear-Span Bridges* listed below in this Operational Statement

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in the violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial, territorial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact the DFO office in your area (listed on the second page).

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Newfoundland and Labrador Operational Statement notification form (**http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/nl/form_e.asp**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Constructing Clear-Span Bridges

1. Use existing trails, roads, or cut lines wherever possible to avoid disturbance to the riparian vegetation.

2. While this Operational Statement does not apply to the clearing of riparian vegetation, the removal of select plants within the road right-of-way (ROW) may be required to meet operational and/or safety concerns for the crossing structure and the approaches. This removal should be kept to a minimum and within the road or utility right-of-way. When practicable, prune or top the vegetation instead of uprooting.

3. Design and construct approaches so that they are perpendicular to the watercourse to minimize loss or disturbance to riparian vegetation.

4. Design the bridge so that stormwater runoff from the bridge deck, side slopes and approaches is directed into a retention pond or vegetated area to remove suspended solids, dissipate velocity and prevent sediment and other deleterious substances from entering the watercourse.

5. Generally there are no restrictions on timing for the construction of clear-span structures as they do not involve in-water work. However, if there are any activities with the potential to disrupt sensitive fish life stages (e.g., crossing of watercourse by machinery), these should adhere to appropriate fisheries timing windows (June 1 - September 30 on the Island and June 15 - September 15 in Labrador).

6. Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossings* Operational Statement is also available.

   6.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
   6.2. Grading of the stream banks for the approaches should not occur.
   6.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
   6.4. The one-time fording should adhere to fisheries timing windows (see Measure 5).
   6.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

7. Install effective sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

8. Operate machinery on land (above the HWM) and in a manner that minimizes disturbance to the banks of the watercourse.

   8.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
   8.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
   8.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
   8.4. Restore banks to original condition if any disturbance occurs.

9. Use measures to prevent deleterious substances such as new concrete (i.e., it is pre-cast, cured and dried before use near the watercourse), grout, paint, ditch sediment and preservatives from entering the watercourse.

10. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with preferably native grass or shrubs.

11. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

    11.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

FISHERIES AND OCEANS CANADA (DFO) OFFICES IN NEWFOUNDLAND & LABRADOR

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DFO Central Area Office
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DFO Southern Area Office
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DFO Western Area Office
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Tel: (709) 637-4349 Fax: (709) 637-4445

DFO Labrador Area Office
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202 Kelland Dr.
Happy Valley-Goose Bay NL A0P 1C0
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http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_f.asp

DFO/2007-1283

NOTIFICATION FORM

Fisheries and Oceans Canada
Newfoundland and Labrador Operational Statement

Version 3.0

PROPONENT INFORMATION

NAME: STREET ADDRESS:
CITY/TOWN: PROVINCE/TERRITORY: POSTAL CODE:
TEL. NO. (RESIDENCE): TEL. NO. (WORK):
FAX NO: EMAIL ADDRESS:

CONTRACTOR INFORMATION (provide this information if a Contractor is working on behalf of the Proponent)

NAME: STREET ADDRESS:
CITY/TOWN: PROVINCE/TERRITORY: POSTAL CODE:
TEL. NO. (RESIDENCE): TEL. NO. (WORK):
FAX NO: EMAIL ADDRESS:

PROJECT INFORMATION

Select Operational Statements that are being used (check all applicable boxes):

- ❒ Aquatic Vegetation Removal
- ❒ Beach Creation for Residential Use
- ❒ Public Beach Maintenance
- ❒ Beaver Dam Removal
- ❒ Bridge Maintenance
- ❒ Clear-Span Bridges
- ❒ Cottage Lot Development
- ❒ Culvert Maintenance
- ❒ High-Pressure Directional Drilling
- ❒ Dock and Boathouse Construction
- ❒ Ice and Snow Fill Bridges
- ❒ Isolated Pond Construction
- ❒ Submerged Log Salvage
- ❒ Maintenance of Riparian Vegetation in Existing Rights-of-Way
- ❒ Moorings
- ❒ Overhead Lines
- ❒ Punch and Bore Crossings
- ❒ Routine Maintenance Dredging
- ❒ Underwater Cables

Select the type of water body or watercourse at or near your project:

- ❒ River, Stream, Creek
- ❒ Lake (8 hectares or greater)
- ❒ Marine (Ocean or Sea)
- ❒ Estuary
- ❒ Pond or wetland (pond is less than 8 hectares)

PROJECT LOCATION (S) (fill out this section if the project location is different from Proponent Information; append multiple project locations on an additional sheet if necessary)

Name of water body or watercourse	Coordinates of the Project (UTM co-ordinate or Degrees, Minutes, Seconds), if available Easting: Northing: Latitude: Longitude:
Legal Description (Plan, Block, Lot, Concession, Township, Section, Range)	Directions to Access the Project Site (i.e., Route or highway number, etc.)
Proposed Start Date (YYYY/MM/DD):	Proposed Completion Date (YYYY/MM/DD):

We ask that you notify DFO, preferably 10 working days before starting your work, by filling out and sending in, by mail or by fax, this notification form to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to the Operational Statement.

I, _____ (print name) certify that the information given on this form is, to the best of my knowledge, correct and complete.

Signature _____ Date _____

Note: If you cannot meet all of the conditions and cannot incorporate all of the measures in the Operational Statement then your project may result in a violation of Subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

Information about the above-noted proposed work or undertaking is collected by DFO under the authority of the Fisheries Act for the purpose of administering the fish habitat protection provisions of the *Fisheries Act*. Personal information will be protected under the provisions of the *Privacy Act* and will be stored in the Personal Information Bank DFO-SCI-605. Under the Privacy Act, Individuals have a right to, and on request shall be given access to, any personal information about them contained in a personal information bank. Instructions for obtaining personal information are contained in the Government of Canada's Info Source publications available at **www.infosource.gc.ca** or in Government of Canada offices. Information other than "personal" information may be accessible or protected as required by the provisions of the Access to Information Act.

This Operational Statement (Version 3.0) may be updated as required by Fisheries and Oceans Canada. It is your responsibility to use the most recent version. Please refer to the Operational Statements web site at http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_e.asp to ensure that a more recent version has not been released.

FISHERIES AND OCEANS CANADA (DFO) OFFICES IN NEWFOUNDLAND & LABRADOR

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CULVERT MAINTENANCE

Fisheries and Oceans Canada
Newfoundland and Labrador Operational Statement

Version 3.0

Culvert maintenance is undertaken to extend the life of the structure and to ensure that it functions as designed, thus ensuring public safety and safe fish passage. Culvert maintenance includes the removal of accumulated debris (e.g., logs, boulders, garbage, ice build-up) that prevents the efficient passage of water and fish through the structure. Culvert maintenance may also include the reinforcement of eroding inlets and outlets, but does not include the replacement of damaged or destroyed bevel ends. Culverts requiring regular maintenance should be considered for future remediation via redesign or reinstallation.

Culvert maintenance activities can affect fish and fish habitat by the removal of woody debris that is important for cover and food production, by causing flooding and excessive stream scouring if blockages are removed too quickly, excessive erosion and sedimentation from the use of equipment along the stream bank, and disruption of critical fish life stages. Replacement of eroded rock armouring can alter flows and fish movement patterns if done excessively.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your culvert maintenance project without a DFO review when you meet the following conditions:

- the work does not include realigning the watercourse, installing a culvert liner or support struts, replacing damaged or destroyed bevels ends, or extending/replacing the existing culvert,
- explosives are not used to remove debris,
- the work does not include any dredging, infilling (e.g., filling scour pools) or excavation of the channel upstream or downstream of the culvert, and
- you incorporate the *Measures to Protect Fish and Fish Habitat* when *Maintaining Culverts listed below in this Operational Statement*.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in the violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial, territorial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact the DFO office in your area (listed on the second page).

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Measures to Protect Fish and Fish Habitat when Maintaining Culverts

1. Use existing trails, roads, or cut lines wherever possible to avoid disturbance to the riparian vegetation.

2. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be required. This removal should be kept to a minimum.

3. Unless accumulated material (i.e., branches, stumps, other woody materials, garbage, etc) is preventing the passage of water and/or fish through the structure, time material and debris removal to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (June 1 - September 30 on the Island and June 15 - September 15 in Labrador).

4. Install effective sediment and erosion control measures before starting work to prevent sediment from entering the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

5. Limit the removal of accumulated material (i.e., branches, stumps, other woody materials, garbage, etc) to the area

within the culvert, immediately upstream of the culvert and to that which is necessary to maintain culvert function and fish passage.

6. Remove accumulated material and debris slowly to allow clean water to pass, to prevent downstream flooding and to reduce the amount of sediment-laden water going downstream. Gradual dewatering will also reduce the potential for stranding fish in upstream areas.

7. Operate machinery on land (above the high water mark (HWM)) **(For lakes-HWM is the highest water level that has been maintained for a sufficient period of time to leave evidence upon the landscape; For rivers and streams – HWM is the elevation of the top of the channel bank – i.e. in many cases this is delineated by the presence of permanent vegetation),** and in a manner that minimizes disturbance to the banks of the watercourse.

   7.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
   7.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
   7.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
   7.4. Restore banks to original condition if any disturbance occurs.

8. If replacement rock reinforcement/armouring is required to stabilize eroding inlets and outlets, the following measures should be incorporated:

   8.1. Place appropriately-sized, clean rocks into the eroding area.
   8.2. Do not obtain rocks from below the HWM of any water body.
   8.3. Avoid the use of rock that is acid-generating. Also avoid the use of rock that fractures or breaks down easily when exposed to the elements.
   8.4. Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment.
   8.5. Ensure rock does not interfere with fish passage or constrict the channel width.

9. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.

10. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

   10.1. Maintain effective sediment and erosion control measures until re-vegetation of the disturbed areas is achieved.

FISHERIES AND OCEANS CANADA (DFO) OFFICES IN NEWFOUNDLAND & LABRADOR

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DFO/2007-1283

NOTIFICATION FORM

Fisheries and Oceans Canada
Newfoundland and Labrador Operational Statement

Version 3.0

PROPONENT INFORMATION

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PROJECT INFORMATION

Select Operational Statements that are being used (check all applicable boxes):

- ❒ Aquatic Vegetation Removal
- ❒ Beach Creation for Residential Use
- ❒ Public Beach Maintenance
- ❒ Beaver Dam Removal
- ❒ Bridge Maintenance
- ❒ Clear-Span Bridges
- ❒ Cottage Lot Development
- ❒ Culvert Maintenance
- ❒ High-Pressure Directional Drilling
- ❒ Dock and Boathouse Construction
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- ❒ Punch and Bore Crossings
- ❒ Routine Maintenance Dredging
- ❒ Underwater Cables

Select the type of water body or watercourse at or near your project:

- ❒ River, Stream, Creek
- ❒ Lake (8 hectares or greater)
- ❒ Marine (Ocean or Sea)
- ❒ Estuary
- ❒ Pond or wetland (pond is less than 8 hectares)

PROJECT LOCATION (S) (fill out this section if the project location is different from Proponent Information; append multiple project locations on an additional sheet if necessary)

Name of water body or watercourse	Coordinates of the Project (UTM co-ordinate or Degrees, Minutes, Seconds), if available Easting: Northing: Latitude: Longitude:
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I, _____ (print name) certify that the information given on this form is, to the best of my knowledge, correct and complete.

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MAINTENANCE OF RIPARIAN VEGETATION IN EXISTING RIGHTS-OF-WAY

Fisheries and Oceans Canada
Newfoundland and Labrador Operational Statement

Version 3.0

Rights-of-way are areas of land devoted to providing transportation corridors (e.g., highways, railways) or utilities (e.g., pipelines, power lines, water lines) that often intersect waterways. Vegetation is closely managed in these areas to prevent disruption to transportation or utilities (e.g., circuit outages, fires) and to ensure personal safety. Maintenance activities include mowing, brushing, topping and slashing of terrestrial vegetation. This Operational Statement applies only to existing rights-of-way at the location where they intersect and cross a water body.

Riparian areas are the vegetated areas adjacent to a water body and directly contribute to fish habitat by providing shade, cover and food production areas. Riparian areas are also important because they stabilize stream banks and shorelines. In order to minimize disturbance to fish habitat and prevent bank erosion, it is important to retain as much riparian vegetation as possible, especially the vegetation directly adjacent to the watercourse, in the right-of-way corridor.

Activities carried out to maintain riparian vegetation in existing rights-of-way can negatively impact fish and fish habitat by causing excessive loss of riparian vegetation, erosion and sedimentation, disturbance to the banks and the bottom of the water body from use of heavy equipment, and introduction of deleterious substances as a result of inadequate containment of spoil piles and improper maintenance of equipment.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to be incorporated into your project in order to avoid negative impacts to fish habitat. You may proceed with your right-of-way maintenance project without a DFO review when you meet the following conditions:

- the work involves the maintenance of vegetation in an existing right-of-way for a transportation or utility corridor and not construction of a new right-of-way,
- it is an existing right-of-way at the location where it intersects and crosses a water body,
- it involves the use of vegetative maintenance techniques that allow the root system to stay intact, to help bind the soil and encourage rapid colonization of low-growing plant species, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Maintaining Rights-of-way in Riparian Areas* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in the violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial, territorial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact the DFO office in your area (listed on the second page).

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Measures to Protect Fish and Fish Habitat when Maintaining Riparian Vegetation in Rights-of-way

1. While this Operational Statement does not cover the complete clearing of riparian vegetation, the alteration (e.g., topping and pruning) of select plants may be necessary to meet operational and safety needs.

2. Combined maintenance activities (e.g., mowing, brushing, topping, slashing, etc.) will affect no more than one third (1/3) of the total woody vegetation, such as trees and shrubs, in the right-of-way within 30 metres of the high water mark (HWM) **(For lakes - HWM is the highest water level that has been maintained for a sufficient period of time to leave evidence upon the landscape; For rivers and streams – HWM is the elevation of the top of the channel bank – i.e. in many cases this is delineated by the presence of permanent vegetation),** in any given year.

3. When practicable, alter riparian vegetation in the right-of-way by hand. If machinery must be used, operate machinery on land (above the HWM) and in a manner that minimizes disturbance to the banks of the water body.

   3.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
   3.2. Wash, refuel and service and store fuel and other materials for the machinery, which include hand tools, at locations away from the water to prevent any deleterious substance from entering the water body.
   3.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
   3.4. Restore banks to original condition if any disturbance occurs.

4. Machinery fording the watercourse to bring equipment required for maintenance to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing* Operational Statement is also available.

   4.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
   4.2. Grading of the stream banks for the approaches should not occur.
   4.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
   4.4. The one-time fording should prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (June 1 - September 30 on the Island and June 15 - September 15 in Labrador).
   4.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

5. When altering a tree that is located on the bank of a water body, ensure that the root structure and stability are maintained.

6. Stabilize any waste materials removed from the work site to prevent them from entering the water body. This could include covering spoil piles with biodegradable mats or tarps. All long-term storage of waste materials should be kept outside of the riparian area.

7. In order to prevent erosion and to help seeds germinate, vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

   7.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

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Select the type of water body or watercourse at or near your project:

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MOORINGS

Fisheries and Oceans Canada Newfoundland and Labrador Operational Statement

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Moorings, which are typically comprised of concrete anchor blocks, chains, rope and floats, are anchored to the bottom of a water body in open water and away from the shoreline and are used to secure a boat or to hold a channel marker in place as a navigational aid. This Operational Statement applies to the installation and operation of moorings in freshwater and marine systems.

Moorings alleviate the need for boats to set temporary anchors and therefore reduce damage to the bed or bottom of a river, lake or ocean from shifting/dragging anchors. Mooring structures can be designed and installed in a manner to prevent disturbing the bottom substrate of the water body and better protect fish habitat.

Moorings can negatively impact fish and fish habitat by disrupting sensitive aquatic habitats and fish spawning areas through the physical placement of mooring anchors and associated boating activity. Moorings can disturb aquatic vegetation and bottom substrates if under-sized mooring anchors are used, if boat moorings are located in very shallow water or if materials to construct anchors are taken from the bed of the water body.

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The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to be incorporated into your project in order to avoid negative impacts to fish habitat. You may proceed with your mooring project without a DFO review when you meet the following conditions:

- the project does not involve the installation or operation of a structure fixed to the bottom (for example, permanent navigational beacon, boat mooring bolted to the substrate), and
- you incorporate the Measures to Protect Fish and Fish Habitat when Placing Moorings listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in the violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

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Measures to Protect Fish and Fish Habitat when Placing Moorings

1. Avoid locating moorings in sensitive aquatic habitats such as eelgrass, kelp beds, salt marshes, shellfish harvesting areas and known fish spawning areas.
2. Minimize disturbance to submerged aquatic vegetation when installing mooring structures on the bed of the water body.
3. Moorings (including anchors and floats) are to be made of clean material. If concrete anchors are used, they are to be pre-cast and cured away from water before use to prevent seepage of potentially toxic substances into the water body.
4. Where conditions at low tide will allow, locate moorings at depths that will allow vessels to remain afloat at the lowest possible water levels to prevent propellers from disturbing the bed of the water body.
5. Mooring anchors are to be adequately sized to secure vessels or structures and prevent the anchor from shifting or dragging along the bed of the water body. Prevent excess chain or line from collecting and disturbing fish habitat features on the bed of the water body.

6. Native beach material such as logs, sand, gravel, and boulders are important components of fish habitat and should not be used as mooring structures or taken from the bed or bank of the water body.

7. Mooring structures should be kept in good repair through a regular inspection and maintenance program.

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Aussi disponible en français

http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_f.asp

OVERHEAD LINE CONSTRUCTION

Fisheries and Oceans Canada
Newfoundland and Labrador Operational Statement

Version 3.0

Overhead lines are constructed for electrical or telecommunication transmission across many watercourses that range in size from small streams and ponds to large rivers, lakes and reservoirs. This Operational Statement applies to selective removal of vegetation along the right-of-way to provide for installation and safe operation of overhead lines, and passage of equipment and materials across the water body.

Although fish habitat occurs throughout a water system, it is the riparian habitat that is most sensitive to overhead line construction. Riparian vegetation occurs adjacent to the watercourse and directly contributes to fish habitat by providing shade, cover, and spawning and food production areas. It is important to design and build your overhead line project to meet your needs while also protecting riparian areas. Potential impacts to fish and fish habitat include excessive loss of riparian vegetation, erosion and sedimentation resulting from bank disturbance and loss of plant root systems, rutting and compaction of stream substrate at crossing sites, and disruption of sensitive fish life stages.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act.*

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your overhead line project without a DFO review when you meet the following conditions:

- it does not require the construction or placement of any temporary or permanent structures (e.g. islands, poles, crib works, etc.) below the high water mark (HWM) **(For lakes - HWM is the highest water level that has been maintained for a sufficient period of time to leave evidence upon the landscape; For rivers and streams – HWM is the elevation of the top of the channel bank – i.e. in many cases this is delineated by the presence of permanent vegetation),** and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Constructing Overhead Lines* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in the violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial, territorial or federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact the DFO office in your area (listed on the second page).

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Newfoundland and Labrador Operational Statement notification form (**http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/nl/form_e.asp**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Constructing Overhead Lines

1. Installing overhead lines under frozen conditions is preferable in all situations. On wet terrains (e.g., bogs), lines should be installed under frozen conditions, where possible, or using aerial methods (i.e., helicopter).

2. Design and construct approaches so that they are perpendicular to the watercourse wherever possible to minimize loss or disturbance to riparian vegetation.

3. Avoid building structures on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in erosion and scouring of the stream bed or overhead line structures.

   3.1. Wherever possible, locate all temporary or permanent structures, such as poles, sufficiently above the HWM to prevent erosion.

4. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to accommodate the overhead line. This removal should be kept to a minimum and within the road or utility right-of-way.

5. Machinery fording the watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossings* Operational Statement is also available.

   5.1 If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
   5.2. Grading of the stream banks for the approaches should not occur.
   5.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
   5.4. Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (June 1 - September 30 on the Island and June 15 - September 15 in Labrador).
   5.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.

6. Operate machinery on land and in a manner that minimizes disturbance to the banks of the watercourse.

   6.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
   6.2. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent any deleterious substance from entering the water.
   6.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
   6.4. Restore banks to original condition if any disturbance occurs.

7. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

   7.1. Avoid work during wet, rainy conditions or use alternative techniques such as aerial methods (i.e., helicopter) to install overhead lines.

8. Stabilize any waste materials removed from the work site to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.

9. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

   9.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

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DFO/2007-1283

NOTIFICATION FORM

Fisheries and Oceans Canada
Newfoundland and Labrador Operational Statement

Version 3.0

PROPONENT INFORMATION

NAME: STREET ADDRESS:
CITY/TOWN: PROVINCE/TERRITORY: POSTAL CODE:
TEL. NO. (RESIDENCE): TEL. NO. (WORK):
FAX NO: EMAIL ADDRESS:

CONTRACTOR INFORMATION (provide this information if a Contractor is working on behalf of the Proponent)

NAME: STREET ADDRESS:
CITY/TOWN: PROVINCE/TERRITORY: POSTAL CODE:
TEL. NO. (RESIDENCE): TEL. NO. (WORK):
FAX NO: EMAIL ADDRESS:

PROJECT INFORMATION

Select Operational Statements that are being used (check all applicable boxes):

- ❒ Aquatic Vegetation Removal
- ❒ Beach Creation for Residential Use
- ❒ Public Beach Maintenance
- ❒ Beaver Dam Removal
- ❒ Bridge Maintenance
- ❒ Clear-Span Bridges
- ❒ Cottage Lot Development
- ❒ Culvert Maintenance
- ❒ High-Pressure Directional Drilling
- ❒ Dock and Boathouse Construction
- ❒ Ice and Snow Fill Bridges
- ❒ Isolated Pond Construction
- ❒ Submerged Log Salvage
- ❒ Maintenance of Riparian Vegetation in Existing Rights-of-Way
- ❒ Moorings
- ❒ Overhead Lines
- ❒ Punch and Bore Crossings
- ❒ Routine Maintenance Dredging
- ❒ Underwater Cables

Select the type of water body or watercourse at or near your project:

- ❒ River, Stream, Creek
- ❒ Lake (8 hectares or greater)
- ❒ Marine (Ocean or Sea)
- ❒ Estuary
- ❒ Pond or wetland (pond is less than 8 hectares)

PROJECT LOCATION (S) (fill out this section if the project location is different from Proponent Information; append multiple project locations on an additional sheet if necessary)

Name of water body or watercourse	Coordinates of the Project (UTM co-ordinate or Degrees, Minutes, Seconds), if available Easting: Northing: Latitude: Longitude:
Legal Description (Plan, Block, Lot, Concession, Township, Section, Range)	Directions to Access the Project Site (i.e., Route or highway number, etc.)
Proposed Start Date (YYYY/MM/DD):	Proposed Completion Date (YYYY/MM/DD):

We ask that you notify DFO, preferably 10 working days before starting your work, by filling out and sending in, by mail or by fax, this notification form to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to the Operational Statement.

I, _____ (print name) certify that the information given on this form is, to the best of my knowledge, correct and complete.

Signature _____ Date _____

Note: If you cannot meet all of the conditions and cannot incorporate all of the measures in the Operational Statement then your project may result in a violation of Subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

Information about the above-noted proposed work or undertaking is collected by DFO under the authority of the Fisheries Act for the purpose of administering the fish habitat protection provisions of the *Fisheries Act*. Personal information will be protected under the provisions of the *Privacy Act* and will be stored in the Personal Information Bank DFO-SCI-605. Under the Privacy Act, Individuals have a right to, and on request shall be given access to, any personal information about them contained in a personal information bank. Instructions for obtaining personal information are contained in the Government of Canada's Info Source publications available at **www.infosource.gc.ca** or in Government of Canada offices. Information other than "personal" information may be accessible or protected as required by the provisions of the Access to Information Act.

This Operational Statement (Version 3.0) may be updated as required by Fisheries and Oceans Canada. It is your responsibility to use the most recent version. Please refer to the Operational Statements web site at http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_e.asp to ensure that a more recent version has not been released.

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TEMPORARY STREAM CROSSING

Fisheries and Oceans Canada
Newfoundland and Labrador Operational Statement

Version 1.0

A temporary stream crossing consists of i) a one-time ford in flowing waters, ii) a seasonally dry streambed ford, or iii) a temporary bridge (e.g., Bailey bridge). Temporary stream crossings are employed for short term access across a watercourse by construction vehicles when an existing crossing is not available or practical to use. They are not intended for prolonged use (e.g., forest or mining haul roads). The use of temporary bridges or dry fording is preferred over fording in flowing waters due to the reduced risk of damaging the bed and banks of the watercourse and downstream sedimentation caused by vehicles. Separate Operational Statements are available for *Ice Bridges and Snow Fills* used for temporary access during the winter and for non-temporary *Clear Span Bridges*.

The risks to fish and fish habitat associated with temporary stream crossings include the potential for direct harm to stream banks and beds, release of excessive sediments and other deleterious substances (e.g., fuel, oil leaks), loss of riparian habitat and disruption to sensitive fish life stages.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your temporary stream crossing project without a DFO review when you meet the following conditions:

- the bridge is no greater than one lane in width, and no part of its structure is placed within the wetted portion of the stream,
- the work does not include realigning the watercourse,
- for fording in flowing waters and temporary bridges, the channel width at the crossing site is no greater than 5 metres from high water mark to high water mark (HWM) (**For rivers and streams - high water mark is the elevation of the top of the channel bank - i.e. in many cases this is delineated by the presence of permanent vegetation**),
- the streambed should consist of bedrock or large rubble material,
- disturbance to riparian vegetation is minimized,
- the work does not involve dredging, infilling, grading or excavating the bed or bank of the watercourse,
- all crossing materials will be removed prior to the spring freshet, or immediately following project completion if this occurs earlier,
- fording involves a one time event (over and back),
- fording will not occur in areas that are known fish spawning sites,
- the crossing will not result in erosion and sedimentation of the stream,
- the crossing will not result in the alteration (e.g., compaction or rutting) of the bed and bank substrates,
- the crossing does not involve installation of a temporary culvert, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Carrying Out a Temporary Stream Crossing* listed below.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain an opinion on the possible options you should consider to avoid contravention of the *Fisheries Act*.

You are required to respect all municipal, provincial and federal legislation that applies to the work being carried out in relation to this Operational Statement. The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (**www.sararegistry.gc.ca**). If you have questions regarding this Operational Statement, please contact the DFO office in your area (listed on the third page).

We ask that you notify DFO, preferably 10 working days before starting your work, by filling out and sending the Newfoundland and Labrador Operational Statement notification form (**www.dfo-mpo.gc.ca/ oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/nl/form_e.asp**) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

Measures to Protect Fish and Fish Habitat when Carrying Out a Temporary Stream Crossing

1. Use existing trails, roads or cut lines wherever possible, as access routes to avoid disturbance to the riparian vegetation.

2. Locate crossings at straight sections of the stream, perpendicular to the bank, whenever possible. Avoid crossing on meander bends, braided streams, alluvial fans, or any other area that is inherently unstable and may result in the erosion and scouring of the stream bed.

3. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the road or utility right-of-way. When practicable, prune or top the vegetation instead of uprooting.

4. Generally, there are no restrictions on timing for the construction of bridge structures or fording seasonally dry streambeds, as they do not involve in-water work. However, if there are any activities with the potential to disrupt sensitive fish life stages (e.g., fording of the watercourse by machinery) these should adhere to appropriate fisheries timing widows (June 1 - September 30 on the Island and June 15 - September 15 in Labrador).

5. Machinery fording of a flowing watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and is to occur only if an existing crossing at another location is not available or practical to use.

    - **5.1.** If minor rutting is likely to occur, stream bank and bed protection methods (e.g., brush mats or clean stone materials) should be used, provided they do not constrict flows or block fish passage.
    - **5.2.** Grading of the stream banks for the approaches should not occur.
    - **5.3.** If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary bridge should be used in order to protect these areas.
    - **5.4.** The one-time fording should adhere to fisheries timing windows (see Measure 4).
    - **5.5.** Fording should occur under low flow conditions, and not when flows are elevated due to local rain events or seasonal flooding.
    - **5.6.** The streambed at the proposed crossing site should consist of bedrock or large rubble material.
    - **5.7.** Fish spawning area must be avoided.
    - **5.8.** Fords should be at right angles to the stream.

6. Install effective sediment and erosion control measures before starting work to prevent the entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.

7. For temporary bridges also employ the following measures:

    - **7.1.** Temporary bridges should be installed where the stream banks are stable and have low slope.
    - **7.2.** Use only clean materials (e.g., rock or coarse gravel fill, wood, or steel) for approaches to the bridge (i.e., not sand, clay or organic soil) and install in a manner that avoids erosion and sedimentation.
    - **7.3.** Approaches to the temporary bridges should be maintained regulary be placing additional slash to prevent erosion.
    - **7.4.** Design temporary bridges to accommodate any expected high flows of the watercourse during the construction period.
    - **7.5.** Restore the bank and substrate to pre-construction condition.
    - **7.6.** Completely remove all materials used in the construction of the temporary bridge from the watercourse following the equipment crossing, and stabilize and re-vegetate the banks.

8. Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks.

    - **8.1.** Protect entrances at machinery access points (e.g., using non-erodible materials, such as coduroy, brush mats, or clean stone material) and establish single site entry and exit.
    - **8.2.** Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
    - **8.3.** Fuel storage containers and repairs/servicing facilities should be located a minimum distance of 100 metres above the high water mark from any watercourse or waterbody and must comply with provincial government regulations.
    - **8.4.** Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.

9. Stabilize any waste materials removed from the work site, above the HWM, to prevent them from entering any watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with preferably native grass or shrubs.

10. Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent soil erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

    - **10.1.** Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

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DFO/2007-1329

Fisheries and Oceans Canada | Pêches et Océans Canada

NOTIFICATION FORM

Fisheries and Oceans Canada
Newfoundland and Labrador Operational Statement

Version 3.0

PROPONENT INFORMATION

NAME: | STREET ADDRESS:
CITY/TOWN: | PROVINCE/TERRITORY: | POSTAL CODE:
TEL. NO. (RESIDENCE): | TEL. NO. (WORK):
FAX NO: | EMAIL ADDRESS:

CONTRACTOR INFORMATION (provide this information if a Contractor is working on behalf of the Proponent)

NAME: | STREET ADDRESS:
CITY/TOWN: | PROVINCE/TERRITORY: | POSTAL CODE:
TEL. NO. (RESIDENCE): | TEL. NO. (WORK):
FAX NO: | EMAIL ADDRESS:

PROJECT INFORMATION

Select Operational Statements that are being used (check all applicable boxes):

- ❒ Aquatic Vegetation Removal
- ❒ Beach Creation for Residential Use
- ❒ Beaver Dam Removal
- ❒ Bridge Maintenance
- ❒ Clear-Span Bridges
- ❒ Cottage Lot Development
- ❒ Culvert Maintenance
- ❒ Dock and Boathouse Construction
- ❒ High-Pressure Directional Drilling
- ❒ Ice and Snow Fill Bridges
- ❒ Isolated or Dry Open-Cut Stream Crossings
- ❒ Isolated Pond Construction
- ❒ Maintenance of Riparian Vegetation in Existing Rights-of-Way
- ❒ Moorings
- ❒ Overhead Lines
- ❒ Public Beach Maintenance
- ❒ Punch and Bore Crossings
- ❒ Routine Maintenance Dredging
- ❒ Submerged Log Salvage
- ❒ Temporary Stream Crossing
- ❒ Underwater Cables

Select the type of water body or watercourse at or near your project:

- ❒ River, Stream, Creek
- ❒ Lake (8 hectares or greater)
- ❒ Marine (Ocean or Sea)
- ❒ Estuary
- ❒ Pond or wetland (pond is less than 8 hectares)

PROJECT LOCATION (S) (fill out this section if the project location is different from Proponent Information; append multiple project locations on an additional sheet if necessary)

Name of water body or watercourse Nearest Town to site	Coordinates of the Project (UTM co-ordinate or Degrees, Minutes, Seconds), if available Easting: Northing: Latitude: Longitude:
Legal Description (Plan, Block, Lot, Concession, Township, Section, Range)	Directions to Access the Project Site (i.e., Route or highway number, etc.)
Proposed Start Date (YYYY/MM/DD):	Proposed Completion Date (YYYY/MM/DD):

Please notify DFO, preferably 10 working days before starting your work, by filling out and sending in, by mail, email or by fax, this notification form to the DFO Regional Headquarters. This information is requested in order to evaluate the effectiveness of the work carried out in relation to the Operational Statement.

I, _____ (print name) certify that the information given on this form is, to the best of my knowledge, correct and complete.

Signature _____ Date _____

Note: If you cannot meet all of the conditions and cannot incorporate all of the measures in the Operational Statement then your project may result in a violation of Subsection 35(1) of the *Fisheries Act* and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the *Fisheries Act.*

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This Notification Form (Version 3.0) may be updated as required by Fisheries and Oceans Canada. It is your responsibility to use the most recent version. Please refer to the Operational Statements web site at **http://www.dfo-mpo.gc.ca/oceans-habitat/habitat/modernizing-moderniser/epmp-pmpe/index_e.asp** to ensure that a more recent version has not been released.

Canada

Appendix B

Navigable Waters Protection Act

Minor Works Policies

Transport Canada Transports Canada

The Navigable Waters Protection Act

Erosion Protection Works

This brochure outlines the specific standards and criteria under which Transport Canada considers erosion protection as a "minor work" and does not require an application under the *Navigable Waters Protection Act* (NWPA).

The NWPA is a federal law designed to protect the public right of navigation. It ensures that works constructed in navigable waterways are reviewed and regulated to minimize the overall impact on navigation.

The Act includes provisions for the removal of unauthorized works or obstructions that render navigation difficult enough to be considered dangerous.

A Minor Work

Historically, many projects pose no threat to the ongoing safety of navigation if positioned and constructed in accordance with specific known standards and criteria. Such projects are considered by Transport Canada as a minor work and, as such, no application under the NWPA is required.

Failure to construct the work in accordance with the standards and criteria identified in this document may result in enforcement action.

Definitions

Erosion protection work: refers to shoreline stabilization, rip rap, and bank protection projects.

Shoreline and bank stabilization: the placement of rock, concrete, felled trees, etc., to reduce erosion of the shoreline.

Rip rap: a layer of stones placed irregularly on a slope, a bank or a hydraulic structure in order to protect it against scouring.

Groyne or spur: a structure built from the bank of a stream or lake in a direction transverse to the current in order to prevent bank erosion.

Riverine: resembling a river such as a creek, stream, or similar body of water.

When is an erosion protection project not considered a minor work?

An erosion protection project meeting any of the following criteria and standards **requires** the submission of an application for review and approval under the NWPA:

1. The erosion protection works project is associated with a bridge, boom, dam, causeway, or other existing or proposed structure located within the limits of the waterway; or
2. The erosion protection works project includes groynes, spurs, or other deflection devices.

TP 14594E
(12/2006)

Canada

When is an erosion protection project considered a minor work?

An erosion protection project meeting the following criteria is considered a minor work under this policy and **does not require** an application under the NWPA and the project may proceed:

1. The finished erosion protection works are:
   - parallel to, and consistent with the existing or natural shoreline; and
   - integrated or "tied in" to adjacent and surrounding shoreline;

2. The toe of the finished work is located within 5m from the ordinary high water mark; and

3. The slope of the finished elevation is greater than 33 per cent (i.e., 1:1, 1:2, and 1:3 ratios, vertical to horizontal respectively, are acceptable).

Procedures during construction

For erosion protection projects determined under these criteria to be a minor work, the following procedures shall be strictly adhered to during construction:

A. All temporary works (including but not limited to silt curtains, signs, cofferdams) will be completely removed upon completion of the project;

B. Navigation shall be allowed safe access through the construction site at all times, and assisted if necessary;

C. Instream temporary works (berms, cofferdams) are required to facilitate the construction of the erosion protection works so that they are marked with yellow flashing lights from dusk to dawn, or during periods of restricted visibility;

D. Any silt curtains shall be marked with "cautionary" buoys in compliance with the Private Buoy Regulations of the *Canada Shipping Act*:
   - the buoys shall be spaced no more than 30m apart; and
   - the buoys shall be lighted from dusk to dawn, or during periods of restricted visibility; and

E. In addition to the above circumstances, the following also applies to riverine systems during construction:
   - Temporary "Warning – Construction Ahead" signs must be placed upstream and downstream of the construction site in accordance with the minimum distances outlined in the table below:

Width of Waterway (metres)	Minimum Distances (metres)
<10m	25m
10m – 20m	50m
20m – 50m	100m
>50m	200m

   – The warning signs shall be posted during all periods of instream activity;
   – The warning signs shall be legible at a minimum distance of 50m; and
   – Appropriate landowner permission shall be sought for the placement of the warning signs.

NOTE

Strict adherence to this policy is mandatory. In addition, other situations may arise that prevent the application of this policy to a specific erosion protection project.

You should note that other laws and regulations may be applicable to your erosion protection project.

If you require further information or clarification, please contact the Navigable Waters Protection Program Office in your area or consult Transport Canada's website at: **http://www.tc.gc.ca/marinesafety/oep/nwpp/menu.htm.**

Transport Canada Transports Canada

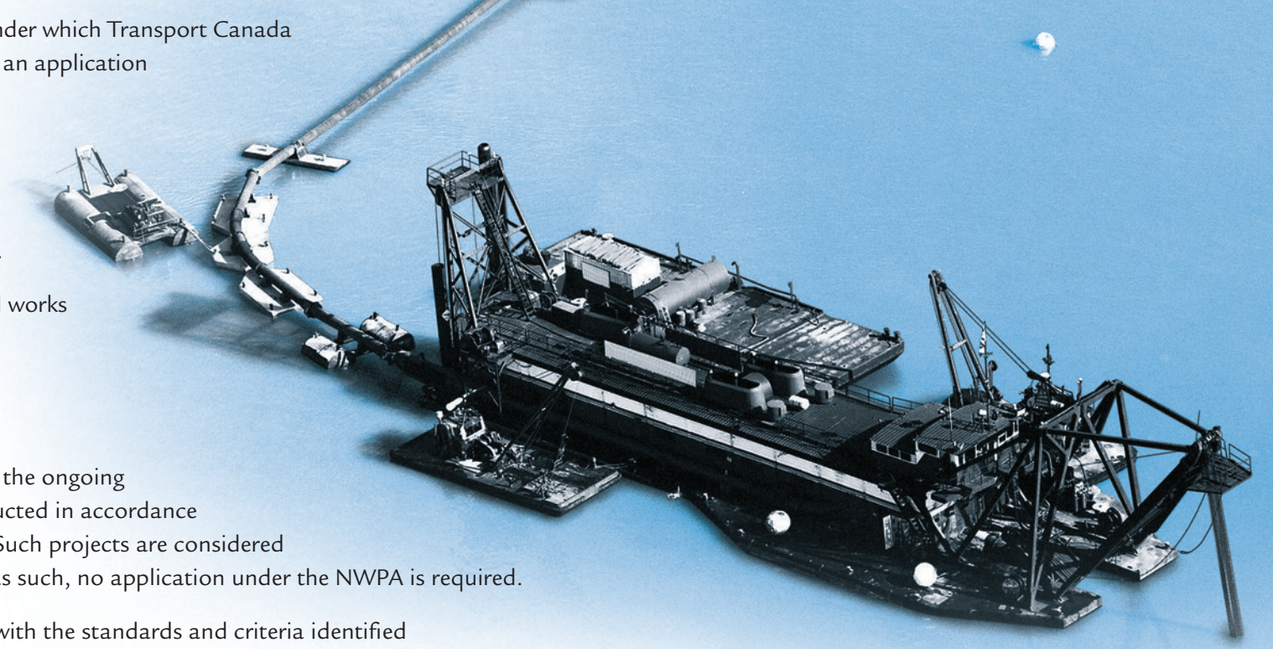
The Navigable Waters Protection Act

DREDGING

This brochure outlines the specific standards and criteria under which Transport Canada considers dredging as a "minor work" and does not require an application under the *Navigable Waters Protection Act* (NWPA).

The NWPA is a federal law designed to protect the public right of navigation. It ensures that works constructed in navigable waterways are reviewed and regulated to minimize the overall impact on navigation.

The Act includes provisions for the removal of unauthorized works or obstructions that render navigation difficult enough to be considered dangerous.



A Minor Work

Historically, many projects pose no threat to the ongoing safety of navigation if positioned and constructed in accordance with specific known standards and criteria. Such projects are considered by Transport Canada as a minor work and, as such, no application under the NWPA is required.

Failure to construct the work in accordance with the standards and criteria identified in this document may result in enforcement action.

Definitions

Navigation channel: includes a charted channel, buoyed channel, or regularly used channel based on local knowledge.

Barge: includes non self-propelled barge, scow, dredge, pile driver, hopper, or pontoon.

High water mark: the line or mark indicating the highest level reached by a body or course of water.

NOTSHIP (Notice to Shipping): a radio broadcast of marine safety information transmitted to ships concerning the establishment, condition or change of a marine facility, service, procedure or navigational hazard.

When is dredging not considered a minor work?

A dredging project meeting any of the following criteria and standards **requires** the submission of an application for review and approval under the NWPA:

1. Open water disposal of dredgeate (dredged materials) where there are less than 20 fathoms of water at all times;
2. The use, construction or placement of any temporary instream works (including but not limited to cofferdams, berms, roads, causeway, and aquadams);
3. Suction dredging, which includes any floating or submerged pipes;
4. Cables spanning any portion of the waterway (submerged or over the waterway);
5. The subject works and associated marine equipment that are located within 30m of a navigation channel; or
6. Projects that include blasting.

TP 14597E
(12/2006)

Canada

When is dredging considered a minor work?

A dredging project meeting the following criteria is considered a minor work under this policy and **does not require** an application under the NWPA and the project may proceed:

1. The dredging consists of regular maintenance around existing docks, retaining walls, wharves, marina basins, and other structures; and

2. All dredged materials shall be disposed above the high water mark, or within open-water disposal sites as approved by the Government of Canada.

Procedures during construction

For dredging projects determined under this criteria to be a minor work, the following procedures shall be strictly adhered to during construction:

A. During construction, any silt curtains will be marked with "cautionary buoys" in compliance with the Private Buoy Regulations of the *Canada Shipping Act*:

- the buoys shall be spaced no more than 30m apart; and
- the buoys will be lighted from dusk to dawn, or during periods of restricted visibility.

B. You must request a NOTSHIP (Notice to Shipping) if your project is on a charted waterway. A NOTSHIP can be obtained through your nearest Canadian Coast Guard Office.

NOTE

Strict adherence to this policy is mandatory. In addition, other situations may arise that prevent the application of this policy to a specific dredging project.

You should note that other laws and regulations may be applicable to your dredging project, including:

- The Collisions Regulations of the *Canada Shipping Act* that outline the requirements for all work, activities and equipment; and
- A listing of approved open-water disposal sites that is available through Environment Canada.

If you require further information or clarification, please contact the Navigable Waters Protection Program Office in your area or consult Transport Canada's website at: **http://www.tc.gc.ca/marinesafety/oep/nwpp/menu.htm.**

Appendix C

Guideline for the Use of Explosives in or Near Canadian Fisheries Waters

Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters

D.G. Wright and G.E. Hopky

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1998

Canadian Technical Report of Fisheries and Aquatic Sciences 2107

Canadian Technical Report of

Fisheries and Aquatic Sciences 2107

1998

GUIDELINES FOR THE USE OF EXPLOSIVES IN OR NEAR CANADIAN FISHERIES WATERS

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Correct citation for this publication:

Wright, D.G., and G.E. Hopky. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Can. Tech. Rep. Fish. Aquat. Sci. 2107: iv + 34p.

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ABSTRACT

Wright, D.G., and G.E. Hopky. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Can. Tech. Rep. Fish. Aquat. Sci. 2107: iv + 34p.

The federal *Fisheries Act* includes provisions for the protection of fish, shellfish, crustaceans, marine mammals and their habitats. The detonation of explosives in or adjacent to fish habitat has been demonstrated to cause disturbance, injury and/or death to fish and marine mammals, and/or the harmful alteration, disruption or destruction of their habitats, sometimes at a considerable distance from the point of detonation.

Within the context of the guidelines and procedures outlined in this report, an explosive is defined as a chemical compound which, when detonated, creates a compressional wave having an almost instantaneous rise time to a very high peak pressure followed by a decay to below ambient pressure by either rapid oxidation or the breaking of high-energy chemical bonds.

The purpose of this report is to provide information to proponents who are proposing works or undertakings that involve the use of confined or unconfined explosives in or near Canadian fisheries waters, and to which the *Fisheries Act*, Sections 32 and 35 in particular, may apply. Guidelines are provided on methods and practices for the conservation and protection of fish, marine mammals, and fish habitat from impacts arising from the destructive forces of explosives. The report describes the suggested application and review procedures and processes for proponents whose use of explosives may result in the destruction of fish, or the harmful alteration, disruption or destruction of fish habitat.

RÉSUMÉ ANALYTIQUE

Wright, D.G. et G.E. Hopky. *Lignes directrices concernant l'utilisation d'explosifs à l'intérieur ou à proximité des eaux de pêche canadiennes,* rapport technique canadien des sciences halieutiques et aquatiques 2107, 1998, iv + 34 p.

La *Loi sur les pêches* fédérale renferme des dispositions relatives à la protection du poisson, des mollusques, des crustacés, des mammifères marins et de leur habitat. Il a été prouvé que la détonation d'explosifs dans l'habitat du poisson ou à proximité perturbe, blesse ou tue des poissons et des mammifères marins ou encore entraîne la détérioration, la destruction ou la perturbation de leur habitat. Il arrive parfois que les dommages se fassent sentir à une distance considérable du point de détonation.

Aux fins des lignes directrices et des procédures énoncées dans le présent rapport, on entend par explosif un composé chimique qui, lorsqu'il explose, crée une vague de compression entraînant presque instantanément un pic de pression extrêmement élevé suivi d'une décroissance sous la pression ambiante soit par oxydation rapide ou par la rupture des liaisons chimiques à haute énergie.

Le présent rapport a pour but de fournir de l'information aux promoteurs qui proposent des ouvrages ou des entreprises nécessitant l'utilisation d'explosifs confinés ou non confinés à l'intérieur ou à proximité des eaux de pêche canadiennes et auxquels la *Loi sur les pêches,* plus précisément les articles 32 et 35, pourraient s'appliquer. Il renferme des lignes directrices concernant les méthodes et pratiques de conservation et de protection du poisson, des mammifères marins et de leur habitat contre les effets découlant de la force destructrice des explosifs. On y décrit les procédures de présentation des demandes et d'examen pour les promoteurs qui prévoient l'utilisation d'explosifs de nature à entraîner la destruction du poisson ou la détérioration, la perturbation ou la destruction de son habitat.

SCOPE AND RATIONALE

The federal *Fisheries Act* includes provisions for the protection of fish, shellfish, crustaceans, marine mammals and their habitats. The detonation of explosives in or adjacent to fish habitat has been demonstrated to cause disturbance, injury and/or death to fish and marine mammals, and/or the harmful alteration, disruption or destruction of their habitats, sometimes at a considerable distance from the point of detonation. Therefore, the Department of Fisheries and Oceans (DFO) has prepared this document to provide information to proponents on the conservation and protection of fish, marine mammals, and their habitat from impacts arising from the use of confined or unconfined explosives in or near Canadian fisheries waters. The guidelines, and application and review procedures and processes outlined in this document apply in the context of the legislative and policy framework summarized below.

APPLICABLE LEGISLATION AND POLICY

Fisheries Act

A number of sections of the *Fisheries Act* and its attendant regulations are applicable to the conservation and protection of fish and fish habitat from the destructive forces of explosives.

- Section 2 defines “Canadian fisheries waters" as meaning all waters in the fishing zones of Canada, all waters in the territorial sea of Canada and all internal waters of Canada.

- Section 2 defines “fish" as including shellfish, crustaceans, marine animals and the eggs, sperm, spawn, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.

- Section 32 prohibits the destruction of fish by any means other than fishing, except as authorized by the Minister of Fisheries and Oceans or under regulations made by the Governor in Council under the *Fisheries Act*.

- Subsection 34(1) defines “fish habitat” as meaning spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.

- Subsection 35(1) prohibits any person from carrying on any work or undertaking that results in the Harmful Alteration, Disruption or Destruction (HADD) of fish habitat.

- Subsection 35(2) provides for the alteration, disruption or destruction of fish habitat by any means or under any conditions authorized by the Minister of Fisheries and Oceans or under regulations made by the Governor in Council under the *Fisheries Act*.

- Subsection 36(3) prohibits the deposit of a deleterious substance into waters frequented by fish, unless otherwise permitted by regulation.

- Subsection 58(1) of the *Fishery (General) Regulations* provides for anyone proposing to carry on any work or undertaking likely to result in the HADD of fish habitat, to apply to have the means or conditions of that work or undertaking authorized by the Minister under Subsection 35(2) of the *Fisheries Act*, using the form set out in Schedule VI. Schedule VI includes a section for the applicant to provide details on the proposed use of explosives.

- Subsection 58(2) of the *Fishery (General) Regulations* provides the means for the Department of Fisheries and Oceans to issue Authorizations under Subsection 35(2) of the *Fisheries Act*, using the form set out in Schedule VII.

- Section 7 of the *Marine Mammal Regulations* prohibits disturbance of marine mammals except when fishing for them.

In addition, the Department of Fisheries and Oceans has developed a policy framework to assist in the interpretation and application of the applicable legislation. The most relevant documents are as follows:

- The **Policy for the Management of Fish Habitat** (1986) provides policy direction for interpreting the broad powers mandated in the *Fisheries Act* in a way that is consistent with the concept of sustainable development. To achieve the Policy's goal of fish habitat conservation when reviewing project proposals with the potential to affect fish habitat, DFO's habitat managers apply the No Net Loss (NNL) guiding principle. Under this principle, the Department strives to maintain the existing productive capacity of fish habitats, such that the fish habitat is able to sustain the production of fish suitable for fisheries purposes.

  In summary, in order to meet the NNL guiding principle, the habitat manager's first preference is to avoid or reduce the project's potential for a HADD of fish habitat through the application of appropriate mitigation measures. Avoidance measures, such as project relocation or redesign, can be effectively applied at the project design stage. Failing that, impacts may be further reduced by application of specific mitigation measures, such as use of timing windows during the construction phase. If a HADD is still expected to occur, unavoidable - i.e. residual - losses in habitat productive capacity may be compensated on a case-by-case basis if the manager concludes that compensation is acceptable and feasible.

- The **Directive on the Issuance of Subsection 35(2) Authorizations** (1995) clarifies the circumstances when an Authorization under Subsection 35(2) may be issued, and on providing proponents with letters of advice suggesting means of avoiding HADD of fish habitat.

- The **Habitat Conservation and Protection Guidelines** (1998) is a document for use by DFO's staff in administering the habitat provisions of the *Fisheries Act*. It outlines a standard approach to habitat conservation and protection through the application of the NNL guiding principle.

Canadian Environmental Assessment Act

A decision to issue an Authorization under Section 32 or Subsection 35(2) of the *Fisheries Act* triggers an environmental assessment under the *Canadian Environmental Assessment Act* (CEAA).

IMPACTS

The use of explosives may result in a number of adverse impacts on fish and marine mammals, and their habitats.

Effects on Fish

The detonation of explosives in or near water produces post-detonation compressive shock waves characterized by a rapid rise to a high peak pressure followed by a rapid decay to below ambient hydrostatic pressure. The latter pressure deficit causes most impacts on fish.

The primary site of damage in finfish is the swimbladder, the gas-filled organ that permits most pelagic fish to maintain neutral buoyancy. The kidney, liver, spleen, and sinus venous also may rupture and haemorrhage. Fish eggs and larvae also may be killed or damaged (Wright 1982).

Studies (Wright 1982) show that an overpressure in excess of 100 kPa will result in these effects. The degree of damage is related to type of explosive, size and pattern of the charge(s), method of detonation, distance from the point of detonation, water depth, and species, size and life stage of fish.

Vibrations from the detonation of explosives may cause damage to incubating eggs (Wright 1982, Wright in prep.). Sublethal effects, such as changes in behaviour of fish, have been observed on several occasions as a result of noise produced by explosives. The effects may be intensified in the presence of ice and in areas of hard substrate (Wright 1982, Wright in prep.).

The detonation of explosives may be lethal to marine mammals and may cause auditory damage under certain conditions. The detonation of explosives in the proximity of marine mammals also has been demonstrated to induce changes in behaviour (Wright in prep.).

The number of shellfish and crustaceans killed by the detonation of explosives is believed to be negligible, however, few data are available. Sublethal effects of explosives on

shellfish and crustaceans including behavioural modifications are little known or understood (Wright 1982, Wright in prep.).

Effects on Fish Habitat

The use of explosives in and near fish habitat may also result in the physical and/or chemical alteration of that habitat. For example, sedimentation resulting from the use of explosives may cover spawning areas or may reduce or eliminate bottom-dwelling life forms that fish use for food. By-products from the detonation of explosives may include ammonia or similar compounds and may be toxic to fish and other aquatic biota (Wright in prep.).

GUIDELINES, AND APPLICATION AND REVIEW PROCESSES

The following sections have been prepared to guide proponents proposing works or undertakings that involve the use of confined or unconfined explosives in or near Canadian fisheries waters, and to which the *Fisheries Act*, Sections 32 and 35 in particular, may apply. Confined explosives are those that would be used within a substrate, including ice, while unconfined explosives are those that would be used in open water, or not within a substrate.

Note that the information and guidance provided in these sections pertains to the conservation and protection of fish and fish habitat in the context of the *Fisheries Act*, and to the CEAA requirements that may result. There is no intent to relieve the proponent of responsibilities under any other federal, provincial or municipal legislation. Proponents are encouraged to contact other appropriate regulatory agencies to ensure that the proposed work or undertaking is carried out according to their requirements.

GUIDELINES

This section provides guidelines on methods and practices which, if incorporated into a project proposal, are intended to prevent or avoid the destruction of fish, or any potentially harmful effects to fish habitat that could result from the use of explosives. Implementation of these measures, for this purpose, is at the discretion of the proponent. Use of these guidelines should not be taken to imply approval of the proposed project in accordance with the *Fisheries Act*. Note that should the proponent proceed with the project and the use of explosives results in the destruction of fish and/or the HADD of fish habitat as a result of a change in plans, or failure to implement the measures, contravention of Section 32 and/or Subsection 35(1) of the *Fisheries Act* could occur.

1. Proponents considering the use of explosives are encouraged to consult the appropriate DFO Regional/Area authorities (Appendix I) as early as possible in their planning process to identify possible alternatives to the use of explosives, the biological resources and their habitats at risk, and/or effective mitigation measures.

2. Where provincial or territorial resource management agencies, or aboriginal resource management boards undertake the administration of fisheries, the proponent is encouraged to consult with the relevant authorities.

3. The use of confined or, in particular, unconfined explosives in or near Canadian fisheries waters is discouraged, and proponents are encouraged to utilize other potentially less destructive methods wherever possible.

4. No use of ammonium nitrate-fuel oil mixtures occurs in or near water due to the production of toxic by-products (ammonia).

   Note:

   - The deposit of deleterious substances into waters frequented by fish is prohibited under Section 36(3) of the *Fisheries Act*, unless otherwise permitted by regulation. There is no regulation pursuant to the *Fisheries Act* that permits the deposit of by-products resulting from the use of ammonium nitrate-fuel oil mixtures.

5. After loading a charge in a hole, the hole is to be back-filled (stemmed) with angular gravel to the level of the substrate/water interface or the hole collapsed to confine the force of the explosion to the formation being fractured. The angular gravel is to have a particle size of approximately 1/12th the diameter of the borehole.

6. All “shock-tubes" and detonation wires are to be recovered and removed after each blast.

7. No explosive is to be knowingly detonated within 500 m of any marine mammal (or no visual contact from an observer using 7x35-power binocular).

   Note:

   - Upon review of a proposal, the DFO Regional/Area authority may impose a greater avoidance distance, depending on the size of the charge or other project specific or fishery resource conditions.

8. No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) in the swimbladder of a fish.

   Notes:

   - For confined explosives, setback distances from the land-water interface (e.g., the shoreline), or burial depths from fish habitat (e.g., from under the riverbed) that will ensure that explosive charges meet the 100 kPa overpressure

guideline are shown in Table 1. Equations to derive these relationships have been adapted from Nicholls et al. (1971) and Anon (1980). The equations are described in Appendix II, and should be used for weights of explosives not covered in Table 1. Sample calculations and examples are illustrated in Appendix Ill.

- If a confined explosive is to be detonated close to the substrate-water interface (such as in trenching or demolition), the set-back distance closely approximates the theoretical lethal range within which 50% of the fish may be killed or injured. Consequently, the 100 kPa guideline is not likely to be met in those situations where, because of the design constraint's of the project, it is also likely not possible or practical to 'adjust' the setback distance as a means to meet the 100 kPa guideline. For example, preparation of a trench for a pipeline crossing typically requires no more than a below grade burial depth of about 2m. Therefore, the weight of explosive charge per delay will have to be adjusted in an effort to meet the 100 kPa guideline. A sample calculation to illustrate a trenching example is given in Appendix III.

- For unconfined explosives, proponents are encouraged to contact the appropriate DFO Regional/Area authorities (Appendix I) for further guidance.

9. No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 $mm \cdot s^{-1}$ in a spawning bed during the period of egg incubation.

Note:

- For confined explosives, setback distances or burial depths from spawning beds that will ensure that explosive charges meet the 13 $mm \cdot s^{-1}$ guideline criteria are shown in Table 2. Equations to derive these relationships have been adapted from Nicholls et al. (1971) and Anon (1980) and are described in Appendix II. Sample calculations and examples are illustrated in Appendix III.

- For unconfined explosives, proponents are encouraged to contact the appropriate DFO Regional/Area authorities (Appendix I) for further guidance.

APPLICATION AND REVIEW PROCESSES

Proponents planning to use an explosive that is likely to destroy fish and/or cause a HADD of fish habitat are subject to certain legal obligations under the *Fisheries Act*, as identified in the preceding 'Applicable Legislation and Policy' section. This section discusses these obligations with respect to the proposed use of explosives, and suggests to proponents how to fulfil them.

Proponents should contact the DFO Regional/Area authorities (Appendix I) as early as possible in their planning process. The purpose is to find out whether the proposed use of

explosives is likely to affect a Canadian fisheries water and whether its use is likely to destroy fish and/or cause a HADD of fish habitat. Depending on the outcome, DFO may also discuss potential issues, specific information requirements, or the next steps and possible outcomes in a further review of the proposal. For example, as summarized in the subsequent 'Review and Decision-making Process' section, possible next steps could include a request for further information, or a recommendation that the proponent seek an authorization pursuant to Section 32 and/or Subsection 35(2). Possible outcomes may include the provision of written advice, the issuance of (an) authorization(s) subject to completion of a CEAA review, or, refusal to issue (an) authorization(s).

Proponents should contact DFO before irrevocable commitments (such as contracts for equipment/services) are made, in order to avoid any unnecessary delays in the application and review process. Note that DFO may become aware of your proposed project through its participation in co-operative arrangements with other governments, agencies, boards, etc.

The following 'Application Procedures' section provides information to assist the proponent in deciding if it should seek Authorization to destroy fish by means other than fishing, and/or Authorization to harmfully alter, disrupt or destroy fish habitat, through the use of explosives and, if so, provides information on procedures for filing, etc.

Note that application for Authorization under Section 32 and/or Subsection 35(2) is voluntary. Proponents are not prohibited from going ahead with their use of explosives without Authorization. But, if as a result of the use of explosives, fish are destroyed and/or there is a HADD of fish habitat, contravention of Section 32 and/or Subsection 35(1) of the *Fisheries Act* could occur and the proponent is liable to prosecution.

Application Procedures

1. Proponents unable to meet the overpressure or peak particle velocity guideline values identified, respectively, in measures 8 or 9 of the preceding 'Guidelines' section, should complete and submit an application for Authorization under Section 32 of the *Fisheries Act*, to destroy fish by means other than fishing. The recommended application form is shown in Appendix IV. However, the proponent should contact the appropriate DFO Regional/Area authority (Appendix I) to verify that this is the appropriate application form to use and/or to identify information requirements.

2. Proponents who wish to file for Authorization under Subsection 35(2) of the *Fisheries Act* should complete and submit a separate application in accordance with the form prescribed pursuant to Subsection 58(1) of the *Fishery (General) Regulations* (Appendix V). Assistance on filing the application form, and related procedures, may be obtained by contacting the appropriate DFO Regional/Area authorities (Appendix I).

3. Proponents seeking Authorization under both Section 32 and Subsection 35(2) should complete and submit both Section 32 (Appendix IV) and Subsection 35(2) (Appendix V) applications. However, to minimize duplication, the proponent may choose to cross-reference those sections that are the same in each application form, and is expected to only submit one set of the documents requested in the forms, unless otherwise requested by the DFO Regional/Area authority. Contact the appropriate DFO Regional/Area authorities (Appendix I) for further information and assistance.

4. In seeking Authorization, the proponent will be expected to provide the information requested in the application forms. Doing so will expedite the review process.

   In general, the proponent is expected to provide all plans, specifications, studies, procedures, samples or other information required to permit an assessment of the potential impact of the proposed use of explosives on fish and fish habitat, and the mitigation and/or compensation measures proposed to alleviate impacts and/or to compensate for any loss of productive capacity of habitat to produce fish. Typically, the fish and/or fish habitat information requirements include, but may not necessarily be limited to the items summarized below:

   a) A description of the project and the expected effects resulting from the use of explosives on the fisheries resources (including marine mammals) and/or fish habitat, including:

      i) A description of fish and marine mammal species and their habitats likely to be affected by the detonation;
      ii) A description of whether the fish, marine mammals and their habitats contribute, or have the potential to contribute, directly or indirectly, to a fishery - subsistence, commercial or recreational;
      iii) The timing of any seasonal migration of fish and marine mammals;
      iv) The theoretical lethal range (i.e., the range, or distance, over which the overpressure exceeds 100 kPa) of the explosives to be used (from equations provided in Appendix II);
      v) An assessment of potential impacts arising from the proposed use of explosives and a description of proposed mitigation and/or compensation measures; and
      vi) Other matters, such as the proposed contingency plan and monitoring and follow-up program.

   b) The proponent's mitigation plan should include discussion of the following measures that are particularly relevant to alleviating the potential impacts of explosives:

      i) The work or undertaking should be undertaken at the time of least biological activity or biological sensitivity. Proponents should consult with DFO Regional/Area authorities to determine the appropriate timing;

ii) If multiple charges are required, time-delay detonation initiators (blasting caps) should be used to reduce the overall detonation to a series of discrete explosions. Time delays for discrete explosions should be greater than 25 ms; and,
iii) If possible, large charges should be subdivided into a series of smaller discrete detonations or explosions using time-delay detonation initiators (a procedure known as decking) to reduce the overall detonation to a series of smaller discrete detonations or explosions.

In addition to these measures, the proponent should also consider additional mitigation measures including, but not limited to the following:

iv) Deployment of bubble curtains/air curtains to disrupt the shock wave;
v) Deployment of noise generating devices, such as an air compressor discharge line, to scare fish away from the site; or,
vi) Removal or exclusion of fish from the work area before the blast occurs.

5. Proponents should be aware that subsequent to filing the application, DFO may request additional information concerning fish and fish habitat, the mitigation and/or compensation plans, the contingency and monitoring and follow-up programs, and other matters as required to complete the *Fisheries Act* review. If the appropriate information is not already available, it is the proponent's responsibility to provide it and, also, to assure DFO that the proposed mitigation and/or compensation measures will be effective. Should it be necessary to conduct an environmental assessment of the project pursuant to the CEAA, then additional information will be required in order to meet the requirements of the CEAA.

6. The Department of Fisheries and Oceans will undertake to: respond to requests for review, or to referrals, of project proposals or activities; issue Authorizations or provide advice; and/or complete environmental assessments in a manner consistent with Departmental service standards. Generally, DFO will respond to requests for review or to referrals within 30 working days of notification. Timeframes required for the issuance of Authorizations or advice will be discussed with proponents. Proponents should be aware that the length of time required to complete a review can vary greatly, often depending on the type and complexity of project proposed, the fish and fish habitat issues involved, and whether or not an environmental assessment under the CEAA is required. Once again, proponents are encouraged to contact the appropriate DFO Regional/Area authorities (Appendix I) to discuss these issues.

7. If an unforeseen need to use explosives arises, Departmental service standards may be waived and a review completed as expeditiously as possible so as not to unduly delay a project. Further, Departmental service standards are waived in the event of an emergency where lives and/or property are threatened. In such cases, the amount of information required may be reduced due to the urgency of the

situation. Any verbal request for an emergency Authorization will be accepted only on the condition that it is followed by a written confirmation of the project details.

8. If applicable, proponents may be required by the Department of Fisheries and Oceans, Canadian Coast Guard, to issue a "Notice to Mariners" and/or a "Notice to Fishers". The appropriate DFO Area/Regional authorities (Appendix I) are prepared to assist the proponent with contacting the Canadian Coast Guard.

9. Resource management agencies of other governments, departments, or boards that have been established under some aboriginal land claim settlements, may have aquatic resource review requirements and service standards that are different than those described in this document. Proponents should contact those agencies to ensure compliance with any requirements they may have.

Review and Decision-making Process

This section summarizes the approach taken by the Department of Fisheries and Oceans in the review of referrals and of applications for Authorization. Included is a description of the key decisions possible from a review, and the criteria used in making decisions. There is also a brief summary of the linkage between Section 32 and/or Subsection 35(2) Authorizations and the responsibilities of the Department of Fisheries and Oceans to undertake environmental assessments pursuant to the *Canadian Environmental Assessment Act* (CEAA).

Fisheries Act

DFO will review the proponent's application in accordance with the *Fisheries Act* and its supporting policy framework, including this document. Upon receipt of information, notice, a referral, or application for Authorization concerning works or undertakings where the use of explosives is proposed, DFO will normally take the following steps in its review of the proposal:

1. Determine the adequacy of the information provided by the proponent.

2. Using the information provided, assess the extent of risk or potential damage to fish and marine mammals and/or fish habitat and the acceptability of this level of damage in context with the level of protection required.

3. Determine the probable success of proposed mitigation and/or compensation measures and, as appropriate the acceptability of any residual impacts.

4. Where relevant, consult with the appropriate provincial or territorial resource management agencies, and/or aboriginal resource management boards.

5. Note that prior to finalizing its review of the proposal DFO may, among other matters, advise the proponent of the need for more information, re-assess a revised project proposal, suggest that the proponent seek authorization, etc. The

review of a proposal is often an iterative process depending on a number of factors, such as the type of referral received by DFO, is completeness, its potential impacts on fish and/or fish habitat and the potential to mitigate and/or compensate for such impacts. Proponents should discuss this and related aspects of the review process with the relevant DFO/Regional area authority (Appendix I).

6. After examination of the proposal, DFO will make a decision regarding the proponent's application.

- **With respect to Section 32, DFO will either,**

  ⇒ upon determining that implementation of mitigation measures by the proponent is expected to prevent or avoid the destruction of fish, advise the proponent by letter that if such measures are incorporated into the project, Section 32 is not expected to be contravened. A letter of advice should not be taken to imply approval of the project pursuant to the habitat provisions of the *Fisheries Act*, or any other legislation. Note, if the destruction of fish occurs as a result of a change in the plans for the proposed project, or failure to implement the measures identified in the letter of advice, contravention of Section 32 of the *Fisheries Act* could occur.

  OR

  ⇒ upon determining that even with the implementation of mitigation measures the destruction of fish is still expected to occur **and**, because this mortality is acceptable within the context of the fisheries resource, issue a Section 32 Authorization using a letter format.

  OR

  ⇒ upon determining that even with the implementation of mitigation measures the destruction of fish is still expected to occur **but**, because this mortality is not acceptable within the context of the fisheries resource, reject the proposal, and notify the proponent that DFO will not issue a Section 32 Authorization and that a contravention of the *Fisheries Act* could occur should the proponent still choose to proceed as proposed.

- **With respect to Section 35, DFO will either,**

  ⇒ upon determining that implementation of mitigation measures by the proponent is expected to prevent or avoid a HADD of fish habitat, advise the proponent by letter that if such measures are incorporated into the project, Subsection 35(1) is not expected to be contravened. A letter of advice should not be taken to imply approval of the project pursuant to the habitat provisions of the *Fisheries Act*, or any other legislation. Note, if a

HADD of fish habitat occurs as a result of a change in the plans for the proposed project, or failure to implement the measures identified in the letter of advice, contravention of Subsection 35(1) of the *Fisheries Act* could occur.

OR

⇒ upon determining that even with the implementation of mitigation measures a HADD of fish habitat is still expected to occur **and**, because the proposed compensation for the unavoidable net loss of productive capacity of fish habitat is acceptable to DFO, issue a Subsection 35(2) authorization using the form provided in Schedule VII of Subsection 58(2) of the *Fishery (General) Regulations*.

OR

⇒ upon determining that even with the implementation of mitigation measures a HADD of fish habitat is still expected to occur **but**, because the proposed compensation for the unavoidable net loss of fish habitat productive capacity is not acceptable, reject the proposal, and notify the proponent that DFO will not issue a Subsection 35(2) Authorization and that a violation of the *Fisheries Act* could occur should the proponent still choose to proceed as proposed.

Notes:

- The Department of Fisheries and Oceans, in arriving at one of the above noted determinations, will also consider the following criteria:
    - Whether the use of explosives is the only technically feasible means by which to attain the desired objective; and
    - Whether the use of explosives is required to alleviate an emergency situation threatening human safety and/or property.
- Section 32 and/or Subsection 35(2) authorizations come with conditions attached, which among others may include:
    - The proponent may be required to develop, undertake and report on a monitoring program at its expense, typically, to monitor compliance and evaluate effectiveness of the mitigation and/or compensation measures.
    - If, during the course of the works or undertakings, the adverse effects of the explosives were significantly greater than anticipated, the proponent may be required to immediately cease all further use of explosives,

pending review of the situation with Department of Fisheries and Oceans personnel.

- Additional, site-specific terms and conditions as may be required in order to satisfy fishery resource and/or fish habitat protection requirements. For example, the conditions may be more stringent than the measures identified in the preceding 'Guidelines' section.

Canadian Environmental Assessment Act

Section 32 and Subsection 35(2) are included in the *Law List Regulation* of the *Canadian Environmental Assessment Act* (CEAA). Consequently, the Department of Fisheries and Oceans as the Responsible Authority must conduct an environmental assessment of the relevant proposed works or undertakings before an Authorization can be issued. If the result of the environmental assessment is that the work or undertaking will, after taking into account the appropriate measures, not likely result in significant impact that cannot be justified, then authorization(s) will normally be issued pursuant to Section 32 and/or Subsection 35(2) of the *Fisheries Act*. Procedures for coordinating the CEAA review with provincial and aboriginal government review processes vary. Proponents are strongly advised to contact the DFO Regional/Area authorities (Appendix I) to obtain additional information on environmental assessment procedures and requirements.

UPDATING

These guidelines will be reviewed and updated as necessary.

ACKNOWLEDGEMENTS

Many individuals and governmental and non-governmental organizations were consulted in the development of these guidelines. We gratefully acknowledge their interest and contributions. In particular, input from D. Haché, K. Fisher, K. Broughton and R. Drolet, from DFO, and L. Macanuf (Golder-VME) and R. Morin (Explotec Engineering Ltd) is appreciated.

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Nicholls H.R., C.F. Johnson, and W.I. Duvall. 1971. Blasting vibrations and their effects on structures. U.S. Dept. of Interior, Bureau of Mines, Washington, DC Bull. 656. 105 p.

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Table 1. Setback distance (m) from centre of detonation of a confined explosive to fish habitat to achieve 100 kPa guideline criteria for various substrates.

The data in this table is incorrect and should not be used.

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
Rock	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3
Frozen Soil	2.3	3.2	4.5	7.2	14.3	16	22.6	32
Ice	1.5	2.1	3.0	4.7	6.6	10.5	14.8	21
Saturated Soil	1.5	2.1	3.0	4.8	6.7	10.0	15.1	21.3
Unsaturated Soil	0.7	1.0	1.4	2.2	3.1	4.9	6.9	9.8

Erratum:

Wright, D.G., and G.E. Hopky. 1998. Guidelines for the use of explosives in or near Canadian fisheries waters. Can Tech. Rep. Fish. Aquat. Sci. 2107: iv + 34p.

Page 15: Table 1 should be replaced by the following Table:

Table 1. Setback distance (m) from centre of detonation of a confined explosive to fish habitat to achieve 100 kPa guideline criteria for various substrates.

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
Rock	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3
Frozen Soil	3.3	4.7	6.5	10.4	14.7	23.2	32.9	46.5
Ice	3.0	4.2	5.9	9.3	3.2	20.9	29.5	41.8
Saturated Soil	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Unsaturated Soil	2.0	2.9	4.1	6.5	9.2	14.5	20.5	29.0

Table 2. Setback distance (m) from centre of detonation of a confined explosive to spawning habitat to achieve 13 mm•sec^{-1} guideline criteria for all types of substrate.

	Weight of Explosive Charge (kg)						
	0.5	1	5	10	25	50	100
Setback distance (m)	10.7	15.1	33.7	47.8	75.5	106.7	150.9

Appendix I
DFO Regional/Area Authorities

Newfoundland Region

Habitat Evaluation Engineer,
Habitat Management Division
Fisheries and Habitat Management Branch
PO Box 5667
St. John's, NF A1C 5X1
Voice: (709) 772-6157
Fax: (709) 772-4525

Maritime Region

New Brunswick and Prince Edward Island

Denis Haché, P. Eng.
Habitat Evaluation Engineer
PO Box 5030
Moncton, NB E1C 9B6
Voice: (506) 851-6252
Fax: (506) 851-6579

Nova Scotia

Brian Jollymore, P. Eng.
Habitat Evaluation Engineer
PO Box 550
Halifax, NS B3J 2S7
Voice: (902) 426-2549
Fax: (902) 426-1489

Laurentian Region

Manager, Fish Habitat
Fish Habitat and Environmental Science
Maurice-Lamontagne Institute
PO Box 1000
Mont-Joli, QC G5H 3Z4
Voice: (418) 775-0577
Fax: (418) 775-0658

Central and Arctic Region

Ontario

Area Manager, Ontario Area
Fisheries Management Branch
PO Box 5050, 867 Lakeshore Road
Burlington, ON L7R 4A6
Voice: (905) 336-4567
Fax: (905) 336-6437

Manitoba, Saskatchewan and Alberta

Manager, Habitat Management Division
Fisheries Science Branch
501 University Crescent
Winnipeg, MB R3T 2N6
Voice: (204) 983-5164
Fax: (204) 984-2402

Appendix I (concluded)
DFO Regional/Area Authorities

Central and Arctic Region (continued)

Nunavut

Area Manager, Nunavut Area
Fisheries Management Branch
PO Box 358
Iqaluit, NWT X0A 0H0
Voice: (867) 979-8002
Fax: (867) 979-8039

Western Arctic

Area Manager, NWT West Area
Fisheries Management Branch
PO Box 2310
Yellowknife, NWT X1A 2P7
Voice: (867) 920-6636
Fax: (867) 873-8871

Pacific Region

North Coast

Chief,
Habitat and Enhancement Branch
North Coast Division
South 417 - 2nd Ave. W.
Prince Rupert, BC V8J 1G8
Voice: (250) 627-3453
Fax: (250) 627-3480

Fraser River

Chief,
Habitat and Enhancement Branch
Fraser River Division
610 Derwent Way
Annacis Island
New Westminster, BC V3M 5P8
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Fax: (604) 666-6627

Northeastern and Southeastern B.C.

Chief, Major Projects Unit
Habitat and Enhancement Branch
327 – 555 Hastings Street
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Fax: (604) 666-7907

South Coast

Chief,
Habitat and Enhancement Branch
South Coast Division
3225 Stephenson Pt. Road
Nanaimo, BC V9T 1K3
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Fax: (250) 756-7162

Yukon

Chief,
Habitat and Enhancement Branch
Yukon Division
122 Industrial Road
Whitehorse, YT Y1A 2T9
Voice: (867) 393-6725
Fax: (867) 393-6738

Appendix II
General Equations to Determine Setback Distance for Confined Explosives to Meet Guideline Criteria of 100 kPa

Equation (A)

Equation (A) describes the transfer of shock pressure from the substrate to the water.

$$P_W = \frac{2(Z_W / Z_R)P_R}{1+(Z_W / Z_R)}$$

where:

P_W = pressure (kPa) in water
P_R = pressure (kPa) in substrate
Z_W = acoustic impedance of water
Z_R = acoustic impedance of substrate

Equation (B)

Equation (B) describes the relationship between acoustic impedance and the density and velocity of the medium through which the compressional wave travels.

$$Z_W/Z_R = \frac{D_W C_W}{D_R C_R}$$

where:

D_W = density of water = 1 g•cm^{-3}
D_R = density of the substrate in g•cm^{-3}
C_W = compressional wave velocity in water
= 146,300 cm•s^{-1}
C_R = compressional wave velocity in substrate in cm•s^{-1}

Appendix II (concluded)
General Equations to Determine Setback Distance for Confined Explosives to Meet Guideline Criteria of 100 kPa

Equation (B) (continued):

The following values are used for D_R and C_R for various substrates:

Substrate	D_R ($g \cdot cm^{-3}$)	C_R ($cm \cdot s^{-1}$)
Rock	2.64	457,200
Frozen Soil	1.92	304,800
Ice	0.98	304,800
Saturated soil	2.08	146,300
Unsaturated soil	1.92	45,700

Equation (C)

Equation (C) describes the relationship between the peak particle velocity (V_R) and the pressure, density and compressional wave velocity in the substrate.

$$V_R = \frac{2P_R}{D_R C_R}$$

Equation (D)

Equation (D) represents the scaled distance relationship and is used to equate the peak particle velocity to charge weight and distance.

$$V_R = 100\,(R/W^{.5})^{-1.6}$$

where:

V_R = peak particle velocity in $cm \cdot s^{-1}$
R = distance to the detonation point in m
W = charge weight per delay in kg

Appendix III
Sample Calculations and Examples for Confined Explosives

SAMPLE CALCULATIONS

Sample Calculation 1: Calculation of Setback Distance Required for a 100 kg Charge Set in Rock to Meet the 100 kPa Guideline.

1. From Equation (B):

$$Z_W/Z_R = \frac{D_W C_W}{D_R C_R}$$

$$= \frac{(1g \bullet cm^{-3})(146{,}300cm \bullet s^{-1})}{(2.64g \bullet cm^{-3})(457{,}200cm \bullet s^{-1})}$$

$$= 0.1212$$

2. From Equation (A):

$$P_W = \frac{2(Z_W / Z_R)P_R}{1+(Z_W / Z_R)}$$

$$P_W = \frac{2(0.1212)P_R}{1+(0.1212)}$$

$$P_W = 0.22\ P_R$$

3. To limit P_W to 100 kPa ($kg \bullet m \bullet s^{-2} \bullet m^{-2}$):

$$P_R = \frac{P_W}{0.22}$$

$$P_R = \frac{100\ kPa}{0.22}$$

$$P_R = 455\ kPa$$

$$P_R = 4.55 \times 10^2\ kPa$$

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

4. Convert kPa to dynes ($g \cdot cm \cdot s^{-2}$):

$$\text{dynes} = \text{kPa} \times 10^4$$

$$P_R = 4.55 \times 10^2 \times 10^4$$

$$P_R = 4.55 \times 10^6 \text{ dynes } (g \cdot cm \cdot s^{-2})$$

5. From Equation (C):

$$V_R = \frac{2P_R}{D_R C_R}$$

$$V_R = \frac{(2)\left(4.55 \bullet 10^6 \ g \bullet cm \bullet s^{-2}\right)}{\left(2.64 \ g \bullet cm^{-3}\right)\left(457{,}200 \ cm \bullet s^{-1}\right)}$$

$$V_R = 7.54 \ cm \bullet s^{-1}$$

6. From Equation (D):

$$V_R = 100(R/W^{.5})^{-1.6}$$
$$R = (W^{.5})(V_R/100)^{-0.625}$$
$$R = (100kg)^{.5}(7.54cm \bullet s^{-1}/100kg \bullet cm \bullet s^{-1} \bullet m)^{-0.625}$$
$$R = 50.3 \text{ m}$$

Therefore, a 100 kg charge of explosives detonated in rock requires a setback of 50.3 m from fish habitat in order to reduce the overpressure produced by the detonation to less than 100 kPa.

Now, the calculation of the set-back distance required for a 100 kg charge set in rock to meet the peak particle velocity guideline of 13 $mm \bullet sec^{-1}$ is as follows:

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

From Equation (D):

$$R = (W^{.5})(V_R/100)^{-0.625}$$

When

V_R = 13 mm•sec^{-1} = 1.3 cm•sec^{-1}

and W = 100 kg

$$R = (100^{.5})(1.3/100)^{-0.625}$$
$$R = 150.9 \text{ m}$$

Therefore, a 100 kg charge of explosives detonated in rock requires a setback of 150.9 m from a spawning area in order to reduce the peak particle velocity produced by the detonation to less than 13 mm•sec^{-1}.

Sample Calculation 2: Simplified Calculation of Setback Distance from Fish Habitat.

The calculations to determine the required setback distance to meet the 100 kPa guideline may be simplified. Since the weight of the charge and the distance from the charge to fish habitat are the only variables in the equations, a factor can be developed for substitution in Equation (D).

From Equation (D):

$$V_R = 100(R/W^{.5})^{-1.6}$$
$$R = (W.5)\ (V_R/100)^{-0.625}$$

Therefore:

$$R = W^{.5}(K)$$

By working through the equations of Appendix II and solving for V_R for each substrate

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

type, the following results are obtained:

SUBSTRATE TYPE	K
Rock	5.03
Frozen Soil	3.2
Ice	2.1
Saturated Soil	2.13
Unsaturated Soil	0.98

Therefore, to determine the setback distance required to meet the peak pressure guideline of 100 kPa, multiply the square root of the charge weight by the appropriate "K" factor.

Sample Calculation 3: Simplified Calculation of Setback Distance from Fish Spawning Habitat.

Similarly, to determine the set-back distance required to meet the peak particle velocity (V_R) guideline of 13 mm•sec^{-1}, a constant can be developed for substitution in Equation (D):

From Equation (D):

$$V_R = 100(R/W^{.5})^{-1.6}$$

$$R = (W^{.5})(V_R/100)^{-0.625}$$

where:

V_R = 13 mm•sec^{-1} = 1.3 cm•sec^{-1}

$$R = (W^{.5})(1.3/100)^{-0.625}$$

$$R = (W^{.5})(15.09)$$

Therefore, to determine the setback distance required to meet the peak particle velocity (V_R) guideline of 13 mm•sec^{-1}, multiply the square root of the charge weight by a factor of 15.09.

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

EXAMPLES

Example 1: On-shore Setback Distance from Fish Habitat.

A proponent wishes to use explosives to break rock in a quarry near a stream. What is the minimum setback distance from the stream required in order to limit the overpressure in the stream to less than 100 kPa?

Calculate the required set back distance for a 35 kg charges set in rock.

W		=	35 kg
$K_{(rock)}$	=	6.75	
R		=	$(W^{.5})(K)$
R		=	$(35^{.5})$ (5.03)
R		=	29.8 m

Note: It is assumed that the rock formation being quarried extends under the stream. Therefore the K factor for rock is used.

Therefore, the proponent would be required to maintain a set back distance of at least 29.8 m in order to meet the DFO guideline criteria of 100 kPa.

Example 2: Buried Charges for Geophysical Exploration.

A proponent wishes to conduct a geophysical survey beneath a shallow lake. Because of the shallow depth of the lake, it is not possible to use an air gun or other similar non-explosive energy source. To what depth must explosive charges (5 kg) be buried in order to limit the overpressure to less than 100 kPa?

W	=	5 kg
$K_{(sat.\ soil)}$	=	2.13
R	=	$(W^{.5})(K)$
R	=	$(5^{.5})$ (2.13)
R	=	4.8 m

Note: It is assumed that the charges are buried in un-consolidated sediments. Therefore the K factor for saturated soil is used.

Therefore the proponent would be required to bury the charges to a depth of at least 4.8 m below the substrate-water interface in order to limit the overpressure at the interface to less than 100 kPa.

Appendix III (continued)
Sample Calculations and Examples for Confined Explosives

Example 3: In-stream Trench Excavation.

A proponent wishes to use explosives to assist in the excavation of a trench for a pipeline across a trout stream. The right-of-way is located in a cobble bottom riffle area that is used as a feeding area. There is a potential spawning bed located 75 m upstream of the right-of-way. The explosives' parameters are as follows:

Weight of individual charges: 15 kg
# of holes detonated/delay: 5
Weight of charge/delay: 75 kg

Does the proposal meet the DFO guideline criteria for overpressure and peak particle velocity?

a) For the Overpressure Criteria:

$W = 75$ kg
$K_{(rock)} = 5.03$
$R = (W^{.5})(K)$
$R = (75^{.5})\ (5.03)$
$R = 43.6$ m

Note: Since explosives must be used to excavate the trench, it is assumed that the substrate consists of rock or strongly consolidated sediments. Therefore the K factor for rock is used.

Therefore the detonation of 75 kg of explosives could kill or injure fish within a radius of 43.6 m of the right-of-way.

b) For the Peak Particle Velocity Criteria:

To determine the setback distance required to meet the peak particle velocity (V_R) guideline of 13 mm•sec^{-1} in a spawning area, multiply the square root of the charge weight by a factor of 15.09.

$R = (W^{.5})(15.09)$
$R = (75^{.5})\ (15.09)$
$R = 130.7$ m

Therefore, the detonation of 75 kg of explosives would exceed the DFO Guideline for peak particle velocity of 13 mm•sec^{-1} in a spawning bed.

Appendix III (concluded)
Sample Calculations and Examples for Confined Explosives

Therefore, the application for an authorization to use explosives would be denied and major changes in the explosives program would be required in order for the project to be acceptable to DFO.

For example:

If the weight of explosive/delay were reduced to 5 kg by increasing the number of holes in the pattern and detonating each hole separately with 25 msec delays between each hole, the zone of overpressure exceeding 100 kPa would be:

$W = 5$ kg
$K_{(rock)} = 5.03$
$R = (W^{.5})(K)$
$R = (5^{.5})\ (5.03)$
$R = 11.2$ m

Similarly, the distance at which the peak particle velocity in the substrate would not exceed 13 mm•sec^{-1} would be:

$R = (W^{.5})(15.09)$
$R = (5^{.5})\ (15.09)$
$R = 33.7$ m

Therefore, if the weight of explosives per delay were reduced to 5 kg, the spawning area would be protected, as it is further than 33.7m from the detonation area. However, the detonation would still produce over-pressures exceeding 100 kPa to a distance of 11.2 m. Additional mitigation such as undertaking the project at a time of least fish activity or by removing/excluding fish from the area by either physical exclusion or scare tactics may be required.

Appendix IV
Application Form for Authorization to Destroy Fish by Means Other Than Fishing

¾ ¾

APPLICATION FOR AUTHORIZATION TO DESTROY FISH BY MEANS OTHER THAN FISHING

I, the undersigned, hereby request authorization to carry out the works or undertakings described on this application form. I understand that the approval of this application, if granted, is from the Department of Fisheries and Oceans standpoint only and does not release me from my obligation to obtain permission from other concerned regulatory agencies.

If an authorization is granted as a result of this application, I hereby agree to carry out all activities relating to the project within the designated time frames and conditions specified in the authorization.

Applicant's Name (Please Print) _____

Applicant's Business Address _____

_____

_____

_____

Applicant's Telephone Number _____

Applicant's Facsimile Number _____

Applicant's E-Mail Number _____

Date of Application _____

I solemnly declare that the information provided and facts set out in this application are true, complete and correct, and I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath. This declaration applies to all material submitted as part of this application.

Applicant's Signature _____

Appendix IV (continued)
Application Form for Authorization to Destroy Fish by Means Other Than Fishing

¾ ¾

APPLICATION FOR AUTHORIZATION TO DESTROY FISH BY MEANS OTHER THAN FISHING (continued)

Location Details

Name of watercourse or waterbody (including co-ordinates)

_____

_____

Nearest Community _____

County _____

Province/Territory _____

Provide details of proposed activity including reasons as to why explosives must be used (attach additional information as required)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Appendix IV (continued)
Application Form for Authorization to Destroy Fish by Means Other Than Fishing

¾ ¾

APPLICATION FOR AUTHORIZATION TO DESTROY FISH BY MEANS OTHER THAN FISHING (continued)

Schedule of Operations

Proposed starting date (D/M/Y) _____

Proposed completion date (D/M/Y) _____

The following documents will assist in assessing your application and help expedite its approval. Please check which documents you have attached.

Map indicating location of project	[ ]
Engineering specifications	[ ]
Dimensional drawings	[ ]
Assessment of fish and marine mammal resources	[ ]
Assessment of potential effects of project on fish and marine mammals	[ ]
Measures proposed to mitigate potential damage to fish and marine mammals	[ ]
Other	[ ]

Appendix IV (concluded)
Application Form for Authorization to Destroy Fish by Means Other Than Fishing

¾ ¾

APPLICATION FOR AUTHORIZATION TO DESTROY FISH BY MEANS OTHER THAN FISHING (concluded)

Explosives Contractor (If different from applicant)

Name _____

Address _____

_____

_____

Telephone number _____

Facsimile number _____

Details of Explosives

Type (including trade name) _____

Total weight of explosive to be used (kg) _____

Weight of individual shots/
Weight per delay _____

Shot pattern _____

Detonation depth _____

Delay period (msec) _____

Method of detonation _____

APPENDIX V
Application Form to Harmfully Alter, Disrupt or Destroy Fish Habitat

SCHEDULE VI/ANNEXE VI

(*Subsection 58(1)/paragraphe 58(1)*)

Fisheries and Oceans

Pêches et Océans

_____

Application No./N° de la demande

APPLICATION FOR AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
DEMANDE D'AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

I, the undersigned, hereby request authorization to carry out the works or undertakings described on this application form. I understand that the approval of this application, if granted, is from the Minister of Fisheries and Oceans standpoint only and does not release me from my obligation to obtain permission from other concerned regulatory agencies.

Je soussigné, demande par les présentes l'autorisation d'exploiter les ouvrages ou entreprises décrits dans la formule. Je comprends que l'approbation de cette demande, le cas échéant, porte sur ce qui relève du ministre des Pêches et des Océans et ne me dispense pas d'obtenir la permission d'autres organismes réglementaires concernés.

If an authorization is granted as a result of this application, I hereby agree to carry out all activities relating to the project within the designated time frames and conditions specified in the authorization.

Si la demande est approuvée, je consens par les présentes à exécuter tous les travaux relatifs à ce projet selon les modalités et dans le laps de temps prescrits dans l'autorisation.

Applicant's Name (Please Print) _____ Nom du requérant (lettres moulées)

Applicant's Business Address _____ Adresse d'affaires du requérant

_____

_____

Applicant's Telephone No./ N° de téléphone du requérant _____ Date_____

I solemnly declare that the information provided and facts set out in this application are true, complete and correct, and I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath. This declaration applies to all material submitted as part of this application.

Je déclare solennellement que les renseignements fournis et les faits énoncés dans cette demande sont véridiques, complets et exacts, et je fais cette déclaration solennelle, la croyant consciencieusement vraie et sachant qu'elle a la même force et le même effet que si elle était faite sous serment. Cette déclaration s'applique à tout document qui est présenté dans le cadre de cette demande.

_____ _____

Applicant's Signature (and corporate seal) Signature du requérant (et sceau de la société)

Name of watercourse or waterbody (give coordinates)
Cours d'eau ou plan d'eau (donner les coordonnées) _____

This watercourse is a tributary of (where applicable)
Cours d'eau tributaire de (le cas échéant)

_____

Nearest community Localité la plus proche	County Comté	Province Province
_____	_____	_____

APPENDIX V
Application Form to Harmfully Alter, Disrupt or Destroy Fish Habitat (continued)

SCHEDULE VI-Continued/ANNEXE VI (suite)

Fisheries and Oceans
Pêches et Océans

Application No./N° de la demande

APPLICATION FOR AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
DEMANDE D'AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

Type of Activity/Genre d'activité

[ ] Bridge Pont	[ ] Stream Realignment Alignement de cours d'eau	[ ] Gravel Removal Enlèvement du gravier	[ ] Stream Traverse Traversée de cours d'eau
[ ] Culvert Ponceau	[ ] Channelization Canalisation	[ ] Obstruction Removal - Bypass Enlèvement ou contournement d'obstacle	[ ] Seismic Survey Levé sismique
[ ] Dam Barrage	[ ] Wharf - Break water Quai - Brise-lames	[ ] Stream Utilization - Recreation Utilisation récréative du cours d'eau	[ ] Agriculture
[ ] Stream Diversion Dérivation de cours d'eau	[ ] Dewatering Assèchement	[ ] Erosion Control Lutte contre l'érosion	[ ] Other (specify) Autres (préciser)
[ ] Mining Activité minière	[ ] Aquaculture	[ ] Flood Protection Protection contre les inondations	

List of Agencies (Federal, Provincial or Municipal) contacted or notified, or who have initiated contact with the applicant.
Liste des organismes (fédéraux, provinciaux ou municipaux) contactés ou qui ont pris contact avec le requérant.

PROVIDE DETAILS OF PROPOSED ACTIVITY INCLUDING REASONS FOR THE PROJECT AND TYPES OF EQUIPMENT TO BE USED
DONNER DES PRÉCISIONS SUR LES TRAVAUX PROJETÉS Y COMPRIS LA JUSTIFICATION DU PROJET ET LE TYPE D'ÉQUIPEMENT À UTILISER

APPENDIX V
Application Form to Harmfully Alter, Disrupt or Destroy Fish Habitat (continued)

SCHEDULE VI-Continued/ANNEXE VI (suite)

Fisheries and Oceans
Pêches et Océans

Application No./N° de la demande _____

APPLICATION FOR AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
DEMANDE D'AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

SCHEDULE/CALENDRIER

	D/J	M/M	Y/A
Proposed Starting Date Date prévue du début des travaux	_____	_____	_____
Proposed Completion Date Date prévue de l'achèvement des travaux	_____	_____	_____

Approximate Timing of Work in shoreline, foreshore, tidal zone, or underwater areas.
Période approximative des travaux sur le rivage et les estrans ainsi que dans les zones àmarées et les zones sous-marines.

	D/J	M/M	Y/A		D/J	M/M	Y/A
From/De	_____	_____	_____	To/A	_____	_____	_____

The following documents will assist in assessing your application and help expedite its approval. Please check which documents you have attached.	**Les documents suivants faciliteront l'évaluation de votre demande et permettront d'accélérer son approbation. Veuillez cochez les documents vous avez joints àvotre demande.**
Map indicating location of project	[ ] Carte indiquant l'emplacement du projet
Engineering Specifications	[ ] Spécifications techniques
Scale Drawings	[ ] Dessins àl'échelle
Dimensional Drawings	[ ] Plans cotés
Assessment of Existing Fish Habitat Characteristics	[ ] Évaluation des caractéristiques existantes de l'habitat du poisson
Assessment of Potential Effects of Project on Fish Habitat	[ ] Évaluation des répercussions possibles sur l'habitat du poisson
Measures Proposed to Offset Potential Damage to Fish Habitat	[ ] Mesures proposées pour compenser les ventuels dommages àl'habitat du poisson
Other	[ ] Autres

ENVIRONMENTAL ASSESSMENT AND REVIEW PROCESS CONSIDERATIONS	**CONSIDIRATIONS CONCERNANT LE PROCESSUS D'IVALUATION ET D'EXAMEN EN MATIORE D'ENVIRONNEMENT**
NOTE: All applications pursuant to section 35 of the Fisheries Act will be assessed in accordance with applicable federal environmental assessment requirements.	REMARQUE : Toute demande en vertu l'article 35 de la Loi sur les pêches sera soumise aux exigences fédérales applicables àl'évaluation environnementale.

APPENDIX V
Application Form to Harmfully Alter, Disrupt or Destroy Fish Habitat (concluded)

SCHEDULE VI-Concluded/ANNEXE VI (fin)

Fisheries and Oceans
Pêches et Océans

Application No./N° de la demande _____

APPLICATION FOR AUTHORIZATION FOR WORKS OR UNDERTAKINGS AFFECTING FISH HABITAT
DEMANDE D'AUTORISATION POUR DES OUVRAGES OU ENTREPRISES MODIFIANT L'HABITAT DU POISSON

COMPLETE ONLY IF USE OF EXPLOSIVES IS INTENDED
A REMPLIR SEULEMENT EN CAS D'UTILISATION D'EXPLOSIFS

EXPLOSIVES CONTRACTOR (IF DIFFERENT FROM APPLICANT)/RESPONSABLE DES EXPLOSIFS (SI AUTRE QUE LE REQUIRANT)

Name/Nom : _____

Address/Adresse : _____

_____

Telephone No./N° de téléphone : _____

	D/J	M/M	Y/A		D/J	M/M	Y/Y
Anticipated Starting Date Date prévue du début des travaux	_____	_____	_____	Completion Date Date d'achèvement	_____	_____	_____

DETAILS OF EXPLOSIVES/PRÉCISIONS SUR LES EXPLOSIFS

Type (including trade name)
Genre (y compris la marque _____

_____

Weight and configuration (where applicable) _____
Poids et forme (le cas échéant)

_____

_____

Weight of individual shots and shot pattern where multiple charges are used
Poids des coups individuels et déploiement des coups, en cas de charges multiples

_____

_____

Detonation depth (in the rock; note also the depth of water, if applicable)
Profondeur de détonation (dans le roc; indiquer aussi, la profondeur de l'eau, s'il y a lieu)

_____

_____

Method of detonation
Méthode de détonation _____

_____

_____