

Nalcor Energy – Lower Churchill Project



Lower Churchill Project

Muskrat Falls Generation and Labrador Transmission Assets

Environmental Protection Plan


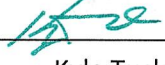
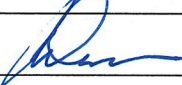
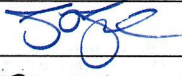
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1 INTRODUCTION

Environmental Protection Plans are of critical importance to large construction projects. This Environmental Protection Plan (EPP) will ensure a high level of environmental protection in all of the Project's work areas during construction and commissioning. This EPP is a working document for use at Site by Project Personnel and Contractors. The intent of this EPP is to help ensure conformance with NE-LCP policy statements, and to serve as a tool for Project participants, including regulators, to monitor regulatory compliance and to improve on environmental performance.

This EPP contains standard environmental protection procedures, or mitigation measures, for activities commonly associated with large projects of this type. The objectives of this EPP are to:

- Anticipate potential negative environmental effects associated with construction; and
- Implement appropriate mitigation measures to minimize or avoid negative effects where practical.

Negative effects include impacts to air quality and climate, groundwater and surface water resources, soil, biota and their habitats, human health and communities, and natural and historic resources. Reference documentation, including publically available Federal and Provincial reference documents, guidelines, fact sheets and operational statements for information detailed in the EPP is located in Reference Material Document for Project Wide Environmental Protection Plan (GV-003-01). Refer to Section, "Reference Documents".

2 PURPOSE

The purpose of this EPP is to establish work practices and assign roles and responsibilities that all Project participants will follow to mitigate negative environmental effects associated with construction and commissioning of the Lower Churchill Project.

Specifically, the purpose of this EPP is to:

- a) Document the conditions and requirements of Environmental Assessment (EA) release;
- b) Outline the Lower Churchill Project's commitments to minimize potential environmental effects, including commitments made in the Environmental Impact Statement (Nalcor, 2009) and during the regulatory review process under the Joint Review Panel (JRP);

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- c) Provide concise and clear instructions to Lower Churchill Project participants regarding procedures for protecting the environment and minimizing potential impacts to the environment;
- d) Provide direction to Lower Churchill Project participants regarding issues and concerns of stakeholder groups including aboriginal peoples, fisheries groups, landowner groups and the public;
- e) Provide a reference document for Lower Churchill Project participants to use when planning and/or conducting specific construction and commissioning activities;
- f) Provide direction for environmental orientation programs for Lower Churchill Project participants;
- g) Document changes to the EPP originating through the interactive revision process;
- h) Provide a reference to applicable legislative requirements and guidelines; and
- i) Provide a detailed summary of environmental issues and protection measures to be implemented during construction.

3 SCOPE

The scope of this EPP covers the engineering, procurement, construction, and commissioning phases of the Lower Churchill Project for Components 1 and 4b. The focus of the EPP is on construction activities, including activities along the transmission line from Muskrat Falls to Churchill Falls, the reservoir, Site access roads, accommodations complex, laydown areas and the Muskrat Falls generation facility. Section “Project Description” describes the Muskrat Falls Generation and Labrador Transmission Assets in more detail.

Please note that there are additional components of the Project that are outside the scope of this EPP. They include the following:

- **Component 2:** Gull Island Generation Facility
- **Component 3:** an ac to dc converter station at Muskrat Falls near the lower Churchill River in Central Labrador; a dc to ac converter station at Soldiers Pond, with some associated Island system upgrades; electrodes, in the Strait of Belle Isle (L'anse Au Diable, Labrador) and Conception Bay (Dowden's Point, Newfoundland); transition compounds at Forteau Point and Shoal Cove; ac switchyards at Soldier's Pond and Muskrat Falls; and synchronous condensers at Soldier's Pond.

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- **Component 4a:** Labrador Island Transmission Link: an overhead HVdc transmission line from Muskrat Falls to the Strait of Belle Isle (approximately 383 km); an overhead HVdc transmission line from the Strait of Belle Isle to Soldiers Pond on the Island's Avalon Peninsula (approximately 695 km); an overhead electrode line from the Soldiers pond to Dowden's Point (approximately 12 km) and an overhead electrode line from the HVdc transmission line to L'Anse Au Diable (approximately 22 km).
- **The Cable Crossing at the Strait of Belle Isle.**

In addition, this EPP does not cover the Operations phase of the Project and a separate EPP for this will be developed and submitted at a later date.

This EPP is one component of the Lower Churchill Project's [*Integrated Environmental Management Plan \(Document # LCP-PT-MD-0000-EV-PL-0002-01\)*](#). Other subordinate documents of the Environmental Management Plan include the following:

- [*Contract-Specific Environmental Protection Plan \(C-SEPP\) Template \(LCP-PT-MD-0000-EV-FR-0002-01\)*](#)
- [*LCP Integrated Regulatory Compliance Plan \(RCP\) \(LCP-PT-MD-0000-EV-PL-0021-01\)*](#); and
- [*Waste Management Plan \(WMP\) \(LCP-PT-MD-0000-EV-PL-0028-01\)*](#).

The Project Emergency Response Plan and Master Spill Response Plan (MSRP) are companion documents to the Environmental Management Plan. The MSRP shall be used by Contractors as a basis for preparing their own spill response plans.

This EPP applies to all Project participants, including PDT, Contractors, Subcontractors, suppliers, service providers, and all Employees of these organizations.

Given the Lower Churchill Project's magnitude, accepted *Contract-Specific Environmental Protection Plans* (C-SEPPs) shall be required. C-SEPPs shall be prepared by all Contractors for all construction contracts to ensure that effects on the environment are minimized to the extent practical. These C-SEPPs shall provide sufficient detail on the Contractor's:

- Scope of work;
- Methods of construction;
- Sequence of activities;

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- List of resources (i.e. equipment and site workforce);
- Temporary and permanent installations;
- Environmental protection procedures and alternative procedures, if required; and
- Environmental contingency measures.

This EPP will serve as a resource to Contractors as they prepare their own C-SEPPs. Contract packages shall include C-SEPP templates, with specific instructions on how these C-SEPPs are to be properly completed. All C-SEPPs will require acceptance by the ERC Manager and PDT prior to the Contractor's mobilization to Site.

In certain cases, particularly in areas where environmental risks are elevated, specific mitigation measures shall be engineered for the Project. These measures, detailed in the form of technical specifications and construction drawings, shall form part of the contract packages.

4 PROJECT DESCRIPTION

The project description below is related only to the Muskrat Falls Generation and Labrador Transmission Asset components of the Lower Churchill Project.

4.1 MUSKRAT FALLS GENERATION

The Muskrat Falls Generation Project will include the following sub-components:

- 22 km of access roads, including upgrading and new construction, and temporary bridges;
- A fifteen-hundred (1,500) person accommodations complex (for the construction period); and
- A north RCC overflow dam;
- A south rockfill dam;
- River diversion during construction via the spillway;
- Five (5) vertical gate spillway;
- Reservoir preparation and reservoir clearing;
- Replacement fish and terrestrial habitat;
- North spur stabilization works;

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- A close coupled intake and powerhouse, including:
 - Four (4) intakes with gates and trash racks;
 - Four (4) turbine/generator units at approximately 206 MW each with associated ancillary electrical/mechanical and protection/control equipment;
 - Five (5) power transformers (includes 1 spare), located on the draft tube deck of the powerhouse; and
 - Two (2) Overhead cranes each rated at 450 tonnes



Figure 4-1 – Muskrat Falls Generating Facility

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4.2 LABRADOR TRANSMISSION ASSET (LTA)

LTA consists in the ac transmission line system from Churchill Falls to Muskrat Falls, specifically:

- Churchill Falls switchyard extension;
- Muskrat Falls switchyard;
- Transmission lines from Muskrat Falls to Churchill Falls: double-circuit 315 kV ac, 3 phase lines, double bundle conductor, Single circuit galvanized lattice steel guyed suspension and rigid angle towers; 247 km long;
- 735 kV Transmission Line at Churchill Falls interconnecting the existing and the new CF switchyards; and
- Labrador Fibre Project (Nalcor's participation in the Aliant led initiative).

4.3 CONSTRUCTION SCHEDULE

Major construction activities associated with the LCP Generation site and Labrador Transmission Asset include the following timelines:

- Bulk Excavation (2013)
- Power house and Spillway (2014-2017)
- North Dam (2016-2017)
- South Dam (2015)
- North Spur Stabilization (2014-2016)
- Reservoir Preparation (2013-2016)
- Clearing Right of Way for HVac line (2013-2014)
- Construction of HVac Transmission Line (2013-2015)
- Construction of HVac Switchyards (2013-2015)

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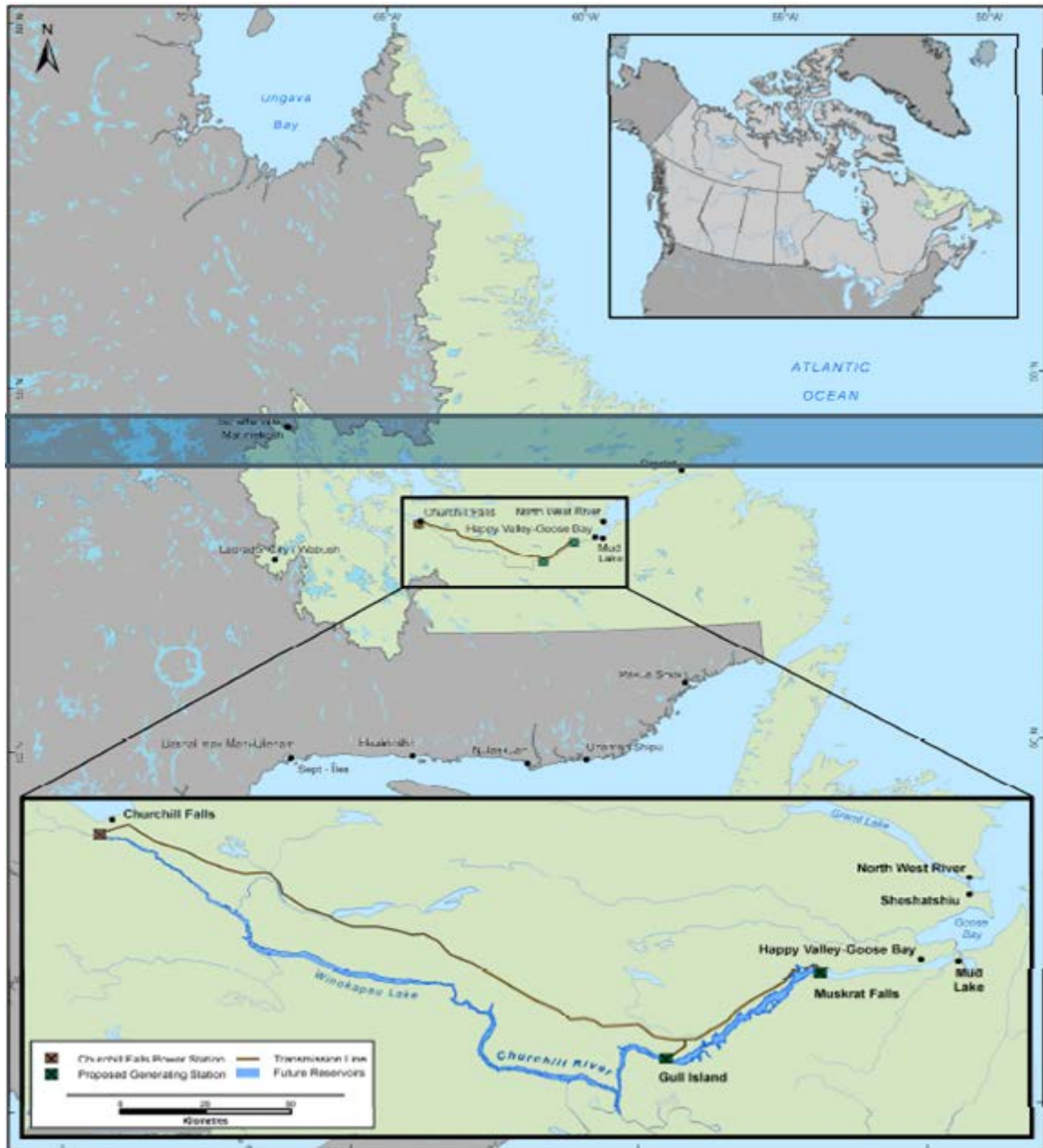


Figure 4-2 – Lower Churchill Hydroelectric Generation Project

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5 DEFINITIONS

Authorized Escort – A Contractor or Subcontractor representative who has completed Site orientation, is fully aware of the Site’s emergency response and evacuation procedures, and has the authority to accompany Site Visitors.

Contractor - Any Contractor engaged by Nalcor or any Subcontractor engaged by Nalcor, or engaged on behalf of Nalcor, or any Subcontractor engaged by a Contractor.

Employee - All Employees employed by Nalcor and consultants engaged by Nalcor to work at any of the Sites, either through third-party agencies or consultants hired or contracted by Nalcor directly. This includes, but is not limited to full time, part time, casual, term, intermittent or occasional Employees, and seconded Employees who are either directly employed by or under assignment to Nalcor.

Personnel - Nalcor Employees, Contractors, Subcontractors and their respective Employees.

Site(s) - Muskrat Falls Power Generating Facility, Labrador Island Link, Labrador Transmission Access, Strait of Belle Isle, direct current (dc) Specialties, and other ancillary Sites and staging areas.

Site Access - Obtaining a Site Pass issued as per the Worker Site Access Standard, Nalcor Doc. No. LCP-PT-MD-0000-HS-SD-0003-01 or Nalcor authorization required to access the various Sites.

Standard – A document capturing an acknowledged measure of comparison for quantitative or qualitative value; a criterion.

Visitor - Any person(s) visiting the Sites, including, but not limited to, vendors, couriers, delivery personnel, regulatory personnel, consultants, engineering representatives, stakeholders, and other personnel not assigned to the Site.

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6 ABBREVIATIONS AND ACRONYMS

C-SEPP	Contract-Specific Environmental Protection Plan
CCME	Canadian Council of Ministers of the Environment
DFO	Department of Fisheries and Oceans Canada
DNR	Department of Natural Resources
EA	Environmental Assessment
EEMP	Environmental Effects Monitoring Plan
ERC	Environment and Regulatory Compliance
ERP	Emergency Response Plan
EPP	Environmental Protection Plan
FSL	Full Supply Level
GAP	Storage and Handling of Gasoline and Associated Products Regulations (NL)
GRH	George River Herd
H&S	Health and Safety
HVac	High Voltage Alternating Current
JRP	Joint Review Panel
kVdc	Kilovolt Direct Current
LSL	Low Supply Level
MCTS	Marine Communication and Traffic Services
MSDS	Material Safety Data Sheets
MSRP	Master Spill Response Plan
MW	Megawatt
NLDOEC	Newfoundland and Labrador Department of Environment and Conservation
NWPA	Navigable Waters Protection Act
OSEM	On Site Environmental Monitor
PAO	Provincial Archeology Office
PDT	Project Delivery Team
RCC	Roller Compacted Concrete
RCP	Regulatory Compliance Plan

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RFP	Request for Proposals
RP	Rehabilitation Plan
RRIF	Revision Request Initiation Form
RWMH	Red Wine Mountains Herd
SARA	Species At Risk Act
TC	Transport Canada
TSS	Total Suspended Solid
WHMI	Workplace Hazardous Materials Information System
WMP	Waste Management Plan

7 RESPONSIBILITIES

The LCP Environmental and Regulatory Compliance (ERC) Team is comprised of environmental engineering and construction management staff. A responsibility matrix is provided in Figure 7-3. Figure 7-4 illustrates the team structure. Roles and responsibilities of team members are further defined in the sections that follow.

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Activity	General Project Manager	Environmental and Regulatory Compliance Manager	Environmental Engineering Manager	Regulatory Compliance Lead	Environmental Engineering Coordinators	Permits Coordinator	EA/EEM Lead	Component Package Lead	Construction Manager	Site Environmental Manager / Coordinators	On-Site Environmental Monitors
Development of the EPP	I	A	R	I	R	S	I	I	I	I	I
Review of the EPP	I	A	R	I	I	C	I	I	I	I	I
Accept EPP	I	A	I	I	I	I	I	I	I	I	I
Implementation of the EPP	I	A	R	I	R	S	I	I	I	R	S
Management /Revisions of the EPP	I	A	R	I	R	C	I	I	I	S	S
Development of the C-SEPP	I	I	A	I	R	S	I	C	I	I	I
Review of the C-SEPP	I	I	A	I	R	C	I	C	I	I	I
Accept C-SEPP	I	C	A	I	R	I	I	I	I	I	I
Implementation of the C-SEPP	I	C	A	I	R	R	I	I	I	R	S
Management /Revisions of the C-SEPP	I	C	R	I	R	S	I	I	I	S	S
Toolbox Meetings	I	I	C	I	C	C	I	I	I	I	A
Project Environmental Awareness											
(i) Employee Orientation	I	A	C	I	S	S	I	I	I	R	S
(ii) Visitor Orientation	I	A	C	I	S	I	I	I	I	R	S
(iii) Contractor Orientation	I	A	C	I	S	S	I	I	I	R	S
Environmental Compliance Monitoring											
(i) Daily Field reports	I	C	A	I	R	S	I	I	I	R	S
(ii) Risk-based Environmental Audits	I	C	A	C	R	C	C	I	I	S	S
(iii) Annual Environmental Performance Review	I	A	R	C	S	S	C	I	I	S	S
Managing Compliance Tracking Registry	I	A	C	R	R	R	C	I	I	S	S
Environmental Effects Monitoring	I	A	I	I	I	I	R	I	I	I	I

Accountable, Responsible, Supports, Consulted, Informed
EPP: Environmental Protection Plan
C-SEPP: Contract-Specific Environmental Protection Plan

Figure 7-3 – Responsibility Matrix

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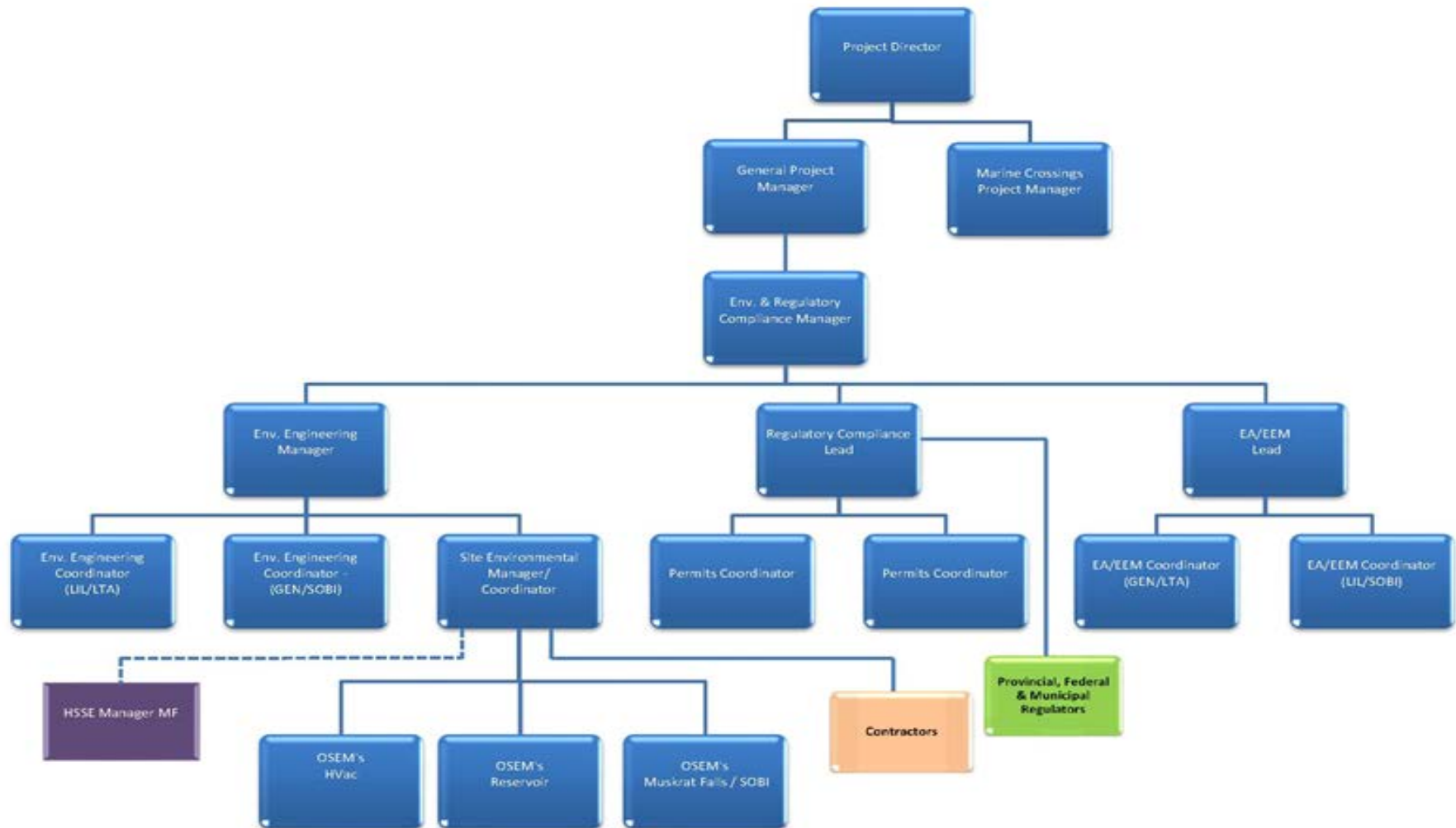


Figure 7-4 – Lower Churchill Project Environmental and Regulatory Compliance Team

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7.1 ENVIRONMENT AND REGULATORY COMPLIANCE TEAM

7.1.1 Auditing Function

The purpose of the auditing function will be to evaluate compliance and effectiveness of the EPP and to identify opportunities for continual improvement. Auditing will consist of daily field reports, risk based environmental compliance audit reports and annual performance reviews.

The daily field reports will be completed by the On-Site Environmental Monitors (OSEM), who will review the daily activities of the Contractors. The risk based environmental compliance audit reports will be completed by a member of the ERC team. The reports will document all incidents of non-compliance with the EPP and their causes. The ERC team will distribute the environmental compliance audit reports to relevant Project participants.

The annual performance review will be completed by the key members of the Environmental and Construction teams. This audit will include a review of all work activities that relate to environmental concerns, issues and/or mitigations, and will include a review of environmental audits carried out by the ERC team during the year. The review process will provide all parties an opportunity to evaluate overall environmental performance and compliance with government regulations, permits, this EPP, and C-SEPPs.

7.1.2 Individual Responsibilities

7.1.2.1 General Project Manager

The responsibilities of the General Project Manager are as follows:

- a) Acceptance of the EPP.
- b) Consulting on the various aspects of EPP management.
- c) Consulting on Environmental Compliance Monitoring processes, such as daily field reports, environmental audits and annual environmental performance reviews, and will be supported in this function by the ERC Manager.
- d) Environmental Effects Monitoring is the responsibility of the ERC team and the General Project Manager will be accountable.

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7.1.2.2 Environment and Regulatory Compliance (ERC) Manager

The responsibilities of the ERC Manager are as follows:

- a) Development, acceptance, implementation and management of this EPP.
- b) Review and acceptance of the C-SEPP, as well as all environmental compliance monitoring.

The ERC Manager will be informed of all activities accountable and responsible by the ERC team such as acceptance of this EPP, C-SEPP and environmental effects monitoring.

7.1.2.3 Environmental Engineering Manager

The responsibilities of the Environmental Engineering Manager are as follows:

- a) The Environmental Engineering Manager is responsible for development, review, implementation, updating, and management of this EPP and review, acceptance and implementation of the C-SEPPs, as well as all environmental compliance monitoring.
- b) The Environmental Engineering Manager will be responsible for scheduling, conducting, and reporting of environmental audits conducted on Contractor activities.
- c) The Environmental Engineering Manager is responsible to ensure all Technical Specifications include EPP requirements.

The Environmental Engineering Manager will be informed of all activities undertaken by the Environmental Engineering Coordinators and the Site Environmental Manager/Coordinators.

7.1.2.4 Regulatory Compliance Lead

The responsibilities of the Regulatory Compliance Lead are as follows:

- a) Review and ensuring commitments and requirements of EA release are included in this EPP as it relates to their work.
- b) Ensuring legislative and permit conditions are reflected in this EPP.
- c) Communicating results of the EEMP to the ERC group.
- d) Responsible for all regulatory correspondence and coordination

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7.1.2.5 Environmental Engineering Coordinators

The responsibilities of the Environmental Engineering Coordinators are as following:

- a) Implementation of this EPP as it relates to their workfronts.
- b) Support the Environmental Engineering Manager with managing changes to the EPP.
- c) Review, acceptance and implementation of the Contractor C-SEPPs.
- d) Along with Site Environmental Manager/Coordinators, they will be responsible for Project Environmental Awareness such as orientation of project Employees, Visitors and Contractors.
- e) Accountable for certain aspects of environmental compliance monitoring such as reviewing daily field reports and environmental audits. They will be informed on environmental effects monitoring details.
- f) Managing opportunity for Improvements, non-conformance and Corrective Action registries.

7.1.2.6 Permits Coordinators

The responsibilities of the Permits Coordinator are as following:

- a) Support for the development and implementation of the EPP, and will be consulted on management or revisions of the EPP.
- b) Provide support for C-SEPP implementation and project environmental awareness through orientation.
- c) Provide support and consultation for several aspects of environmental compliance monitoring. This person will also be consulted on the review of the EPP to ensure compliance with condition of permits.
- d) Accountable for managing the permit registry (in consultation with the Environmental Engineering Coordinators) and will be informed on environmental effects monitoring details.
- e) Supports the Regulatory Compliance Lead with regulatory correspondence.

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7.1.2.7 Site Environmental Manager/Coordinators

The responsibilities of the Site Environmental Manager/Coordinator are as follows:

- a) Coordinate all activities and monitoring effort by the On-Site Environmental Monitors to ensure compliance with the EPP, C-SEPP, and permit conditions.
- b) Report directly to the Construction Manager, and interface functionally with the Environmental Engineering Manager and Environmental Engineering Coordinators.
- c) Communicate directly with the Contractor's on environmental performance and non-conformance issues. These individuals may participate in the environmental audit reviews.

7.1.2.8 On-Site Environmental Monitors (OSEM)

The responsibilities of the On-Site Environmental Monitors are as follow:

- a) Monitor on-Site Project activities.
- b) Evaluate the Contractors' environmental performance with respect to requirements established in the EPP and C-SEPP.
- c) Evaluate the performance of designed/constructed environmental mitigation systems through sampling and testing programs.
- d) Track on-Site compliance with regulatory requirements and conditions of all permits and approvals.
- e) They will be responsible for producing daily field reports as part of environmental compliance monitoring and will provide support for managing the opportunity for improvements, corrective action and non-conformance registries.
- f) Report directly to the Site Environmental Manager and functionally to the Environmental Engineering Coordinators.
- g) Interact with the Contractors on environmental procedures and requirements.
- h) Participate in Project team meetings and toolbox meetings.
- i) Conduct environmental reviews of drawings, and assist in the revision and update of the EPP and C-SEPP as necessary.

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- j) Responsible for ensuring Employees, Visitors and Contractors to the Site receive the appropriate orientation and training before going on Site.

7.1.2.9 Component Package Leads

The responsibilities of the Component Package Leads are as follows:

- a) Provide support for the development of the EPP and the C-SEPP and support the acceptance and implementation of the C-SEPP.
- b) Ensure the EPP is included in procurement packages.

They will be informed about all aspects of the EPP, C-SEPP, and compliance tracking.

7.1.2.10 Area Managers

The Area Managers will be informed on all aspects of the development of the EPP and C-SEPP. They will be informed of environmental compliance monitoring and environmental effects monitoring and will provide support for managing the compliance tracking.

7.1.2.11 Construction Managers

The Construction Managers will be responsible for the following:

- a) Overseeing construction management, including management of on-Site environmental issues through implementation of the EPP.
- b) Responsible for the acceptance and implementation of the C-SEPP and also for revisions to this document.
- c) Report directly to the Project Manager and will be responsible for certain aspects of environmental compliance monitoring and compliance tracking.
- d) Ensuring Visitors, Contractors and Employees to the Site receive the appropriate orientation and training required. This responsibility has been delegated to the HSSEER Manager for the Muskrat Falls Site.

7.1.2.12 Package Lead

The Package Leads will be responsible for ensuring the EPP is included in procurement packages. The Package Lead will support acceptance and implementation of the C-SEPP. They will be informed about all aspects of the EPP, C-SEPP and compliance tracking.

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7.2 CONTRACTORS

Contractors shall be responsible for the following:

- a) Build, supply and/or install various components of the Project, or be involved in provision of services to support construction and/or procurement, as defined in the work scopes of their respective contract packages.
- b) Ensure EPP conditions are reflected in their proposals and bids, and will comply with all relevant regulations, guidelines, permits, approvals and authorizations.

The Environmental Engineering Manager and Environmental Engineering Coordinators will ensure that the EMS is followed in contract documents (i.e., technical specification and C-SEPP).

8 REFERENCES

Information and documents referenced in this EPP can be found at the Project Office in St. John's and are all publically available documents. DFO Operational Statements and Factsheets, as well as DOEC Environmental Guidelines and Federal Government Regulations are available in Reference Material Document for Project Wide Environmental Protection Plan (GV-003-01) (LCP-PT-MD-0000-EV-SD-0001-01). A listing of the key reference material is provided below:

8.1 PROVINCIAL GOVERNMENT GUIDELINES (WATER RESOURCES DIVISION, DOEC)

- Environmental Guidelines for Watercourse Crossings;
- Environmental Guidelines for Stream Crossings by All-Terrain Vehicles;
- Environmental Guidelines for Bridges;
- Environmental Guidelines for Culverts;
- Environmental Guidelines for Fording;
- Environmental Guidelines for Diversions, New Channels, Major Alterations;
- Environmental Guidelines for Pipe Crossings; and
- Environmental Guidelines for General Construction Practices.

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8.2 DFO OPERATIONAL STATEMENTS

- Aquatic Vegetation Removal in Freshwater Systems Operational Statement;
- Beaver Dam Removal Operational Statement;
- Bridge Maintenance Operational Statement;
- Clear Span Bridges Operational Statement;
- Culvert Maintenance Operational Statement;
- Dock and Boathouse Construction Operational Statement;
- High Pressure Directional Drilling Statement;
- Ice Bridges and Snow fills Operational Statement;
- Isolated Pond Construction Operational Statement;
- Maintenance of Riparian Vegetation in Existing Right-of-ways Operational Statement;
- Overhead Line Construction Operational Statement;
- Punch and Bore Crossings Operational Statement;
- Routine Maintenance Dredging Operational Statement; and
- Underwater Cables Operational Statement.

8.3 DFO FACT SHEETS

- Fact Sheet on Effects of Silt on Fish and Fish Habitat;
- Fact Sheet on Blasting – Fish and Fish Habitat Protection;
- Fact Sheet on Ditching;
- Fact Sheet on Temporary Fording Sites;
- Fact Sheet on Forwarder Trails;
- Fact Sheet on Filter Fabric;
- Fact Sheet on Rock Check Dam;

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- Fact Sheet on Temporary Bridges;
- Fact Sheet on Resource Road Construction;
- Fact Sheet on Instream Work in the Dry – Cofferdams;
- Fact Sheet on Streambank Stabilization;
- Fact Sheet on Instream Work in the Dry – Temporary Diversion;
- Fact Sheet on Instream Work in the Dry – Elevated Pipes;
- Fact Sheet on Culvert Stabilization;
- Fact Sheet on Storm Drain Outlets;
- Fact Sheet on Temporary Settling Basins;
- Fact Sheet on Bridge Construction/Demolition;
- Fact Sheet on Freshwater Salmonid Habitat Requirements;
- Fact Sheet on Highway Construction/Upgrading – Infilling, Stabilization and No-Grub Zones;
- Fact Sheet on Freshwater Intake End-of-Pipe Fish Screen;
- Fact Sheet on Stream Clean-up;
- Fact Sheet on Timber Crib;
- Fact Sheet on Water and Sewer Installation – Stream Crossings;
- Fact Sheet on Culvert Installation; and
- Fact Sheet on AVTs, Fish Habitat and You

8.4 OTHER PERTINENT FEDERAL DOCUMENTS

- Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters, Wright and Hopky, 1998;
- Freshwater Intake End-of-Pipe Fish Screen Guidelines, Fisheries and Oceans Canada, 1995;
- Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador. Fisheries and Oceans Canada, St. John's, NF, Gosse, M.M., et. al. 1998;

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- Standard Methods Guide for the Classification/Quantification of Lacustrine Habitat in Newfoundland and Labrador, Bradbury C., et. Al. 2001;
- Forestry Guidelines for the Protection of Fish Habitat in Newfoundland and Labrador, Scruton, D.A., et. al. 1997; and
- Standard Methods Guide for Freshwater Fish and Fish Habitat Surveys in Newfoundland and Labrador Rivers & Streams, Sooley, Darrin R. 1998.

8.5 OTHER PERTINENT PROVINCIAL DOCUMENTS

- Environmental Policy for Infilling Bodies of Water W.R. 91-1(*Water Resources Act*, DOEC);
- Environmental Policy for Land and Water Developments W.R. 95-01 (*Water Resources Act*, DOEC);
- Environmental Policy for Development in Shore Water Zones W.R. 97-1 (*Water Resources Act*, DOEC);
- Environmental Policy for Development in Wetlands W.R. 97-2 (*Water Resources Act*, DOEC);
- Environmental Code of Practice for Concrete Batch Plant & Rock Washing Operations (Department of Environment and Lands);
- Newfoundland and Labrador Species at Risk Data Sheets; and
- Motorized Snow Vehicles and All-Terrain Vehicles Regulations (NL Department of Natural Resources).
- NL Water Resources Act;
- Accredited Laboratory Policy (PD:PP 2001-01.02)

8.6 LCP REFERENCES

The Lower Churchill Project reports provide information in support of the EPP. Such information is a useful and key source of information for the overall documentation of environmental performance throughout the life of the Project. The documentation is listed below:

- Nalcor Energy's Environmental Policy and Guiding Principles;
- Lower Churchill Hydroelectric Generation Project - Environmental Impact Statement, Nalcor Energy, 2009;

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- Information Responses, Lower Churchill Project, 2009;
- Information Responses, Lower Churchill Project, 2010;
- Standard Operating Procedures, AMEC Earth & Environmental Ltd., Large River/Waterbody De-Watering and Fish Relocation;
- Standard Operating Procedures, AMEC Earth & Environmental Ltd., Pond De-Watering and Fish Relocation;
- Labrador-Island Transmission Line, Environmental Assessment, Historic and Heritage Resources Component Study, May 2011;
- LCP No Harvesting Policy - LCP-PT-MD-0000-EV-PY-0001-01; and
- Reference Material Document for Project Wide Environmental Protection Plan (GV-003-01) - LCP-PT-MD-0000-EV-SD-0001-01.

9 MAINTENANCE OF THE ENVIRONMENTAL PROTECTION PLAN (EPP)

This EPP will at times require updating in response to changes in the Project, Contractor work methods, group structure, or technological advancements that provide higher level of environmental protection. The subsections below indicate the process with respect to maintenance and implementation of the EPP.

Initiating Revisions

This EPP is a controlled document and revisions may only be processed by the Environment and Regulatory Compliance (ERC) Manager. It is anticipated that most of the revisions to this EPP will be initiated by the Environment and Regulatory Compliance Team at the work fronts or at the Lower Churchill Project office in St. John's.

Project Delivery Team (PDT) staff will request revisions through document control. EPP holders and readers/reviewers (within the PDT, government agencies, contracting firms, other stakeholders, etc.) may request revisions by forwarding a completed Revision Request Form (RRF), to the Environment and Regulatory Compliance Manager. These revision requests will be screened and reviewed by the ERC Manager and forwarded to the General Project Manager for approval.

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Compliance Instructions

Revision requests that have been accepted by the Project Manager will be sent to the Environment and Regulatory Compliance Manager for distribution to key Project participants as “Compliance Instructions”. These instructions will be signed off by key holders of the EPP and returned within two (2) days of receipt. A log of compliance instructions will be maintained by the Environmental Engineering Coordinators, and these will be incorporated periodically into a revised edition of the EPP.

Revision Procedures

Revisions to the EPP will be made annually, or as required, in accordance with Project document control procedures. The Environment and Regulatory Compliance Manager will issue the accepted revisions of the EPP to key holders, Contractors, and readers/reviewers. Each revision will be accompanied by a Revision Control Record, which:

- Identifies all compliance instructions that have been issued since the last revision; and
- Lists the sections being superseded.

Within two (2) working days of receiving a revised Plan, EPP holders will:

- Familiarize themselves with revised sections of the EPP;
- Incorporate all revisions into their areas of responsibility, as appropriate;
- Ensure that all Personnel are familiar with the revisions; and
- Acknowledge receipt of the revised EPP by forwarding via fax, email, or mail a signed and dated Acknowledgement Form to the Environment and Regulatory Compliance Manager.

10 PROJECT ENVIRONMENTAL AWARENESS

10.1 EMPLOYEE ORIENTATION

A Project environmental orientation has been developed and will be presented to all people that arrive at the Project Site. The orientation is considered a prerequisite to entering any of the LCP Sites.

Project Environmental Orientation will include elements of this EPP, such as: environmental protection procedures; proper storage and handling of materials; encounters with wildlife, rare/endangered species,

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historic resources, waste management, and emergency response. Project Environmental Orientation will be delivered by experienced individuals with an in depth knowledge of the EPP and a knowledge of construction and execution activities.

The Project Environmental Orientation will include a review of the following:

- Environmental management;
- Environmental considerations;
- Non-compliance and corrective actions;
- Environmental contingency measures;
- Incident reporting requirements;
- All permit-required work; and
- Construction Site rules and regulations.
- All Personnel who attend the Project Environmental Orientation session will be required to sign an attendance sheet, and will be provided access to copies of the EPP, or C-SEPP as appropriate, and documentation indicating the completed training and expiration dates.

10.2 VISITOR ORIENTATION

A temporary orientation will be provided to those persons who have arrived at the Project, but will not be completing any field construction work (meetings, office work, deliveries, etc.). The visitor orientation will cover relevant environmental protection measures, Project emergency procedures, environmental incident reporting requirements, and other general Project environmental requirements.

Any person, who has not taken the full orientation program, will be supervised by a designated, oriented Project person at all times, and will abide by the EPP.

10.3 CONTRACTOR ORIENTATION

Contractors may develop and deliver additional environmental orientations to their workforces, Visitors, consultants and inspectors on the details of their C-SEPP, and/or corporate requirements. The Contractor orientations are subject to review and acceptance by the Environment and Regulatory Compliance Manager.

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10.4 TOOLBOX MEETINGS

Toolbox meetings (short, informal meetings) will be held by the Contractor with its field crews and supervisors at the beginning of each work shift. The tool box meeting will involve discussion of work task assignments for the day and any associated safety hazards. These meetings will also provide the opportunity to discuss environmental concerns and applicable mitigation measures that apply.

11 RELEVANT LEGISLATION

There are regulatory requirements at the provincial, federal and municipal levels that apply to the design and construction of the Project. Compliance will be evaluated through a program of environmental compliance monitoring, primarily implemented by On-Site Environmental Monitors.

The Project has adopted Nalcor Energy's Corporate Environmental Policy and Guiding Principles and its Environmental Management System meets the requirements of ISO 14001:2009 (Environment). As a result, environmental protection measures and mitigation associated with this Project will meet the same high corporate Standard.

All work undertaken during the design, construction and commissioning phases of the Project will be in accordance with the most recent guidelines. For a detailed discussion of the regulatory requirements on the Project, refer to the *LCP Integrated Regulatory Compliance Plan (LCP-PT-MD-0000-EV-PL-0002-01)*.

11.1 FEDERAL

The following federal environmental acts apply to one or more aspects of Project:

- *Canadian Environmental Assessment Act (CEAA);*
- *Canadian Environmental Protection Act (CEPA);*
- *Species at Risk Act (SARA),*
- *Navigable Waters Protection Act (NWPA);*
- *Transportation of Dangerous Goods Act, 1992;*
- *Oceans Act;*
- *Canada Shipping Act;*
- *Migratory Bird Convention Act; and*
- *Fisheries Act.*

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11.2 PROVINCIAL

The following provincial acts and regulations apply to one or more aspects of the Project:

- *Dangerous Goods Transportation Act*;
- *Endangered Species Act*;
- *Forestry Act*;
- *Historic Resources Act*;
- *Newfoundland and Labrador Lands Act*;
- *Environmental Protection Act* (EPA);
 - *Air Pollution Control Regulations, 2004*
 - *Gasoline Volatility Control Regulations, 2003*
 - *Pesticides Control Regulations, 2003*
 - *Storage and Handling of Gasoline and Associated Products Regulations, 2003*
 - *Used Oil Control Regulations, 2002*
 - *Waste Diversion Regulations, 2005*
 - *Waste Management Regulations, 2003*
 - *Waste Material Disposal Areas, 1996*
- *Nalcor Energy/Lower Churchill Generation Project Undertaking Order, Environmental Protection Act*;
- *Wildlife Act*; and
- *Water Resources Act*;
 - *Well Drilling Regulations, 2003*
 - *Water Power Rental Regulations, 2003*
 - *Environmental Control Water and Sewage Regulations, 2003*
- *Motorized Snow Vehicles and All-Terrain Vehicles Act*
 - *Motorized Snow Vehicles and All-Terrain Vehicles Regulations, 1996*

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11.3 MUNICIPAL

In some areas, construction activity will take place within municipal boundaries. In these areas, local bylaws will be complied with and permits obtained.

12 GENERAL ENVIRONMENTAL PROTECTION PROCEDURES

In general, environmental mitigation will be planned and designed prior to issuing proposal calls for construction contracts. Environmental mitigation plans and specifications will be incorporated into documents provided to prospective contractors for proposal purposes.

Environmental mitigation will be consistent with applicable Standards, codes, acts and regulations and the conditions of Environmental Assessment (EA) Release. This section contains a comprehensive suite of Environmental Protection Procedures to be used.

The procedures in this section may need to be modified in the future to address new activities, unforeseen Site conditions, changes in engineering design and/or construction work methods, or new environmental performance Standards. These changes will be part of the maintenance of the EPP as outlined in the front of this report.

12.1 SCHEDULING AND TIMING OF CONSTRUCTION ACTIVITIES

Construction planning is one of the most fundamental activities in the management and execution of construction projects. One of the most important factors in a large scale project is the scheduling and timing of various activities, and the primary importance will be maintenance of the project schedule.

However, sensitive time periods outlined in the section below will be considered in Project planning where practical. Where activities are to be carried out during sensitive time periods, additional mitigations will be applied as required.

Environmental Concerns

Construction activities shall be organized so that various tasks that must be accomplished, have the necessary precedence, and resources required to complete the task.

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Environmental Protection Procedures

- A complete schedule of activities provided by the Contractor and accepted by On-Site Environmental Monitors shall be completed prior to commencement of any construction task and any restrictions on timing shall be noted on the schedule;
- While the ideal time of year for construction near a body of water is early June through late October, due to the low flow and low rainfall period; construction will be occurring in other times and specific attention shall be paid to ensure environmental mitigations are applied during this period;
- Stripping, grading, excavating and/or rehabilitation activities shall be scheduled to minimize the amount of time the soil is exposed to elements;
- Activities shall be conducted in such a way as to reduce the amount of time spent in or around a stream or water body;
- Construction activities shall be scheduled, where possible, to avoid any sensitive areas of fish and wildlife habitat and critical periods in fish and wildlife cycles. The sensitive life stages of wildlife in Labrador are illustrated in Figure 12-5. These are used to identify the timing of migration, spawning and calving in the vicinity of the site, which shall be considered, where possible, in the scheduling of construction activities; and
- If timing is not ideal, alternative mitigations shall be implemented.

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SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
AQUATIC												
Arctic Char (sea-run)												
Atlantic Salmon												
Brook Trout												
Burbot												
Lake Trout												
Lake Whitefish												
Northern Pike												
Ouananiche												
Rainbow Smelt												
Round Whitefish												
Suckers												
TERRESTRIAL												
Early Nesting Waterfowl												
Late Nesting Waterfowl												
Forest Avifauna												
Raptors												
Caribou												
Moose												
Semi-aquatic Furbearers												
Terrestrial Furbearers												
Black Bear												

	No interaction
	Low Interaction
	Moderate to High Interaction

*Aquatic information updated Feb 2014. Terrestrial taken from Environmental Impact Statement, Lower Churchill Hydroelectric Generation Project.

Figure 12-5 – Sensitive Life History Stages of Aquatic and Terrestrial Fauna

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12.2 CONSTRUCTION ENTRANCE

Environmental Concerns

Environmental concerns include the vegetation clearing that may be required for the construction of these features, and tracking of dirt and mud from the Site onto public roads and streets.

Environmental Protection Procedures

Measures to remove mud and dirt from vehicles, heavy equipment and pedestrians will be required. Measures include rumble racks, tire washes and sediment traps.

- All cleaning activities shall occur on a gravel pad with runoff running through a sediment trapping device prior to discharge;
- The gravel pad shall be designed for the heaviest vehicle anticipated on Site;
- All Site traffic shall use the facility and the responsible Contractor shall ensure the sediment trapping device is cleaned and maintained regularly;
- Temporary erosion control measures shall be applied as required in the area of vegetation clearing for any gate areas or entrance buildings. Refer to Section, “Erosion Prevention and Sediment Control” for applicable control measures; and
- Machinery/vehicles shall be properly cleaned to prevent potential spread of invasive species.

12.3 LINEAR DEVELOPMENTS

Environmental Concerns

Linear developments encompass a diverse range of standard construction related activities such as ditching, right-of-way clearing, roads and transmission line construction. Environmental concerns associated with linear developments include potential sedimentation/erosion, and the loss of vegetation and fish/wildlife habitat. Linear features can also have a negative impact on caribou beyond habitat loss.

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Environmental Protection Procedures

Road Construction & Ditching

- Aggregate (fill) materials for construction purposes shall not be removed from any stream;
- Sedimentation control measures as outlined in Section, “Erosion Prevention and Sediment Control” shall be followed. Solids that accumulate in a settling pond or behind a sediment trap shall be removed on a regular basis to ensure such systems remain effective;
- Work shall not be undertaken on easily erodible materials during or immediately following heavy rainfalls without approved protection measures in place;
- Buffer zones shall be flagged prior to any disturbance activities, as required;
- Natural vegetation shall be left in place where possible. Rights-of-way, particularly in areas of dense vegetation, shall be as narrow as practicable; loss of ground vegetation shall be kept to a minimum;
- Roads shall be adequately ditched so as to allow for good drainage. Where possible ditches shall be kept at the same gradient as the road;
- Drainage from areas of exposed fill shall be controlled by grade or ditching and directed to vegetated areas away from all watercourses and at least 30 m from stream crossings. These drainage areas shall be determined in consultation with the OSEM’s;
- Surface water shall be directed away from work areas by ditching. Runoff from these areas shall have sediment removed by filtration or other suitable methods as outlined in Section, “Erosion Prevention and Sediment Control” and shall be directed away from wetlands and watercourses;
- The sediment control measures shall be determined on Site by the Contractor Personnel and accepted by the OSEM;
- Check dams shall be used as required to reduce runoff from work areas with exposed soil;
- In areas where natural vegetation must be removed, the topsoil layer shall be separately stored from grubbed material for rehabilitation;
- Cut areas through silt and clay materials shall have erosion prevention measures (refer to Section, “Erosion Prevention and Sediment Control);

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- Temporary erosion control shall be applied on exposed slopes in sensitive areas immediately following exposure of a slope. A permanent control measure shall be installed shortly thereafter. Refer to Section, “Erosion Prevention and Sediment Control” for applicable erosion control measures;
- The cutting and filling phase of road construction, and the development of other work areas shall be conducted as outlined in the following procedures:
 - Cutting and filling shall be done only upon completion of grubbing. Where engineering requirements do not require grubbing (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;
 - Filling in the vicinity of stream crossings shall be done in a manner which ensures that erosion and sedimentation of watercourses, water bodies and other ecologically sensitive areas such as wetlands is minimized and done in strict compliance with the required watercourse alteration permits from the DOEC. The hydrologic function of wetlands shall be maintained;
 - The infilling of watercourses and water bodies shall not be permitted, except as authorized by regulatory agencies and with the approval of the OSEM. The OSEM shall inspect the work to ensure it is completed in compliance with the required watercourse alteration permits from the DOEC, a letter of advice from DFO (if issued) and the Authorization for Works or Undertakings Affecting Fish Habitat from DFO, if required;
 - Buffer zones shall be maintained between the roads and the bank of any watercourse they parallel (refer to Section, “Buffer Zones”); and
 - Road fill shall be dry and ice free. On areas of sensitive terrain, excess fill shall be end-dumped from the established roadbed.
 - Culverts shall be installed to maintain natural cross-drainage and to prevent ponding;
 - The number of stream crossings shall be minimized. Where the road must cross a stream, the environmental protection procedures detailed in Section, “Watercourse Crossing – Fording, Culverts and Bridges” shall be followed;
 - Where possible, construction activities shall avoid areas of wildlife concentrations to prevent undue disturbance of wildlife during critical periods (refer to Sections, “Scheduling and Timing of Construction Activities”, “Resource Specific Mitigations” and “Diversion Head Pond Formation and

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Reservoir Impoundment”). If encounters with wildlife are unavoidable, then measures in Section, “Contingency Plans” shall be followed;

- Boundaries shall be staked for all rights-of-way, road easements, facilities, infrastructure and borrow sites that will be developed;
- Where possible, rights-of-way shall avoid known archaeological, historical and/or spiritual sites and required buffers shall be respected (refer to Section, “Buffer Zones”). Where they cannot be avoided, the site shall be mitigated to satisfaction of Provincial Archaeological Office (PAO) prior to work proceeding. If any archaeological or historical sites are encountered (known or otherwise), all work shall cease in that area until approval to proceed has been granted by the PAO; and
- Reference shall be made to the Guidelines for Protection of Fish Habitat in Newfoundland and Labrador, 1998.

Right-of-Way Clearing

- All salvaged timber shall be piled at right angles to rights-of-way so as not to obstruct the access or work of others, damage vegetation or be placed within buffer zones of critical habitat;
- Disposal of cleared non-merchantable timber, slashing and cuttings from cleared areas shall take place through mulching and/or piling to minimize the amount of slash. No burning of materials is permitted for this Project;
- If slash piles are to be used, they shall be piled so as not to cause unnecessary damage to vegetation outside the right-of-way. A 6.5 m break in slash piles shall be made every 200 m to allow for drainage and animal access. The maximum height of the piles shall not exceed 3 m; and
- All conditions outlined under Road Construction and Ditching (above), as well as Transmission Line Development (below) that also apply to right-of-way clearing shall be adhered to.

Transmission Line Development

- Where feasible and applicable, untreated wood shall be used. Where untreated wood is not practical, it shall be treated with Pentachlorophenol (PCP), Chromated Copper Arsenate (CCA) Ammonical Copper Arsenate (ACA), Ammoniacal Copper Zinc Arsenate (ACZA), or Copper Naphthenate (CuN) only (refer to

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Section, "Wood Treatment" for information regarding the use of treated wood in and around waterbodies and protected water supply areas);

- Access for the transmission line development shall follow the protective measures as listed above for roads and ditching; and
- Ground travel on the transmission line shall follow existing trails and tote roads where practical. Stream crossings shall follow DFO Standard Operating Procedures (SOP) where feasible (i.e. one time ford, clear span bridge etc.) Where the SOP cannot be adhered to, a stream survey and request for letter of advice from DFO may be required.

12.4 WINTER CONSTRUCTION

Environmental Concerns

The principal concerns associated with winter construction are potential effects on freshwater ecosystems and water quality.

Environmental Protection Procedures

- Winter vehicles shall be confined to properly prepared, groomed and approved trails and to work sites;
- Maintenance and refuelling of vehicles shall be restricted to designated areas;
- Only streams or water bodies that are frozen shall be traversed, unless permits to ford are in place. (See the DFO Operational Statement for Ice Bridges and Snow Fills);
- Any debris or materials placed upon the ice surface of any waterbody shall be removed immediately after job completion;
- The ground must be frozen or a minimum 0.5 m snow cover for unfrozen ground is required for winter trails to avoid ground disturbance;
- All known archaeological sites shall be avoided;
- Snow removed for snow clearing operations shall be disposed of in areas directed by the On-Site Environmental Monitor; and
- Gaps of at least 2 m shall be left in windrowed snow for ease of animal movements.

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12.5 EQUIPMENT OPERATION AND MOVEMENT

A variety of equipment will be used on Site during construction. This is a potential source of noise, air emissions, and potential leaks or spills.

Environmental Concerns

Noises associated with equipment operation and movement may negatively affect wildlife. Air emissions may have air quality implications. Accidental leaks or spills of fuel or other hazardous materials may affect soils, water, fish, vegetation and wildlife. Tracked equipment has the potential to disturb the ground around/at the Site.

Environmental Protection Procedures

- All approvals, authorizations and permits for Project activities shall be followed;
- Noise control procedures shall be followed during construction (refer to Section, “Noise Control”);
- All equipment shall have exhaust systems regularly inspected and mufflers shall be operating in accordance with manufacturer’s recommendations;
- All equipment (e.g., diesel generators, etc.) shall meet the requirements of the *NL Air Pollution Control Regulations* under the *Environmental Protection Act*, as required. Diesel generators shall be registered with DOEC, as required. Refer to the guidance document for Approval of Diesel Generators (GD-PPD-061) for the registration form and guidance on completion;
- All equipment used during construction shall follow the environmental protection procedures outlined in this EPP. In the case of an accidental event resulting from the use of equipment (e.g., a fuel spill), refer to the contingency plans in Section “Contingency Plans”;
- All equipment on the Project site shall use only oils/lubricants that classify as “biodegradable” where feasible (refer to Section, “Storage, Handling, Use and Disposal of Fuel and Other Hazardous Materials” for additional information on the use of biodegradable oils/lubricants);
- ATVs and tracked vehicles shall only be used where necessary. ATV use shall comply with the Motorized Snow Vehicles and All-Terrain Vehicle Regulations, 1996, the Environmental Guidelines for Stream Crossings by ATV, 1994 and the DFO Fact Sheet ATVs, Fish Habitat and You;

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- The use of heavy equipment in or near water courses shall be minimized and restricted;
- All equipment shall be regularly maintained and inspected. If problems are identified the equipment shall be taken out of service and repaired to prevent release of hydrocarbons into the environment. Any field maintenance should be completed with appropriate spill containment to prevent contamination to the environment; and
- Best Management Practices outlined in “Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities” (May 2005, ChemInfo Services Inc. for Environment Canada) shall be implemented to mitigate air quality effects during the site preparation and construction phase, where practical.

12.6 VESSEL OPERATIONS (BARGE / BOATS)

Vessel traffic during construction may be required, including barges, tugs and ocean-going barges, and marine vessels to transport equipment and supplies to the construction sites. Heavy lift vessels shall be used for some of the larger modules particularly if they are being transported on the high seas. All vessels shall meet Transport Canada Regulations and Standards, under the *Canada Shipping Act*, as well as international regulations established by the International Maritime Organization (IMO).

Environmental Concerns

Project vessel traffic may, at times, increase vessel traffic in Goose Bay and/or Cartwright. There is a risk due to increase in vessel traffic 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 non-compliant ballast water could also introduce non-indigenous species or deleterious substances into Canadian waters.

Environmental Protection Procedures

- All vessel activity shall comply with the *Vessel Pollution and Dangerous Chemicals Regulations (SOR/2012-69)* and *Vessel Traffic Services Zones Regulations (SOR/89-98)* as required under the *Canada Shipping Act*;
- All commercial vessels 20 metres or more in length entering Goose Bay shall report to the MCTS centre;

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- The On-Site Environmental Monitors and the local public shall be advised of all particulars with regard to incoming/outgoing vessel traffic on a timely basis, including updates regarding the Estimated Time of Arrival/Estimated Time of Departure (ETA/ETD) as advised by vessel masters;
- Project vessel masters shall observe the following basic rules:
 - Demonstrate that they have a set of safety and emergency procedures on board;
 - Advise the Site office of their time of departure from their port of origin and their estimated time of arrival at Happy Valley-Goose Bay or Cartwright;
 - Notify the Site office of their progress at sea or, if stopping at other ports enroute, update their ETA;
 - Relevant Canadian Hydrographic Charts or electronic charting systems shall be on board prior to leaving their port of origin; these charts shall be kept on board at all times;
 - Implement best management practices designed to achieve zero discharge of oily waste while at the Site and along the shipping route;
 - All Project-related vessels shall have onboard adequate oil spill response equipment to handle an accidental release of product into the environment; and
 - Refer to the Master Spill Response Plan in the event of a spill or leak.
- No Project-related vessels shall discharge wastes into surrounding waters. The discharge of garbage from ships into Canadian waters and the waters of the Fishing Zones of Canada is prohibited;
- All crewmembers shall be familiar with emergency procedures for both life threatening and potentially polluting situations;
- Vessel traffic shall not encroach on the marine or land portion of the Gannet Islands Ecological Reserve;
- All stationary hazards, such as moored platforms or vessels, shall be clearly marked according to the *Navigable Waters Protection Act (R.S.C., 1985)* and/or *Collision Regulations (C.R.C., c. 1416)* under the *Canada Shipping Act*; and
- All vessels shall comply with the *Ballast Water Control and Management Regulations (SOR/2011-237)* under the *Canada Shipping Act*.

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12.7 HELICOPTER TRAFFIC

Helicopter use at the Project site during construction will be required.

Environmental Concerns

Noise from the aircraft may disturb wildlife. Collisions with wildlife could result in mortality for both wildlife and humans and fuelling of helicopters may result in spills.

Environmental Protection Procedures

- All aircraft shall maintain an altitude of no less than 500 m from concentrations of birds or other wildlife;
- Flights for wildlife viewing or photography are not permitted, except when conducting wildlife surveys. Permits from the Wildlife Division are required for wildlife surveys;
- The On-Site Environmental Monitor shall inform all charter pilots of the EPP requirements;
- All aircrafts shall inform the Contractor of their expected arrival and departure times;
- Aviation fuel caches shall have approval from Service NL;
- The Contractor shall ensure that helicopter landing areas are kept clear of equipment, materials/supplies at all times throughout the construction phase to avoid accidents or damage to the helicopter;
- All aircraft operators shall review marine and aviation weather forecasts prior to departure;
- Raptors (e.g., Bald Eagle, Osprey, Red Tailed Hawk) are known to nest within in the Project area. Under no circumstances shall nesting raptors be approached. The disturbance effects that helicopters have on nesting raptors can be detrimental for both the birds and the safety of the aircraft. All aircraft shall maintain a 300 m vertical and horizontal buffer from known active raptor nests between May 15 to August 15;
- Locations along the Churchill River are known as spring and fall staging areas for waterfowl. Helicopters moving through these areas during this time (typically May or September) shall maintain a minimum altitude of 500 m from concentrations of waterfowl; and
- The number of helicopter trips shall be minimized to the extent feasible by combining trips or using other appropriate means of travel.

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12.8 CLEARING OF VEGETATION

Environmental Concerns

Vegetation clearing (e.g., trees and shrubs) will be required during site preparation for work areas, laydown areas, roads, and for reservoir preparation. Environmental concerns include loss of habitat, sedimentation of watercourses, and disturbance or destruction of historic resources.

Environmental Protection Procedures

The following measures shall be implemented to reduce the potential effects of vegetation clearing:

General

- All vegetation shall be removed in such a manner that will accommodate salvage of merchantable timber;
- Clearing activities shall be limited to those areas that are required for reservoir preparation (i.e. trees in the stick-up and ice zones), as well as those areas that are required for construction of infrastructure;
- All clearing shall comply with the requirements of all applicable permits, including a Commercial Cutting Permit and an Operating Permit;
- A cutting permit shall be obtained prior to the start of any site clearing. Clearing and tree removal shall be restricted to the minimum areas needed for the site and stockpiles;
- Clearing shall consist of cutting to within 15 cm or less of the ground and stockpiling of all merchantable timber; as well as the removal, piling and mulching of shrubs, debris and other non-merchantable timber in the area, as appropriate;
- Disposal of cleared non-merchantable timber, slash and cuttings from cleared areas shall take place through mulching and/or piling to minimize the amount of slash. No burning of materials is permitted for this project;
- If slash piles are to be used, they shall be piled so as not to cause unnecessary damage to vegetation outside the right-of-way. A 6.5 m break in slash piles shall be made every 200 m to allow for drainage and animal access. The maximum height of the piles shall not exceed 3 m;

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- Limits of clearing shall be shown on all drawings issued for construction. Only those areas designated on drawings shall be cleared. Trees shall be blazed/flagged at intervals in advance of clearing to demarcate the limits of the work. Blazed trees shall not be felled. For reservoir clearing however, the limits of work may not be marked in the field. Clearing activities shall not remove any trees outside the authorized clearing limits;
- Slash and any timber shall not be permitted to enter any watercourse and shall be piled above spring flood levels;
- Mechanical clearing by mechanical harvesters will likely take place within the reservoir area and main construction areas. For other clearing required, chain saws or other hand-held equipment may be used except where alternative methods or equipment are accepted by the OSEM;
- Mechanical clearing by means other than mechanical harvesting equipment (i.e. bull dozer or excavators) shall not occur;
- Firefighting tools and water delivery systems must be available, as required, by the operating permit for the activity;
- A buffer zone of undisturbed vegetation shall be maintained between construction areas and all water, watercourses, and ecologically sensitive areas (refer to Section, "Buffer Zones"), unless otherwise authorized. Buffer zones within the reservoir shall be left in place and flooded. Buffer zone features shall be key elements of the environmental review of drawings prior to construction;
- Where possible, timber shall be felled inward toward the work area to avoid damaging any standing trees within the immediate work area;
- Workers shall not destroy or disturb any features that are indicative of a historical or archaeological site. Any such findings shall be reported immediately to the OSEM (refer to sub-section, "Historic and Archaeological Resources" – under Section titles, "Resource Specific Resources" and "Contingency Plans");
- Clearing activities between May 15 and July 31 shall be in compliance with the Avifauna Management Plan;

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- No clearing shall take place within 800 m of an active raptor nest between the period of May 15 to August 15. If a nest is encountered during clearing activities, all work shall stop until the site is evaluated and accepted by the OSEM, in consultation with the appropriate regulatory agencies;
- If a tree containing an inactive eagle or osprey nest is encountered during site and reservoir clearing, the nest shall be assessed for viability and if the nest is deemed viable a platform shall be established as approved by the provincial Wildlife Division. For other raptors such as hawks and owls, active nests shall be identified as per the Avifauna Management Plan and appropriate buffers applied; and
- If a tree containing an inactive raptor nest is encountered during transmission line clearing a platform will not be required as the tower will provide an alternative nesting site.

Merchantable Timber

- Merchantable timber is defined as being 2.5 m or more in length with a top diameter not less than 9.1 cm and being of generally sound condition. Non-merchantable timber consists of all vegetation with no merchantable value, such as small trees, shrubs, limbs and/or branches;
- All merchantable timber shall be salvaged. It shall be cut into standard harvesting lengths (i.e., 2.5 - 3.5 m lengths), trimmed, and stored in identified stockpile areas. For reservoir clearing, merchantable timber may be left as tree length. Figure 12-6 depicts poorly cut and piled wood and Figure 12-7 shows properly cut and piled wood; and
- All merchantable timber within the specific clearing limits shall be stockpiled so as not to obstruct the access of work of others.



Figure 12-6 – Poorly Cut and Piled Wood



Figure 12-7 – Proper Way to Remove, Cut and Pile Wood

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Transmission Line/Road Rights-of Way

- All salvaged timber shall be piled at right angles to rights-of-way so as not to obstruct the access or work of others, damage vegetation or be placed within buffer zones of critical habitat; and
- Slash and debris is to be disposed of as per the general conditions outlined above.

12.9 PUMPS AND GENERATORS

Environmental Concerns

A variety of water pumps, hoses and generators will be in frequent use in many areas of the main construction site and at remote work camps. Environmental concerns are associated with any accidental spills or chronic leaks contaminating water bodies and soil. There may also be concerns with air emissions from generators on the Site.

Environmental Protection Procedures

- Refer to Section, “Buffer Zones” for required buffer zones for fuel and other hazardous materials storage and handling;
- Drip pans shall be placed underneath pumps and generators. The drip pans shall be lined with absorbent material and shall have a cover to prevent water from entering. Absorbent material shall be kept at all Sites where pumps and generators are in use;
- Spill kits shall accompany all pumps and generators at the Site (refer to Section, “Storage, Handling, Use and Disposal of Fuel and Other Hazardous Materials”);
- Pumps and generators shall be located as far as practical from all waterbodies;
- Pumps and generators shall be located on a level, stable surface. All pumps used for freshwater supply shall have a fine mesh screen on the intake hose;
- Hoses and connections on equipment located near water bodies shall be inspected routinely for leaks and drips;
- A water use license from the Water Resources Management Division shall be required for withdrawal of water from a waterbody;

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- All diesel generators on site shall meet the requirements of the *Air Pollution Control Regulations, 2004 (NLR 39/04)* under the *Environmental Protection Act* as required. Generators built to Tier 4 Final emission standard may be exempt from NLDOEC Certificate of Approval; and
- All leaks shall be reported immediately to the OSEM. Upon detection of a leak, the equipment (i.e. pump, generator, etc.) shall be shut down immediately and corrective action taken to repair the leak and clean up any contaminated soil and/or water (Refer to the Master Spill Response Plan).

12.10 SURVEYING

Surveying activities may include: vegetation removal; traversing; establishing targets, permanent benchmarks and transponder stations.

Environmental Concerns

Surveying activities may disturb vegetation, wildlife, and historic resources.

Environmental Protection Procedures

Vegetation Removal

- Where possible vegetation removal shall be scheduled to minimize disturbance to animals in sensitive areas or during sensitive time periods;
- There shall be no cutting in areas designated as sensitive without notification of the OSEM's;
- Width of survey lines shall be limited to that which is absolutely necessary for line of sight and unobstructed passage;
- Whenever possible, cutting lines to the edge of open areas shall be avoided;
- Trees and shrubs shall be cut flush with the ground wherever possible with stumps not to exceed 15 cm;
- Cutting of survey lines shall be kept to a minimum;
- All trees not exactly on transit lines shall be left standing and trees partly on line shall be notched (notch not to exceed 1/3 tree's diameter) instead of removed, to allow sighting;

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- Discretion shall be used when large trees are encountered. For example, trees 30 cm at Diameter Breast Height (DBH) or larger shall, whenever possible, should not be cut. On grid lines, trees of 30 cm diameter or larger shall be left intact and shall be traversed to continue the line;
- Wildlife shall not be harassed or disturbed;
- Vehicles shall yield the right-of-way to wildlife;
- Archaeological sites and features shall not be disturbed during survey work. Any historic resource discoveries shall be reported as per Section, "Historic and Archaeological Resources"; and
- Survey crews shall have a briefing on the recognition of historic resources prior to commencing work.

Traversing

- ATVs shall not be allowed off the right-of-way, access and by-pass roads except where acceptable to the On-Site Environmental Monitor. ATV use shall comply with the *Motorized Snow Vehicles and All-Terrain Vehicle Regulations, 1996, (NLR 1163/96)* the *Environmental Guidelines for Stream Crossings by ATV, 1994* and the DFO Fact Sheet *ATVs, Fish Habitat and You*;
- No motorized vehicles shall enter the areas designated as sensitive without notification of the On-Site Environmental Monitors;
- Activity within sensitive areas shall be minimized; and
- Walking in sensitive areas shall be restricted to established walking paths, where available.

Establishing Targets, Permanent Benchmarks and Transponder Locations

- A driven T-bar, embedded to readily identify each benchmark location, shall be used;
- Access to sensitive areas shall be accepted by the OSEM;
- Standard iron bars and sledgehammers shall be used to establish benchmarks; and
- Heavy equipment shall not be used to access sensitive areas.

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12.11 DRILLING

Geotechnical

Drilling will be required as part of geotechnical investigations to recover soil samples, characterize the subsurface of proposed foundation, excavate areas and probe the bedrock surface. Seismic geophysical methods may also require drilling of shot holes in which small sources of energy (explosives, weight drop, air gun, etc.) are to be placed.

Environmental Concerns

The environmental concerns associated with drilling 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.

Environmental Protection Procedures

The following mitigation measures must be followed when drilling at the Site:

- If water withdrawal is required for drilling, a request for project review to DFO is required. If a letter of advice is issued from DFO, all conditions shall be followed. A water use license is also required from the Water Resources Management Division;
- Shot holes for seismic activities shall not be within 100 m of any water well, structure or buried service line;
- Drilling mud, together with drilling cuttings and return water, shall be treated using a polydrill filter box or suitable alternative (See Figure 12-8). Solids collected shall be disposed of at an approved waste disposal site. All treated water shall be discharged on land to the environment in a manner that will promote infiltration into overburden soils and will not enter or impair water bodies. If drilling mud is required, biodegradable products such as clear-bore or an approved equivalent shall be used. The type shall be documented and Material Safety Data Sheets (MSDS) provided and kept on file;
- All discharges shall meet the Environmental Control Water and Sewer Regulations (ECWSR);
- Drilling of boreholes shall be conducted in compliance with all conditions of the Exploration Approval for the work required under the *Mineral Regulations* issued under the *Mineral Act*;

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- All drilling equipment on the Project site shall use only oils/lubricants that classify as “biodegradable” (see Section, “Storage, handling, Use and Disposal of Fuel and Other Hazardous Materials” for additional information on the use of biodegradable oils/lubricants);
- Due to the nature of drilling activities (quicksnaps, couplings) oil drops and leaks may occur. The area shall be cleaned up at every opportunity and all rigs shall be equipped with spill kits (as outlined in Section, “Storage, handling, Use and Disposal of Fuel and Other Hazardous Materials”);
- In the event of a hose rupture or loss of hydraulic fluid, the Master Spill Response Plan shall be followed;
- Abandoned drill holes shall be sealed with a cement grout bentonite mixture;
- If explosives are used in seismic shot holes, a blasting plan shall be reviewed with the OSEM to ensure any unexploded charges are removed from the holes prior to sealing;
- Drilling sites shall be cleared of vegetation following the procedures detailed in Section, “Clearing of Vegetation”;
- Disposal of all drilling materials and associated solid wastes shall be undertaken in accordance with the procedures in Section, “Solid Waste Disposal”;
- Fuel shall be stored, handled and transported according to Sections, “Storage, handling, Use and Disposal of Fuel and Other Hazardous Materials” and Section, “Buffer Zones”;
- Water applications shall be used to control dust. Water-based drilling dust suppression systems may require anti-freeze in winter months, which shall be approved by the DOEC. The use of water for dust control or coring/wash boring shall be undertaken in a manner that ensures return water does not enter watercourses;
- Drilling equipment shall have muffled exhaust to minimize noise.
- No person shall deposit or permit deposition of oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds; and
- If possible, drilling shall be scheduled to minimize disturbance to animals in sensitive areas during sensitive time periods.

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Figure 12-8 – Poly Drill Filter Box Used for Solids Removal in Drilling Applications

12.12 WATER WELL

Water well drilling may be required on land during hydrogeological investigations to evaluate groundwater quality and quantity of bedrock aquifers.

Environmental Concerns

The environmental concerns associated with drilling water wells 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.

Environmental Protection Procedures

Potential drilling sites in sensitive areas shall be confirmed by the On-Site Environmental Monitors.

- Drilling sites shall be cleared of vegetation following the procedures detailed in Section, “Clearing of Vegetation”;
- Disposal of all drilling materials and associated solid wastes shall be undertaken in accordance with the procedures in Section, “Solid Waste Disposal”;
- Fuel shall be stored, handled and transported according to Section, “Storage, handling, Use and Disposal of Fuel and Other Hazardous Materials”;
- Drilling equipment shall have muffled exhaust to minimize generated noise; and
- Drilling of water wells shall be conducted in compliance with the *Water Resources Act* and the *Well Drilling Regulations*.

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12.13 MARINE AND RIVERINE ENVIRONMENT

Marine and riverine drilling may be required during geotechnical investigations to determine foundation conditions - assess stability, and underlying seabed or riverbed for Project infrastructure. Drilling shall be conducted from a barge of suitable size.

Environmental Concerns

The environmental concerns associated with this type of geotechnical drilling in a marine/riverine environment include 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) caused by increased turbidity in the area proximal to the drill collar location.

Environmental Protection Procedures

- All drilling equipment on the Project site shall use only oils/lubricants that classify as “biodegradable” (see Section, “Storage, handling, Use and Disposal of Fuel and Other Hazardous Materials” for additional information on the use of biodegradable oils/lubricants);
- Potential drilling sites shall be inspected and accepted by the OSEM prior to drilling proceeding;
- The drill rig shall be inspected for mechanical soundness prior to mobilization to the drill site. Barges used to support drilling shall be inspected and approved prior to drill mounting onto barge. Any drilling activities from a barge in the Churchill River require a request for project review to DFO. If a letter of advice is issued from DFO, all conditions shall be followed. The drill crew shall also keep a daily log of inspections and mechanical soundness of barge and drill. Daily logs shall note the general stability of the drill rig and overall assessment of the surrounding sea/river state;
- Following the initial inspection and prior to each drill mobilization, the drill rig and barge shall be inspected by the OSEM for potential environmental risks;
- All fuel, lubricants and other hydrocarbons shall be stored, handled and transported according to Section, “Storage, handling, Use and Disposal of Fuel and Other Hazardous Materials”. Only necessary quantities shall be stored at the drill rig at any time;
- A spill containment boom shall be deployed around the barge until it is removed from the drill site;

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- Disposal of drilling materials and all solid wastes shall be undertaken according to Section, “Solid Waste Disposal”;
- Drilling equipment shall have muffled exhaust to minimize noise;
- Turbidity from the release of drill water shall be localized to the area of the drill site and shall cease after drilling is complete. Release of suspended solids shall be frequently monitored by the OSEM;
- All discharges shall meet the Environmental Control Water and Sewer Regulations (ECWSR);
- Operations shall be suspended when weather and flow conditions exceed the capabilities of the drill and moorings to operate in a safe and effective manner. Guidelines relating to drill and moorings performance capabilities shall be established by H&S Coordinators and/or OSEM in consultation with the drilling foreman;
- All drill workers shall be familiar with oil spill response procedures (Traffic Services Centre, Oil Spill Report – at sea or on land: 1-800-563-9089). Spill response equipment shall be on the barge at all times. All fuel spills shall be handled in accordance with the Master Spill Response Plan; and
- In the event of a spill, all drilling activity shall cease until clean-up is performed. Priority in the event of a spill shall be the safety of all crewmembers.

12.14 SURFACE WATER AND GROUNDWATER USE

Groundwater and/or surface water may be extracted from wells or intake structures at different project areas including the accommodations complex, concrete batch plant, south side access road, security building and various construction camps.

Environmental Concerns

Environmental concerns associated with water wells include potential for saltwater intrusion, proximity to sources of contamination, and excessive drawdown at the aquifer. Environmental concerns associated with surface water use at the site include excessive removal of water and the potential effect on fish habitat.

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Environmental Protection Procedures

- Wells shall be developed in consultation with the DOEC Water Resources Management Division to avoid areas of groundwater constraint such as potential sources of contamination (septic fields, landfills, etc.), proximity of other wells, and seawater;
- Water extraction rates shall be established, under approval of the Water Resources Management Division, to address concerns for drawdown or potential effects on the water table, and to ensure withdrawal from surface water bodies does not affect the natural flow regime and fish/fish habitat;
- Water withdrawal shall be documented in the Water Withdrawal Form located in Section, “General; Environmental Protection Procedures”;
- Applicable reference documents include *Freshwater Intake End-of-Pipe Fish Screen Guidelines, 1995*, *Freshwater Intake End-of-Pipe Fish Screen Fact Sheet*, *Guidelines for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador, 1998* and the *Policy for Allocation of Water Use W.R. 88-1 (rev 1995)*; and
- If water withdrawal is required, a request for project review to DFO is required. If a letter of advice is issued from DFO, all conditions shall be followed. A water use license is also required from the Water Resources Management Division.

12.15 STORAGE, HANDLING, USE AND DISPOSAL OF FUEL AND OTHER HAZARDOUS MATERIALS

A variety of fuels and potentially hazardous materials will be used during Project construction activities. Gasoline, diesel fuel, grease, motor oil and hydraulic fluids are all needed for equipment. Other potentially hazardous materials, which may be routinely used, include but are not limited to:

- Propane;
- Explosives;
- Acetylene (i.e. welding);
- Oxygen;
- Paints;
- Epoxies;

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- Concrete additives;
- Wood Treatments;
- Antifreeze; and
- Cleaners and solvents.

Environmental Concerns

The primary concern regarding the use of fuel and hazardous materials is their uncontrolled release to the environment through spillage, and the subsequent adverse effects on human health and safety, terrestrial, aquatic and marine habitat and species, soil, and groundwater quality.

Environmental Protection Procedures

General Practices

All fuel, hazardous and controlled product storage areas, including temporary and permanent fuelling and fuel storage facilities shall be designed in accordance with applicable codes and regulations.

The *Storage and Handling of Gasoline and Associated Products Regulations, 2003* (referred to as the “GAP Regulations”) under the Environmental Protection Act controls the construction, operation, and registration of “storage tank systems”¹ in the province of Newfoundland and Labrador.

Information on storage tanks, storage tank systems, and equipment storage tanks proposed for use on the Project shall be provided for review. Tanks that are not already registered under GAP shall be evaluated on a case-by-case basis to determine if GAP Regulations apply. Tank registration shall be accompanied by any necessary regulatory variances.

In general, the GAP Regulations apply to all stationary storage tanks and storage tank systems except in the following cases:

- Tanks with capacities of 2,500 litres or less that are connected to a heating appliance;

¹ The GAP Regulations defines “storage tank system” as an “... atmospheric or low pressure closed tank container and all vents, fill and withdrawal piping associated with it installed in a fixed location and includes temporary arrangement on cradles and skids”.

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- Tanks that are designed, constructed and utilized in the inherent operation of a piece of equipment. In this case, the tanks must be physically secured and dedicated to the equipment requiring the fuel for its operation; and
- "Mobile" tanks (e.g. tank trucks and tank truck trailers) used for temporary, stationary storage. In this case storage period must not exceed fourteen (14) days and no additional fuel can be added to the tank. There must also be a minimum of fourteen (14) days of downtime between separate storage periods and there can be no more than two, fourteen (14) day storage periods within a twelve (12) month time frame.

Note: All provisions of the GAP Regulations, including registration, apply for all tanks associated with mobile generators.

Consideration for the design and construction of storage facilities shall include:

- Contracted fuel suppliers shall comply with the Lower Churchill Project's EPP. A C-SEPP shall be developed by the Contractor, including contingency plans which shall require acceptance by the Project. Before transporting or positioning fuel at the Site the Contractor shall read and accept the Master Spill Response Plan;
- All fuel storage and handling shall be in compliance with *GAP Regulations*. Necessary registrations and variances shall be obtained from Service NL for storage facilities, as required;
- The Master Spill Response Plan that contains information regarding spills of fuel and hazardous materials shall be kept on site near all fuel storage facilities (refer to Section, "Contingency Plans" in addition to fuel suppliers contingency plans);
- Any soil contaminated by small leaks of fuel, oil or grease from equipment (including hydraulic hose ruptures and loss of fluid) shall be disposed of as per policies and guidelines. For larger leaks and spills a disposal plan shall be developed and submitted to regulators for approval;
- The *Used Oil Control Regulations* shall be used to determine requirements for the storage and disposal of used oil;

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- All equipment on the Project site shall use only oils/lubricants² that classify as “biodegradable”³; unless demonstrated by the contractor and accepted that it is not feasible because of:
 - Technical or performance constraints;
 - Negative impacts on equipment warranties;
 - Cost constraints; and/or
 - Unavailability of biodegradable oils and lubricants.
- The Contractor shall document the consideration of this issue providing, as a minimum, the following information:
 - Cost differential in using biodegradable and non-biodegradable oils and lubricants;
 - Life cycle cost differential for equipment maintenance and operation;
 - Product specifications indicating the product meets the definition of “biodegradable” when tested in accordance with the OECD 301b ready biodegradability test procedure; or
 - Reasons (e.g. Technical, market availability, equipment warranty provisions, etc.) for not using biodegradable fluids, should that option be proposed.
- Contractors shall at all times maintain in good condition at least one (1) spill kit dedicated to each piece of fuel-powered equipment. Each spill kit shall be located on the equipment and stored in a weather-proof container. Each spill kit shall have an absorption capacity of no less than 23 litres. Examples of acceptable spill kits with various absorption capacities are as follows:

23 Litre Absorption Capacity

- One (1) 10-liter bag Oclansorb®, or equivalent;
- Two (2) 4-mil heavy duty disposal plastic bag 762 mm x 1219.2 mm;
- One (1) steel hand spade;

² For example: hydraulic oil; multipurpose lubricant; chain oil; form oil; gear oil; transmission fluid; differential fluid; rust proofing; heat transfer fluids; compressor fluid; saw guide oil; electrical insulating fluid; and grease.

³ i.e. the product must be either “readily biodegradable”; or have inherent, primary biodegradability; or inherent, ultimate biodegradability, as defined by the OECD 301 B: Ready Biodegradability Test procedure.

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- Two (2) 100 mm x 1200 mm Sorb Sox®, or equivalent;
- Five (5) sorbent pads 9.5 mm x 431.8 mm x 482.6 mm.

64 Litre Absorption Capacity

- One (1) 13-liter bag Oclansorb®, or equivalent;
- Ten (10) sorbent pads 9.5 mm x 431.8 mm x 482.6 mm or equivalent;
- Two (2) 4-mil yellow heavy duty disposal bag 762 mm x 1.2 m;
- One (1) steel hand spade;
- Two (2) 101.6 mm x 1.2 m Sorb Sox®, or equivalent;
- Two (2) 101.6 mm x 2.4 m Sorb Sox®, or equivalent;

121 Litre Absorption Capacity

- Twenty five (25) sorbent pads 9.5 mm x 431.8 mm x 482.6 mm
- Ten (10) 4-mil yellow heavy duty disposal bag, 762 mm x 1219.2 mm:
- One (1) 44-liter bag Oclansorb®, or equivalent;
- Eight (8) Sorb Sox® 101.6 mm x 1.2 m, or equivalent;
- Five (5) Sorb Sox® 101.6 mm x 2.4 m, or equivalent;
- Two (2) Spillows® 50.8 mm x 431.8 mm x 482.6 mm, or equivalent;
- One (1) spark resistant poly-shovel;
- One (1) Sorb Sox® Boom 177.8 mm x 3 m, or equivalent; and
- One (1) Pair of chemical resistant gloves.

In addition to equipment-dedicated spill kits, the Contractor shall at all times maintain in good condition spill response caches that are accessible within fifteen (15) minutes travel of all work faces and within the immediate vicinity of fuel/hazardous materials storage areas. Each cache shall have sufficient absorption capacity for 1000 litres of fuel or hazardous liquids, and shall contain at a minimum the following:

- Forty (40) hazardous material socks 76.2 mm x 1.2 m;

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- Twenty four (24) hazardous material socks 76.2 mm x 2.4 m;
- Sixty (60) Sorb Sox® 101.6 mm x 1.2 m, or equivalent;
- Sixteen (16) hazardous material pillows 457.2 mm x 457.2 mm;
- Eight (8) 44-liter bag Oclansorb®, or equivalent;
- Eight (8) 13-liter bag Oclansorb®, or equivalent;
- Four (4) 25-pound Qualisorb Gold #628, or equivalent;
- One-hundred (100) hazard material pads 9.5 mm x 431.8 mm x 482.6 mm;
- One-hundred twenty (120) Hi-Point Pads (9.5 mm x 431.8 mm x 482.6 mm), or equivalent;
- Four (4) Neoprene drain cover 914.4 mm v 914.4 mm x 3.2 mm;
- Four (4) 1-pound Container Gap Seal plugging compound;
- Four (4) spark resistant poly-shovels;
- Eight (8) pairs chemical resistant gloves;
- Eight (8) pairs splash goggles;
- Eight (8) pairs Tyvek coveralls;
- Fifty (50) 4-mil yellow heavy duty disposal bags 762 mm x 1219.2 mm;
- Two (2) plastic scoop and brush;
- Eight (8) steel hand spades; and
- Eight (8) 4-kg. Vytac ACX powder acid neutralizer with colour indicator and instructions (for battery acid spills), or equivalent;
 - The *Canadian Transport Emergency Centre (CANUTEC – 613-996-6666)* operated by Transport Canada can assist emergency response personnel in handling dangerous goods emergencies.
 - Waste oils, lubricants, and other used oil shall be reused, recycled or disposed of at an approved, licensed waste management facility in accordance with the WMP (as per the *Used Oil Control Regulations, 2002* and the *Air Pollution Control Regulations, 2004*);
 - Storage areas shall be equipped with firefighting equipment, in accordance with approvals;

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- Smoking shall be prohibited within 50 m of a fuel storage area; and
- Refer to Section, “Buffer Zones” for specific information related to buffer zones required for fuel storage, equipment fuelling and fuel transfer activities.

Fuel Storage Requirements

- Fuel storage tanks shall comply with GAP Regulations and shall be equipped with vacuum gauges and vent pipes, as applicable.
- Waste oil storage tanks shall comply with the *Used Oil Control Regulations, 2002 (NLR 82/02)* (see Figure 12-9 for a typical waste oil tank);
- All bulk fuel and waste oil storage (> 2000 L) shall be in tanks with suitable secondary containment (i.e. double walled, self dyked, lined, earthen dyke etc.);
- Diesel fuel and gasoline to be used for refuelling purposes shall be stored in appropriate 20 L containers (i.e. yellow containers for diesel, red containers for gasoline). Containers shall be clearly identified stating container contents;
- A letter of consent shall be obtained from designated officials of the Service NL for fuel caches of 10 or more 205 L drums (including helicopter fuel caches). A letter of consent is not required for fuel caches under 10 drums;
- A marker stake or flag shall be required for a petroleum products storage site of less than 10 x 205 L drums;
- Empty drums shall be stored and backhauled to nearest receiving community, as per the WMP. Bungs shall be inspected and tightened prior to shipping;
- Boundary poles or posts with colourful flags or a painted marker shall be required for temporary petroleum product sites of 10 to 100 x 205 L drums;
- Fuels stored inside dykes or self-dyked units shall be clearly marked to ensure they are not damaged by moving vehicles and are visible under all weather conditions. Dykes and barriers shall be designed and constructed in accordance with the GAP Regulations (see Figures 12-10 and 12-11 for typical dyked and concrete pad methods for tank installation);
- Used oil can be stored in a 205 L drum as long as the drum is:

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- Clearly marked "used oil";
 - Made of 18 gauge steel;
 - Stored in an area providing secondary containment;
 - Equipped with sufficient size openings to prevent spillage during filling or emptying;
 - Equipped with venting if they are intended to be vacuumed out; and
 - In compliance with CAN/GSSB-43.150-95 if they are to be transported by road.
- All used oil tanks shall be inspected on a regular basis as per Section 24 of the *Used Oil Control Regulation*. All fuel storage tank systems shall be inspected on a regular basis as per Sections 20 and 21 of the *GAP Regulations*. This involves, but is not limited to, gauging or dipping and the keeping of reconciliation records for the duration of the program.



Figure 12-9 – Typical Waste Oil Tank Featuring Vacuum Gauges, Vent Pipe, etc.



Figure 12-10 – Acceptable Fuel Storage with Dykes



Figure 12-11 – Fuel Storage on Concrete pad

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Fuel Transfer

The following procedures shall apply to the transfer of fuel or hazardous material:

- In all cases, a qualified person shall attend the transfer to storage tanks, for the duration of the operation. This person shall be trained in proper fuel handling procedures to minimize the risk of a spill. The attendant shall be trained in the requirements of the fuel suppliers approved Spill Contingency Plan, Master Spill Response Plan (MSRP) and Workplace Hazardous Materials Information System (WHMIS);
- Hoses or pipes used for fuel transfer shall be equipped with properly functioning and approved check valves, spaced to prevent backflow of fuel in the case of failures;
- All tanks shall be dipped before and after filling;
- Fuel transfers between ship and shore or between ships shall be conducted in accordance with the *Canada Shipping Act, Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals (SOR/2012-69)*. Exposed pipelines shall be protected from vehicular collision damage by the installation of guardrails; and
- Exposed “ship to shore” fuel transfer lines shall be clearly flagged from the shoreline to the receiving fuel tank to prevent traffic collision during transfer operations.

Equipment Fuelling and Lubrication

The following procedures shall apply to the fuelling of heavy construction equipment:

- Fuelling and lubrication of equipment shall occur in such a manner as to minimize the possibility of contamination to soil or water;
- When refuelling equipment, operators shall:
 - Use leak-free containers and reinforced rip and puncture-proof hoses and nozzles;
 - Be in attendance for the duration of the operation; and
 - Seal all storage container outlets except the outlet currently in use.
- Regular inspections shall be performed on the hydraulic and fuel systems of machinery. Leaks shall be repaired immediately;

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- Fuelling or servicing of mobile equipment on land shall not be allowed within 30 m of watercourses or waterbodies, except in designated areas with dewatering pumps; and
- Fuelling attendants shall be trained in the requirements under the Contractors Spill Contingency Plan in the C-SEPP and the MSRP.

Hazardous Materials

The following procedures shall apply to the use of hazardous materials:

- Hazardous materials shall be used only by Personnel who are trained and qualified in the handling of these materials and only in accordance with manufacturers' instructions and government regulations. WHMIS and the provisions of the *Transportation of Dangerous Goods Act* shall be implemented throughout the job site. All Employees involved with hazardous materials shall be appropriately trained;
- All hazardous wastes shall be stored, removed and disposed of in accordance with the WMP (as per government regulations and applicable permits);
- Material Safety Data Sheets (MSDS) must be available on-site prior to receipt of any hazardous materials;
- A hazardous waste storage area shall be constructed and properly marked. A permit may be required for construction of this area; and
- Hazardous waste shall not be permitted to be poured down drains, oil/water separators, septic systems or discharged into the environment in any form.

12.15.1 Spills and Leaks of Fuel and Hazardous Materials

The following procedures shall apply to the Spills of Fuel and Hazardous Materials:

- All necessary precautions shall be implemented to prevent the spillage and leakage of fuels and other hazardous materials used during the construction phase;
- All spills of fuel and hazardous materials shall be reported immediately to the On-Site Environmental Monitor. In the event of a spill refer to the Master Spill Response Plan; and
- A copy of the Master Spill Response Plan shall be present on site and in the event of a spill the outlined procedures shall be followed.

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12.16 WOOD TREATMENT

The following standards shall apply to the use of wood preservatives on the site:

- Creosote shall not be used on the site.
- In Protected Water Supply Areas:
 - Treated wood products shall not be used in protected water supply areas;
 - Where written justification for treated wood is presented, for the use in protected water supply areas, for acceptance, the treatment options shall be restricted to Chromated Copper Arsenate (CCA), Ammonical Copper Arsenate (ACA), Ammoniacal Copper Zinc Arsenate (ACZA), Pentachlorophenol (PCP), or Copper Naphthenate (CuN);
 - Table 12-1 below specifies the required buffer zones separating water bodies (within protected water supply areas) from locations where treated wood products, including poles, are to be used:

Body of Water	Width of Buffer Zone
Pond/Lake	150 m (for pond/lake intake structures)
River	150 m for a distance of 1 km upstream and 100 m downstream of river intake structures
Main river channel	75 m
Major Tributaries/Lakes/Ponds	50 m
Other bodies of water	30 m

Table 12-1 – Buffer Zones for Placement of Treated Wood within a Protected Water Supply Area

- If structures are required within these specified buffer zones, then only untreated wood, steel or concrete shall be used; and
- If wood poles are required within the buffer zones outlined in Table 12-1, but untreated wood poles are not practical or feasible, alternative protective measures may be used. However, regulatory approval for such alternative measures shall be required. Specific techniques used to eliminate or minimize environmental disturbance shall be applied as appropriate.

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- Saltwater and Freshwater Areas (other than Protected Water Supply Areas):
 - In areas of low water hardness (i.e., 15-25 mg/L-1 CaCO₃), pH 5.5 or less, and elevated background metals levels, or areas where metals-sensitive biota exist, ACA, ACZA and CCA shall not be used;
 - Pentachlorophenol shall not be used in salt water environments;
 - For temporary installation of wood structures (i.e. bridge abutments or wood poles) within 15 metres of a water body only untreated timber shall be used;
 - For permanent installations, non-invasive materials such as concrete or steel shall be used;
 - If use of untreated wood or alternative materials is not feasible or practical, approval by regulators is required prior to use of CCA, ACA, PCP and CuN; and
 - Protective measures outlined above under Protected Water Supply Areas shall be considered; however, using these alternatives requires preapproval by regulatory agencies.

12.17 SEWAGE DISPOSAL

All sewage disposal activities shall comply with Newfoundland and Labrador's *Health and Community Services Act, 1997* and the *Environmental Control Water and Sewage Regulations, 2003 (65/03)* under the *Water Resources Act, 2003*.

Environmental Concerns

The accidental release of untreated sewage is a concern to human health, drinking water quality, and freshwater and marine ecosystems. This applies to effluent from a sewage treatment system that does not meet the limit set in Schedule A of the *Environmental Control Water and Sewage Regulations, 2003*.

Environmental Protection Procedures

- Development of sewage treatment facilities shall be undertaken in consultation with the relevant regulatory agencies for a temporary or permanent sewage collection system, and a Certificate of Approval shall be obtained from the Service NL and/or the DOEC;

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- The health inspector with the Service NL is the approval authority for sewage flows under 1000 gallons. The general sanitization of the site is under the jurisdiction of the health inspector who shall perform periodic inspections;
- All sewage disposal activities shall comply with Section 36(3) of the Fisheries Act.
- For septic systems, the location of a tile field shall be clearly marked and vehicular traffic shall not be permitted to operate within this defined boundary; and
- Portable washrooms and toilets used at the Lower Churchill Project site shall be routinely inspected and properly maintained by their owners or by the Project as determined by the WMP. Sewage sludge removed from the facilities shall be transported off site for approved treatment and disposal. Companies engaged to perform this work must have approval from the Service NL and/or DOEC. Copies of government approvals must be provided to the On-Site Environmental Monitor before work can proceed. All human sanitary waste must be contained and disposed in a manner that meets all environmental and health requirements. Any concerns must be brought to the immediate attention of the On-Site Environmental Monitors and H&S Coordinator.

12.18 SOLID WASTE DISPOSAL

Environmental Concerns

Solid waste (e.g. construction waste, domestic waste, paper, cardboard, and wood), if not properly controlled and disposed of, can be unsightly, may cause human safety and health concerns, and could negatively affect wildlife.

Environmental Protection Procedures

- A Waste Management Plan for the Generation and LTA phases of the Project is in place to address waste generation, handling, storage and disposal during construction. The WMP includes methods for waste stream separation, collection, storage, transport, disposal and associated schedules. Any procedures or strategies for management of solid waste shall also be in accordance with the Provincial Waste Management Strategy;
- Waste management at the site shall comply with all provisions of the WMP;
- Waste material shall not be deposited in a body of water; and

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- Waste material shall not be deposited anywhere except at a facility or site approved to accept that specific type of waste.
- Cardboard boxes remaining from blasting must be burned. This is a requirement of federal blasting regulations, Section 13 – Pre-Firing and Firing Requirements, (18).

12.19 WORKING WITHIN 15 METRES OF A BODY OF WATER

Environmental Concerns

Working close to water bodies poses a risk of introducing contaminants into the aquatic ecosystem, affecting fish, fish habitat, and other receptors, and affecting the natural flow regime of the water body. Contaminants such as sediment, petroleum hydrocarbons, and other deleterious substances may impact fish, wildlife, plants, and human receptors. Proper protection plans are required to minimize or eliminate sedimentation and water pollution and maintain riparian habitat near water bodies.

Environmental Protection Procedures

Mitigation measures provided in various sections (refer to Sections, “Erosion Prevention and Sediment Control”, “Storage, Handling and Disposal of Fuel and Other Hazardous Material”, and “Buffer Zones”, etc.) shall be consulted to ensure that appropriate measures are understood and implemented during the course of construction. Work within 15 m of a body of water requires a permit under Section 48 of the *Water Resources Act*.

In addition, the following steps shall be taken to ensure protection of water bodies:

- A joint engineering and environmental reconnaissance of the site shall be completed in the early planning stages to identify all nearby bodies of water and mitigation and protective measures shall be identified;
- Where possible, the majority of construction works shall take place during low flow and low rainfall period;
- Any vehicles or equipment working near a body of water shall be clean and in good condition;
- Heavy equipment shall be kept outside the high water mark of all bodies of water, where possible; and

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- All equipment on the Project site shall use only oils/lubricants that classify as “biodegradable” where feasible (refer to Section “Storage, Handling and Disposal of Fuel and Other Hazardous Material” for additional information on the use of biodegradable oils/lubricants).

12.20 WATERCOURSE CROSSING – FORDING, CULVERTS AND BRIDGES

Environmental Concerns

The environmental concerns associated with fording, culvert installations, bridge construction and maintenance include direct disturbance to, or mortality of, fish, disturbance to waterfowl, loss of fish habitat caused by sedimentation and removal of substrate, and disturbances to stream bank vegetation.

Environmental Protection Procedures

Erosion stabilization methods and effective sedimentation control practices shall be implemented when required (refer to Section, “Erosion Prevention and Sediment Control”), and these shall conform to requirements, guidelines, and principles contained in DFO FactSheets, Operational Statements, DOEC Environmental Guidelines, and specific requirements of regulatory permits and approvals.

All watercourse crossings (fording, culvert installation and bridge crossings) shall comply with permits issued by DOEC. In addition, a notification form or a request for Project review to DFO is required. If a letter of advice is issued for Works and Undertakings Affecting Fish Habitat from DFO, all conditions shall be followed.

The following measures shall be implemented to minimize negative effects of watercourse crossings:

- Attention shall be given to scheduling in order to minimize the time the watercourse is disturbed and therefore minimize the sediment entering the watercourse. The ideal time for construction is during low flow and low rainfall period;
- Any alterations to a body of water, which may impact navigation shall require a Navigable Waters Permit Application under *Navigable Waters Protection Act (NWP)* request for project review under NWP from Transport Canada (TC). If a NWP authorization is issued, the conditions shall be adhered to;
- Any alterations to a body of water which may impact water quality shall require a DOEC permit(s) under the *Water Resources Act*;
- Watercourse crossing construction activities, in areas of fish habitat, shall be undertaken in accordance with DFO requirements and under the direct guidance of the OSEM;

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- All water courses and bodies of water shall be examined by the OSEM or sub-contractors on a site-specific basis in order to evaluate each watercourse crossing (including upstream and downstream);
- Work shall be performed in such a way as to ensure that materials such as sediment, fuel and oil do not enter watercourses and water bodies;
- The banks and flood plains of watercourses must be adequately protected from erosion using an applicable erosion prevention method as outlined in Section, “Erosion Prevention and Sediment Control”;
- A suitable buffer (refer to Section, “Buffer Zones”) of undisturbed natural vegetation shall be left between the access road and the bank of any adjacent watercourse, unless otherwise specified. The typical buffer width shall be determined in consultation with the OSEM according to the following formula:
 - *Buffer width (m) = 20 m + 1.5 x slope (%) (where slope >30%);*
 - The buffer width for reservoir clearing shall be 15 m (slope distance); and
 - Refer to Section, “Buffer Zones” for buffer widths related to temporary fuelling services or washing of equipment near watercourses or waterbodies.

Fording

When fording any watercourse, the DOEC Environmental Guidelines for Fording and the DFO fact sheet for Temporary Fording Sites shall be followed in conjunction with the following:

- Areas of known or suspected spawning habitat shall be avoided;
- Where feasible, crossings shall be restricted to a single location and made at right angles to the watercourse;
- Equipment activity within the watercourse shall be minimized by limiting the number of crossings;
- All equipment shall be clean and mechanically sound to avoid the introduction of oil, gasoline, and hydraulic fluids to waterbodies;
- No servicing or washing of heavy equipment shall occur adjacent to a watercourse, waterbody, or ecologically sensitive area. These areas shall be identified on constraint mapping and shall be identified in the field by the OSEM;

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- Where the ford area is not natural bedrock or is easily disturbed by fording, the entire fording area shall 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; 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 under the guidance of the OSEM;
- 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;
- Photographs of all ford sites shall be taken prior to and after the fording has been completed. The OSEM shall be responsible for collecting these photographs. However, the Contractor may take photographs on behalf of the OSEM in order to continue with its works. The Contractor would then be responsible for providing these photographs to the OSEM within 24 hours ;
- Waterbodies shall not be forded during high flow periods;
- All bank sections, which contain erodible materials shall be stabilized or avoided if possible. 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 shall be deposited above the high water mark of the watercourse; and
- Proposed fording activities on waterbodies or water courses visible on 1:50,000 scale maps shall require a permit from DOEC.

Culverts

In those locations where installations or upgrading of existing culverts are required, permits are required from DOEC. In addition a request for project review to DFO may be required. If a letter of advice is issued from DFO, all conditions shall be followed.

The culverts used shall be sized to handle the 1-in-100 year return period flood. However, design criteria may vary depending on site-specific conditions and the length of time a culvert will be used (i.e. temporary vs. permanent), and shall be constructed in accordance with the DOEC Environmental Guidelines for Watercourse Crossings and Culverts, the DFO operational statement for Culvert Maintenance, as well as the DFO fact sheets for Culvert Installations. The following measures shall also be implemented:

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Installation of Culverts

- Install culvert(s) in accordance with good engineering and environmental practice. Photographs of culvert installation are shown as Figures 12-12 and 12-13;
- Proposed culvert installations on water courses visible on a 1:50,000 scale map shall require a permit from DOEC;
- Unless otherwise indicated, all work shall take place in dry conditions, either by the use of cofferdams or by diverting the stream with pumps and hoses. All work involving major alterations to stream channels shall be carried out at a time of low flow, in a manner that prevents downstream sedimentation;
- Cylindrical culverts shall be counter sunk when installed in fish habitat (as recommended by DFO) such that the culvert bottom is one-third 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 bottom shall be installed a minimum of 300 mm below the streambed;
- If two (2) culverts are to be installed at one (1) location, one (1) culvert shall be installed at an elevation lower than the other one. A maximum of two (2) culverts are allowed at one (1) location;
- The natural low flow regime of the watercourse shall not be altered; culverts shall not disrupt flow of water or cause ponding at the upstream side of the installation;
- A culvert shall not be installed before Site-specific information such as localized stream gradient, fish habitat type and species present have been evaluated, as required;
- When rock energy dissipaters are utilized at culvert outlets, proper fish passage shall be ensured;
- Photographs of all culvert installations shall be taken prior to and after the installation has been completed. The On-Site Environmental Monitor shall be responsible for collecting these photographs;
- Inlet and outlet areas shall be adequately protected from erosion by installing erosion prevention structures as outlined in Section, "Erosion Prevention and Sediment Control";
- Culverts shall be of sufficient length to extend a short distance beyond the toe of the fill material;
- Backfill material shall be of texture that shall support the culvert and limit seepage and subsequent washing out;

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- Culverts shall be aligned such that the original direction of stream flow is not significantly altered and the gradient at the culvert follows the stream channel gradient to the extent possible. Infilling or reduction of the natural cross-sectional area of the watercourse shall not be permitted;
- Fill and construction debris shall be removed from the culvert area to a location above the peak flow level to prevent its entry into the watercourse;
- Construction activity shall be confined to the immediate area of the culvert;
- Fill material shall not be removed from streambeds or banks except when removal of material is necessary to ensure a flat foundation for installing a culvert;
- The use of heavy equipment in watercourses or bodies of water shall not be permitted;
- Culverts shall be marked to indicate their position under the snow;
- As required, cofferdams of non-erodible material shall be installed above and below work areas to separate them from the watercourse when excavating for culverts and footings. All sandbags used in construction must be accounted for and removed after work is completed. Where pumping is used to bypass flow, pumps shall have sufficient capacity to prevent washout of the cofferdams. Refer to DFOs fact sheet for Instream Work in the Dry – Cofferdams;
- Cofferdams shall be removed upon completion of construction and the streambed returned as closely as possible to its original condition;
- Water pumped from work areas or other runoff must have sediment and turbidity removed by settling ponds, filtration, or other suitable means before discharging to a waterbody;
- The release of sediment laden water into a waterbody, watercourse or ecologically sensitive area, due to construction activities, shall comply with applicable discharge guidelines as presented in the Newfoundland and Labrador Environmental Control Water and Sewage Regulations, 2003 under the Water Resources Act;
- With respect to maintenance of water quality within receiving waterbodies on and around the Site, the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life shall be used; and;
- Culvert installations shall not require a DFO review when the following conditions are met (unless the culvert installations are within fish habitat):

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- 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; and
- The work does not include any dredging, infilling (e.g., filling scour pools) or excavation of the channel upstream or downstream of the culvert.

Culvert Upgrading/Maintenance

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 and well as reinforcement of eroding inlets and outlets. The following measures shall be implemented when upgrading/maintaining culverts:

- In locations where upgrading and/or alterations are required for existing culvert at the Site, the mitigation measures listed above for installation of a culvert shall be reviewed and followed, as applicable;
- Culverts shall be inspected regularly so that immediate action can be taken to clear blockages caused by ice or debris and to identify any apparent problems, such as erosion, which may require remedial action;
- An inspection of culverts shall be made during and after major floods to observe the culvert operation and record high water marks. Conditions, which require corrective maintenance, shall be noted, including debris accumulations, sedimentation, erosion, piping, scour, and structural damage and reported if applicable;
- Culverts which have been damaged by ice or debris, by improper installation or construction procedures, or are in a condition which could impair their proper functioning shall be replaced immediately to prevent overtopping, erosion, or flooding;
- Access for maintenance shall be provided, especially where debris control structures are installed. Such access shall not disrupt the site rehabilitation efforts; and
- During rehabilitation activities following the end of construction, culverts within the flood zone (below LSL) may be left in place and flooded during reservoir impoundment. Culverts above the LSL shall be removed.

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Figure 12-12 – Example of a Well Installed Culvert



Figure 12-13 – Example of Culvert Installation

Bridges

- Environmental protection measures outlined above which are applicable to bridge construction and maintenance shall be adhered to;
- Any proposed bridge installations require a permit from DOEC. In addition, a request for project review or project notification to DFO is required. If a letter of advice is issued from DFO, all conditions shall be followed;
- Photographs of all bridge installations shall be taken prior to and after the installation has been completed. The On-Site Environmental Monitor shall be responsible for collecting these photographs;
- During bridge construction all applicable guidelines shall be adhered to including but not limited to: DOEC Environmental Guidelines for Bridges and Watercourse Crossings, DFO Clear Span Bridges Operational Statement, DFO Fact Sheet for Temporary Bridges, and DFO Fact Sheet for Bridge Construction/Demolition;
- To safely convey peak flows, permanent bridges shall be designed for a 100-year return period stream flow;
- Temporary bridges shall consider the following basic design criteria:
 - Hydraulic design shall be based on the 1:2 year storm event;
 - Abutment logs shall be placed a minimum of 1 meter from the top of the bank;
 - Deck height shall be a minimum of 250 cm above the bank height; and
 - Deck height shall be a minimum of 450 cm above the water surface at the time of installation.

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- Each installation shall take into consideration Site-specific conditions and appropriate criteria shall be accepted by the OSEM;
- The upstream and downstream sides of abutments must be protected with erosion prevention structures as outlined in Section, “Erosion Prevention and Sediment Control”, to prevent erosion and scouring;
- Roadside embankments near the watercourse shall be adequately protected from erosion by installing applicable erosion prevention structures as outlined in Section, “Erosion Prevention and Sediment Control”;
- Adequate erosion protection as per Section, “Erosion Prevention and Sediment Control” shall be provided where roadside ditches discharge into the watercourse near the bridge;
- Abutments and piers shall be constructed in the dry and where possible during times of low flow;
- During construction of concrete components, formwork shall be constructed to prevent any fresh concrete from entering bodies of water. Dumping of concrete or washing of tools and equipment in any body of water is prohibited;
- Periodic maintenance such as painting, resurfacing, clearing of debris, or minor repairs, shall be carried out without causing any physical disruption of the watercourse. Care shall be taken to prevent spillage of pollutants into the water;
- All waste materials shall be disposed of in accordance with the WMP;
- All areas affected shall be returned to a state that resembles local natural conditions; and
- During rehabilitation activities following the end of construction, all temporary bridges shall be removed.

12.21 BUFFER ZONES

Environmental Concerns

The potential for erosion/sedimentation, spills, etc. and resulting effects on water quality, fish and fish habitat is a key environmental concern associated with construction activities. In addition, sensitive and rare environmental receptors (e.g. Osprey nesting sites, archaeological/historic resources, etc.) require protection from activities associated with construction.

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Buffer zones of natural vegetation or undisturbed areas that separate these environmental receptors from construction activities are needed to mitigate adverse environmental effects. These undisturbed areas may also provide wildlife habitat and/or travel corridors near work areas and Project features.

Due to the many buffer zones referenced in various government documents and others that may be stated in regulatory permits yet to be obtained, the appropriate buffer zone to use in a specific area may vary over time.

Therefore, the OSEM shall be the only site-based Personnel to determine, which buffer is applicable, and Contractors shall be required to consult with these individuals prior to establishing buffers. For general guidance, however, the following procedures shall define the minimum requirements during construction.

Environmental Protection Procedures

- DFO recommends buffer zones to separate areas of land disturbance/roadways from water bodies, which shall be calculated by the following formula:

$$\text{Buffer Width (m)} = 20 \text{ m} + 1.5 \times \text{slope (\%)} \text{ (where slope >30\%);}$$

- A minimum 15 m (slope distance) vegetation buffer shall be maintained for reservoir clearing;
- A minimum buffer zone of natural vegetation 20 m from the high water mark of waterbodies, watercourses and ecologically sensitive areas shall be maintained around work areas where available space poses a constraint, except where specified otherwise. If the available space allows, then wider buffer zones of 100 m shall be maintained between construction areas and watercourses, waterbodies and ecologically sensitive areas (Figure 12-14 shows a typical buffer zone being protected by tarp fencing);
- Sediment control devices shall be constructed outside buffer zones as required. This is required to control runoff from areas of exposed soils and prevent transport of sediments towards water bodies. Section, "Erosion Prevention and Sediment Control" outlines all acceptable sediment control measures;
- All aircraft must maintain a 300 m vertical and horizontal buffer from known active raptor nests between May 15 to August 15;

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- No clearing shall take place within 800 m of an active raptor nest between the months of May 15 to August 15;
- For all work activities other than clearing, a 200 m buffer shall be respected for active raptor nests from May 15 to August 15. Within this 200 m buffer zone the following applies, after consultation with the provincial government:
 - Only essential vehicular activity shall be permitted;
 - Work shall only be permitted in the presence of the OSEM; and
 - Crews shall cease work if there is a disturbance at a nest until activity at the nest has returned to normal; work shall not commence again until approval from the On-Site Environmental Monitor.
- Crews shall not establish a permanent or temporary camp within 800 m of a known raptor nest;
- Locations along the Churchill River are known as spring and fall staging areas for waterfowl and harlequin ducks. Helicopters moving through these areas during this time (typically May or September) shall maintain a minimum altitude of 500 m from concentrations of waterfowl and harlequin ducks;
- For known harlequin duck nesting areas, a 100 m buffer of natural vegetation shall be maintained along the river's edge during their breeding, nesting and staging times (May through September). A 30 m buffer shall be maintained outside the sensitive nesting season. Clearing and construction within these buffers during this time shall not occur unless otherwise authorized;
- Buffer zones for other bird species not indicated in this document are outlined in the Avifauna Management Plan and shall be respected;
- A minimum buffer zone of 100 m shall be maintained from the high water mark of waterbodies, watercourses and ecologically sensitive areas around any bulk fuel storage activities;
- The typical buffer zone for quarries and borrow pits in relation to a water body is 100 m. In some instances the development of quarries and borrow pits shall be allowed within this 100 m buffer zone, however applicable permits from regulators shall be required, as well as consultation with the On-Site Environmental Co-ordinator;
- A minimum buffer zone of 50 m shall be maintained around any archaeological site. The size of buffer zones may increase or decrease depending on the type of site and the buffer zone may be revised based

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on direction from the Provincial Archaeology Office (PAO). Where the site has been designated for recovery and/or recording the buffer zone shall be maintained until it has been cleared by the OSEM. Where available space poses constraints, this width may be reduced and supplemented by other protective measures. Site-specific mitigative measures for known historic resources in the Project area are addressed within Section, “Historic and Archaeological Resources”; and

- Buffers for working around caribou are outlined in Section, “Wildlife Protection”.

Table 12-2 provides a summary of all buffer zones.



Figure 12-14– Tarp Fence Outlining a Vegetation Buffer Zone

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Activity	Environmental Receptor	Recommended Width (m) of Buffer Strip
Handling, use and storage of bulk fuels (> 2000 L)	Waterbody	100 m
Storage and handling of small quantities (<2000 L) of fuel in appropriately contained areas and with adequate spill response	Water body	30 m
Handling and use of fuels (including transfer and fuelling of equipment). Storage of fuel in containers ≤25 L	Waterbody	15 m
Linear Developments/ Clearing of Vegetation	Waterbody	20 m (+1.5 x slope (%) where >30%) 15 m buffer for reservoir clearing
	Active Raptor Nests	800 m (between May 15 – August 15)
Other Work Activities	Active Raptor Nests	200 m (between May 15 – August 15)
Aircrafts	Active Raptor Nests	300 m (vertical and horizontal)
	Waterfowl and Harlequin Duck Concentrations	500 m vertical distance
Quarrying and Aggregate Removal from Borrow Areas	Waterbody	100 m
All Activities	Archaeological sites	50 m
Cutting	Black Bear Denning Sites (Late October – Late April)	50 m*
Cutting/Construction	Harlequin Duck	100 m* during nesting, breeding and molting seasons (Early May through September) 30 m* outside the sensitive time
Cutting/Construction	Active waterfowl/waterbird nests (species not of management concern)	100 m
Cutting/Construction	Active passerine nests (species not of management concern)	30 m
Cutting	Waterbody occupied by a beaver	30 m

Table 12-2 – Recommended Buffer Strips for Various Activities

Buffer Zone Widths May Vary Once Cutting Permits Are Obtained

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12.22 ALTERATIONS TO A BODY OF WATER/ INSTREAM WORKS

Environmental Concerns

The environmental concerns associated with alterations to a body of water include direct disturbance to, or mortality of, fish, disturbance to waterfowl, loss of fish habitat caused by sedimentation and removal of substrate, and disturbance to stream bank vegetation. Typical alterations to a body of water include fording, bridges and culverts. However, other less common alterations include cofferdams, pumping and stream diversions. Fording, bridges and culverts have been discussed in subsequent sections therefore this section shall concentrate on cofferdams, pumping and stream diversions.

Environmental Protection Procedures

- Any work within 15 m of a water body visible on a 1:50,000 scale map shall require a permit from DOEC. A request for project review shall be submitted to DFO. If a letter of advice is issued by DFO, the conditions of the letter shall be adhered to;
- Erosion stabilization methods and effective sedimentation control practices shall be implemented when required, and these shall conform to requirements, guidelines, and principles contained in DFO Fact Sheets, Operational Statements, DOEC Environmental Guidelines and specific requirements of regulatory permits and approvals;
- Two (2) cofferdams or a square type structure shall be used for best results. The first cofferdam shall be upstream of the construction area and shall keep the construction area dry and provide a basin for water to be pumped. The second cofferdam shall be downstream of the construction area and shall prevent any sediment laden water that may have accumulated in the construction area from discharging directly into the watercourse;
- Pumping the water shall commence prior to starting intrusive work to prevent the river from being silted as water passes the work area. When a watercourse is too large to divert by other measures, part of the river may be blocked off to allow work to take place in dry conditions. 1/3 the width of the watercourse or less shall be blocked at any time in order to ensure efficient remaining capacity in the channel to safely accommodate flow without causing excessive high velocity, erosion or overtopping of banks. A dewatering plan shall be developed prior to dewatering activities;

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- An alternative means of isolating the work area shall be to construct a temporary diversion channel lined with plastic sheeting or an impermeable material. The channel shall be designed to handle the predicted flows of the watercourse. Figure 12-15 shows typical cofferdam usage in a river and Figure 12-16 illustrates the usage of a stream diversion coupled with cofferdams;
- Floating silt curtains or suitable alternative shall be used to contain and control the dispersion of turbidity and sediment when working in or near a waterbody;
- The curtain shall be located beyond the lateral limits of the construction site;
- The alignment shall be as close as possible to the activities but not so close as to be disturbed by the construction equipment;
- The curtain shall be firmly anchored in place by posts; and
- The Contractor shall remove built up sediment and debris as required; if the fabric becomes clogged it shall be replaced.



Figure 12-15 – Cofferdams Surrounding Work Area

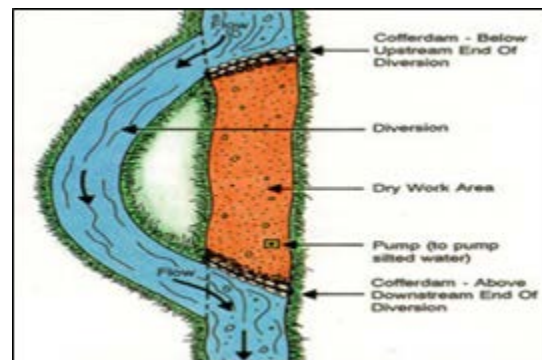


Figure 12-16 – Illustrations of Stream Diversion and Cofferdam

Fish Habitat and Relocation

- A license to conduct fish sampling/collection permits shall be obtained from DFO prior to any sampling, collection or relocation activities;
- The waterbody shall be de-watered using a screened pump which shall be deployed on a floating structure near the deepest portion of the pond/river. The pump shall be monitored during all de-watering. The water shall be directed to a vegetated area so that any sediment carried by the pump shall

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be further filtered through vegetation before reaching another water body. The pumped water and the screen shall be monitored for fish during all pumping. Optimally, the isolated section of river shall be reduced to a small containment area capable of being electrofished/ seined by boat;

- If soft sediment moves toward the deeper part of the area during draw-down, this will effectively reduce the size of the area and shall require careful monitoring of water levels so that too much water is not removed hence trapping all fish in a thick layer of sediment;
- Electrofishing inside the small containment area left after de-watering shall be conducted by a small boat so as to reduce the amount of sediment disturbance. Other techniques shall be available should electrofishing become inefficient due to increased sediment disturbance (e.g. seining and/or casting net). The boat shall be of a non-conducting material so that the electrofisher will not short out (e.g. zodiac, fibreglass/plastic canoe). A second small boat shall be used to transport any captured fish to shore so that disturbance of bottom sediment is minimized. This boat shall be moved between the shore and collection boat by ropes. This may be modified in the field as necessary;
- Water temperature will be another critical factor in successful relocation of all fish, as the reduced pond will warm relatively quickly. Optimally, it would be desirable to begin collection of fish in the early morning hours. Coordination of the draw-down shall be conducted to ensure this can occur. Water temperature shall be monitored continually and any exceedance of the Experimental License requirement shall mean a stop in collection, is required. However, this may be a field-call as pausing once the isolated section of river is reduced may cause more harm than completing the relocation. This situation shall be avoided;
- Monitoring shall include recording water temperatures, dissolved oxygen levels, pH, and visual observations of stress and/or overcrowding. If signs of stress and/or overcrowding are observed, additional measures may be required that will be developed and followed by Nalcor. These additional measures will be provided to DFO in a Fish Stranding/Relocation Plan for their review, prior to the initiation of any dewatering activities (including infilling of the Diversion Head Pond).
- Once the isolated section of river has been de-watered, the small containment area shall be electrofished, seined, and/or netted to remove any remaining fish;
- All fish shall be contained in 20 litre buckets for transport to the release point. Each bucket shall be relocated once five (5) fish are exceeded or thirty (30) minutes have passed so that stress is avoided;

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- All fish shall be acclimatized prior to release. Each bucket shall be laid into the receiving water so that water temperatures between both are equal (measured using thermometers). Once acclimated, fish shall be released;
- An estimate of the length of each fish shall be obtained in order to calculate the total weight of the fish;
- Experienced Personnel shall be responsible for capture and release of the fish. The person responsible for capture shall be familiar with all equipment and shall be able to adjust the voltage on the electrofisher as water levels and conductivities change. They shall also be able to detect signs of fish stress. The person responsible for fish release shall be experienced in acclimating fish and monitoring their health. They shall also be able to estimate fish species and lengths; and
- If dewatering is required as part of the execution of work, a dewatering plan shall be developed as part of the C-SEPP.

12.23 WORK IN / AROUND MARINE ENVIRONMENT

Environmental Concern

The principle environmental concerns from marine construction include the release of fines, hazardous liquids, and toxic substances to the water and substrate, and disturbance to fish and fish habitat. Marine construction activities can also disturb near shore terrestrial habitat and cause seabirds, waterfowl and marine mammals to avoid the area.

Environmental Protection Procedures

- Work in and around the marine environment shall require a permit for the Alteration of a Waterbody under the *Newfoundland and Labrador Water Resources Act*, and the *Federal Navigable Waters Protection Act*. In addition a request for project review to DFO may be required for infilling. If a letter of advice is issued from DFO, all conditions shall be followed;
- Clean blasted rock shall be used for infilling. Armour stone protection shall be placed progressively to minimize erosion and to prevent the loss of infill material. All blasted material shall be taken from an approved quarry site;
- The operation of heavy equipment shall be confined to dry, stable areas or approved barges;
- Infilling shall be done in compliance with the *Navigable Waters Protection Act* authorization;

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- Any timber cribbing used for construction of temporary or permanent structures shall consist of untreated wood (or preservatives safe for the marine environment);
- Sedimentation prevention methods as outlined in Section, “Erosion Prevention and Sediment Control” shall be used where appropriate to control sedimentation into the marine environment during infilling;
- Refer to Section, “Alterations to a Body of Water/Instream Works” for silt control procedures in water works;
- All equipment shall have muffled exhausts to minimize noise;
- Fuelling of equipment shall follow the buffers outlined in the Buffer Zone section (refer to Section, “Buffer Zones”);
- All vehicles shall be clean and in good repairs. Regular mechanical inspections for leaks on all equipment shall be made and repairs undertaken immediately; and
- The Master Spill Response Plan and appropriate spill kits for equipment shall be available on-site (refer to Section, “Storage, Handling, Use and Disposal of Fuel and Other Hazardous Materials”).

12.24 GRUBBING AND DISPOSAL OF RELATED DEBRIS

Environmental Concerns

The principal concerns associated with grubbing and disposal of related debris are the potential effects of erosion and sedimentation on marine and freshwater ecosystems and water quality.

Environmental Protection Procedures

All grubbing and disposal of related debris near watercourses shall adhere to relevant regulatory requirements, including the permits from DOEC and the formal “Letters of Advice”, “Operational Statements”, and/or Authorizations for Works or Undertakings Affecting Fish Habitat from the Fisheries and Oceans Canada.

Other specific measures to be undertaken to minimize potential effects on aquatic habitat and resources are as follows:

- Grubbing activities shall be limited to only those areas that are required for Project development;

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- Grubbing of the organic vegetation mat and/or the upper soil horizons shall be minimized. These shall be left in place where possible. Limits of stripping and/or grubbing shall be shown on all drawings issued for construction;
- The organic vegetation mat and upper soil horizon material, which has been grubbed, shall be spread in a manner that attempts to cover exposed areas. Any surplus material shall be stored or stockpiled for site rehabilitation and revegetation purposes elsewhere in the Project area. Topsoil and peat shall be stockpiled separately from the overburden and separated by a buffer zone (refer to Section, “Buffer Zones”) from any waterbodies, watercourse or ecologically sensitive areas. The location of the stockpiles shall be shown on drawings issued for construction and accessible for future rehabilitation purposes;
- A minimum of 5 metres shall separate stockpiles of grubbed material from standing timber;
- Grubbed material and/or topsoil shall be stored in low piles to decrease the effect of compaction on structure. Stockpiles of topsoil shall be seeded or otherwise protected using erosion control methods as outlined in Section, “Erosion Prevention and Sediment Control” to prevent erosion and loss of nutrients. This is especially important if stockpiles are to remain in place for periods of a year or more;
- Overburden and topsoil from grubbing activities shall be stored, and stabilized, for the purpose of future rehabilitation;
- Erosion prevention and sediment control measures shall be installed to minimize and control runoff soil erosion and transport of sediment laden water during grubbing and the re-spreading and stockpiling of grubbed materials. Section, “Erosion Prevention and Sediment Control” outlines all acceptable prevention and control methods (i.e. use of sediment ponds);
- Where grubbed materials are re-spread or stockpiled, as many stumps and roots as possible shall be left in place to maintain soil cohesion to dissipate the energy of runoff, and promote natural re-vegetation;
- The length of time that grubbed areas are left exposed to the natural elements shall be minimized to prevent unnecessary erosion. These areas shall be monitored for erosion and such findings shall be reported to the OSEM;
- During grubbing, care shall be taken to ensure that grubbed material shall not be pushed into areas that are to be left undisturbed (Figures 12-17 and 12-18 show examples of grubbing activities and a grubbed right-of-way);

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- Grubbing shall be avoided on steep slopes near watercourses. A buffer zone shall be maintained between grubbed areas and watercourses, waterbodies and ecologically sensitive areas (refer to Section, “Buffer Zones”). Grubbing limits adjacent to watercourses shall be flagged in the field prior to undertaking grubbing/stripping activities;
- Grubbing and other debris shall not be permitted to enter any watercourse;
- Bog and other wet material that is excavated from the site shall be piled and graded on well drained ground in low piles. The piles shall be seeded or otherwise protected using erosion control methods as outlined in Section, “Erosion Prevention and Sediment Control”; and
- Where the piles are in the transmission line right-of-way they shall not impede access to the line for future maintenance or access.



Figure 12-17 – Example of Grubbing Activities



Figure 12-18 – Example of a Grubbed and Cleared Path

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12.25 QUARRYING AND AGGREGATE REMOVAL FROM BORROW AREAS

Environmental Concerns

The principle concerns for quarry development and associated aggregate removal include the potential for impacts on aquatic systems, loss of terrestrial habitat and historic resources, potential quarry development/rehabilitation plans.

Environmental Protection Procedures

The following measures shall be implemented to minimize these effects:

- Permits to quarry shall be obtained from the NL Department of Natural Resources before quarries are established. Quarry activity shall be undertaken in compliance with these quarry permits and shall comply with all other relevant regulations;
- Quarries shall be located 100 m from a water body unless otherwise approved by the Department of Natural Resources. If approved, additional mitigative measures may be required;
- The development of quarry sites and rock excavations shall require monitoring to determine the absence or presence of sulphide bearing rock. For environmental protection against Acid Rock Drainage (ARD), the OSEM shall visually inspect bedrock before, during, and after excavation work on a periodic basis. Previous surveys have indicated that materials at the site are Not Potentially Acid Generating (NPAG), however in the event that visible evidence of ARD is noted, the OSEM shall be notified immediately. Visible evidence of ARD is typically a yellowish colour of water or sediment called yellow boy or evidence of sulphides in rock. Photographs of yellow boy and sulphides (Figures 12-19– 12-21) are shown below:



Figure 12-19 - Photograph of Yellow Boy Water Run-off



Figure 12-20 - Photograph of Yellow Boy Water Run-off

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Figure 12-21 – Photograph of Yellow Boy Run-off

- Quarry areas shall be developed in a controlled manner so as to minimize potential environmental effects and quarry locations shall consider sensitive wildlife areas. The following protection procedures shall be implemented to minimize disturbance and facilitate rehabilitation:
 - A buffer zone of undisturbed vegetation shall be maintained between borrow areas/quarries and watercourses, waterbodies and ecologically sensitive areas (refer to Section, “Buffer Zones”);
 - The quarry area, stockpile area and limits of clearing shall be staked and/or flagged to prevent over-extension of the development, (corner posts at least 1 metre high above ground shall be installed to mark the quarry area);
 - The area to be excavated shall be clear cut of all vegetation prior to grubbing, excavation or removal of any material. Only the area necessary for one year’s production shall be cleared;
 - All stumps, organic matter and topsoil shall be stripped from the area to be excavated and stockpiled at least 5 m from uncleared areas; stockpiles shall be kept at least 10 m from the area of excavation; separate overburden piles shall be developed where this material is present; topsoil and the underlying overburden shall not be mixed (refer to Section, “Grubbing and Disposal of Related Debris”);
 - Stockpile areas are to be confirmed by the OSEM, prior to stripping;
 - Upon completion of excavation of a quarry, no cliff faces or benches shall be left at a height of greater than 5 m. Available material left over from quarrying and stockpiled overburden shall be

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used to minimize slopes and face heights and to rehabilitate the area (refer to Section, “Site Rehabilitation”);

- Each quarry shall be evaluated by the On-Site Environmental Monitor on a Site-specific basis to determine whether the cliff faces shall be converted to rubble slopes; and
- Following sloping, the topsoil and any organic materials shall be re-spread over the disturbed area to promote natural re-vegetation by adjacent seed sources (refer to Section, “Site Rehabilitation”).
- In order to prevent sedimentation of waterbodies, watercourses and ecologically sensitive areas, sediment control measures (basins and traps) shall be established, if required, and cleaned on a regular basis, as required, to ensure that the retention capacity is maintained at all times. Section, “Erosion Prevention and Sediment Control” outlines all acceptable sediment control measures;
- The Total Suspended Solid (TSS) content of construction-altered water that is released into a natural waterbody shall not exceed 30 milligrams per litre⁴ and be in compliance with *Environmental Control Water and Sewage Regulations, 2003*;
- With respect to maintenance of water quality within receiving waterbodies on and around the Site, the *CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life* shall be used;
- The pH level of construction-altered water that is released into a natural waterbody shall be between 5.5 and 9 pH units and be in compliance with *Environmental Control Water and Sewage Regulations, 2003*;
- Dust from aggregate processing, storage and handling shall be controlled with water as required during times when temperatures are above freezing. A water use license must be obtained from DOEC; and
- If crushing activities in the quarry require a water source, A water use license is also required from the Water Resources Management Division; Quarry operations shall consider sensitive wildlife periods as outlined in Section, “Scheduled and Timing of Construction Activities”.

⁴ If water is being abstracted from a water course, used, treated and subsequently returned to the same water course, these solids data mean that the effluent shall not contain more than 30 milligrams per litre more than was in the water originally abstracted.

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12.26 TRENCHING

Environmental Concerns

Where linear excavations for the construction of water lines or any other infrastructure is undertaken, potential runoff of sediment-laden water could result in effects on marine or freshwater fish and fish habitat, water quality and historic resources.

Environmental Protection Procedures

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

- Topsoil and excavated overburden and bedrock shall be stored in separate stockpiles for later use during rehabilitation;
- Any unsuitable material shall be disposed of in a disposal area to be confirmed by the On-Site Environmental Monitor;
- Dewatering of trenches, as outlined in Section, “Dewatering Work Areas” shall make use of measures to minimize and control the release of sediment laden water through the use of acceptable sediment control measures as outlined in Section, “Erosion Prevention and Sediment Control”; and
- Backfilling of linear trenches shall allow for settlement to ensure that the finished grade of the trench is level with the surrounding surface.

12.27 EXCAVATION, BACKFILLING AND GRADING

Excavation, backfilling and grading of common rock and other materials may be required at various locations within the Project site.

Environmental Concerns

The principal environmental concerns associated with excavation, backfilling and grading are potential effects on water quality and fish and fish habitat due to run-off of sediment laden water. Potential disturbance to rare species and habitat and archaeological resources must also be taken into account.

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Environmental Protection Procedures

All work shall be conducted in a manner that ensures the minimum amount of disturbance necessary and controls potential sedimentation of watercourses and waterbodies in or adjacent to the work areas as outlined in the following procedures:

- Excavation, backfilling and grading shall be done only after grubbing and stripping is completed. 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;
- Excavation, backfilling and grading in the vicinity of stream crossings shall be done in a manner that minimizes erosion and sedimentation of watercourses and water bodies; and
- A buffer zone of undisturbed vegetation shall be maintained between construction areas and all watercourses, waterbodies and ecologically sensitive areas (refer to Section, Buffer Zones”).

12.28 EROSION PREVENTION AND SEDIMENT CONTROL

Environmental Concerns

The potential for erosion and resulting effects to water quality and fish and fish habitat is a key environmental concern associated with construction activities. Figures 12-22 and 12-23 show sediment run-off situations that can be avoided by following the environmental protective measures herein.



Figure 12-22 – Sediment Plume in Water



Figure 12-23 – Sediment on Land

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Environmental Protection Procedures

Erosion prevention and sedimentation control shall be a main objective in all work areas where soil may be transported by water, wind, or ice. An Erosion and Sedimentation Control Plan shall be prepared and submitted by the Contractor as part of the C-SEPP, prior to the start of site activities.

Storm water discharge into any water body showing on 1:50,000 mapping shall require a DOEC permit under the Water Resources Act.

Site-Specific Erosion and Sedimentation Control Plan

The following outlines the requirements of the Erosion and Sedimentation Control Plan:

- A brief description of the proposed land disturbing activities, existing site conditions and adjacent areas;
- A description of the critical areas on the site (i.e. areas that have a potential for serious erosion problems);
- Construction schedule that includes the date stripping and grading will begin and the expected date of stabilization;
- A brief description of the measures that shall be used to minimize erosion and control sedimentation on the site including types, options, when they shall be installed and where they shall be located;
- An inspection and maintenance program including frequency of inspection and repair, clean out and disposal of trapped sediment, duration and final rehabilitation when site work is complete;
- Shut down plans where construction plans are delayed for an extended period of time;
- An emergency response plan that identified available short term resources in terms of Personnel, equipment and erosion and sedimentation control measures and reporting steps;
- Name of person preparing plan and professional stamp/designation;
- Site plan including the following features:
 - Existing and final site contours at an interval and scale sufficient to identify runoff patterns before and after disturbance;
 - Existing vegetation and buffers;
 - Limits of clearing and grading;

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- Critical areas; and
- Location and type of erosion and sedimentation control measures with dimensions.
- Detailed drawings of all erosion and sedimentation control structures and measures showing dimensions, material and other important details;
- The following calculations:
 - Design calculations for erosion and sedimentation control measures (culverts, channels, sediment traps, etc.) Such as particle size, flow rates and peak discharge;
 - Calculations to demonstrate the design of sediment removal efficiency; and
 - Any other calculations, as required.
- Contingency measures shall be implemented to deal with storm events and high run-off in order to minimize adverse environmental effects from these events. Erosion prevention and sediment containment measures and required equipment shall be available to address contingency/emergency situations.

12.28.1 Erosion Prevention

The primary way to control erosion is to prevent activities that can contribute to it. However, specific erosion control measures may be required to be designed for the Site to minimize the effects of construction activities on the environment. Options for erosion prevention are discussed in the following sections.

12.28.2 Discussion of Erosion Control Options

Slope Treatments

Several slope treatments can be used to reduce erosion. Roughening methods include stair-step grading, grooving, and tracking. All three methods are shown in Figures 12-24 to 12-26.

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Figure 12-24 - Photograph of Grooving Slope Treatment Method

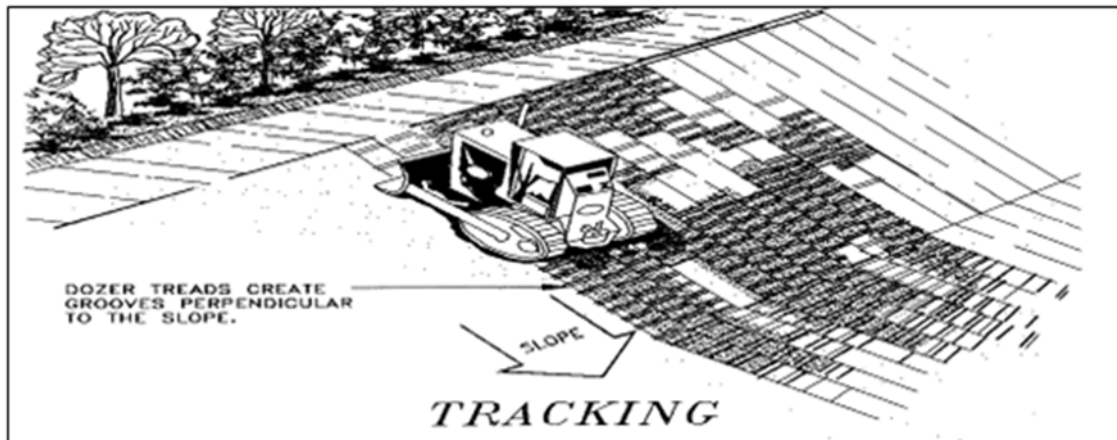


Figure 12-25 - Illustrations of Tracking Slope Treatment Method

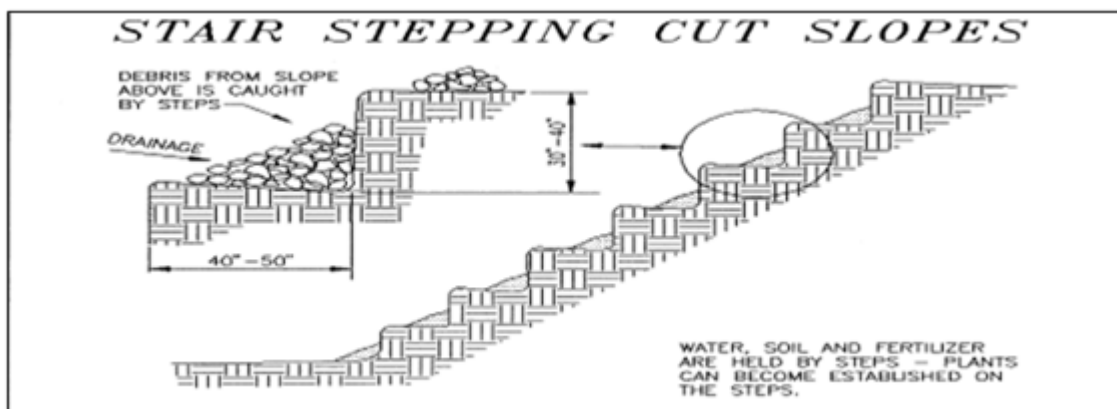


Figure 12-26 - Illustration of Stair Stepping Slope Treatment Method

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Erosion Control Nets/Mats/Blankets/Fibrous Rolls

Erosion control blankets are temporary protective barriers laid on top of bare soil vulnerable to erosion, commonly made of mulch, wood fibre, straw or synthetics. They are typically used on short steep slopes where there is a high erosion potential and slow vegetation establishment. Rolled Erosion Control Products (RECPs) are manufactured mulch blankets that protect soil from erosion and Turf Reinforcement Mats (TRMs) are used to help establish vegetation in channels.

Erosion control nets are typically synthetic textiles or nets that degrade over time. The nets are woven to permit plants to take root through the holes in them. They also act as a medium to retain water for longer period of time. Different grade of nets are used based on the topography of the ground.

The more closely knit nets can be used to curtail erosion in high slope areas, while the more loosely knit nets can be used in flatter terrain. Installation of erosion control mats and blankets shall take into consideration the criteria listed in Section, “Sedimentation Prevention”.

Fibre rolls serve as barriers between up gradient construction and downgradient water bodies. Fibre rolls are installed on slopes in line with one another with one at the base of the slope. The space between each row of fibre roll is dependent on the steepness of the slope. The steeper the slope, the more rows of evenly spaced horizontal rows of rolls is needed. Fibre rolls are fastened to the ground with wooden stakes. Figures 12-27 to 12-29 show some of the erosion control methods.



Figure 12-27 – Photograph of Erosion Control



Figure 12-28 – Photograph of Fibre Rolls Used to

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Figure 12-29 - Photograph Shows Erosion Control Blanket on Slope and Erosion Control Mat in Channel

Rip Rap

Rip rap can be used as an erosion-resistant ground cover and when installed properly it reduces the velocity of runoff and increases infiltration. Rip rap typically works well on river banks and/or bottoms, roadside ditches and tops of slopes. A non-woven geo-textile liner shall be used at the top of the channel to prevent migration of fines. Rip rap placement shall follow criteria listed in Section, "Sedimentation Prevention" and applicable construction specifications and drawings. Figure 12-30 shows properly placed rip rap while Figure 12-31 shows poorly placed rip rap with geotextile exposed.



Figure 12-30 – Photograph of Rip Rap Placed Along a Slope



Figure 12-31 – Photograph of Failed Rip Rap Protection

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Check Dams and Dikes

Check dams and dikes are temporary barriers that are typically constructed of rocks, gravel bags, sandbags or fibre rolls that are installed across a constructed swale or drainage ditch to reduce the velocity of water. They are placed in areas where runoff erosion has occurred or where runoff needs to be diverted or channelled. They are not designed to stop the water, but to slow it down. Check dam and dyke installation shall follow the criteria listed in Section, “Sedimentation Prevention” and applicable construction specifications and drawings.

Check dams shall be maintained and inspected periodically as well as unscheduled inspections prior to, and after, a significant rainfall event, anticipated heavy precipitation or runoff event (e.g. snow melt). Removal of sediment from check dams shall be conducted as required, in order that the check dam continues to perform its function of reducing the amount of sediment present in the run-off. Photographs of rock constructed check dams are shown below in Figures 12-32 and 12-33.



Figure 12-32 – Photograph of a Rock Constructed Dyke



Figure 12-33 – Photograph of a Rock Constructed Check Dam

Energy Dissipaters

Energy dissipaters (or outlet protection devices) are devices that are installed on the downstream end of a culvert or outlet and are used to reduce the velocity of the water flow. Energy dissipaters are typically made of rocks (rip rap apron); however they can be man-made devices such as concrete blocks or metal prongs. Energy dissipaters required for fish bearing waters shall be of natural means (not man-made). Energy dissipaters require engineering design to accommodate the velocity and volume of flow and shall follow the criteria listed in Section, “Sedimentation Prevention” and applicable construction specifications and drawings. Figure 12-34

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shows properly constructed or placed energy dissipaters while Figure 12-35 shows improperly placed rocks as energy dissipaters.



Figure 12-34 – Correct Construction of Rock Energy Dissipaters



Figure 12-35 – Incorrect Construction of Rock Energy Dissipaters

Design Criteria and Installation Procedures for Erosion Control Measures

Design criteria and installation procedures for applicable options discussed above are listed below. Reference shall be made to these criteria if either of these options is deemed suitable for Site-specific conditions.

Straw Mats

- Straw mats shall be applied at a rate of 3000 to 8000 lb/acre;
- Soil shall be visible through the straw mat (not too heavily applied);
- Straw shall be applied by blower or by hand; and
- Straw shall be anchored to prevent it from blowing away.

Wood Fibre Mulch

- Preferable on steep cut slopes of 2H:1V or steeper; and
- Wood fibre mulch shall be applied at a rate of at least 1000 lb/acre (increasing the rate of application will increase effectiveness).

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Rolled Erosion Control Products (RECPs)

- May be used for gradients of 2.5H:1V or steeper;
- Shall be installed on unfrozen ground;
- Slopes shall be top soiled and seeded prior to placing RECP;
- Blankets shall be in full contact with the soil by properly grading soil, removing rocks or deleterious materials, prior to placing blanket;
- In channels, blankets shall extend above the anticipated flow height, with a minimum 0.5 m of free board;
- For Turf Reinforcement Mat (TRM), blanket shall be placed immediately after top soiling;
- Blanket shall be anchored by using wire staples, metal geotextile stake pins, or triangular wooden stakes; and
- Blankets shall be placed longitudinal to direction of flow, with fabric not stretched, but maintaining contact with underlying soil.

Rolled Erosion Control Products (RECPs) on Slopes

General Installation Methods for RECPs on slopes are listed below however all installation shall be designed on a site-specific basis and products shall be installed according to manufacturers' procedures.

- Prepare surface and place topsoil and seed (surface shall be smooth and free of rocks, debris, or other deleterious materials);
- Blanket shall be anchored at top of slope in a minimum 0.15 m by 0.15 m trench for the entire width of the blanket;
- The blanket shall be rolled out downslope;
- Where the blanket roll is not long enough to cover the entire length of the slope, a minimum 0.15 m by 0.15 m check slot shall be excavated at the location of the lap, and the downslope segment of blanket shall be anchored in the check slot. This is similar to the method used for the top of the slope, or when blankets are spliced down the slope; in this case, place the blanket end over end (shingle style) with approximately 0.10 m overlap. Staple through overlapped area at 0.3 m intervals;

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- The upslope portion of blanket shall overlap the downslope portion of blanket, shingle style, at least 0.15 m with staple anchors placed a maximum 0.3 m apart;
- Adjacent rolls of blanket shall overlap a minimum 0.1 m;
- Anchors shall be placed along central portion of blanket spaced at 4/m² minimum (0.5 m spacing) for slopes steeper than 2H:1V and 1/m² (1 m spacing) for slopes flatter than 2H:1V; and
- Anchors along splices between adjacent rolls shall be placed 0.9 m apart.

Rolled Erosion Control Products (RECPs) in Channels

General Installation Methods for RECPs in channels are listed below however all installation shall be designed on a site-specific basis and products shall be installed according to manufacturer's procedures.

- Prepare surface and place topsoil and seed (surface shall be smooth and free of large rocks, debris, or other deleterious materials);
- Excavate a minimum 0.15 m deep and 0.15 m wide trench at the upstream end of channel and place end of RECP into trench;
- Use a double row of staggered anchors approximately 0.1 m apart (i.e. 0.2 m linear spacing) to secure RECP to soil in base of trench;
- Backfill and compact soil over RECP in trench;
- Roll centre RECP in direction of water flow on base of channel;
- Place RECP end over end (shingle style) with a minimum 0.15 m overlap downgrade;
- Use a double row of staggered anchors approximately 0.1 m apart to secure RECP to soil;
- Full length edge of RECP at top of sideslopes shall be anchored in a minimum 0.15 m deep and 0.15 m wide trench;
- Use a double row of staggered staple anchors a maximum of 0.1 m apart (i.e. 0.2 m linear spacing) to secure RECP to soil in base of trench;
- Backfill and compact soil over RECP in trench;
- Overlap RECP on side slopes (shingle style down channel) a minimum of 0.1 m over the centre RECP and secure RECP to soil with anchors spaced a maximum of 0.2 m apart;

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- In high flow channels, a check slot across the width of the channel is recommended at a maximum spacing of 10 m to anchor the ends of the RECP to the underlying soil;
- Use a double row of staggered staple anchors a maximum of 0.1 m apart (0.2 m linear spacing) to secure RECP to soil in base of check slot; and
- Backfill and compact soil over RECP in check slot.

Rip Rap

The following criteria shall be considered when installing a check dam:

- Used for grades 5-15%;
- It shall be constructed of durable, large, loose stone;
- A non-woven geo-textile liner shall be used at the top of the channel to prevent migration of fines;
- Side slopes of rip rap must be a slope of IV:3H or less;
- Rip rap shall be of angular stone; and
- Rip rap depth shall be at least 300mm and 1.5x the maximum stone diameter.

Check Dams and Dikes

The following criteria are to be considered when installing a check dam:

- Check dams shall not be used in live streams or in channels with extended base flows, as this may have a detrimental effect on fish or fish habitats;
- The check dam sediment trap shall consist of rock fill with filter fabric on the upstream face held in place with small shot rock;
- Accumulated sediment shall be cleaned out of the filter fabric at regular intervals as required and the material shall be disposed of so that it cannot subsequently run into any waterbodies containing fish;
- Any damaged section(s) of filter fabric as well as any undercut or end flow areas where water flows freely around the filter fabrics shall be repaired or replaced;
- Drainage area shall be less than 4 ha;
- The filter fabric shall be of a weight of at least 200g/m²;

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- The rock fill shall be clean rock, with rock fragments sized between 100 and 150mm;
- The small shot rock shall be clean rock, with fragments no larger than 120mm;
- When used in series, the top of the downstream check dam shall be level with the bottom of the next dam upstream;
- The check dam shall extend beyond the top of the ditch banks and the centerline elevation shall be low enough that flow does not go around the structure; and
- Check dams shall be maintained and inspected periodically as well as unscheduled inspections prior to, and after, a significant rainfall event, anticipated heavy precipitation or runoff event (e.g. snow melt). The following maintenance shall be completed, as required:
 - Remove any accumulations of sediment; and
 - Add or remove rock as necessary to maintain design height, cross-section and flow through characteristics.

Energy Dissipaters

The following criteria are to be considered when installing energy dissipaters:

- Energy dissipaters are preferably constructed on level grade for a distance which is related to the outlet flow rate and the tail water level;
- The sill or transition to the natural channel shall be level with and at the same slope as the receiving channel;
- Energy dissipaters are applicable for small and medium size culverts of any cross section where the depth of flow at the outlet is less than the culvert height;
- For rip rap aprons, the apron width at the pipe end shall be 3x the pipe diameter;
- Energy dissipaters shall drain by gravity when not in operation; and
- Energy dissipaters shall be self-cleaning and require minimum maintenance.

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12.28.3 Sedimentation Prevention

Silt Fences/Sediment Barriers

Sediment barriers are temporary sediment control devices that are used to protect water quality of down gradient rivers, streams and other water bodies from sediment in water run-off. The most common barriers are silt fences; however other options include straw or hay bales or a berm of erosion control mix. Silt fences are typically used in combination with other site water control measures including sediment traps and basins. Engineering requirements may vary depending on the locations of the silt fence and shall take such factors into consideration as drainage/surface area of exposed soils and time of year the silt fence is employed.

Silt fences are suitable for sheet runoff from exposed areas of soil with grades less than 5% as a result of construction activities. The following criteria shall be taken into consideration when installing silt fences:

- The silt fence shall consist of a filter fabric fence held in place by posts;
- The woven filter fabric shall be of a weight of at least 200 g/m²;
- No single run of silt fence shall exceed 100 m in length;
- The drainage area behind the silt fence shall not exceed 0.1 ha per 30 meters of fence;
- Silt fences shall not be installed on a slope, and be located no nearer than 1 m from the toe of slope;
- Silt fences shall not be used when the overland flow exceeds 0.03 m³/sec;
- The fabric shall be at least 900 mm wide/high;
- The fence posts shall be of sufficient length to support the fabric, be sturdy and be of dimensions of at least 50 mm square;
- The staples shall be sufficiently sturdy to support the fabric for the required life of the fence;
- The posts shall be secured at 3 m intervals on the immediate down slope side of the trench;
- The filter fabric shall be taken from a continuous roll, and cut to the required length. The maximum length of the filter fabric shall be stapled to the upstream side of the stakes, with 200mm of fabric extending into the trench and spread over the trench bottom;
- When installing a silt fence in frozen earth or rock, metals posts shall be used and wire ties shall be used to attach the filter fabric (Figure 12-36);

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- When a fence is installed in frozen earth it shall be checked and potentially replaced during spring melt as the posts may have shifted with the melting earth; and
- Silt fences shall be removed when the site has been stabilized, or re-vegetated

Silt fences shall be inspected and maintained on a regular basis as well as before any anticipated heavy precipitation or runoff event (e.g. snow melt). Accumulation of sediment shall be periodically removed and disposed of in an area where it shall not re-enter any waterbody.

Also, repairs and replacement of damaged silt fences shall be addressed immediately. Figure 12-36 to Figure 12-38 show proper construction of silt a fence. Figures 12-39 and 12-40 show poorly constructed silt fences that have failed and allowed silt or silty water to pass through.



Figure 12-36 – Well Constructed Silt Fence

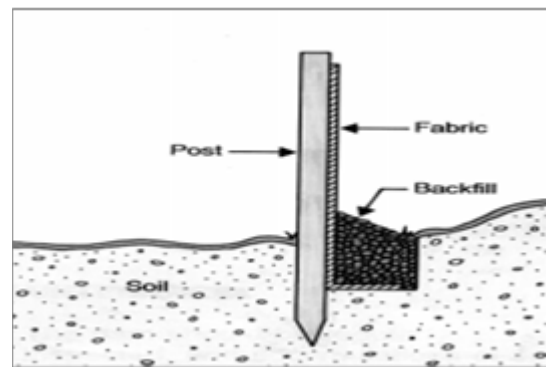


Figure 12-37 – Properly Constructed Silt Fence

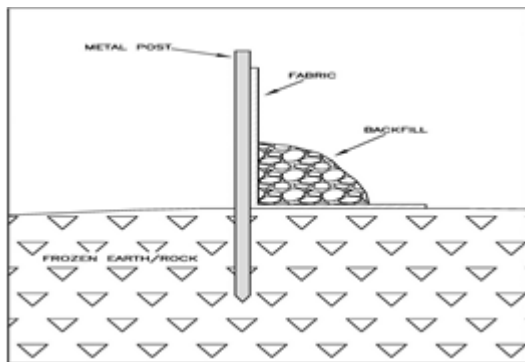


Figure 12-38 – Properly Constructed Silt Fence for Frozen Earth or Rock



Figure 12-39 – Example of Poorly Installed Silt Fences

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Figure 12-40 – Example of Poorly Installed Silt Fences

12.29 SITE WATER MANAGEMENT

Environmental Concerns

For a large-scale, earth-moving construction projects such as the Lower Churchill Project, a major consideration in the protection of water quality and aquatic resources is the management of site water run-off and associated suspended solids. The protection of water quality and aquatic resources shall focus on prevention, containment and treatment of water and wastewater associated with the Site. Site water management can be divided into three main categories: Surface Water Interception, Containment and Treatment.

Environmental Protection Procedures

The main focus of measures to protect water quality and aquatic resources is prevention. Preventative measures shall include measures to reduce the volume of water entering the work sites (thereby reducing the volume of water that requires subsequent containment and treatment). Site water management systems shall be installed as per technical specifications and/or the C-SEPPs. See references such as DFO's Fact Sheets on Ditching, Filter Fabric, Rock Check Dams and Temporary Settling Basins for more information related to erosion prevention and sedimentation control.

Storm water discharge into any water body showing on 1:50,000 mapping shall require a DOEC permit under the *Section 48 of the Water Resources Act*. Effluent monitoring locations, frequency, sampling and reporting shall comply with the conditions of the permit.

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12.29.1 Description of Site Water Management Methods

Surface Water Interception

Reducing the amount of water entering the work sites through surface water runoff, infiltration through the cofferdams and groundwater seepage may be required. At the main work sites, ditches shall be incorporated into the site layout to intercept surface water and divert it around the work areas. Infiltration through the cofferdams and groundwater seepage shall be reduced by the installation of a properly designed sump and pump well systems that shall draw down the water table.

Containment

Once in the work areas, water shall be contained until the water can be treated and released. A system of ditches and drains, incorporated with sump and pump systems, may be required to handle water that enters all excavations. Where required, ditches, drains and sumps shall be located along the lower boundaries of the construction sites to intercept and contain silty or sediment laden water. Measures to contain water from excavations and other construction works shall include, but not be limited to the following:

- The containment of water from concrete production and placement, including the cutting of concrete, washing of forms or water otherwise contaminated by concrete components or admixtures;
- The containment of wash water from the cleaning of mixers and mixer trucks;
- The control of sediment and run-off from aggregate washing areas. This may include, but shall not be limited to, use of a closed system washing operation or a multiple tiered settling basin system; and
- Testing and treatment for elevated levels of TSS or other contaminants related to blasting (such as Ammonium Nitrate and fuel oil).

Treatment (Sediment Ponds / Traps)

Once contained, water shall undergo testing and if necessary treatment prior to release. The goal of site water management is to release water within regulatory limits for all parameters. Water shall be tested for oil and grease, TSS, ammonium nitrates and/or any other parameters outlined by the monitoring plan in the C-SEPP based on usage of equipment and site chemicals required to meet the *Environmental Control Water and Sewage Regulations, 2003*.

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For open excavations, a system of properly designed and constructed settling basins is the preferred method of sediment removal. A sediment basin (also called a sediment pond – See Figure 12-41) is a temporary pond built on a construction site to capture eroded or disturbed soil that is transported due to water run-off. The sediment basin protects the water quality of down gradient water bodies. The sediment suspended in the water settles in the pond before the runoff is discharged. Sediment basins are typically used on larger construction sites (>5 acres). Use of sediment basins is usually in conjunction with other sediment and erosion controls. Reference the DFO Fact Sheet for Temporary Settling (Detention) Basins for more information.

A sediment trap is similar to a sediment basin and is basically an embankment built along a waterway or low-lying area on the site. Sediment traps shall be installed prior to construction and earth moving activities and are commonly used on smaller construction sites, where a sediment basin is not practical. Use of sediment traps is usually in conjunction with other sediment and erosion controls. The size of sediment traps and basins shall depend on the size of the site, location and rainfall runoff for the area. See Figure 12-42 for a photograph of a sediment trap.

Both sediment ponds and sediment traps require periodic inspection and maintenance. Inspections shall occur following each significant rainfall to ensure proper drainage and to determine if structure repairs are required. Maintenance shall include removal and disposal of accumulated sediment from the settling basins in order to maintain their operating capacity. Sediment shall be disposed of in area that would preclude the sediment from entering waterbodies downstream.



Figure 12-41 – Sediment Basin



Figure 12-42 – Sediment Trap

Water leaving sediment traps and basins shall be tested for applicable parameters (Schedule A of the *Environmental Control Water and Sewage Regulations, 2003* under the *Water Resources Act*). Following testing, the addition of chemicals or the use of mechanical processes may be required to treat the water in conjunction with settling and filtration.

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Contaminated or silted water pumped from excavations or work areas, or any runoff or effluent shall have sediment removed by applicable sediment control measures as outlined in Section, “Erosion Prevention and Sediment Controls” before discharging to a watercourse, waterbody or other ecological sensitive area. In addition, any effluent directed out of the Project site shall be tested for TSS and hydrocarbons (if there are any indications of hydrocarbon contamination, such as a sheen or odour) before being discharged to any watercourse, waterbody or other ecological sensitive area. Effluent discharge shall comply with the provincial *Environmental Control Water and Sewage Regulations, 2003* under the provincial *Water Resources Act*.

With respect to maintenance of water quality within receiving waterbodies on and around the site, the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life shall be used.

Design Criteria and Construction Considerations

The design of the structures shall consider the following:

- The loading of suspended solids in the water;
- Particle size and gradation;
- The volume of water to be treated;
- The rate of inflow;
- Rate of outflow; and
- The contributing surface area.

Specific design criteria are provided below:

- Design storm shall be the precipitation of the twenty-four (24) hour rainfall intensity from a 1:20 year storm;
- Drainage area for each sediment retention structure shall not exceed 2 ha;
- Ponds shall be located in low lying areas where they will not contribute to high groundwater conditions and where the system can return the water to a body of water or recharge the water table;
- The Contractor may also use other low-lying areas or wetlands for treating lightly silted water or smaller quantities of water;
- Sedimentation ponds shall be accessible by heavy equipment for removal of accumulated silt;

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- Pond designs shall include an overflow discharge in case of flooding. The overflow section shall have a minimum width of 1.5 m for every 250 m² of pond area;
- Provide 1 to 2 % elevation drop between inlet and outlet grades; and
- Maintain a minimum pond depth of 1 m. A minimum length to bottom width ratio of 4:1. The size shall be determined to ensure discharge water meets the Environmental Control Water and Sewage Regulations, 2003.

12.30 DEWATERING WORK AREAS

Environmental Concerns

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

Environmental Protection Procedures

- Filtration or other suitable measures, such as settling ponds, silt fences and dikes, shall be implemented for sediment removal and turbidity reduction in water pumped from work areas before discharging;
- Where possible, clean water meeting the *Environmental Control Water and Sewage Regulations, 2003* shall be discharged to vegetated areas to further reduce any potential effects on watercourses. Additionally, mechanisms to prevent scouring and erosion of the discharge location shall be installed as outlined in Section, "Erosion Prevention and Sediment Control";
- The size of sedimentation ponds shall be designed to accommodate the anticipated volume of collected water and meet discharge criteria for water quality as outlined in Section, "Site Water Management";
- Discharged water shall be encouraged to follow natural surface drainage patterns;
- Harmful alteration, disruption and destruction of fish habitat shall not be permitted unless a formal HADD Authorization has been obtained from DFO; and
- See Fish Habitat and Relocation in Section, "Alterations to a Body of Water/Instream Works".

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12.31 BLASTING AND WASTE ROCK DISPOSAL

Environmental Concerns

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

- Destruction of vegetation outside excavation limits;
- Noise disturbances to wildlife;
- Disturbance of archaeological resources;
- Release of chemicals (i.e. ammonia) to the environment (explosive mixtures and products); and
- Dust generation.

Blasting in or near water bodies can affect organisms with swim bladders (fish) but may also affect a variety of aquatic animals including shellfish, marine mammals, otters, seabirds and waterfowl. The introduction of sediment into the water column is also a concern for marine/freshwater water quality and related effects on aquatic life.

Environmental Protection Procedures

The handling, transportation, storage and use of explosives and all other hazardous materials shall be conducted in compliance with all applicable laws, regulations, orders of the DOEC and the Service NL, the *Explosives Act*, and the *Transportation of Dangerous Goods Act*. The following measures shall be implemented to minimize the effect of the use of explosives and blasting:

Explosives shall be used in a manner that shall minimize damage or defacement of landscape features, trees, ecologically sensitive areas such as wetlands, and other surrounding objects by controlling through standard best practice (including precisely calculated explosive loads and adequate stemming), the scatter of blasted material beyond the limits of activity. Outside of cleared areas, inadvertently damaged trees shall be cut, removed, and salvaged if merchantable (refer to Section, "Clearing of Vegetation"). Fly rock that inadvertently enters a waterbody watercourse or any ecologically sensitive area, and that can be recovered without further damage to the environment shall be removed. Instances where larger fly rock (boulders) enters these areas or deep waterbodies, recovery of this shall be discussed with the On-Site Environmental monitor;

- Blasting patterns and procedures shall be used, which minimize shock or instantaneous peak noise levels;

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- Time delay blasting cycles or blasting mats shall be used, if necessary, to control the scatter of blasted material;
- Blasting shall not occur in the vicinity of fuel storage facilities;
- All blasters shall have a Blasters' Safety Certificate from the NL Department of Labour. This certificate and a Temporary Magazine License shall be obtained prior to drilling and blasting;
- Use of explosives shall be restricted to authorized personnel who have been trained in their use;
- There shall be separate magazines on site for explosives and for dynamite blasting caps. All temporary magazines for explosive storage shall have appropriate approvals;
- The immediate area of the blast site shall be surveyed within one hour prior to a blast and operations shall be curtailed if wildlife (e.g. black bears, water fowl, raptors, etc.) is observed within 500 m. Environmental personnel and On-Site Environmental Monitors shall conduct pre-blast monitoring to see and identify species of concern. Additionally, any individual animal sightings by other personnel shall be reported to the On-Site Environmental Monitor. Blasting may be delayed in such circumstances until wildlife have been allowed to leave the area of their own accord;
- All blasting associated debris, such as explosive boxes and used blasting wire, must be collected for proper disposal as soon as possible following blasting activity;
- If blasting is necessary within the vicinity of an archaeological site, precautions shall be taken to ensure that blasted material and shock waves do not disturb any part of the site. If necessary, protective covering shall be applied to the site under the supervision of an approved archaeologist. Blasting shall not be undertaken in these areas without first notifying the OSEM;
- Waste rock that is suitable for usage at the site shall be set aside for subsequent use. Waste rock not suitable for site use shall be deposited in the designated stockpile area;
- Previous testing on selected samples of bedrock has shown the samples to be Non-Potentially Acid Generating (NPAG). As a precautionary measure the On-Site Environmental Monitor shall inspect all areas of blasted rock and rock stockpiles to ensure no evidence of PAG material exists; and
- If possible, blasting shall be done outside of sensitive time periods for important wildlife areas (refer to Table, "Buffer Zones for Placement of Treated Wood within a Protected Water Supply Area").

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12.31.1 Blasting in Close Proximity to or In a Body of Water

Seismic geophysical methods may require in-water blasting. This may include the use of small sources of energy (explosives, air gun, weight drop, etc.) in the water column.

The following measures shall be implemented to minimize the effect of the use of explosives and blasting in or near water:

- When blasting operations are within 200m of a waterbody occupied by fish, the operations shall be carried out in accordance with DFO guidelines;
- Downstream areas shall be monitored after each blast for evidence of fish kills and if any are evident, blasting operations shall cease and the incident shall be reported to the OSEM;
- Three hours prior to any blasting activities near water bodies, a visual reconnaissance of the area shall be undertaken to establish the presence of water fowl or aquatic mammals;
- If blasting is necessary within 15 m of a waterbody, it shall be undertaken in compliance with the required Water Resources permits from the DOEC, and DFO Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters, 1998. A copy of this reference shall be kept at the Project site and made available to all contractors;
- Underwater blasting activities shall require review and authorization from DFO, the OSEM shall confirm that the DFO Area Habitat Biologist has been notified twenty-four (24) hours before the start of blasting operations;
- Drilling and blasting activities shall be undertaken in a manner that ensures the magnitude of explosions is limited to that which is absolutely necessary. A blasting plan shall be reviewed with the OSEM in advance of work in close proximity to water bodies;
- For multiple charges, time delay detonators shall be used to reduce the overall detonation to a series of single explosions separated by minimum delay;
- Large charges shall be subdivided into a series of smaller charges with minimum delay detonation;
- The on land set-back distance from the blast site to the waterbody or the set-back distance around the blast site in the waterbody shall be based on the maximum weight of charge to be detonated at one instant in time, the substrate, and the type of fish or fish habitat in the area of the blast. These set-back

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distances are outlined in the Guidelines for Use of Explosives In or Near Canadian Fisheries Waters, 1998 and the DFO Fact Sheet for Blasting – Fish and Fish Habitat Protection; and

- Blast holes shall be stemmed with sand or gravel to grade or to streambed/water interface to confine the blast.

Waste Rock Disposal

For environmental protection against ARD and other leaching of heavy metals the On-Site Environmental Monitor shall visually inspect rock before, during, and after blasting work and on a periodic basis. Previous surveys have indicated that materials at the site are Not Potentially Acid Generating (NPAG). However in the event that visible evidence of ARD is noted, the OSEM shall be notified immediately. Visible evidence of ARD is typically a yellowish color of water or sediment called yellow boy or evidence of sulphides in rock. Photographs of yellow boy and sulphides are shown in Section, “Quarrying and Aggregate Removal from Borrow Areas”.

Stockpiling shall be completed in a manner that will reduce the potential for acid rock drainage and metal leaching. All stockpiles shall be placed in an area where drainage can be collected, tested and treated, if required. Consideration shall be given to installing a settling pond for runoff to deal with suspended solids. Stockpile areas and limits of clearing shall be staked and/or flagged to prevent overextension of the development, thereby minimizing the extent of the operation.

Treatment shall be site-specific based on analytical results, however typical treatment shall include settling ponds, the addition of chemicals or the use of mechanical processes to aid in settling or filtration. Treatment options shall be confirmed by the OSEM and approved by DOEC.

The release of water from blasting activities and waste rock drainage shall meet Schedule A of the *Environmental Control Water and Sewage Regulations, 2003* before it shall be permitted to be discharged directly or indirectly into a storm sewer, body of water, or onto the ground.

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12.32 CONCRETE PRODUCTION

Environmental Concerns

The major concern relating to concrete production is the effects of effluent released to the environment. Liquid wastes may contain hazardous materials such as cement, concrete additives, and form oil.

Cement is very alkaline and washwater from spoiled concrete or from the cleaning of the batch plant mixers and mixer trucks, conveyors and pipe delivery systems can have pH levels outside the acceptable range. Similarly, spoiled concrete or washwater would contain concrete additives and agents, some of which are toxic to aquatic species. Aggregates, particularly the finer sand fractions may be washed from spoiled concrete or discharged in washwater. Uncontrolled release of such washwater, chemicals and sediments could adversely affect aquatic life and aquatic habitat.

Environmental Protection Procedures

- Approval from DOEC shall be obtained to establish the required concrete batch plants at each Site. Plant operations shall comply with the conditions outlined in the approvals and requirements under air pollution control regulations;
- Prior to the release of effluent to the environment it shall be tested for appropriate parameters (as outlined in Schedule A of the *Environmental Control Water and Sewage Regulations, 2003*) to ensure effluent quality standards are met. The specific criteria for concrete production are a pH level between 5.5 and 9 and TSS less than 30 mg/L. Release shall be in accordance with runoff control procedures;
- With respect to maintenance of water quality in receiving waterbodies on and around the site the *CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life* shall be used;
- If water to be released does not meet discharge criteria, it shall be further treated until these discharge criteria have been met;
- Treatment shall be site-specific as it depends on analytical results, however typical treatment may include the addition of chemicals or the use of mechanical processes to aid in filtration or settling. Treatment options shall be confirmed by the On-Site Environmental Monitor and approved by DOEC;
- The *Environmental Code of Practice for Concrete Batch Plant and Rock Washing Operations, 1992* shall be adhered to during concrete production activities, as applicable;

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- When concrete is to be placed within 15 m of a waterbody, provisions of all required permits shall be followed. Under no circumstances shall fresh concrete come into contact with a waterbody, before the concrete has cured;
- Washwater from the cleaning of mixers, mixer trucks and concrete delivery systems shall be handled using the procedures outlined in Section 3.0 of the *Environmental Code of Practice for Concrete Batch Plant and Rock Washing Operations*. The following outlines important steps to take; however the code of practice shall be reviewed thoroughly:
 - All rinsing activities shall be carried out at the site of the concrete batch plant, except rinsing of the chute;
 - The rinsing of the chute may be carried out at the delivery site, but care and caution shall be taken before any concrete is rinsed from a chute at the delivery site. It is permissible to rinse onto the ground or soil but under no circumstances into a pond or stream or onto a surface that leads directly to a water body, such as a storm sewer;
 - All rinsing activities at the site of the batch plant shall be done over a containment pond (approximately 12.2 m x 4.57 m and less than 0.91 m deep). The material used to form the bottom and sides of the pond can be compacted clay or a synthetic liner, however the DOEC shall approve any installation of a synthetic liner. The pond shall be self-contained with no water inlets or outlets and no possibility of surface drainage into or out of the pond;
 - Any trucks returning with unused concrete shall dispose of this concrete into an approved area able to contain it while still in liquid form before the trucks can be washed. Once the concrete has hardened it may be used as fill material. Liquid concrete shall not be permitted to run freely over the ground;
 - Once all concrete has been removed from the truck, the truck may be brought over to the containment pond where washing can take place. Any water that is used to wash the truck shall be directed into the pond;
 - when the water level in the pond reaches a height that necessitates discharge, water can be discharged following the procedure outlined in b) and c) above otherwise it shall be removed by pumper truck or undergo additional treatment; and

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- Water shall not be discharged in an area where it would cause erosion or be able to pick up solids from the surface.

12.33 DUST CONTROL

Environmental Concerns

The environmental concerns associated with dust include effects on human health and aquatic ecosystems, waterfowl and vegetation.

Environmental Protection Procedures

The following measures shall be taken to mitigate potential effects of dust:

- Dust from construction activities shall be controlled where possible by using frequent applications of water. Waste oil shall not be used for dust control but other agents such as wood chips, calcium chloride, matting and re-vegetation shall be considered on a Site-specific or as needed basis and shall require the approval of appropriate regulators;
- Environment Canada's Best Practices for the Use and Storage of Chloride-Based Dust Suppressants, (February, 2007) shall be followed for the application of chloride based dust suppressants. This includes but is not limited to:
 - Chloride based dust suppressants shall not be applied prior to a heavy rainfall or if rain is threatening for at least thirty-six (36) hours;
 - Dust suppressants shall be applied after a rainfall event to aid in mixing.
 - Suppressants shall be applied during early morning or evening times to reduce evaporation; and
 - Chloride suppressants shall not be applied to a bridge deck or paved surface.
 - Dust control agents (wood chips, calcium chloride, matting, etc.) Shall be stored at suitable distances from all watercourse, water body, or ecologically sensitive areas using proper buffer zones (refer to Section, "Buffer Zones").

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12.34 NOISE CONTROL

Environmental Concerns

A variety of noises associated with construction and operation activity can negatively affect wildlife and fish and can affect human safety and health. Noises associated with blasting are temporary in nature and noises associated with drilling are considered long-term, but localized.

Environmental Protection Procedures

Measures shall be implemented wherever possible to minimize potential effects arising from a variety of noise sources, including:

- Wildlife surveillance shall be conducted prior to and post noisy activities. Activities may be delayed until wildlife have been allowed to leave the area as directed by the OSEM;
- Adherence to all applicable permits and approvals;
- All equipment shall have exhaust systems regularly inspected and mufflers shall be operating properly in accordance with the manufacturers recommendations; and
- Low level flying of aircraft shall be avoided in areas where wildlife, particularly sensitive wildlife are present (i.e. caribou, osprey, harlequin duck and other waterfowl).

12.35 RESOURCE SPECIFIC MIGITATIONS

Environmental Concerns

Construction activities have the potential to impact a number of specific resources in the Lower Churchill Region. The resources are historical and archaeological resources, species at risk, forestry resources, land use, etc.

12.35.1 Historic and Archaeological Resources

Sites of historic or archaeological significance have been identified at the Muskrat Falls generation site, the reservoir impoundment area and the HVac transmission line. When working in areas of high potential for historic or archaeological sites, site-specific work measures shall be developed.

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To date, fifty-nine (59) sites have been identified in the area of the generation facility, reservoir and the HVac transmission line. Sites are a combination of archaeological sites and sites that are of cultural and spiritual importance to the Innu.

Sixteen (16) sites were recovered through fieldwork during 2012, and the remainder of sites will be either protected during Construction or recovered prior to Construction. See Table 12-3 for information about the known sites within the project boundaries, including proposed mitigation measures and contributing project activity.

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Table 12-3 – Historical and Archaeological Resources in the Lower Churchill Region

Archaeological Registration Number / Name	Project Feature	Environmental Mitigation	Contributing Project Activity
FhCe-01	Muskrat Falls Generation Facility	To be recovered	Several Project Activities
FhCe-02	Muskrat Falls Generation Facility	Protected/To be recovered	Construction of Generation Components
FhCe-03	Muskrat Falls Reservoir/ Generation Facility	Protected/To be recovered	Several Project Activities
FhCe-04	Muskrat Falls Reservoir/ Generation Facility	Recovered	Several Project Activities
FhCe-05	Muskrat Falls Reservoir/ Generation Facility	Recovered	Several Project Activities
FhCe-06	Muskrat Falls Reservoir/ Generation Facility	To be recovered	Several Project Activities
FhCe-07	Muskrat Falls Reservoir/ Generation Facility	Recovered	Several Project Activities
FhCe-08	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FhCe-09	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FhCe-10	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FhCe-11	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FhCe-12	Muskrat Falls Reservoir -downstream of falls	To be recovered	Reservoir Preparation; Impounding
FhCf-01	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FhCf-02	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FhCf-03	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCg-02	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCg-03	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCg-08	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCg-01	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCg-04	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCg-07	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCg-05	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCg-06	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding

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Archaeological Registration Number / Name	Project Feature	Environmental Mitigation	Contributing Project Activity
FgCh-01	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FfCi-01	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FfCi-02	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FfCi-05	Muskrat Falls Reservoir/Generation Facility	To be recovered	Construction of Access Road or Bridge
FgCh-05	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCh-06	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FfCh-02	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCh-04	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCh-02	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCh-03	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FfCh-01	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FiCt-01	Proposed AC Transmission Line	To be recovered	Construction and/or Increased Access
Manitu-utshu 1 (FhCe-13)	Muskrat Falls Reservoir/Generation Facility	Protected	Site Access
Manitu-utshu 2 (FhCe-14)	Muskrat Falls Reservoir/Generation Facility	Protected	Site Access
Manitu-utshu 3 (FhCe-15)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 4 (FhCe-16)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 5 (FhCe-17)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 6 (FhCe-18)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 7 (FhCe-19)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 8 (FhCe-20)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 9 (FhCe-21)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 10 (FhCe-22)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 11 (FhCe-23)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 12 (FhCe-24)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 13 (FhCe-25)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction

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Archaeological Registration Number / Name	Project Feature	Environmental Mitigation	Contributing Project Activity
Manitu-utshu 14 (FhCe-26)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 15 (FhCe-27)	Muskrat Falls Reservoir/Generation Facility	Recovered	Dam Construction
Manitu-utshu 16 (FhCe-28)	Muskrat Falls Reservoir/Generation Facility	Protected	Reservoir Preparation; Impounding
Manitu-utshu 17 (FhCe-29)	Muskrat Falls Reservoir/Generation Facility	Protected	Reservoir Preparation; Impounding
Manitu-utshu 18 (FhCe-30)	Muskrat Falls Reservoir/Generation Facility	Protected	Reservoir Preparation; Impounding
Manitu-utshu 19 (FhCe-31)	Muskrat Falls Reservoir/Generation Facility	Protected	Reservoir Preparation; Impounding
Manitu-utshu 20 (FhCe-32)	Muskrat Falls Reservoir/Generation Facility	Protected	Reservoir Preparation; Impounding
Manitu-utshu 21 (FhCe-33)	Muskrat Falls Reservoir/Generation Facility	Protected	Reservoir Preparation; Impounding
Manitu-utshu 22 (FhCe-34)	Muskrat Falls Reservoir/Generation Facility	Protected	Reservoir Preparation; Impounding
Manitu-utshu 23 (FhCe-35)	Muskrat Falls Reservoir/Generation Facility	Protected	Reservoir Preparation; Impounding
Ushkan-shipiss	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
FgCg-09	Muskrat Falls Reservoir	To be recovered	Reservoir Preparation; Impounding
Manitu-utshu 23 (FhCe-36)	Generation Facility	Recovered	Dam Construction

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As per the requirements of the PAO, a historic and archaeological resources impact assessment shall be conducted at sites where historic and archaeological resources may be unearthed. For low potential sites, a desktop review may be adequate. For higher potential sites, field assessment may be required.

Existing information shall be provided where available, and where activity will take place in an area that has not been previously reviewed a historic resources overview assessment may be required.

The following mitigations shall be implemented with respect to historic and archaeological resources:

- All persons on Site shall be informed of the historic resources potential of the area, of their responsibility to report any unusual findings, and to leave such findings undisturbed;
- Site orientation must be attended by all Personnel and Contractors, where areas of high historic resources potential shall be identified;
- The OSEM shall report to the PAO if any potential archaeological resources are uncovered during excavation (Martha Drake, Provincial Archaeologist, 709-729-2462);
- Possible known sites shall be avoided by modifying design (i.e. road and transmission line alignment adjustment) to ensure a 50 m minimum buffer (actual size may be revised based on direction from the PAO). Where the site cannot be avoided, the site shall be recorded/recovered to the satisfaction of the PAO before work can proceed, as per Historic Resources Management Plan developed by the ERC Team;
- The on-Site environmental monitor shall be immediately contacted if any historical resources are discovered during the course of the work. All work within 50 m of the discovery location shall stop and contingency plan procedures implemented; and
- Regular monitoring shall be conducted by the OSEM to ensure that site protection measures are adequate and that the terms and intent of the EPP requirements are being met. Sites registered with the PAO outside the immediate Project area shall be visited annually by the On-Site Environmental Monitor during periods when the sites are not snow covered to ensure they have been left undisturbed.

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12.35.2 Species at Risk

Many wildlife species (including plants, animals and birds and their habitat) are protected under provincial and federal regulations such as the *National Species at Risk Act*, *Migratory Birds Convention Act* and the *NL Endangered Species Act*. Of primary concern are disturbances, destruction or degradation of critical habitat, recovery habitat and disturbance during critical life periods (i.e. nesting and spawning), displacement of species due to construction activities (i.e. blasting) or encounters with construction equipment and Personnel is also a concern.

Six (6) species have been identified through the Environmental Assessment (EA) process as being of concern in the Lower Churchill River Area and the HVac transmission line right-of-way. They are as follows:

- Common Nighthawk;
- Olive Sided Flycatcher;
- Red Wine Mountain Caribou Herd;
- Grey Cheeked Thrush;
- Rusty Blackbird; and
- Harlequin Duck;

Reference should be made to the fact sheets for species listed on the SARA list and the Endangered Species Act to find further information about these species.

A research permit for work around SARA listed species may be required from the Wildlife Division, Dept. of Environment and Conservation, Gov NL.

The following mitigations shall be implemented with respect to endangered, threatened or vulnerable wildlife at the site:

- Critical habitats shall be identified on site plans or plan profiles for roads and transmission lines for C-SEPP;
- All Site Personnel shall receive training to recognize any endangered, threatened or vulnerable species of plant or animal and its habitat prior to the start of clearing and any other Site activities;
- Through site surveys, existing potential rare plants habitat shall be identified and mapped prior to the commencement of any Site work. Based on this mapping, travel routes and “no-go” zones shall be

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established to avoid sensitive areas. Animals and animal habitats such as active nesting sites and beaver dams, shall also be identified and mapped;

- Work plans shall be submitted in advance and shall be reviewed for potential conflicts, including rare plants, endangered species, critical habitat and other areas of concern (i.e. beaver dams and nesting sites);
- Where required (i.e. as per the Avifauna Management Plan or associated EEM Plans), prior to commencement of work, an on-Site wildlife biologist shall be on-Site to survey for areas of concern (critical breeding habitat, rare plants, nest sites, etc.) and to provide input on work methods, lay out approved travel routes and work areas and associated buffer zones;
- In areas where concerns have been identified, the On-Site Environmental Monitor shall ensure work crews are aware of concerns identified and work methods to be used;
- There shall be no intrusion onto “no-go” zones without prior permission of the On-Site Environmental Monitor;
- Crews shall not travel outside of marked work areas and trails. If markers are not clear or are missing, the On-Site Environmental Monitor shall be consulted prior to commencing or continuing with the work;
- The On-Site Environmental Monitor shall monitor work activity in sensitive sites at all times and provide advice on access and travel requirements;
- The Environmental Coordinator shall be informed of activities near sensitive areas so that they may notify any regulators;
- Notice of potential impacts to rare or protected species and their habitat at the job site shall be given to the On-Site Environmental Monitor for evaluation;
- Prior to construction during nesting season (May 15 to August 15), the area shall be surveyed for active nests, including raptor and other SARA listed species listed in Section, “Species at Risk”;
- No clearing shall take place within 800 m of an active raptor nest between the months of May 15 to August 15. If a nest is encountered during clearing activities, all work shall stop until the site is cleared by the On-Site Environmental Monitor, in consultation with the appropriate regulatory agencies.

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- For all work activities other than clearing, a 200 m buffer shall be respected for active raptor nests from May 15 to August 15. Within this 200 m buffer zone the following applies, after consultation with the provincial government:
 - Only essential vehicular activity shall be permitted;
 - Work shall only be permitted in the presence of the OSEM;
 - Crews shall cease work if there is a disturbance at a nest until activity at the nest has returned to normal; work shall not commence again until approval from the OSEM.
- Crews shall not establish a permanent or temporary camp within 800 m of a known raptor nest;
- If a tree containing an inactive nest is encountered during reservoir and site clearing, the nest shall be assessed for viability, and if the nest is deemed viable a platform shall be established as approved by the provincial government; and
- If a tree containing an inactive nest is encountered during the transmission line right-of-way clearing, a platform may not be required as the transmission line tower will provide an alternative nesting site.

12.35.3 Wildlife Protection

The following mitigative measure shall be implemented for the protection of wildlife at the site:

- Construction activities shall be scheduled considering any sensitive areas of fish and wildlife habitat and critical periods in fish and wildlife cycles, and considering additional mitigation measures that may be required. Annual timing of migration, spawning and calving in the vicinity of the site shall be considered at all times;
- Personal pets shall not be brought to the construction site;
- Buffer zones shall be implemented to protect wildlife at the site (refer to Section, “Buffer Zones” for buffer zones pertaining to helicopter traffic at the site);
- Fishing and hunting are prohibited at or near the construction site. All Project participants shall be prohibited from fishing and hunting at or near the construction site while working on the Project;
- Under no circumstances are wildlife to be fed and all measures shall be taken to avoid inadvertent feeding;

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- Wildlife shall not be chased, caught, diverted, followed or otherwise harassed by project participants;
- All Wildlife sightings and nuisance wildlife shall be reported to the OSEM;
- The forestry branch shall be contacted and updated with regards to nuisance wildlife and wildlife encounters;
- Equipment and vehicles shall yield the right-of-way to wildlife and adhere to construction site speed limits;
- Environmental awareness training with regular briefings shall be implemented for all Personnel;
- All persons on Site shall be made aware of the potential for encounters with black bears and instructed to report all sightings to the OSEM;
- Black bear deterrent measures, such as bear bangers and bear spray, may be used and translocation of bears shall be undertaken before any lethal means are considered. A research permit for relocation of bears may be required from the Wildlife Division, Department of Environment and Conservation, Government of Newfoundland and Labrador;
- Fire arms shall not be permitted on Site, with exception of approved bear monitors;
- Black bear protection permits shall be obtained for each black bear monitor. Permits shall be signed by the individual, to which the permit is issued;
- An Avifauna Management Plan has been developed by NE-LCP. This Plan includes the following:
 - Surveying for migratory bird nests prior to cutting during the nesting season;
 - Surveying for sensitive habitat that typically supports nest;
 - Information regarding avoiding identified nests until fledged;
 - Information regarding cutting in sensitive habitats during nesting season; and
 - Employing on-Site support of qualified biologists during construction, as required.
- Clearing activities between May 1 and July 31 shall be in compliance with the Avifauna Management Plan; and
- No one shall disturb, move or destroy migratory bird nests. If a nest or young birds are encountered, work shall cease in the immediate area of the nest. Work shall not continue in the area until the nest is no

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longer occupied, otherwise the work plan shall be modified to avoid nest sites by a minimum of 30 m (100m for the Rusty Blackbird).

Caribou

Throughout the construction of the Project, LCP will maintain communications with the provincial Wildlife Division, and other stakeholders and officials regarding the movements of the George River Herd (GRH) and Red Wine Mountains Herd (RWMH) sightings in the Project area.

If caribou are present on the Project during the calving and post-calving season (May 1 – July 1), a progressive level of heightened awareness shall be implemented by Project Personnel and increased interaction shall be conducted with the Wildlife Division.

The following describes specific potential interaction scenarios and the associated mitigation:

Scenario 1 – Caribou within 20 km of Project activities (based on satellite telemetry or other reports):

- OSEM will conduct weekly visual surveys of 10 km radius around each activity from road-accessible vantage points for caribou or signs of caribou (i.e., winter craters, tracks or scat). If present, wildlife observations will be included in the weekly environmental report to be sent to NLDOEC-WD in Corner Brook (whenever Project activities are ongoing), and such information will be presented during environmental awareness training and regular briefings for all Personnel.

Scenario 2 – Caribou within 5 km of Project activities (based on satellite telemetry or other reports):

- OSEM to issue advisory to all Project Personnel that all sightings of caribou to be reported immediately to the OSEM. The OSEM will then immediately notify all vehicle operators.
- OSEM will conduct daily visual surveys of 10 km radius around each activity from road-accessible vantage points for caribou or signs of caribou (i.e., winter craters, tracks or scat).
 - o If present, wildlife observations will be included in the weekly environmental report to be sent to NLDOEC-WD in Corner Brook

Scenario 3 – Caribou present during sensitive time periods. If GRH Caribou are observed during the calving/post calving season (May 1 – July 1), the LCP will consult the NLDOEC-WD to discuss appropriate mitigation considering the Project activity to reduce disturbance to caribou.

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Scenario 4 – Blasting at the Main Site:

- Prior to blasting, the OSEM will conduct a visual survey.
- If caribou are within 3 km of the site, blasting will be delayed until caribou have left the area.
- Methods to encourage caribou to leave the area may be implemented in consultation with NLDOEC-WD.
- Note, if LCP can demonstrate the planned blasting activity will not likely result in a behavioural response by caribou, the 3 km radius may be reduced.

Scenario 5 – Other Project activities (e.g., grubbing, grading and leveling, laydown and storage of equipment and material in existing areas, generators to support the activity, vehicle and heavy equipment use, handling and transfer of fuel and other hazardous material, waste disposal, sewage disposal and hazardous waste disposal, localized and low intensity blasting, tower erection and conductor stringing):

- As these activities would not be audible beyond a short distance, if caribou are observed within 500 m of such an activity, the OSEM will determine if the activity will be delayed or curtailed.
- Wildlife interactions will be included in the weekly environmental report to be sent to NLDOEC-WD in Corner Brook.

12.35.4 Muskrat Falls Rock Knoll

Construction activities conducted to reduce interaction with rock knoll to extent practical, in consultation with the Innu Nation through the Environmental Management Committee.

12.36 COMMISSIONING

Environmental Concerns

Commissioning will occur after installation and prior to release for commercial operation; it is a means of verifying and documenting that each component, system and assembly of a facility is built, installed and tested as planned and designed to meet Project requirements.

Environmental concerns related to commissioning relate to unintended release of hydrocarbons into the environment.

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Environmental Protection Procedures

- All equipment containing fluids shall be checked for leaks by the supplier and/or manufacturer and shall be tested according to the manufacturer's directions prior to commissioning activities;
- There shall be monitoring during commissioning for spills and/or leaks;
- Appropriate spill kits shall be on hand to respond to a spill or leak (refer to Section, "Storage, Handling, Use and Disposal of Fuel and Other Hazardous Materials");
- In the event that a spill or leak is detected, the Master Spill Response Plan shall be referred to for response to any incidents; and
- All other requirements of this EPP shall be adhered to during commissioning.

12.37 DIVERSION HEAD POND FORMATION AND RESERVOIR IMPOUNDMENT

Construction of the north and south dams will result in the formation of a 59 km long reservoir. At Full Supply Level (FSL), the area of inundation will be 41 km², resulting in a reservoir with a total surface area of 101 km². During the impoundment of the reservoir the downstream flow will be significantly reduced (30% of normal flows will be maintained during impoundment).

It is estimated that it will take approximately ten (10) to twelve (12) days to fill the reservoir to FSL, at which time normal downstream flows will re-commence in the river. A detailed plan outlining the schedule and duration of diversion head pond formation and impoundment will be provided to DFO in advance of these activities for their review and acceptance/approval.

Prior to full impoundment, a diversion head pond will be created when the riverside cofferdam is complete and the river is diverted through one (1) spillway during construction of the hydroelectric facilities. Prior to winter freeze up, the flow through the spillway will be controlled and a diversion head pond will be formed to facilitate the development of a stable ice cover for the remainder of the construction period. The diversion head pond will be maintained at an elevation of 24 m during the spring, summer and fall seasons, with a total reservoir surface area of 74 km².

In winter, the head pond will be maintained at an elevation of 25 m, with a total reservoir surface area of 76 km². During diversion, the total outflows will be equal to the total inflows.

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Environmental Concerns

Environmental concerns associated with formation of the diversion head pond and reservoir impoundment include:

- Previously dry soils will become hydrated. This may change the cohesive properties of the soil and may lead to slumping; and
- Nesting/mating of terrestrial wildlife in the impoundment/head pond zone may be flooded and spawning and habitat of aquatic species in the impoundment/head pond zone and downstream may be affected.

Environmental Protection Procedures

The flooding of habitat for terrestrial and aquatic species is date sensitive due to the timing of reproduction and rearing in a variety of species. See Table, “Buffer Zones for Placement of Treated Wood within a Protected Water Supply Area” for information related to sensitive life stages for aquatic and terrestrial fauna in Labrador. As construction progresses and, more certainty, is gained regarding the timing of head pond formation/impoundment, a filling plan shall be developed in consultation with the Regulatory Compliance Lead and relevant regulatory authorities.

The filling plan shall include timing of activities, sequencing and execution plans and relevant mitigations depending on the timing/season of impoundment/head pond formation.

12.38 SITE REHABILITATION

Environmental Concerns

The primary concern with environmental rehabilitation is site stabilization and erosion prevention. This is particularly pertinent in regards to temporary structures such as roads, quarries, cofferdams, etc.

Environmental Protection Procedures

Environmental rehabilitation shall be consistent with all applicable standards, codes, acts and regulations and the conditions of EA release.

General rehabilitation approaches are provided in this section. However, specific rehabilitation approaches shall also be developed in compliance with regulatory requirements and industry best practice, and shall be

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completed on a site-by-site basis and included in the C-SEPP. An outline of the requirements of the Site-specific rehabilitation plan is provided below.

12.38.1 Site-Specific Rehabilitation Plan

The following outlines the requirements of the Site-Specific Rehabilitation Plan:

- Removing and stockpiling overburden and organic material for re-use;
- Re-grading areas to control erosion and establish suitable drainage;
- Replacing the overburden and organic material to produce conditions for re-growth; and
- Encouraging natural re-vegetation, or re-planting with suitable vegetation.

On some sites, there may be limited overburden and organic matter. Nutrient poor soils and a shorter growing season may also slow down and reduce the rate of vegetation re-establishment. In these cases, it may be necessary to import seed, mulch or geotextiles to artificially improve revegetation for key areas. Measures to prevent the invasion of disturbed sites by non-native plant species shall be considered. Acceptable approaches include, but are not limited to the following:

- Use of native plant and soil material for rehabilitation and re-vegetation;
- Use of only species that are non-aggressive and non-persistent (where local plants are not available or shall not meet the rehabilitation objectives).
- Implementation of measures to ensure that additional materials (required to limit erosion, reduce sedimentation or enhance establishment) are weed and disease free; and
- Equipment coming from other regions or provinces shall be clean and free of potential seed sources of invasive plants.

All areas of the construction sites shall require careful consideration of the landscape within which the work is taking place to ensure that the correct approach is taken. Areas shall be prioritized in terms of need and importance, and the level of rehabilitation shall be modified accordingly. Factors that shall be considered in determining the rehabilitation approach include, but are not limited to the following:

- Site and public safety (including future access requirements);
- Sedimentation concerns and proximity to water bodies;

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- The natural habitat of the area (i.e. vegetation, soil, hydrology, etc.);
- Wildlife habitat considerations;
- Riparian habitat considerations;
- The productivity of the site (i.e. moisture, content and nutrient regime) and its effect on re-vegetation;
- The availability of materials and implications of importing unnatural material;
- Land use and their effect on success of rehabilitation techniques; and
- Overall cost of rehabilitation measures.

Once the schedule of work at each construction area has been developed, a detailed schedule for carrying out rehabilitation work shall be developed in accordance with regulatory requirements and shall also consider industry best practice for implementation of site rehabilitation. The site-specific rehabilitation plan shall indicate timing of the rehabilitation works for each area to be rehabilitated. Consideration shall be given to progressive rehabilitation throughout the construction period, as opposed to waiting for the end of construction before starting with rehabilitation.

12.38.2 General Measures

- Rehabilitation shall be required for all temporary works, including roads, stream crossings, camps and quarry and borrow areas;
- No temporary buildings or structures associated with the work shall be left on site upon completion of the work;
- All solid waste, including petroleum, oil and lubricant containers shall be removed from site;
- Prior to occupancy the OSEM shall inspect the proposed area of occupancy and, if required, coordinate soil and groundwater testing to confirm site conditions;
- Prior to contract close out, abandoned sites will be inspection by the OSEM and, if required, coordinate soil and groundwater testing to confirm site conditions;
- Pre/Post occupation inspection shall be completed;
- The On-Site Environmental Monitor shall prepare a report for all Sites documenting site conditions (and any associated test results) prior to disturbance and upon site abandonment and rehabilitation. Each

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report shall include a description of the condition of vegetation and other aspects of natural environment; and

- Any contamination or unacceptable site conditions shall be addressed by the Contractor prior to complete demobilization.

Quarry/Borrow Areas

The following measures are specific to quarry and borrow areas and shall be considered in rehabilitation plans for those areas:

- Any organic material or overburden removed during development of the borrow pits and quarries shall be stockpiled near the pit or quarry area for future use during rehabilitation of the borrow pit or quarry. Overburden (and non-PAG rock) that is not suitable for rehabilitation purposes shall be stockpiled for temporary use or permanent disposal. Stockpiling shall be in stable configurations and contoured to match the surrounding landscape. For temporary stockpiling it shall be and returned to the borrow pit or quarry opening once extraction from the pit or quarry is complete;
- As site conditions dictate, vegetation or other cover materials may be established on slopes to control erosion and dust (as outlined in Section, "Erosion Prevention and Sediment Control"). Quarries and pits reclaimed during operations may be used as test plots to evaluate suitable re-vegetation techniques to be used for the rehabilitation of other work areas in the future;
- Arrangements shall be made with the representatives of the Department of Natural Resources for an inspection to be conducted prior to abandonment of the site;
- All equipment and material shall be removed from the site;
- All pit and quarry slopes shall be graded to slopes less than 20%, or to a slope conforming to that existing prior to quarrying;
- Excess overburden may be used for sloping but topsoil or organic material may not be used for sloping. Following sloping, topsoil or organic material may be spread over the entire quarry area to promote vegetation; and
- Quarry conditions, including slope on rock walls, shall be determined through the Rehabilitation Plan. Each quarry shall be evaluated on a site-specific basis to determine if cliff faces shall be converted to rubble slopes.

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Roads/Stream Crossings

The following measures are specific to road and culvert/bridge rehabilitation and shall be considered in rehabilitation plans for those areas:

- The Contractor shall submit a plan for controlling erosion during rehabilitation activities. This plan would address construction activities that have the potential for stream sedimentation;
- When working in a stream or water body, remove all fill around pipes before water bypass installation and pipe removal;
- The stream shall be dewatered at the site using a non-eroding, water tight diversion during excavation. Settling basins shall be used to ensure that muddy water does not enter the water body;
- Fill material that requires temporary placement shall be placed in stable areas outside of stream channels and flood plains;
- Channel banks shall be armoured with large rock, woody debris and vegetation when needed;
- Channel and vegetation rehabilitation shall be required if there are disturbances upstream and downstream of the stream crossing site;
- Stream channels shall be restored to natural grade and dimensions and re-vegetation may be required;
- Culverts within the flood zone (below LSL) may be left in place and flooded during reservoir impoundment/head pond formation. Culverts above the LSL shall be removed;
- Temporary bridges in all areas of the site shall be removed; and
- Removed culverts and other structural materials shall be disposed of as per the WMP.

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13 ENVIRONMENTAL MONITORING AND FOLLOW UP

13.1 ENVIRONMENTAL COMPLIANCE MONITORING

To ensure that appropriate and effective environmental mitigation measures are employed during construction, the Project will have full-time On-Site Environmental Monitors at various construction sites. These individuals will inspect worksites and activities for conformance with the EPP, C-SEPPs, engineered mitigation measures required by design; and compliance with government regulations and permits.

This EPP establishes the basis for environmental compliance monitoring at the various work fronts (i.e. monitoring for regulatory compliance to verify that conditions of all permits and approvals are satisfied, and that all environmental regulatory requirements are met). Refer to the Regulatory Compliance Plan (RCP) for further information on regulatory compliance for the Lower Churchill Project.

Non-conformance with this EPP and/or non-compliance with permits, approvals, and regulatory requirements will be documented, as indicated in the following paragraphs and in the RCP, and addressed with the Contractor responsible for mitigation measures. Corrective action will be identified, target dates will be agreed upon, and responsibilities will be assigned to appropriate Personnel.

This documentation will be distributed to other members of the Project's environmental management team, and written notice of agreed corrective action will be forwarded to the Contractor so that issues are resolved to the satisfaction of the Project's environmental management team.

If non-conformance items are noted that require immediate attention, or if agreed corrective action is not implemented in a timely and effective manner, then appropriate resources will be contracted by the Project to immediately undertake the required action.

Daily field reports will be prepared by the On-Site Environmental Monitor and Site Environmental Manager and distributed to the Construction Manager, the Environment and Regulatory Compliance Manager and the Environmental Engineering Coordinator(s). These reports will describe the work being undertaken by the Contractor, and document incidents of non-conformance with environmental requirements.

The Environmental Engineering Coordinators, in consultation with Project staff and the Contractor, will prepare risk based Environmental Compliance Audit Reports on the various work fronts. The reports will document all incidents of non-compliance and their causes. The Environmental Engineering Coordinators will distribute the Environmental Compliance Audit Reports to relevant Project participants. The Environmental Engineering

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Coordinators will be responsible for managing the Non-Conformance and Corrective Action Registry, including updating it regularly, and incorporating all conditions into the Registry to ensure that these are complied with in a timely manner.

The Contractor shall be responsible for developing a site-specific Compliance Monitoring Plan to be included in the C-SEPP. This shall include such things as frequency of monitoring, parameters, locations and media to be monitored, etc.

All analysis conducted to support compliance monitoring shall be subject to the Accredited Laboratory Policy.

13.2 ENVIRONMENTAL EFFECTS MONITORING

The intent of Environmental Effects Monitoring (EEM) is to verify predictions made as part of the environmental assessment.

EEM monitoring will be carried out by the ERC Team via third party consultants. The EEM program results will be communicated to the field team by the ERC Lead. Should effects deviate from predicted, the ERC Manager will determine the cause and appropriate action. Should this information be linked to work practices, the EPP will be revised and updates will be provided to Contractors and Personnel.

It is noted that there may be additional requirements for approvals and communication with the regulators related to the EEM Plan.

13.3 ANNUAL ENVIRONMENTAL PERFORMANCE REVIEW

At the end of each construction year the Project will convene an environmental performance workshop to review all work activities that relate to environmental concerns, issues and/or mitigations. This workshop will include a review of environmental audits carried out by Project staff during the year. The review process will give all parties a chance to evaluate overall environmental performance and compliance with government regulations, permits, this EPP, and C-SEPPs.

14 CONTINGENCY PLANS

Contingency plans, to address unplanned occurrences and emergency situations, are provided in the following sections. The following unplanned occurrences and emergencies have been addressed under contingency plans:

- Fuel and Hazardous Material Spills (Master Spill Response Plan)

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- Wildlife Encounters (including nesting and denning sites)
- Historic and Archaeological Resources
- Forest Fires (ERP)

14.1 FUEL AND HAZARDOUS MATERIALS SPILLS

In case of a fuel or hazardous material spill, Project staff shall refer to the Master Spill Response Plan (MSRP) for detailed contingency measures. A site-specific fuel and hazardous materials response plan will form part of the C-SEPP.

14.2 WILDLIFE ENCOUNTER

Wildlife encounters pose a potential risk for stress or injury to both the wildlife and Site Personnel. In the case of wildlife encounters, the following will be implemented:

- No attempt shall be made by any worker at the Project Site to chase, catch, divert, follow or otherwise harass wildlife by vehicle or on foot;
- Equipment and vehicles shall yield the Right-Of-Way (ROW) to wildlife;
- Any wildlife sightings or encounters shall be reported to the OSEM, and the information will be distributed to Site Personnel to increase their level of awareness and caution;
- The OSEM will be responsible for all actions in response to nuisance animals, including the use of firearms by bear monitors in the project area. A research permit for relocation of nuisance animals may be required from the Wildlife Division, Department of Environment and Conservation, Government of Newfoundland and Labrador;
- If the nest of any bird is encountered during construction and operation activities, work around the nest shall be stalled until the Wildlife Division has assessed the situation and appropriate mitigation is applied;
- Any incidents that result in the displacement or killing of wildlife shall be reported to the On-Site Environmental Monitor complete with details on the incident and the names (and contact information) of the persons involved; and
- In the event of a bear encounter Project Personnel shall follow the procedures as outlined in the Bear Awareness Training.

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14.3 HISTORIC AND ARCHAEOLOGICAL RESOURCES

Historic resource material that is disturbed, destroyed or improperly removed from a site represents a potential cultural loss of information and history that could otherwise be handled and interpreted in an efficient and appropriate manner.

In case of a suspected discovery of an archaeological site or artefact, the following procedures shall apply:

- Archaeological materials encountered shall be reported initially to the On-Site Environmental Monitor. The On-Site Environmental Monitor will then immediately report this to the Site Environmental Manager, Environmental Engineering Coordinators and Construction Manager.
- The Provincial Archaeologist at PAO (Martha Drake, Provincial Archaeologist, 709-729-2462) shall be informed of the discovery by Nalcor's Environmental and Regulatory Compliance Coordinator with the following information:
 - Nature of activity;
 - Nature of the material discovered; and
 - Precise location of the find.
- Under the Historic Resources Act, RSNL 1990, c.H-4, all archaeological sites and artefacts are the property of the Crown, and shall not be disturbed. The Project will take all reasonable precautions to prevent Employees or other persons from removing or damaging any such objects or sites. Persons in contravention and may be held liable for prosecution under Section 35.1 and 35.2 of the *Historic Resources Act (RSNL 1990, c. H-4)* for all contravention. Personnel working in the vicinity shall be advised of the find, including the OSEM. The site area shall be flagged for protection and avoidance;
- All work will cease within 50 m of the discovery until NE-LCP advises the PAO of the discovery. The PAO, in consultation with NE-LCP, will provide direction regarding the discovery and may authorize a resumption of the work. If required, a full archaeological assessment will be conducted of the site and immediate area; and
- The PAO will assess the significance of the discovery and determine if mitigation is required. NE-LCP in consultation with the PAO will develop mitigation measures and advise the PAO of any such measures.

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14.4 FOREST FIRES

Construction for the development of the Lower Churchill may have activities that increase the risk of fire in the natural environment. Fires on site could spread to the surrounding area and forest. The main concerns include human health, damage to vegetation, wildlife and air and water quality. In case of a forest fire Project Personnel shall refer to the Emergency Response Plan for detailed contingency measures.

The operator will take all precautions necessary to prevent fire hazards when working at the site. In the case of a fire being encountered, the following will be implemented:

- The Construction Manager will appoint a supervisory staff member as “On Scene Commander” for fighting any forest fires;
- Immediate steps will be taken by the operator and Contractors on Site to contain or extinguish the fire. Applicable Personnel will be trained in firefighting and the use of such equipment. Equipment will be provided in proper operating condition to suit the labour force and shall comply with manufacturer’s standards;
- Fires shall be immediately reported to the Construction Manager who will in turn report it to the applicable authorities (1-866-709-3473). The following information is required when reporting a fire:
 - Name and telephone number
 - Time of detection of fire
 - Size of fire
 - Location of fire
 - Weather conditions (rain, sun, wind direction and speed, etc.)
- Sufficient firefighting equipment to suit the labour force and fire hazards shall be provided by the Contractor. Equipment shall be provided as specified in the forest fire regulations and Operating Permit, and shall include shovels, back tanks and axes. Such equipment shall comply with and be maintained to the manufacturer’s standards. Project Personnel shall be trained in the use of such equipment;
- During the fire season, ATV’s shall be equipped with a fire extinguisher or suitable equivalent containing a minimum of 227 grams of ABC dry chemical. Other machinery and equipment shall be equipped with a fire extinguisher containing a minimum of 4.5 kilograms of ABC dry chemical;

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- The forest fire suppression equipment referred to in the Operating Permit shall be provided at the operating site in the following ratio:

Employees	Back Tank Pumps	Axes or Pulaski Tools	Grubbers or Shovels
5 or less	1	1	1
6-10	2	2	2
11-15	3	3	3
16-20	4	4	4
>20	Add 1 back tank pump, 1 axe or Pulaski tool and 2 grubbers or shovels to the above figure for each group of 5 additional employees or fraction of that number of employees. The back tank pump must have a capacity of 20 litres and be of a type approved by the forest service.		

Table 14-4 – Forest Fire Suppression Equipment Requirements

- The Contractor is required to ensure all fire pumps are approved by forest services, and all approvals shall be documented;
- When the number of Employees reaches twenty (20) or over, one (1) fully functional forest fire pump, such as the Wajax Mk3, shall be available at the Site. Pump accessories shall include: a gated “Y” valve, hose strangler and two nozzles for each unit, additionally, 610 meters of forest fire hose shall be available for each unit. If there are greater than forty (40) Employees, two (2) of these systems are required;
- The forestry official issuing the operating permit may specify deviations from the equipment requirements should local operating conditions warrant deviations;
- The actual location of the forest fire suppression equipment in relation to the operating site may be designated by the forestry official issuing the permit;
- A copy of the operating permit shall be on the operating site and shall be shown when requested by a forestry official;
- Where a forest fire occurs on forest land in an area where logging or industrial operations are being carried out, the person(s) carrying out the operations shall immediately notify the nearest forest management district office or ranger station and commence fighting the fire with all labour, materials, equipment and facilities at his or her disposal until relieved of this responsibility by a forestry official or the fire is extinguished; and
- For additional information regarding forest fire contingency planning, refer to the ERP.

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15 REGULATORY CONTACT LIST

Lower Churchill Project General Information:

lowerchurchill@nalcorenergy.com

<http://muskratfalls.nalcorenergy.com/>

Telephone: 1(888)-576-5454

DOEC Water Resources – St. John's:

Telephone: (709) 729-5713

DOEC Crown Lands - Happy Valley/Goose Bay:

Telephone: (709) 896-2488

DOEC Wildlife Division:

(709) 637-2029

DFO: Habitat Management – Labrador:

Telephone (709) 896-6193

DNR Forestry Division:

Telephone: (709) 497-8479

DNR Mines Division:

Telephone:(709) 729-6447

Service NL, GSC - Happy Valley/Goose Bay:

Telephone: (709) 896-5471

Provincial Archaeology Office:

Telephone: (709) 729-2462

Environment Canada Environmental Emergency Report Line:

Telephone: (709) 772-2083 or 1 (800) 563-9089.

Town of Happy Valley Goose Bay

Telephone: (709) 896 3321