5.0 ENVIRONMENTAL MANAGEMENT PROGRAM ............................................. 5-1
5.1 Introduction ............................................................................................... 5-1
5.2 The Environmental Protection Plan .......................................................... 5-2
  5.2.1 Design and Construction Management ................................................. 5-2
  5.2.2 Environmental Protection Measures .................................................... 5-3
  5.2.3 Emergency Response and Contingency Procedures ............................ 5-4
5.3 Fisheries Mitigation and Compensation Plan ............................................. 5-7
5.4 Monitoring Plan ....................................................................................... 5-7
5.5 Summary ................................................................................................. 5-7

List of Tables

Table 5-1: Electric Power Generation Facilities Operated by Canadian Hydro ........ 5-6
5.0 ENVIRONMENTAL MANAGEMENT PROGRAM

5.1 Introduction

The parent company of Glacier Power, Canadian Hydro Inc., is a developer of green, renewable energy and is committed to protecting the environment throughout all phases of the Project. Accordingly, Canadian Hydro has traditionally taken a very active, hands-on role with the design and development of its hydroelectric projects. Canadian Hydro has developed an Environment Health and Safety Management System (EHSMS) based on their corporate Sustainable Development Policy. The EHSMS incorporates environmental, health and safety policies and practices for each of Canadian Hydro’s operating plants. The Project will be included in that program. As a wholly owned subsidiary of Canadian Hydro, Glacier Power is also committed to sustainable development and to the protection of the environment, health and safety of its employees, contractors, customers and those affected by the company’s activities.

The Project will be constructed, operated and decommissioned in a safe and environmentally sound manner. During construction activities, a representative of Glacier Power or Canadian Hydro will be on site throughout the work. Glacier Power will retain the services of an independent environmental monitor or inspector during the construction phase of the Project.

The Environmental Management Program (EMP) will be developed in full during the detailed design phase of the Project and will be presented to the relevant agencies for approval before initiating any construction activity. The EMP for the Project involves developing the following plans:

- **Environmental Protection Plan (EPP)** – will be prepared following project approvals during the detailed engineering phase of development and incorporates three main components; detailed engineering and development schedule, environmental protection measures and emergency response and contingency procedures.

- **Fisheries Mitigation and Compensation Plan (FMCP)** – is prepared in detail to meet the requirements of Fisheries and Oceans Canada (DFO) authorization and describes measures to maintain, enhance or create habitat or other important biophysical features affected by the Project, and any compensation works required as a result of residual effects. The FMCP will draw on information contained in the Fisheries No Net Loss Plan (Mainstream, 2006) submitted with this EIA.

- **Monitoring Plan (MP)** – outlines a monitoring program to verify effects and mitigation measures and any compliance-related requirements. Glacier Power has prepared and submitted a Fisheries Monitoring Plan as part of this EIA.

Canadian Hydro is presently operating several plants in Alberta, British Columbia and Ontario, that it has successfully designed and built, and is very experienced in the management of environmental, health and safety risks associated with hydroelectric project development.
5.2 The Environmental Protection Plan

The Environmental Protection Plan (EPP) presents standard, good environmental practices and the environmental protection requirements of provincial and federal environmental departments. It outlines the procedures, organization and instructions to provide project personnel with an understanding and effective means of implementing environmental protection procedures for both routine activities and unplanned events associated with the proposed site development work. The information presented within the EPP will be used as a management tool to meet the goals of Canadian Hydro and Glacier Power’s EHSMS, with applications for training and educating CHD personnel and their representatives, as well as site personnel.

The EPP incorporates three main components or sections: detailed design and construction management; environmental protection measures; and, emergency response and contingency procedures. Appendix F gives a summary of environmental protection procedures for inclusion in the project EPP.

5.2.1 Design and Construction Management

Engineering design and construction management outlines final design, equipment procurement, construction techniques, scheduling, permits and approvals and project management. The EPP will form part of the construction contract. It will identify the Construction Management Team (CMT) and any special provisions expected of the contractor. The EPP will be written in construction-specification format to be read with engineering drawings where specific mitigation measures will be applied.

Glacier Power will retain the services of an independent environmental monitor who will be approved by AENV, ASRD, and DFO. The monitor, or Environmental Officer (Officer), will participate directly in implementing the Project as part of the CMT. The Officer will be independent of the contractor and will report directly to the CMT as well as communicate with DFO and AENV as necessary.

In order to function effectively, the Officer requires sufficient authority to create immediate changes to inappropriate construction activities. In this regard the Officer’s role and authority is clearly outlined to the CMT and the contractor and he or she is given the ability to issue stop-work orders through delegated authority of a senior representative of Glacier Power.

The terms of reference for the Officer will be provided in the EPP. The Officer’s responsibilities are summarized below:

- to ensure the proper implementation of environmental control, mitigation measures and construction specifications concerning environmental protection
- to maintain liaison and communication with the CMT, contractor, Glacier Power and regulatory agencies
- to ensure the contractor is aware of environmentally sensitive areas in advance of construction activities (preconstruction meeting)
- to promote environmental education and awareness among the CMT and the contractor’s workforce
The Officer will inspect construction sites daily, give advice and information about construction matters related to environmental issues, assess the effectiveness of mitigation measures, prescribe remedial measures, conduct monitoring duties and maintain a record of site activities.

5.2.2 Environmental Protection Measures

The environmental protection measures will include specific mitigation measures (where, when and how) to be implemented during site preparation, construction, reclamation and operations to eliminate or minimize adverse environmental effects.

Many of the standard practices and specific mitigation measures that will be implemented during the construction and operations phases of the Project are identified in various sections of the EIA as they relate to specific valued environmental components (VECs). These will be incorporated into the EPP under the following topics and recommended approaches related to construction and operations:

Construction:

- environmental issues and mitigation measures
- licences and permits required
- timing constraints and construction windows
- surveying, clearing and timber salvage
- grading and site preparation
- surface soil conservation
- burning of slash
- the construction, upgrade and maintenance of access roads
- erosion and dust control measures
- sedimentation pond dimensions
- reclamation of disturbed areas
- discharge water quality
- storage and disposal of waste
- spill response and clean-up
- fire prevention and control
- river rescue
- construction monitoring

Operations:

- waste management
- maintenance procedures
- environmental monitoring

The EPP will also identify station-by-station construction requirements along the access roads and transmission line related to any of the above topics. Details of the EPP will be submitted to the regulatory agencies for approval before beginning construction activities. The EPP will be reviewed periodically during construction to revise procedures, as necessary.
5.2.3 Emergency Response and Contingency Procedures

The emergency response and contingency procedures, key contacts, communications systems and reporting requirements will be documented and be in place before construction for all potential hazardous conditions including:

**Construction:**

- hazardous material spill
- cement spill
- sediment pond breach
- structure failure
- fire
- rescues

**Operations:**

- severe storms or high inflows
- cracking of headworks structure
- failure of headworks structure
- landslides
- earthquakes
- fires
- rescues
- hazardous material spills
- medical emergencies

Procedures will be developed during detailed design based on consultation with local authorities and municipal district (MD) representatives. Copies of these procedures will be on file at the project office, local MD offices and with the local RCMP detachments.

Canadian Hydro has several hydroelectric facilities, none of which have encountered emergency spill response or compliance situations during operations. However, the operators are knowledgeable of spill hazards and response procedures. At the project site, the operators will be trained to meet the goals of the *EHSMS Policies and Procedures Manual* including emergency and spill response.

Glacier Power is aware that the public is generally unaware of the dangers associated with hydroelectric facilities based on Canadian Hydro's own experience at other operating plants in Canada. Public safety is of primary concern to Glacier Power. The project description (Section 3) and the health and safety section (Section 4.15) describe the safety issues, signage and safety measures Glacier Power is committed to implementing. Canadian Hydro has 12 operating run-of-river hydroelectric facilities ranging is size from 1 to 45 megawatts (MW) in Canada, each with a slightly different operating regime and safety concerns. Some of these facilities are remote and some are in heavily populated areas; none are manned 24 hours a day. Each of these facilities are signed with safety booms and gated or fenced to encourage public safety under the corporate EHSMS program.
The Project will be manned 24 hours a day, seven days a week. Public and plant operator safety programs will be implemented oriented specifically to hazards at the plant.

Construction contractors and site personnel, plant operating staff and maintenance contractors will receive training in spill recognition and response techniques. Once the plant is operational, the in-plant spill response will start at the operations and maintenance level. The key elements of in-plant spill response will be:

- spill prevention by training staff to recognize potential sources and hazards
- safety of plant employees and the public
- controlling the source of the spill by shutting down equipment
- containing the spill by using specialized equipment and materials
- reporting procedures
- clean-up

The project description section (Section 3) describes the low potential for structure failure and the consequences to downstream residence. Regardless of the low potential and the minimal effects downstream, Glacier Power will implement a notification system through consultation with AENV and will integrate into the nearby MD, fire departments and RCMP emergency response programs. The basis for the notification system is laid out in the Canadian Dam Association’s Dam Safety Guidelines, AENV’s Dam and Canal Safety Guidelines and the Guidelines for the Preparation of an Operations, Maintenance and Surveillance Manual for Water Management Projects. Other hydroelectric and irrigation system dams in the province have similar emergency response plans. As such, there is a significant knowledge based on the operation of smaller and larger projects than Dunvegan. The notification system will contain the following elements:

- checklist system:
  - initial field response
  - initial response to potential emergency
  - initial response to imminent emergency
- site manager checklist
- downstream notification log
- communications list

Glacier Power’s parent company, Canadian Hydro is a Canadian public company engaged in the development and operation of renewable, green power generation facilities in Canada. Canadian Hydro has over 15 years of experience in the design, construction and operations of small hydroelectric run-of-river facilities that use the same concepts as those of the Project. The company is very familiar with the civil works required for the construction of such projects. Canadian Hydro owns and operates twelve run-of-river plants (eight of which the present management designed, permitted and constructed) in three provinces totaling over 115 MW. Each of these facilities incorporates turbine technology and civil works similar to the Project.
Table 5-1 lists the electric power generation facilities operated by Canadian Hydro.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Capacity</th>
<th>Province</th>
<th>Facility Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belly River Hydroelectric Plant</td>
<td>3 MW</td>
<td>Alberta</td>
<td>High Head Irrigation System</td>
</tr>
<tr>
<td>Waterton Hydroelectric Plant</td>
<td>2.8 MW</td>
<td>Alberta</td>
<td>High Head Irrigation System</td>
</tr>
<tr>
<td>St. Mary Hydroelectric Plant</td>
<td>2.3 MW</td>
<td>Alberta</td>
<td>High Head Irrigation System</td>
</tr>
<tr>
<td>Taylor Hydroelectric Plant</td>
<td>13.5 MW</td>
<td>Alberta</td>
<td>High Head Irrigation System</td>
</tr>
<tr>
<td>Akolkolex Hydroelectric Plant</td>
<td>10 MW</td>
<td>British Columbia</td>
<td>High Head Run-of-River</td>
</tr>
<tr>
<td>Pingston Hydroelectric Plant</td>
<td>45 MW</td>
<td>British Columbia</td>
<td>High Head Run-of-River</td>
</tr>
<tr>
<td>Upper Mamquam Hydroelectric Plant</td>
<td>25 MW</td>
<td>British Columbia</td>
<td>High Head Run-of-River</td>
</tr>
<tr>
<td>Galetta Hydroelectric Plant</td>
<td>1.6 MW</td>
<td>Ontario</td>
<td>Low Head Run-of-River</td>
</tr>
<tr>
<td>Misema Hydroelectric Plant</td>
<td>3.2 MW</td>
<td>Ontario</td>
<td>High Head Run-of-River</td>
</tr>
<tr>
<td>Appleton Hydroelectric Plant</td>
<td>1.4 MW</td>
<td>Ontario</td>
<td>Low Head Run-of-River</td>
</tr>
<tr>
<td>Moose Rapids Hydroelectric Plant</td>
<td>1.0 MW</td>
<td>Ontario</td>
<td>Low Head Run-of-River</td>
</tr>
<tr>
<td>Ragged Chute Hydroelectric Plant</td>
<td>6.6 MW</td>
<td>Ontario</td>
<td>Low Head Run-of-River</td>
</tr>
</tbody>
</table>

The Belly, Waterton, St. Mary and Taylor facilities were added to existing irrigation system structures in southern Alberta. As such, they take advantage of irrigation storage and dam structures to provide suitable head (drop in elevation) to generate hydroelectric power. All of the Ontario hydroelectric plants are run-of-river facilities using between 5 and 15 m of elevation drop (low head), with the exception of the Misema facility, which uses a high head of 42 m. In British Columbia, all of the facilities use higher head, with the lowest being the Akolkolex plant (30-m head), and the highest being Pingston Creek (557-m head, the third highest in Canada). Canadian Hydro recently completed the construction and commissioning of a third facility in British Columbia, the Upper Mamquam Hydroelectric Project near Squamish, which uses 120 m of head to generate 25 MW of electrical energy. All of Canadian Hydro’s hydroelectric facilities operate as run-of-river, and have been Ecologo® certified as green power.

In 1999, Canadian Hydro diversified into the wind energy field by acquiring and adding on to the Cowley Ridge Wind Plant consisting of 52 wind turbine units. Today Canadian Hydro has 118 MW of operating wind power in Alberta and southern Ontario, with another 330 MW of wind power currently undergoing regulatory review and nearing construction in Ontario. In 2005 Canadian Hydro completed construction on the 25 MW Grande Prairie EcoPower® Centre, a wood waste facility adjacent to the Canfor mill in Grande Prairie. In August 2006, Canadian Hydro was also awarded power purchase contracts from BC Hydro for four run-of-river projects in central British Columbia, totaling 45 MW, which are in various stages of permitting, and will see construction begin in 2007.
5.3 Fisheries Mitigation and Compensation Plan

A “No Net Loss Plan” has been prepared by Mainstream Aquatics (2006) to document the effects of the Project on fish habitat and the alternatives examined to compensate for habitat loss or alteration. The final FMCP will be prepared to address the final mitigation and compensation commitments Glacier Power will make to the regulatory agencies in order for the Project to obtain final approval and authorization from DFO. The FMCP describes the quality and quantity of habitat potentially affected by the project development, the measures being implemented at the design and construction phases to mitigate the loss or alteration of habitat (including water quality), and the details of any compensation measures, including timelines for completion.

5.4 Monitoring Plan

Glacier Power will develop a monitoring plan to be implemented during the operations phase to verify the predicted effects of the Project on the environment, and the success of mitigation and compensation measures that are implemented. Environmental Compliance Monitoring (ECM) may also be a condition of project approval. The ECM could be integrated with other monitoring programs on the Peace River to add to the regional database.

5.5 Summary

Glacier Power’s parent company, Canadian Hydro, is highly experienced in the design, construction and operation of environmentally sound hydroelectric projects. It is Canadian Hydro’s corporate goal to develop low-impact, renewable energy projects by incorporating environmental protection principles and mitigation measures into all phases of project development.