Northland Power Inc.
Toronto, Ontario

Project Description

For

Kabinakagami River Project

H338464-0000-07-124-0001
Rev. 1
November 30, 2011
REPORT DISCLAIMER

This report was prepared by Hatch Ltd ("Hatch") for the purpose of assisting Northland Power Inc. ("Client") with respect to potential development of the Kabinakagami River Project (the "Project"). Any use of this report by the Client is subject to the terms and conditions of the Agreement between Hatch and the Client, dated November 17, 2008.

Hatch acknowledges that this report may be provided to specific third parties in connection with transactions contemplated by the Client; provided that all such parties shall (by virtue of their acceptance of this report) be deemed to have (a) acknowledged that Hatch shall not have any liability to any party other than the Client in respect of this report and (b) waived and released Hatch from any liability in connection with this report.

This document is meant to be read as a whole, and sections should not be read or relied upon out of context. The report includes information provided by others. Unless specifically stated otherwise, Hatch has not verified such information and disclaims any responsibility or liability in connection with such information.

This report contains the expression of the professional opinions of Hatch, based upon information available at the time of preparation. The quality of the information and conclusions contained herein are consistent with the circumstances and constraints under which this report was prepared.
Project Description

Table of Contents

1. General Information ............................................................................................................................ 1-1
   1.1 General ....................................................................................................................................... 1-1
      1.1.1 Name and Proposed Location of Project ............................................................................ 1-1
      1.1.2 Nature of Project ............................................................................................................... 1-1
      1.1.3 Purpose of the Project ....................................................................................................... 1-2
      1.1.4 Parties who Receive the Project Description ................................................................. 1-2
      1.1.5 Federal, Provincial and Municipal Agency and Stakeholder Consultations ......................... 1-2
      1.1.6 Other Environmental Assessment Processes ....................................................................... 1-5
   1.2 Contacts ...................................................................................................................................... 1-6
      1.2.1 Proponent and Contact Information ................................................................................. 1-6
      1.2.2 Proponent’s Consultant ..................................................................................................... 1-6
   1.3 Federal Involvement .................................................................................................................... 1-6
      1.3.1 Financial Support .............................................................................................................. 1-6
      1.3.2 Land Ownership ................................................................................................................ 1-6
   1.4 Authorizations Required .............................................................................................................. 1-7

2. Project Information .............................................................................................................................. 2-1
   2.1 Common Elements ........................................................................................................................ 2-1
      2.1.1 Common Hydraulic Characteristics ................................................................................... 2-1
      2.1.2 Installed Capacity .............................................................................................................. 2-1
      2.1.3 Site Access ........................................................................................................................ 2-1
      2.1.4 Transmission ..................................................................................................................... 2-1
      2.1.5 Powerhouse ...................................................................................................................... 2-2
      2.1.6 Maintenance and Control Facility ...................................................................................... 2-2
      2.1.7 Operating Strategy ........................................................................................................... 2-2
      2.1.8 Water Management Plan .................................................................................................. 2-2
   2.2 Neeskah (Site 3) Site Description ................................................................................................... 2-7
      2.2.1 Description of Proposed Project ....................................................................................... 2-7
      2.2.2 Site Specific Hydraulic Characteristics ............................................................................. 2-7
      2.2.3 Site Specific Design .......................................................................................................... 2-7
      2.2.4 Tailrace ............................................................................................................................. 2-7
      2.2.5 Area of Inundation ............................................................................................................ 2-7
2.3 Peeshoo (Site 4) Site Description
2.3.1 Description of Proposed Project
2.3.2 Site Specific Hydraulic Characteristics
2.3.3 Site Specific Design
2.3.4 Tailrace
2.3.5 Area of Inundation
2.4 Wahpeestan (Site 5) Site Description
2.4.1 Description of Proposed Project
2.4.2 Site Specific Hydraulic Characteristics
2.4.3 Site Specific Design
2.4.4 Tailrace
2.4.5 Area of Inundation
2.5 Wapoose (Site 6) Site Description
2.5.1 Description of Proposed Project
2.5.2 Site Specific Hydraulic Characteristics
2.5.3 Site Specific Design
2.5.4 Tailrace
2.5.5 Area of Inundation
2.6 Project Aspects
2.6.1 Construction Schedule
2.6.2 Project Controls
2.6.3 Decommissioning
2.7 Construction Power and Material Requirements
2.7.1 Energy and Water Requirements and Sources
2.7.2 Excavation and Quantity of Fill
2.7.3 Toxic/Hazardous Materials
2.8 Waste Disposal

3. Project Site Information
3.1 Project Location
3.2 Natural Environmental Features
3.2.1 Physical Environment
3.2.1.1 Geology and Soils
3.2.1.2 Surface Water Resources
3.2.1.3 Surface Water Quality
3.2.2 Biological Environment
3.2.2.1 Fish and Fish Habitat
3.2.2.2 Benthic Invertebrates
3.2.2.3 Odonates
3.2.2.4 Terrestrial Vegetation and Wildlife
3.3 Socioeconomic Features
3.3.1 Current and Past Land Uses
3.3.1.1 Traditional Canoe and Fur Trade Route
3.3.1.2 Forestry
3.3.1.3 Hunting/Harvesting
3.3.1.4 Mineral Resources
3.3.1.5 Recreation/Tourism
3.3.2 Potential Contamination of the Site from Past Uses
3.3.3 Proximity to Aboriginal Reserves and Traditional Territory
3.3.4 Proximity to Important or Designated Environmental or Cultural Sites
3.3.5 Proximity to Residential and Other Urban Areas ............................................................... 3-7
3.3.6 Additional Baseline Studies ............................................................................................... 3-7

4. Additional Requirements Related to Fish, Fish Habitat and Navigable Waters ................... 4-1

4.1 Environmental Features ....................................................................................................... 4-1
4.2 Use of Waterway ................................................................................................................... 4-1
  4.2.1 Existing Use of Waterway .............................................................................................. 4-1
  4.2.2 Information on Fisheries .............................................................................................. 4-1

5. Potential Effects to the Environment ..................................................................................... 5-1

5.1 Zone of Influence ............................................................................................................... 5-1
5.2 Potential Effects to the Environment .................................................................................. 5-1

6. References ........................................................................................................................... 6-1
List of Figures

Figure 1.1 Project Location Map ........................................................................................................ 1-3
Figure 2.1 Typical Earth-Fill Dam and Overflow Weir Profiles............................................................ 2-3
Figure 2.2 Typical 2 Unit Powerhouse ............................................................................................... 2-5
Figure 2.3 Site 3 – Neeskah GS and 50 m Overflow Weir and Earth-Fill Embankments (Below Rapids). ............................................................................................................................... 2-9
Figure 2.4 Neeskah Reservoir Inundation ......................................................................................... 2-11
Figure 2.5 Site 4 – Peeshoo GS and 50 m Long Overflow Weir with Earth-Fill Embankments (Below Rapids). .............................................................................................................................. 2-13
Figure 2.6 Peeshoo Reservoir Inundation ........................................................................................ 2-17
Figure 2.7 Site 5 – Wahpeestan GS and 70 m Overflow Weir with Earth-Fill Embankments .......... 2-19
Figure 2.8 Wahpeestan Reservoir Inundation ................................................................................... 2-21
Figure 2.9 Site 6 – Wapoose GS and 70 m Overflow Weir with Earth-Fill Embankments.............. 2-23
Figure 2.10 Wapoose Reservoir Inundation.................................................................................... 2-27

List of Tables

Table 1.1 Government Agencies and Organizations to be Contacted............................................. 1-5
Table 1.2 Federal, Provincial and Municipal Approvals ................................................................. 1-7
Table 3.1 Geographic Coordinates of Sites ....................................................................................... 3-1
Table 3.2 Average Monthly Flows .................................................................................................... 3-1
Table 3.3 High- and Low-Flow Return Period Flows ..................................................................... 3-2
Table 3.4 Summary of Fish Species at Proposed Development Sites ........................................ 3-4
Table 5.1 Potential Effects Identification Matrix.............................................................................. 5-3
1. General Information

1.1 General

This Project Description has been prepared to meet the requirements of the Canadian Environmental Assessment Act (CEAA), the provincial Class Environmental Assessment (Class EA) for Waterpower Projects (OWA, 2011) and the provincial Class EA for MNR Resource Stewardship and Facility Development Projects (MNR, 2003).

1.1.1 Name and Proposed Location of Project

The name of the project is the Kabinakagami River Project. The proposed project consists of four small hydroelectric facilities located on the Kabinakagami River approximately 20 km north of Highway 11, approximately 30 km west of Hearst, Ontario (Figure 1.1). The Kabinakagami River flows north towards James Bay and is part of the Hudson Bay drainage basin.

1.1.2 Nature of Project

Originally, there were seven sites proposed for this development on the Kabinakagami River by the joint venture partnership of Constance Lake First Nation (CLFN) and Northland Power Inc. (Northland).

- Site 1 Muskoo (Bear)
- Site 2 Mahekun (Wolf)
- Site 3 Neeskah (Goose)
- Site 4 Peeshoo (Lynx)
- Site 5 Wahpeestan (Martin)
- Site 6 Wapoose (Rabbit)
- Site 7 Neekik (Otter)
- Site 8 Amisk (Beaver)

Applications were issued to the Ontario Ministry of Natural Resources (MNR) for each of these sites as potential waterpower developments under the Direct Site Release Process.

Following discussions with CLFN members and baseline field investigations undertaken in 2009, Northland decided to not pursue Site 8 (Amisk), given the potentially significant environmental and socioeconomic impacts of the proposed facility.

Applications for Feed In Tariff (FIT) contracts for the remaining seven sites were submitted in November 2009 under the Ontario Power Authority’s (OPA) FIT program. Only four sites (Sites 3, 4, 5 and 6) were awarded FIT contracts in April 2010.

Northland was awarded Applicant of Record status for these four sites by the MNR in April 2011.

Accordingly, CLFN and Northland are proposing to construct cascading, run-of-river hydroelectric facilities at Site 3 (Neeskah), Site 4 (Peeshoo), Site 5 (Wahpeestan) and Site 6 (Wapoose). Each site would consist of an overflow weir across the river, a powerhouse containing the generating
equipment, and intake and tailrace channels to direct flow into and out of the powerhouse. Based on the preliminary engineering conducted to date, each site would have two generating units of 3.25-MW capacity for a total installed capacity of 6.5 MW per site and 26 MW overall. The overflow weirs would create small head ponds upstream from each facility which are intended only to provide generating head, i.e., no flow manipulation or storage. Additional facility components would include access roads, a 44-kV transmission line, a central works facility and temporary construction camp and laydown areas.

The design information to date is based on the design provided in the Prefeasibility Study (Hatch Ltd., 2009a) and additional follow-up engineering activities. Feasibility studies and field investigations will be required to optimize the design and it could be subject to change from that presented herein.

1.1.3 Purpose of the Project

The purposes of the project are to

• generate environmentally sustainable hydroelectric green power on a consistent, reliable basis
• connect to and utilize the existing distribution grid to deliver power generated by the project
• sell the generated power under an electricity contract from the OPA to derive financial benefits for CLFN and Northland.

1.1.4 Parties who Receive the Project Description

This Project Description is being submitted to the Canadian Environmental Assessment Agency (CEA Agency) in Toronto for distribution to relevant federal agencies including Fisheries and Oceans Canada (DFO), Transport Canada (TC), Environment Canada (EC), Health Canada (HC), Aboriginal Affairs and Northern Development Canada (AANDC) and Natural Resources Canada (NRCan) and any other agencies deemed relevant by the CEA Agency.

The Project Description will also be submitted to the MNR (Hearst District Office and Kapuskasing Area Office) and the Ontario Ministry of the Environment (MOE) offices in Timmins, Thunder Bay and London.

1.1.5 Federal, Provincial and Municipal Agency and Stakeholder Consultations

The agencies and other stakeholders shown in Table 1.1 are among the entities to be consulted for this environmental screening/Class EA/Water Management Plan (WMP), based on the federal and provincial government agencies that may have an interest in the Project and potential stakeholders identified in the Site Information Package (SIP) provided by the MNR (2010). Aboriginal Engagement and Public Consultation Plans have been prepared to identify the consultation processes that will occur. Other stakeholders may be identified by the agencies. All of the agencies and stakeholders listed in Table 1.1 will be sent an introductory letter and copy of the Notice of Commencement. In addition, public consultations will also be held as part of the environmental screening/Class EA/WMP process.
Figure 1.1
Northland Power Inc.
Kabinakagami River Project
Project Location Plan

Legend

- Proposed Dam Location
- Existing Roads
- Limited Use Road/Trail
- Proposed New Access Road
- Existing Hydro Lines
- Proposed Transmission Line
- Railway
- Wetland
- First Nation
- Provincial Park

1. Base data downloaded from GeoGratis, 1:200,000 scale, maps ON2F16 and ON2K01, GCS 1983
2. Additional data from MNR LIO.
Table 1.1 Government Agencies and Organizations to be Contacted

<table>
<thead>
<tr>
<th><strong>Federal Government</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Environmental Assessment Agency</td>
</tr>
<tr>
<td>Environment Canada</td>
</tr>
<tr>
<td>Fisheries and Oceans Canada</td>
</tr>
<tr>
<td>Health Canada</td>
</tr>
<tr>
<td>Aboriginal Affairs and Northern Development Canada</td>
</tr>
<tr>
<td>Transport Canada</td>
</tr>
<tr>
<td>Natural Resources Canada</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Provincial Government</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Aboriginal Affairs</td>
</tr>
<tr>
<td>Ministry of Energy</td>
</tr>
<tr>
<td>Ministry of the Environment</td>
</tr>
<tr>
<td>Ministry of Natural Resources</td>
</tr>
<tr>
<td>Ministry of Transportation</td>
</tr>
<tr>
<td>Ministry of Tourism and Culture</td>
</tr>
<tr>
<td>Ministry of Northern Development, Mines and Forestry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Municipal Government</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporation of the Town of Hearst</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>First Nations</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Constance Lake First Nation</td>
</tr>
<tr>
<td>Hornepayne First Nation</td>
</tr>
<tr>
<td>Fort Albany First Nation</td>
</tr>
<tr>
<td>Kashechewan First Nation</td>
</tr>
<tr>
<td>Cochrane Northern Lights Métis Council</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Industry/Commercial Stakeholders</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario Waterpower Association</td>
</tr>
<tr>
<td>Hearst Forest Management Inc.</td>
</tr>
<tr>
<td>Lecours Lumber</td>
</tr>
<tr>
<td>Tembec Inc.</td>
</tr>
<tr>
<td>Hearst Chamber of Commerce</td>
</tr>
<tr>
<td>Ontario Northland Rail</td>
</tr>
<tr>
<td>Ontario Federation of Anglers and Hunters</td>
</tr>
<tr>
<td>Hearst Trappers Council</td>
</tr>
<tr>
<td>Trans Canada Pipelines</td>
</tr>
</tbody>
</table>

Other potential stakeholders include local residents, tourists, canoeists, whitewater enthusiasts, local trappers, hunters, forestry industry representatives, tourism industry representatives, Local Citizens Committees, snowmobile clubs, Bear Management Operators, baitfish harvesters and rod and gun clubs. Means of consultation with these potential stakeholders will be identified in the Consultation Plan.

1.1.6 **Other Environmental Assessment Processes**

This project is subject to the Class EA for Waterpower Projects (OWA, 2011), which is an approved Class EA under the Ontario Environmental Assessment Act. The project is considered to be a ‘new project on an unmanaged waterway’ and will be assessed in accordance with the Class EA requirements for such a designation.

Portions of the project that do not require assessment under the OWA Class EA, including the 44-kV transmission line that will run connect to the provincial electricity grid, will require assessment under
the MNR Class EA for Resource Stewardship and Facility Development Projects (Class EA for RSFD), since a disposition to Crown land will be required. This Project Description will be provided to the MNR who will make the determination of the Category of the project under the Class EA for RSFD.

1.2 Contacts

1.2.1 Proponent and Contact Information
The project proponent is a joint venture between CLFN and Northland. Northland is the managing partner in the joint venture. Contact information for Northland is as follows:

Northland Power Inc.
30 St. Clair Avenue West
17th Floor
Toronto, Ontario
M4V 3A1

Mr. Tim Richardson, General Manager, Waterpower Development
Phone: (647) 288-1052
Cell: (416) 820-9521
Email: TimRichardson@northlandpower.ca

1.2.2 Proponent’s Consultant
Northland retained Hatch Ltd. (Hatch) to conduct the environmental screening/Class EA for this project. Contact information is as follows:

Hatch Ltd
4342 Queen Street, Suite 500
Niagara Falls, Ontario
L2E 7J7

Mr. Hans de Meel, Project Manager
Mr. Noel Boucher, EA Coordinator
Phone: (905) 374-0701, Ext 5319
Phone: (905) 374-0701, Ext 5757
Email: hdemeel@hatch.ca
Email: nboucher@hatch.ca

1.3 Federal Involvement

1.3.1 Financial Support
Northland may apply for federal funding, but the funding program has not been determined at this time.

1.3.2 Land Ownership
The land to be used by the project (i.e., for the generating stations, overflow weirs, head ponds, switchyards, access roads and transmission line corridors) is provincial Crown land. No portion of the Project is anticipated to be located on the CLFN Reserve lands.
1.4 Authorizations Required

Table 1.2 outlines the potential federal, provincial and municipal permits and approvals that might be required.

<table>
<thead>
<tr>
<th>Permit and Legislative Requirement</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorization for Works and Undertakings Affecting Fish Habitat - Fisheries Act [Section 35(2)]</td>
<td>DFO</td>
</tr>
<tr>
<td>Authorization for Destruction of Fish by Means other than Fishing - Fisheries Act (Section 32)</td>
<td>DFO</td>
</tr>
<tr>
<td>Approval for Construction in Navigable Waters - Navigable Waters Protection Act (Section 5)</td>
<td>TC (Navigable Waters Protection)</td>
</tr>
<tr>
<td><strong>Provincial</strong></td>
<td></td>
</tr>
<tr>
<td>Lakes and Rivers Improvement Act (LRIA) – Location Approval and Plans and Specifications Approval</td>
<td>MNR</td>
</tr>
<tr>
<td>Water Management Plan</td>
<td>MNR</td>
</tr>
<tr>
<td>Public Lands Act – various work permit requirements</td>
<td>MNR</td>
</tr>
<tr>
<td>Cultural Heritage Clearance – Stage 1 Archaeological Assessment (at a minimum)</td>
<td>MTC</td>
</tr>
<tr>
<td>Permit to Take Water – Ontario Water Resources Act (Section 34)</td>
<td>MOE</td>
</tr>
<tr>
<td>Certificate of Approval (Industrial Sewage) – Ontario Water Resources Act (Section 53)</td>
<td>MOE</td>
</tr>
<tr>
<td>Certificate of Approval (Air and Noise) – Environmental Protection Act (Section 9)</td>
<td>MOE</td>
</tr>
<tr>
<td>Waste Generator Registration – Environmental Protection Act [Section 18(1)], Ontario Regulation 347</td>
<td>MOE</td>
</tr>
<tr>
<td>Notice of Project and Registration of Contractors – Construction Regulation 213/91</td>
<td>Ministry of Labour</td>
</tr>
</tbody>
</table>

An authorization from DFO under the *Fisheries Act* and approval from TC under the *Navigable Waters Protection Act* (NWPA) will likely be required. Either will trigger the need for an environmental assessment under CEAA. If federal funding is obtained, this will also trigger the need for a federal environmental assessment under CEAA. Use of CLFN land for any part of the project may also trigger the involvement of Aboriginal Affairs and Northern Development Canada as a Responsible Authority (RA). Since the proposed project is less than 200 MW, a screening level environmental assessment would be completed in accordance with CEAA and CEA agency guidelines.
2. **Project Information**

The proposed project on the Kabinakagami River comprises four small hydropower plants, each with an installed capacity of 6.5 MW and designed to be very similar to one another. Numerous common elements have been introduced into the development concept and have been built into the layout arrangements, as described below in Section 2.1. Detailed descriptions of the individual sites are provided in Sections 2.2 through 2.5, while specific information on the construction and operation of the plants is provided in the remainder of this section.

2.1 **Common Elements**

The proposed development at each site includes an earth-fill dam as the main water retaining structure and a concrete overflow spillway (either 50 or 70 m long, depending on the site) to pass flood flows. The close coupled intake/powerhouse structure is an integrated part of the dam structure and is located on the west bank of the river (left side, looking downstream) at each site. Each powerhouse is sized to contain two pit-type turbine units. Typical earth dam and concrete overflow spillway sections are shown in Figure 2.1.

2.1.1 **Common Hydraulic Characteristics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal operating gross head</td>
<td>10.0 m</td>
</tr>
<tr>
<td>Estimated net head</td>
<td>9.7 m</td>
</tr>
<tr>
<td>Long-term average flow</td>
<td>50 m$^3$/s</td>
</tr>
<tr>
<td>Rated turbine flow</td>
<td>82 m$^3$/s</td>
</tr>
</tbody>
</table>

2.1.2 **Installed Capacity**

The installed capacity at each site will be two units of 3.25 MW capacity each for a total installed capacity of 6.5 MW per site and 26 MW overall.

2.1.3 **Site Access**

Access to the project sites will be from Highway 11, with access potentially required to both the east and west banks of the Kabinakagami River, at each of the four proposed development locations. Access to the west side of the river will be via Highway 663, Rogers Road and an upgraded Pelican Road (Figure 1.1) to Neeskah (Site 3). Two short (approximately 300 m) sections of new access road will be developed to tie the existing Pelican Road into the facility locations at Neeskah (Site 3) and Peeshoo (Site 4). A new (approximately 8 km long) access road will be required to connect Pelican Road to the Wahpeestan (Site 5) and Wapoose (Site 6) sites.

Access to the east bank of the river would be via Fushimi Road, existing logging roads and new local roads to each development site (Figure 1.1). The route of the east bank roads will be determined following further engineering investigation and will be documented in the Class EA.

2.1.4 **Transmission**

Preliminary transmission routing is shown on Figure 1.1. It will consist of a single 44-kV line from Wapoose (Site 6), south along the (new) access road to Neeskah (Site 3), and then through a new
corridor running south to interconnect with the existing substation and 115-kV line at the Calstock power plant (Figure 1.1).

From the interconnection point, the power will be routed through the existing 115-kV line to enter the provincial electricity grid at the Hearst Transformer Station, owned and operated by Hydro-One Networks Inc (HONI).

Since the proposed transmission line is rated at 44-kV, it does not require assessment under the OWA Class EA, since only 115-kV or greater lines are included. However, a disposition to Crown land (e.g., through land use permits or other tenure instrument) will be necessary to authorize construction of the line and its long-term occupation of Crown land. Therefore, the transmission line is subject to the MNR Class EA for RSFD. As mentioned previously, this Project Description has been prepared to meet the requirements of that Class EA.

2.1.5 **Powerhouse**

The four powerhouses will be virtually identical. Typical sections are shown in Figure 2.2.

Each powerhouse is an integral part of the dam structure and is located on the west bank of the river. They are sized to contain two-pit-type turbine units, each with a diameter of about 3.0 m. Roller-type draft tube gates will be incorporated to negate the need for an intake gate, for which stop logs only are required. No provision for a powerhouse crane was made and no powerhouse superstructure was designed. Large equipment handling will be performed through roof hatches using a mobile crane. Switchyard equipment, including the transformer, may be placed on the roof of the powerhouse, so that a separate switchyard will not be required.

2.1.6 **Maintenance and Control Facility**

No maintenance bay is provided in the powerhouses. Instead, a centralised maintenance and control facility will constructed.

2.1.7 **Operating Strategy**

The proposed developments will be operated as run-of-river facilities. Daily or seasonal peaking operations are not proposed and there is little reservoir storage capacity available at the sites.

The proposed operational regime for each facility is based on the natural flow regime of the Kabinakagami River. During periods of normal inflow (up to the rated flow of the units, approximately 80% of the time), the headwater level will be maintained at the level of the overflow spillway with all inflow passing through the turbines. During periods of high flow (beyond rated flows), the level of the head ponds will increase to allow the water to flow over the overflow spillway. For the 1:100-yr flood, the head pond levels will temporarily increase by between approximately 2 m and 2.5 m (depending on the site).

2.1.8 **Water Management Plan**

There is no existing water management plan (WMP) for the Kabinakagami River as there is currently no water power development on the river system. A simplified WMP will be incorporated into the Class EA for this project.
Main Dam

Grout Curtain

Top of Core

Downstream Cofferdam

Upstream Cofferdam

Excavate to Sound Bedrock

Earthfill Dam Profile

Overflow Weir Profile

Figure 2.1
Northland Power
Kabinakagami River Development
"Typical Earthfill Dam and Overflow Weir Profiles"
Figure 2.2
Northland Power
Kabinakagami River Development
Typical 2 Unit Powerhouse
2.2 Neeskah (Site 3) Site Description

2.2.1 Description of Proposed Project

The Neeskah Site location is characterized by a localized S-shaped section of the river, the upstream part of which contains a series of rapids, about 6 m high and about 120 m long. The proposed development would raise the water level above the rapids by 3.5 m and improve the tailrace to capture an overall gross head of about 10 m.

The proposed general arrangement for Neeskah is shown in Figure 2.3.

2.2.2 Site Specific Hydraulic Characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum headwater level (1:100-yr flood)</td>
<td>el 201.0 m</td>
</tr>
<tr>
<td>Normal operating headwater level</td>
<td>el 198.5 m</td>
</tr>
<tr>
<td>Normal tailwater level downstream at powerhouse</td>
<td>el 188.5 m</td>
</tr>
<tr>
<td>Normal operating gross head</td>
<td>10.0 m</td>
</tr>
<tr>
<td>Estimated net head</td>
<td>9.7 m</td>
</tr>
<tr>
<td>Long-term average flow</td>
<td>50 m³/s</td>
</tr>
<tr>
<td>Rated turbine flow</td>
<td>82 m³/s</td>
</tr>
</tbody>
</table>

The expected maximum and minimum water levels in the head pond are 198.5 m during normal operation and 201.0 m, during maximum design floods respectively, but will be further investigated during subsequent planning/engineering studies. The tailrace water level is expected to be el 188.5 m, and will be verified during the design stage of the project.

2.2.3 Site Specific Design

An earth-fill dam will be placed at the base of the existing rapids and extended onto each bank. The powerhouse will be constructed on the left bank, adjacent to the 50-m long concrete overflow spillway. The bedrock in the area is thought to be sufficiently competent that no apron slab is required to dissipate energy and prevent erosion.

2.2.4 Tailrace

Minor tailrace improvements will be required to achieve the proposed tailwater level at the plant. These will be in the order of 1 m deep and extend approximately 60 m downstream of the powerhouse.

2.2.5 Area of Inundation

The Kabinakagami River is characterised by relatively steep river banks incised 10 to 15 m into otherwise flat terrain. Because of these steep banks, relatively little lateral inundation is expected (Figure 2.4). The total area of the proposed Neeskah head pond is approximately 19 ha of which only 7 ha would result from new inundation.
2.3 Peeshoo (Site 4) Site Description

2.3.1 Description of Proposed Project
Similar to Neeskah, the Peeshoo location is also characterized by a localized S-shaped section of the river. The upstream part contains a series of rapids, about 3.5 m high and 70 m long. The project will be constructed approximately 180 m downstream of the rapids, capturing an additional 1.5 m of head. The proposed development would raise the water level above the rapids by about 3.0 m and improve the tailrace to capture an overall gross head of about 10 m.

The proposed general arrangement for Peeshoo is shown in Figure 2.5.

2.3.2 Site Specific Hydraulic Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum headwater level (1:100-yr flood)</td>
<td>el 191.0 m</td>
</tr>
<tr>
<td>Normal operating headwater level</td>
<td>el 188.5 m</td>
</tr>
<tr>
<td>Normal tailwater level downstream at powerhouse</td>
<td>el 178.5 m</td>
</tr>
<tr>
<td>Normal operating gross head</td>
<td>10.0 m</td>
</tr>
<tr>
<td>Estimated net head</td>
<td>9.7 m</td>
</tr>
<tr>
<td>Long-term average flow</td>
<td>50 m³/s</td>
</tr>
<tr>
<td>Rated turbine flow</td>
<td>82 m³/s</td>
</tr>
</tbody>
</table>

The expected maximum and minimum water levels in the head pond are 188.5 m during normal operation and 191.0 m, during maximum design floods respectively, but will be further investigated during subsequent planning/engineering studies. The tailrace water level is expected to be el 178.5 m, and will be verified during the design stage of the project.

2.3.3 Site Specific Design
An earth-fill dam will be placed extending from the east bank across most of the river width. The powerhouse will be constructed on the west bank and is adjacent to the 50-m long concrete overflow spillway. A total of approximately 150 m of low earthen wing dikes extend from the main dam and powerhouse into the banks. These are used to provide freeboard for the earth-fill dam in the case of severe floods and will not be part of the head pond during normal operation. The bedrock in the area is thought to be sufficiently competent that no apron slab is required to dissipate energy and prevent erosion.

2.3.4 Tailrace
Tailrace improvements will be required to achieve the proposed tailwater level at the plant. These will be in the order of 1 to 2 m deep and extend approximately 120 m downstream of the powerhouse.
Site 3 - Neeskah GS and 50m Overflow Weir with Earth Fill Embankments (below Rapids)
Figure 2.4
Northland Power Inc.
Kabinakagami River Project
Neeskah Reservoir Inundation
Site 4 - Peeshoo GS and 50m Long Overflow Weir with Earth Fill Embankments (below Rapids)
2.3.5 Area of Inundation
The Kabinakagami River is characterised by relatively steep river banks incised 10 to 15 m into otherwise flat terrain. Because of these steep banks, relatively little lateral inundation is expected (Figure 2.6). The total area of the proposed Peeshoo head pond is approximately 24 ha of which only 6 ha would result from new inundation.

2.4 Wahpeestan (Site 5) Site Description

2.4.1 Description of Proposed Project
The proposed Wahpeestan Site is located in a natural bend in the river, without any significant natural gradient change in the riverbed at this location.

The proposed general arrangement for Wahpeestan is shown in Figure 2.7.

2.4.2 Site Specific Hydraulic Characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum headwater level (1:100-yr flood)</td>
<td>el 180.5 m</td>
</tr>
<tr>
<td>Normal operating headwater level</td>
<td>el 178.5 m</td>
</tr>
<tr>
<td>Normal tailwater level downstream at powerhouse</td>
<td>el 168.5 m</td>
</tr>
<tr>
<td>Normal operating gross head</td>
<td>10.0 m</td>
</tr>
<tr>
<td>Estimated net head</td>
<td>9.7 m</td>
</tr>
<tr>
<td>Long-term average flow</td>
<td>50 m³/s</td>
</tr>
<tr>
<td>Rated turbine flow</td>
<td>82 m³/s</td>
</tr>
</tbody>
</table>

The expected maximum and minimum water levels in the head pond are 178.5 m during normal operation and 180.5 m, during maximum design floods respectively, but will be further investigated during subsequent planning/engineering studies. The tailrace water level is expected to be el 168.5 m, and will be verified during the design stage of the project.

2.4.3 Site Specific Design
The Wahpeestan Site is located in a natural bend in the river with a wide (50 m) bench on the inside of the bend (west bank). This natural bench allows for the powerhouse and part of the spillway to be constructed in the dry. The remainder of the 70-m concrete overflow spillway and the main earth-fill dam will be constructed across the river.

As with Peeshoo, low earthen wing dikes extend from the main dam and powerhouse into the banks. A total of approximately 300 m (150 m per side) are required to provide freeboard for the earth-fill sections in the case of severe floods and will not be part of the head pond during normal operation.

The bedrock at the Wahpeestan Site appears to be dominated by interbedded shales, siltstone and limestone. This foundation material could be prone to erosion, therefore an apron slab with or without energy dissipating baffle blocks will be constructed downstream of the overflow spillway.
2.4.4 Tailrace
Tailrace excavations are required to convey the water from the powerhouse across an existing bench back to the main river course. No significant in-water tailrace excavation is anticipated.

2.4.5 Area of Inundation
The Kabinakagami River is characterised by relatively steep river banks incised 10 to 15 m into otherwise flat terrain (Figure 2.8). The total area of the proposed Wahpeestan head pond is approximately 83 ha of which 43 ha would result from new inundation.

2.5 Wapoose (Site 6) Site Description

2.5.1 Description of Proposed Project
Similar to Wahpeestan, the proposed Wapoose Site is located in a natural bend in the river with a bench on the left bank and without any significant change in river bed elevation.

The proposed general arrangement for Wapoose is shown in Figure 2.9.

2.5.2 Site Specific Hydraulic Characteristics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum headwater level (1:100-yr flood)</td>
<td>el 170.5 m</td>
</tr>
<tr>
<td>Normal operating headwater level</td>
<td>el 168.5 m</td>
</tr>
<tr>
<td>Normal tailwater level downstream at powerhouse</td>
<td>el 158.5 m</td>
</tr>
<tr>
<td>Normal operating gross head</td>
<td>10.0 m</td>
</tr>
<tr>
<td>Estimated net head</td>
<td>9.7 m</td>
</tr>
<tr>
<td>Long-term average flow</td>
<td>50 m³/s</td>
</tr>
<tr>
<td>Rated turbine flow</td>
<td>82 m³/s</td>
</tr>
</tbody>
</table>

The expected maximum and minimum water levels in the head pond are 168.5 m during normal operation and 170.5 m, during maximum design floods respectively, but will be further investigated during subsequent planning/engineering studies. The tailrace water level is expected to be el 158.5 m, and will be verified during the design stage of the project.

2.5.3 Site Specific Design
The Wahpeestan Site is very similar in layout and design to the Wapoose Site. It is located in a natural bend in the river with a wide (50 m) bench on the inside of the bend (west bank). This natural bench allows for the powerhouse and part of the spillway to be constructed in the dry. The remainder of the 70-m concrete overflow spillway and the main earth-fill dam will be constructed across the river.

Low earthen wing dikes extend from the main dam and powerhouse into the banks. A total of approximately 400 m (200 m per side) are required to provide freeboard in the case of severe floods and will not be part of the head pond during normal operation.
Figure 2.6
Northland Power Inc.
Kabinakagami River Project
Peeshoo Reservoir Inundation
Site 5 - Wahpeestan GS and 70m Overflow Weir with Earth Fill Embankments
Figure 2.8
Northland Power Inc.
Kabinakagami River Project
Wahpeestan Reservoir Inundation

Figure 2.8
Northland Power Inc.
Kabinakagami River Project
Wahpeestan Reservoir Inundation
The bedrock at the Wapoose Site, like Wahpeestan, appears to be dominated by interbedded shales, siltstone and limestone. This foundation material could be prone to erosion, therefore an apron slab with or without energy dissipating baffle blocks will be constructed downstream of the overflow spillway.

2.5.4 Tailrace
Similar to Wapoose, tailrace excavations are only required to convey the water from the powerhouse, across the existing bench, back to the main river channel. No significant in-water excavation is anticipated.

2.5.5 Area of Inundation
The Kabinakagami River is characterised by relatively steep river banks incised 10 to 15 m into otherwise flat terrain. The total area of the proposed Wapoose head pond is approximately 38 ha of which 21 ha would result from new inundation (Figure 2.10).

2.6 Project Aspects
2.6.1 Construction Schedule
Construction of the proposed facilities is scheduled to take place between 2012 and 2014. The first units are scheduled to be on-line in December, 2013 and the last in December, 2014.

2.6.2 Project Controls
The facilities will be designed to be automatic and remotely operated, however, manual control will be available at the plants.

2.6.3 Decommissioning
There are no present plans for decommissioning of the facilities at any point in time. Upgrading or rehabilitation to extend the facility’s life will take place as part of major maintenance expenditures and depend on the condition of the plant and equipment.

2.7 Construction Power and Material Requirements
2.7.1 Energy and Water Requirements and Sources
On-site energy requirements during construction are likely to be provided by portable diesel generators. Operational energy requirements for the facility after commissioning will be supplied via on-site station service. A back-up diesel generator will be installed to provide black start capability.

There will be a requirement for water supply during construction (i.e., wash water, etc). This water may be supplied from the Kabinakagami River via portable pumps. The quantities required are anticipated to be small and may not require a Permit to Take Water (PTTW) from MOE as the taking will be much less than the 50 000 L/d threshold. Construction process water might also be trucked in from outside sources if so required.

Operational water requirements for the facility are not known at this time. Small amounts of cooling water may be withdrawn from the Kabinakagami River to cool the generating equipment. A PTTW will be obtained if the amount required exceeds the PTTW threshold. Operational water requirements will be determined during the detailed design process.
2.7.2 Excavation and Quantity of Fill

Excavation may be required to prepare the foundations for the earth-fill dams, overflow spillways, powerhouses and tailraces. Excavated material may include topsoil, underlying soils and bedrock in terrestrial areas, and channel bed material and bedrock within the riverbed.

Existing channel bed material will be reused to the greatest extent possible for protection of alluvial material exposed to flows. Other excavated material may be used for the access roads and construction of the earth-fill dams (filter material). Remaining excess material will be disposed of in accordance with local regulations. Solid waste materials requiring off-site disposal will be chemically tested for waste classification purposes in accordance with the Ontario Waste Management Regulation (O. Reg. 347), as amended by Regulation 558/00, and then disposed of accordingly.

Fill materials may be required for the earth-fill dams and the concrete aggregates. These may be sourced from local borrow areas and possibly crushed excavated bedrock material.

2.7.3 Toxic/Hazardous Materials

Fuels, hydraulic fluids and lubricants will be used in equipment during construction and operation of the facilities. The storage facility for these materials will comply with all current regulations and guidelines. The storage of small amounts of hydraulic fluids and lubricants will be in a contained area, well away from the watercourse. Any explosives stored and used on site (if required) will be in a manner compliant with NRCan requirements and industry standards. Transport of explosives will be done in accordance with TC requirements (e.g., Transportation of Dangerous Goods Act).

2.8 Waste Disposal

Solid nonhazardous construction waste (e.g., material packaging) generated during the construction process will be removed from the site to an approved disposal location (likely the approved CLFN landfill area) or recycling/composting facility if available. Waste debris from clearing activities (e.g., grubbing, non-merchantable timber) will be disposed of in accordance with regulatory requirements. No gaseous wastes other than construction equipment emissions are anticipated. Industrial liquids such as paints, sealants, fuels and lubricating fluids will be stored in a secure containment area and disposed of in accordance with provincial liquid waste disposal regulations (e.g., Environmental Protection Act and Ontario Waste Management Regulation 347).
Figure 2.10
Northland Power Inc.
Kabinakagami River Project
Wapoose Reservoir Inundation

Kilometers
Contours in Meters

Meters

HWY 11
Rogers Road
Kabinakagami River
Neeskah
Peeshoo
Wahpestan
Wapoose
3. Project Site Information

3.1 Project Location

Figure 1.1 shows the project location. Table 3.1 below provides the geographic coordinates of the sites.

<table>
<thead>
<tr>
<th>Table 3.1 Geographic Coordinates of Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Name</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Neeskah</td>
</tr>
<tr>
<td>Peeshoo</td>
</tr>
<tr>
<td>Wahpeestan</td>
</tr>
<tr>
<td>Wapoose</td>
</tr>
</tbody>
</table>

All the sites are located within the Cochrane District.

3.2 Natural Environmental Features

3.2.1 Physical Environment

3.2.1.1 Geology and Soils

The project study area is situated in the Precambrian Shield with Precambrian bedrock present at Neeskah (Site 3) and Peeshoo (Site 4) and sedimentary, mostly carbonate formations present at Wahpeestan (Site 5) and Wapoose (Site 6). The overlaying soils are deposits of glacial and post-glacial events. The MNR SIP (MNR, 2010) indicates that the bedrock changes from granite based to limestone based between Peeshoo (Site 4) and Wahpeestan (Site 5).

3.2.1.2 Surface Water Resources

The Kabinakagami River flows from Kabinakagami Lake north towards James Bay, crossing Highway 11 approximately 30 km west of Hearst, Ontario near CLFN. The Kabinakagami River flows into the Albany River approximately 53 km northwest of Wapoose (Site 6), as the crow flies. The Albany River flows north into James Bay, approximately 290 km northeast of where the Kabinakagami River connects to the Albany River, as the crow flies. Neeskah (Site 3) is located approximately 20 km north of Highway 11, Peeshoo (Site 4) is located approximately 21 km north of Highway 11, Wahpeestan (Site 5) is located approximately 26 km north of Highway 11 and Wapoose (Site 6) is located approximately 28 km north of Highway 11.

Flow data outlined in the following tables are based on WSC Gauge 04JA002 (1951 to 1989) for the Kabinakagami River prorated to drainage areas and mean annual runoff.

<table>
<thead>
<tr>
<th>Table 3.2 Average Monthly Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month</td>
</tr>
<tr>
<td>Site 3 – Neeskah</td>
</tr>
<tr>
<td>January</td>
</tr>
<tr>
<td>February</td>
</tr>
<tr>
<td>March</td>
</tr>
<tr>
<td>April</td>
</tr>
<tr>
<td>May</td>
</tr>
</tbody>
</table>
Table 3.3  High- and Low-Flow Return Period Flows

<table>
<thead>
<tr>
<th>Return Period (yrs)</th>
<th>Site 3 - Neeskah</th>
<th>Site 4 - Peeshoo</th>
<th>Site 5 - Wahpeestan</th>
<th>Site 6 - Wapoose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>458</td>
<td>459</td>
<td>463</td>
<td>463</td>
</tr>
<tr>
<td>100</td>
<td>386</td>
<td>387</td>
<td>390</td>
<td>390</td>
</tr>
<tr>
<td>50</td>
<td>364</td>
<td>365</td>
<td>368</td>
<td>368</td>
</tr>
<tr>
<td>20</td>
<td>333</td>
<td>334</td>
<td>337</td>
<td>337</td>
</tr>
<tr>
<td>10</td>
<td>308</td>
<td>309</td>
<td>311</td>
<td>311</td>
</tr>
<tr>
<td>5</td>
<td>280</td>
<td>281</td>
<td>283</td>
<td>283</td>
</tr>
<tr>
<td>2</td>
<td>234</td>
<td>235</td>
<td>237</td>
<td>237</td>
</tr>
<tr>
<td>1.25</td>
<td>196</td>
<td>197</td>
<td>198</td>
<td>198</td>
</tr>
</tbody>
</table>

Depending on the final route selected, the proposed transmission line may cross several smaller tributaries of the Kabinakagami River, including Carey Creek and its tributaries, which flow into the Kabinakagami River at the upstream end of the proposed Neeskah (Site 3) head pond.

3.2.1.3  Surface Water Quality

Surface water samples were collected in May, September and October 2009 from five sites throughout the project study area, including

- immediately downstream of Highway 11 (upstream control site)
- Site 2 (Mahekun) – within proposed head pond
- Site 4 (Peeshoo) – within proposed head pond
- Site 5 (Wahpeestan) – within proposed head pond
- Rogers Landing.

Samples were analyzed for a suite of chemical parameters, including low level total and methyl mercury. The results of the assessment were documented in Hatch Ltd. (2009c).

3.2.2  Biological Environment

3.2.2.1  Fish and Fish Habitat

The MNR SIP, which was prepared based on the existing information MNR had on the river system prior to implementation of the baseline field investigations for the project, identified the Kabinakagami as a cool water body; however, it was noted that cold water species such as Brook Trout (Salvelinus fontinalis) have been identified. The MNR SIP also notes that fish species in the
Kabinakagami River include, but are not limited to Lake Sturgeon (*Ascipenser fulvescens*), Northern Pike (*Esox lucius*), Walleye (*Sander vitreus*), Yellow Perch (*Perca flavescens*) and Longnose Sucker (*Catostomus catostomus*). The SIP noted that high potential exists for fish habitat, including spawning, nursery, rearing and feeding areas at or in close proximity to the proposed sites (MNR, 2010).

In order to obtain additional information regarding fish and fish habitat, baseline environmental field investigations were undertaken in 2009/10. Components of the field investigations included

- spring spawning studies (Walleye, Lake Sturgeon, sucker species)
  - fish collections (netting, angling)
  - visual observations
  - egg collection
  - habitat assessment
- Riverine Index Netting (RIN)
- small fish inventory (backpack electroshocking)
- aquatic habitat assessment
- Lake Whitefish (*Coregonus clupeaformis*) spawning studies
- Brook Trout spawning studies
- benthic invertebrate studies
- fish tissue mercury content studies
- Lake Sturgeon radio-tagging and tracking.

The complete methodology and results of those studies are documented in several reports (Hatch Ltd., 2011a and 2011b).

The field investigations identified the presence of Lake sturgeon, Brook trout, Walleye, Lake Whitefish, Northern Pike, Longnose Sucker, White Sucker (*Catostomus commersonii*), Sshorthead Redhorse (*Moxostoma macrolepidotum*), Lake Chub (*Couseius plumbeus*), Common Shiner (*Notropis cornutus*), Spottail Shiner (*Notropis hudsonius*), Longnose Dace (*Rhinichthys cataractae*), Brook Stickleback (*Culaea inconstans*), Trout-perch (*Percopsis omiscomaycus*), Yellow Perch, Johnny Darter (*Etheostoma nigrum*), Logperch (*Percina caprodes*), Mottled Sculpin (*Cottus bairdii*) and Burbot (*Lota lota*) in the study area (Hatch Ltd., 2011a; 2011b). Table 3.4 summarizes the species that were captured or observed at each of the seven development sites for which FIT applications were submitted, during the spring, summer or fall investigations.
Table 3.4  Summary of Fish Species at Proposed Development Sites

<table>
<thead>
<tr>
<th>Species</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
<th>Site 5</th>
<th>Site 6</th>
<th>Site 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Sturgeon</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Brook Trout</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Lake Whitefish</td>
<td></td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern Pike</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longnose Sucker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White Sucker</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shorthead Redhorse</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake chub</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common shiner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spottail shiner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Longnose dace</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burbot</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Brook stickleback</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Trout-perch</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walleye</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow perch</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Johnny darter</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logperch</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mottled sculpin</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

X  Species presence confirmed through field study
+  Species presence confirmed by First Nations Traditional Ecological Knowledge (TEK)

The fish and aquatic habitat investigations focussed on identifying aquatic habitat features (e.g., channel morphology, substrate, aquatic vegetation, instream cover) and habitat uses (e.g., spawning, nursery, foraging, overwintering) within the zone of influence of the Project. The complete results are discussed in Hatch Ltd. (2011a and 2011b).

3.2.2.2  Benthic Invertebrates

Benthic invertebrate studies were undertaken throughout the study area in October 2009 using a variety of methodologies. Hess sampling was conducted in fast flowing, shallow water environments and petite ponar sampling was conducted in slower moving, deeper, depositional environments to sample the range of species throughout the river system. The methodology and results are presented in Hatch Ltd. (2011b).

3.2.2.3  Odonates

A study of odonate species (i.e., dragonflies and damselflies) was undertaken by Northern Bioscience in summer 2009 to assess species presence and habitat use throughout the project study area. The complete results are documented in Northern Bioscience (2009), which is included as an Appendix in Hatch Ltd. (2011b). A total of 30 species were observed, including three provincially rare species.

3.2.2.4  Terrestrial Vegetation and Wildlife

The study area is located within the Hudson Bay Lowlands and Northern Clay forest section of the Boreal Forest Region. All four sites are located within the Northern Clay forest section and a portion
of the transmission line may cross through the Central Plateau forest section. Jack Pine (*Pinus banksiana*) is prevalent throughout the study area.

Terrestrial field investigations were undertaken in September 2009. The complete results are presented in Hatch Ltd. (2011c). Site 3 (Neeskah) and Site 4 (Peeshoo) have areas of exposed bedrock, rocky rivershore habitat with limited vegetation present in these areas. Site 5 (Wahpeestan) and Site 6 (Wapoos) have the forest edge predominately along the shoreline. Eastern White Cedar (*Thuja occidentalis*), spruce and birch are common at these sites (Hatch Ltd., 2011c). There are no vegetation species at risk identified on schedules associated with either the federal *Species at Risk Act* (SARA), or the provincial *Endangered Species Act*, 2007, with ranges that overlap that of the study area. The MNR SIP identifies a heronry located east of Site 4 (Peeshoo); however the presence of a breeding population has not been confirmed for many years. This feature was not observed during the field study.

Wildlife surveys conducted identified numerous bird and mammal species present within the study area. All species observed within the study are common in northern Ontario.

The zone of discontinuous distribution for Woodland Caribou (*Rangifer tarandus*), a Threatened species both federally and provincially, in Ontario overlaps the study area (MNR, 2010). Few isolated patches of ground lichen were observed and the closest muskeg was identified as being over 5 km north of Site 6. A Woodland Caribou survey was conducted in February 2011 by flying transects over the study area in a helicopter, as per the protocol recommended by the MNR. No Woodland Caribou individuals or tracks were observed during the study. The results of this report are documented in Pellegrini (2011).

No reptile or amphibian Species at Risk are expected to occur within the study area.

### 3.3 Socioeconomic Features

#### 3.3.1 Current and Past Land Uses

The MNR SIP indicated that the Kabinakagami River is known to be a traditional canoe route that was utilized during the fur trade. Currently, forestry resource extraction continues. As the Kabinakagami River is used as a canoe route, campsites do exist on the river. Two boat launches are present on the river; one is located at the Highway 11 crossing and the other is located at the end of Roger’s Road. The MNR SIP indicates that the launch at Roger’s Road serves as the “gateway” to the Albany River (MNR, 2010).

The project is located within General Use Area “G1729: Resource Utilization Area” as per the Crown Land Use Policy Atlas.

#### 3.3.1.1 Traditional Canoe and Fur Trade Route

According to MNR’s SIP, the Kabinakagami River is considered to be of cultural and historical significance as a traditional canoe and fur trade route. A Stage I Archaeological Assessment will be undertaken to confirm/establish any archaeological resources. If required, a Cultural Heritage
Assessment will also be completed to determine any cultural heritage resources potentially affected by the project.

3.3.1.2 Forestry

As noted in MNR’s SIP (MNR, 2010), a 10-yr Forest Management Plan (2007 to 2017) for the Hearst Forest is currently in effect. Phase 1 (first 5 years) is currently in effect and Phase 2 (2012 to 2017) is in the planning stage.

3.3.1.3 Hunting/Harvesting

Local residents and local First Nations are involved in trapping and fishing. Harvested furbearing species include Beaver (Castor Canadensis), Mink (Neovison vison), Marten (Martes americana), River Otter (Lontra Canadensis), Fisher (Martes pennanti), Lynx (Lynx Canadensis), Muskrat (Ondatra zibethicus), Red Fox (Vulpes vulpes) and Gray Wolf (Canis lupus). Hunting of Moose (Alces alces) and White-tailed Deer (Odocoileus virginianus) regularly occurs within the region. Popular game species in the area include moose, Black Bear (Ursus americanus), grouse, ptarmigan, rabbit and hare. The project area is located within the licensed Bear Management Area (BMA) HE 24-005 and in the vicinity of BMA 24-004.

The project area is also located within the Baitfish Harvest Area (BHA) HE-0139 and in the vicinity of HE-0138.

3.3.1.4 Mineral Resources

The SIP provided by MNR (2010) describes the withdrawal of surface rights in the vicinity of the project by the Ministry of Northern Development, Mines and Forestry (MNDMF). Existing mining claims 4257586, 4257587, 4246830, 4257584, and 4257585 may overlap with Wahpeestan (Site 5) and Wapoose (Site 6).

3.3.1.5 Recreation/Tourism

According to the MNR’s SIP the Kabinakagami River area is used for recreational sport fishing and hunting by local residents and some tourists are drawn to the area to pursue those activities as well. The SIP also notes that their may be some interest in other recreation and tourism pursuits on the river, such as white water rafting. The Roger’s Road landing downstream from the study area is a popular launch location.

3.3.2 Potential Contamination of the Site from Past Uses

No contamination of the proposed sites from previous land use is known or anticipated given the remote location and Greenfield nature of the project.

3.3.3 Proximity to Aboriginal Reserves and Traditional Territory

Local Aboriginal communities identified by the MNR and informed about the project include the CLFN, located approximately 15 km southwest of Neeskah (Site 3) (Figure 1.1). The Hornepayne First Nation is located approximately 95 km southwest of the project, the Fort Albany First Nation is located approximately 305 km northeast, the Kashechewan First Nation is located approximately 315 km northeast, and the Cochrane Northern Lights Métis Council is located approximately 240 km southeast.

The project sites fall within the traditional use area of CLFN. The Kabinakagami River was a traditional canoe route during the fur trade, but the portion with the study area of the four proposed developments is not currently known to be used as a traditional canoe route.
3.3.4 Proximity to Important or Designated Environmental or Cultural Sites
A Stage 1 Archaeological Assessment is scheduled to be undertaken by a licensed archaeologist to determine whether there is potential for archaeological resources to exist within the project area.

3.3.5 Proximity to Residential and Other Urban Areas
The sites are located approximately 15 km northeast of the CLFN Reserve and approximately 36 km northwest of the Town of Hearst. There are no residential or other urban areas in closer proximity to the sites.

3.3.6 Additional Baseline Studies
Additional baseline environmental studies that will be undertaken for the project include

- Fluvial geomorphology study
- Stage 1 Archaeological Assessment Study (and follow-up studies if necessary)
- Terrestrial and aquatic studies along transmission line and new access road routes.
4. Additional Requirements Related to Fish, Fish Habitat and Navigable Waters

4.1 Environmental Features
The field investigations carried out for the have identified all key environmental features within the study area. The results of those studies are briefly summarized in Section 3 and are documented in detail in Hatch Ltd. (2011a, 2011b and 2011c).

4.2 Use of Waterway

4.2.1 Existing Use of Waterway
The MNR SIP notes that the Kabinakagami River below the Roger’s Road landing is a traditional First Nations canoe route. Portages are present at Neeskah (Site 3) and Peeshoo (Site 4) to bypass the non-navigable rapids at those sites. The river areas proposed for Wahpeestan (Site 5) and Wapoose (Site 6) are navigable and there are no portages present at those sites.

4.2.2 Information on Fisheries
Baseline fisheries information from the various field investigations is documented in Hatch Ltd. (2011a and 2011b).
5. Potential Effects to the Environment

5.1 Zone of Influence

Due to the strict run-of-river nature of the proposed development, the zone of influence for each facility extends from the upstream end of the proposed head pond to the downstream end of the tailrace. The zone of influence also includes the on-land ancillary components of the project including upgraded and new access roads and the transmission line from the project.

5.2 Potential Effects to the Environment

In order to provide a preliminary identification of the potential effects that the proposed project could have on the environment, the Potential Effects Identification Matrix from the Class EA document (OWA, 2011) was completed (Table 5.1). It is important to note that this table was completed using preliminary information regarding the existing natural and socioeconomic features of the project study area and the preliminary project design to date. The effects assessment will be reviewed and modified as appropriate following completion of the remaining baseline studies that are proposed and further refinements to the proposed engineering design of the facilities.

The potential level of effect (positive or negative) is based on the guidance in the OWA Class EA (OWA, 2011) and the MNR Class EA (MNR, 2003). Accordingly, the following definitions of effect were utilized:

- A ‘nil’ effect would be assigned where there is no effect on that criterion
- A ‘low’ potential effect would be assigned where the potential impact and/or benefit is considered low or minimal
- A ‘high’ potential effect would be assigned where the potential impact and/or benefit is believed to be considerable
- A ‘unk’ would be assigned where the potential effects are unknown or there is insufficient information to assign a potential level of effect with reasonable certainty
- A ‘−’ means a potential negative effect
- A ‘+’ means a potential positive effect.

The potential effects are identified as occurring before the implementation of mitigation measures, which would be enacted to prevent or minimize the adverse effects identified in Table 5.1. The ‘Comments, Rationale’ column in the table identifies the potential effects that could occur, and the ‘Mitigation Measures’ column identifies the measures that could potentially be implemented to prevent or minimize adverse effects. Additional mitigation measures that could potentially be utilized are identified in Appendix B of the Class EA (OWA, 2011).
### General Natural Environment Considerations

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Potential Level of Effect</th>
<th>Comments, Rationale</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air quality, including green house gas (GHG) offsets</td>
<td>X</td>
<td>Potential adverse effects during construction due to equipment exhaust, smoke from burning waste materials and dust emissions. Potential adverse effects during operations due to back-up diesel generator emissions. Potential positive effects due to GHG offsets using water power.</td>
<td>Standard construction site best management practices to minimize air emissions due to exhaust, waste burning and dust. Back-up diesel generator operates very infrequently (typically only in emergency situations).</td>
</tr>
<tr>
<td>Water quality or quantity (surface water)</td>
<td>X</td>
<td>Potential adverse effects on water quality during construction due to erosion and sedimentation and accidental spills. Potential effects on water quality during operation due to shoreline erosion, inundation of terrestrial land in head ponds (e.g., nutrients, mercury inputs) and accidental spills.</td>
<td>Standard construction site best management practices to control erosion and sedimentation and prevent accidental spills from occurring. Spill prevention and containment measures to be in place throughout operational period. Run-of-river mode of operation will prevent water level fluctuations which could cause excessive shoreline erosion and associated adverse water quality conditions. Small increase above ambient river level and clearing of vegetation in proposed head ponds to limit nutrient availability in inundated area. Close coupled dam and powerhouse to eliminate need for bypass reach. Transmission line routing and construction methodology will minimize water crossing requirements to the extent possible.</td>
</tr>
<tr>
<td>Water quality or quantity (groundwater)</td>
<td>X</td>
<td>Potential adverse effects on groundwater quality during construction due to accidental spills. Potential decreases in local groundwater quantity during construction due to groundwater leakage into project excavations.</td>
<td>Standard construction site best management practices to prevent accidental spills and manage groundwater.</td>
</tr>
<tr>
<td>Species at risk or their habitats</td>
<td>X</td>
<td>Lake Sturgeon, a species of Special Concern, is present within the study area.</td>
<td>Run of river operation will prevent changes to significant sturgeon spawning and foraging areas downstream from Site 6 (Wapoose). Habitat enhancements may be implemented at Site 6 to provide spawning habitat for sturgeon. Post construction monitoring will be employed to assess impacts on sturgeon and adaptive management will be utilized to assess requirements for remedial measures or monitoring in the event unanticipated impacts are observed.</td>
</tr>
<tr>
<td>Significant natural or life science features</td>
<td>X</td>
<td>Woodland Caribou, a Threatened species, are present within the general area, but not likely present within the zone of influence of the Project.</td>
<td>No adverse effects are anticipated on Woodland Caribou since their use of the Project area is likely minimal.</td>
</tr>
<tr>
<td>Land subject to natural or human-made hazards</td>
<td>X</td>
<td>Terrestrial wildlife could be affected by loss/fragmentation of habitat (associated with construction of site facilities and associated infrastructure including transmission line and access roads, as well as head pond creation, etc.), and disturbance associated with construction and operations of the proposed facilities.</td>
<td>Terrestrial wildlife (including numbers, diversity and movement of resident or migratory species)</td>
</tr>
<tr>
<td>Terrestrial wildlife (including numbers, diversity and movement of resident or migratory species)</td>
<td>X</td>
<td>No significant natural hazards were identified within the study area.</td>
<td>Habitat loss associated with the project will be minimized to the greatest extent possible. Mitigation measures will be developed to minimize potential effects on terrestrial wildlife from loss/fragmentation of habitat and disturbance. Transmission line routing to avoid potentially significant wildlife habitat features to extent possible.</td>
</tr>
<tr>
<td>Natural vegetation and terrestrial habitat linkages</td>
<td>X</td>
<td>Terrestrial wildlife could be affected by loss/fragmentation of habitat (associated with construction of site facilities and associated infrastructure including transmission line and access roads, as well as head pond creation, etc.), and disturbance associated with construction and operations of the proposed facilities.</td>
<td>Natural vegetation and terrestrial habitat linkages</td>
</tr>
<tr>
<td>Soils and sediment quality</td>
<td>X</td>
<td>Soil and sediment quality could be adversely affected by excavation and removal, compaction, loss due to fugitive dust or erosion or accidental spills during construction or operation.</td>
<td>Soils and sediment quality</td>
</tr>
<tr>
<td>Significant natural heritage features and areas</td>
<td>X</td>
<td>No significant natural heritage features were identified within the study area.</td>
<td>Significant natural heritage features and areas</td>
</tr>
<tr>
<td>Aquatic and Riparian Ecosystem Considerations</td>
<td>X</td>
<td>Shoreline dependant species may be impacted by the creation of head ponds.</td>
<td>Aquatic and Riparian Ecosystem Considerations</td>
</tr>
<tr>
<td>Criteria</td>
<td>Potential Level of Effect</td>
<td>Comments, Rationale</td>
<td>Mitigation Measures</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------</td>
<td>--------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Wetland dependant species</td>
<td>-H</td>
<td>Wetland habitat is not present within the project footprint.</td>
<td>No mitigation required.</td>
</tr>
<tr>
<td>Fish habitat</td>
<td>A</td>
<td>Fish habitat could be affected by infrastructure (e.g., overflow weirs, tailrace excavations, temporary cofferdams and dewatering, water crossings on access roads and transmission lines), head pond inundation, blockage of movement and adverse effects due to sedimentation and potential spills.</td>
<td>Fish habitat mitigation and compensation measures will be developed to ensure no net loss of the productivity of fish habitat as a result of the project. Run of river mode of operation will minimize changes in flow and water level. Construction and in-water work best management practices to minimize potential for erosion and sedimentation and accidental spills. In-water work timing windows will be followed to prevent impacts due to reproductive periods.</td>
</tr>
<tr>
<td>Fish migration</td>
<td>A</td>
<td>Installation of dams will block the movement of fish throughout this section of the river.</td>
<td>Habitat enhancements will be undertaken as necessary to ensure that isolated populations within each head pond have access to all critical habitat requirements (e.g., spawning, nursery, foraging) such that there is no net loss of productivity of fish habitat.</td>
</tr>
<tr>
<td>Fisheries</td>
<td>X</td>
<td>Fisheries could be affected by changes in habitat and associated changes in fish community. Head ponds may result in an overall increase in the amount of aquatic habitat available.</td>
<td>Assessment and mitigation measures noted above are intended to address this issue.</td>
</tr>
<tr>
<td>Erosion and sedimentation</td>
<td>A</td>
<td>Potential for erosion and sedimentation due to construction activities. No potential for long-term bank erosion since facilities operated in a strict run of river mode of operation.</td>
<td>Standard construction site best management practices to minimize erosion and sedimentation potential during construction. Run of river mode of operation to limit unnatural water level and flow fluctuations.</td>
</tr>
<tr>
<td>Fish injury or mortality (impingement and entrainment)</td>
<td>A</td>
<td>Potential for some impingement on fish at turbines and entrapment and mortality through turbine flows.</td>
<td>Low intake velocities to minimize impingement and entrainment potential. Determine expected turbine mortality using published formulas with site and facility characteristics.</td>
</tr>
<tr>
<td>Water levels, flows and movement (surface or groundwater)</td>
<td>A</td>
<td>Water levels in the head ponds will be increased due to the overflow weirs. Some minor decrease in flow during head pond filling.</td>
<td>Run-of-river mode of operation to minimize changes in water levels and flows. Close coupled powerhouses to prevent requirement for bypass reaches. River flow not to be reduced by more than 10% during head pond filling.</td>
</tr>
<tr>
<td>Drainage, flooding and drought patterns</td>
<td>A</td>
<td>Minor changes in local drainage could potentially occur due to presence of facility, laydown, access road and transmission line corridors. This will be accommodated through a drainage system. Extreme flood levels may be somewhat higher in the head ponds due to the water level increase.</td>
<td>A drainage network will be installed around the facility to ensure adequate site drainage. Facilities will be constructed to meet flood passage requirements.</td>
</tr>
<tr>
<td>Water temperature</td>
<td>A</td>
<td>Changes in water temperature in head pond due to increased surface area and slower flow velocity anticipated to be negligible.</td>
<td>No mitigation required – overall thermal regime of the river not likely affected.</td>
</tr>
<tr>
<td>Other (specify)</td>
<td>X</td>
<td>No other components identified.</td>
<td></td>
</tr>
</tbody>
</table>

**Aboriginal Community Considerations**

| Lands subject to land claims | X | The project is proposed within the boundaries of Treaty 9. The Constance Lake First Nation is in partnership for this project. | First Nation consultation during the Class EA process will be undertaken. |
| Economic Development | X | The project is a joint venture partnership with Constance Lake First Nation and Northland Power Inc. and therefore will provide income and employment opportunities to the community. | N/A |
| Other (specify) | X | N/A | N/A |

**Land and Resource Use Considerations**

| Access to inaccessible areas (land or water) | X | The four sites are accessible by ATV and water. The creation of new access roads, and upgrading existing roads to accommodate construction equipment and material delivery will result in improved access to the areas by land. Access to the area by water will remain via portage routes. | Public access to the construction area will be prohibited to ensure public safety. Portage routes around the falls will be constructed/restored to ensure safe passage around the falls during construction and operation. |
### Project Description

**Navigation**
- **Comments, Rationale:** Navigation and portage routes could be affected by the proposed developments.
- **Mitigation Measures:** Existing portage routes will be identified, and a commitment made to maintain or temporarily re-route portage routes during construction to ensure safe passage around the sites for canoe/kayakers. Portage routes will be restored/maintained during operation.

**Riparian rights or privileges**
- **Mitigation Measures:** Consultation with stakeholders will determine appropriate mitigation.

**Recreational use (land or water)**
- **Appropriate mitigation requirements will be determined based on stakeholder consultation.**

**Angling and hunting opportunities**
- **Mitigation Measures:** Portages will be maintained/installed to ensure safe passage around the facilities during construction and operation. Additional mitigation requirements will be determined in consultation with project stakeholders.

**Trapping activities**
- **Mitigation Measures:** Consultation will be required with baitfishermen to identify harvesting areas and effects.

**Baitfish harvesting activities**
- **Mitigation Measures:** Appropriate mitigation requirements will be determined based on stakeholder consultation.

**Views or aesthetics**
- **Mitigation Measures:** The full extent of effects to recreational use will be determined in consultation with project stakeholders.

**An existing land or resource management plan**
- **Mitigation Measures:** Appropriate mitigation requirements will be determined based on stakeholder consultation.

**An existing water management plan**
- **Mitigation Measures:** Facilities will be close coupled to prevent the requirement for a bypass reach that could experience significantly reduced flows in order to maintain site aesthetics.

**Protected areas**
- **Mitigation Measures:** Consultation to be undertaken to confirm or to identify area(s) to be protected.

### Cultural Heritage Resources Considerations

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Potential Level of Effect</th>
<th>Comments, Rationale</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archeological sites</td>
<td>X</td>
<td>Archiological sites are known to exist within the project area. A Stage One Archeological Assessment will be completed to determine potential effects.</td>
<td>Appropriate mitigation measures will be proposed based on assessment findings as required.</td>
</tr>
<tr>
<td>Buildings or structures</td>
<td>X</td>
<td>Structural resources potentially affected by the project are currently unknown.</td>
<td>Appropriate mitigation measures will be proposed as required.</td>
</tr>
<tr>
<td>Cultural heritage landscapes</td>
<td>X</td>
<td>It is unknown whether a cultural heritage landscape assessment will be required for the project.</td>
<td>Appropriate mitigation measures will be proposed based on assessment findings as required.</td>
</tr>
</tbody>
</table>

### Social and Economic Considerations

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Potential Level of Effect</th>
<th>Comments, Rationale</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>The location of people, businesses, institutions, or public facilities</td>
<td>X</td>
<td>Limestone Lake First Nation Reserve is the nearest community in the vicinity of the project. Potential effects will be determined in consultation with local residents, business owners and other stakeholders.</td>
<td>Appropriate mitigation measures will be determined based on stakeholder consultation.</td>
</tr>
<tr>
<td>Community character, enjoyment of property, or local amenities</td>
<td>X</td>
<td>Effects to community character, enjoyment of property and local amenities are not expected.</td>
<td>N/A</td>
</tr>
<tr>
<td>Employment</td>
<td>X</td>
<td>The construction and operation of the project will require local and non-local employment based on qualification.</td>
<td>N/A</td>
</tr>
<tr>
<td>Public health and/or safety</td>
<td>X</td>
<td>Public safety risks/concerns normally associated with run of river hydroelectric stations will be present during construction and throughout operations. Public access to the head ponds will be present during operations.</td>
<td>Prevention of public access to the construction site through use of signage, gates and fencing among other security procedures as required. Proper barriers and warning devices installed following construction to restrict public access to intake/tailrace areas during operation, including safety booms, fencing and signage. Safe portages will be provided around the facilities.</td>
</tr>
<tr>
<td>Local, regional, or provincial economies</td>
<td>X</td>
<td>Economic benefits will include employment, expenditures on materials, equipment and services, contribution of renewable energy to the Provincial supply mix</td>
<td>N/A</td>
</tr>
<tr>
<td>Tourism values</td>
<td>X</td>
<td>See &quot;Cultural heritage landscape&quot; above.</td>
<td>N/A</td>
</tr>
<tr>
<td>Water supply</td>
<td>X</td>
<td>The Kabinakagami River within the study area does not provide a water supply for local communities.</td>
<td>N/A</td>
</tr>
<tr>
<td>Aesthetic image of the surrounding area</td>
<td>X</td>
<td>See &quot;Views or Aesthetics&quot; above.</td>
<td>N/A</td>
</tr>
<tr>
<td>Criteria</td>
<td>Potential Level of Effect</td>
<td>Comments, Rationale</td>
<td>Mitigation Measures</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Other (specify)</td>
<td>H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy/Electricity Considerations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Reliability (e.g., voltage support) | X                        | • New power generation units are of a relatively small capability, and operation of them in parallel with the existing power grid will provide minor impact on the overall power system reliability and power quality - voltage and frequency.  
• The power generation interconnection to the power grid may reduce the reliability of the interconnection feeder. | N/A                                                                                                        |
| Security (e.g., black start)     | X                        | • Operation of the projects will improve distribution customer service reliability in this area. The power generation units will be able to provide a black start and island mode of operation (assuming that is allowed by HONI) to continue to supply or electrically re-energize in a safe, controlled and reliable manner, part of the distribution system, including customer load that is separated from the rest of distribution system. | The island mode of operation could require the change of the interconnection protection and control scheme/settings in the HONI distribution system. Further consultation with HONI required. |
| Electricity flow patterns        | X                        | • Operation of the new power generation units will redistribute power flow in the existing distribution system.                                                                                                    | Appropriate technical mitigation measures will be proposed in the control system of the power grid and/or new generation units if required. |
| Other (specify)                  | X                        | • Operation of the new power generation units will affect existing protection and control settings in the distribution system.                                                                                   | Appropriate technical mitigation measures will be proposed in protection and control system of the power grid.  
• Oil-filled electrical and mechanical equipment can potentially leak oil into the environment.  
• Appropriate containment and maintenance measures will be proposed to minimize the risk. |
6. **References**


