



## **Project Description**

# **Larder and Raven Hydroelectric Generating Station**

**Distribution:**

Canadian Environmental Assessment Agency

**Federal Agencies to be contacted by the Federal Environmental Assessment Coordinator**

Environment Canada

Fisheries and Oceans Canada

Health Canada

Indian and Northern Affairs Canada

Natural Resources Canada

Transport Canada

Other departments as identified by CEEA

**Provincial Agencies**

Ministry of Aboriginal Affairs

Ministry of Tourism and Culture

Ministry of Energy and Infrastructure

Ministry of the Environment

Ministry of Municipal Affairs and Housing

Ministry of Natural Resources

Ministry of Transportation

Ministry of Northern Development, Mines and Forestry

Ontario Waterpower Association

Ontario Parks- Larder Lake Provincial Park

**Municipal**

Town of Larder Lake and Township of Larder Lake

Town of Englehart

Township of McGarry

Township of Evanturel

Town of Kirkland Lake

**First Nations**

Matachewan First Nation

Beaverhouse First Nation

Métis Nation of Ontario

Wabun Tribal Council

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## **1. General Information**

### **1.1 General**

This Project Description has been prepared by the proponent, Xeneca Power Development Inc. (Xeneca), based on the current conceptual designs for the Larder and Raven Generating Station, in order to satisfy the requirements of the federal *Canadian Environmental Assessment Act* (CEAA) as well as the provincial Class Environmental Assessment for Waterpower Projects (Ontario Waterpower Association (OWA), 2008). Conceptual design is subject to change subsequent to the results of studies in support of the proposed undertaking, comment by regulatory agencies, First Nation and Aboriginal Communities and other stakeholders.

#### **1.1.1 Name and Proposed Location of Project**

The name of the project is the Larder and Raven Hydroelectric Generating Station (GS) Project. The proposed project is located on the Larder River upstream of Raven Falls, 100 m upstream of the existing Raven Dam and 1.4 km downstream of the existing Larder Lake Control Dam (Figure 1). Both water control structures are owned by the Ministry of Natural Resources (MNR).

#### **1.1.2 Nature of the Project**

Xeneca submitted a Waterpower Site Release Application (No. DSR-2006-009) to the MNR for Larder and Raven on November 30, 2006, Site ID Numbers; 2JC21 and 2JC22. The MNR released this project site as a Direct Site Release. Xeneca was awarded Applicant of Record Status on November 25, 2009.

Xeneca Power was awarded a Feed-in-Tariff (FIT) contract for this site by the Ontario Power Authority on April 29, 2010.

Xeneca is proposing to construct a hydroelectric facility on the Larder River upstream of Raven Lake. The facility will have a generating capacity of 1.25 MW. The structure's components will include a water control structure (dam), penstock and powerhouse. Road upgrades as well as new road construction will be required to access the site. A 16 km 44 kV power line, connecting to feeder line 16M62 from the Larder Lake Distribution Station, will be installed in order to connect the station to the provincial electrical power supply grid.

Project design information presented herein is based on preliminary investigations and analyses. Design optimization and finalization will be conducted pending the results of feasibility studies, field investigations as well as public and agency consultation. The description of the components of the project will be updated throughout the environmental assessment process as detailed design information becomes available.

#### **1.1.3 Purpose of the Project**

The purposes of the project are to:

- Meet government and energy regulatory agency goals and objectives to generate environmentally sustainable hydroelectric green power on a consistent and reliable basis; and

- Sell the generated power under a Feed-In-Tariff electricity contract from the Ontario Power Authority (OPA).

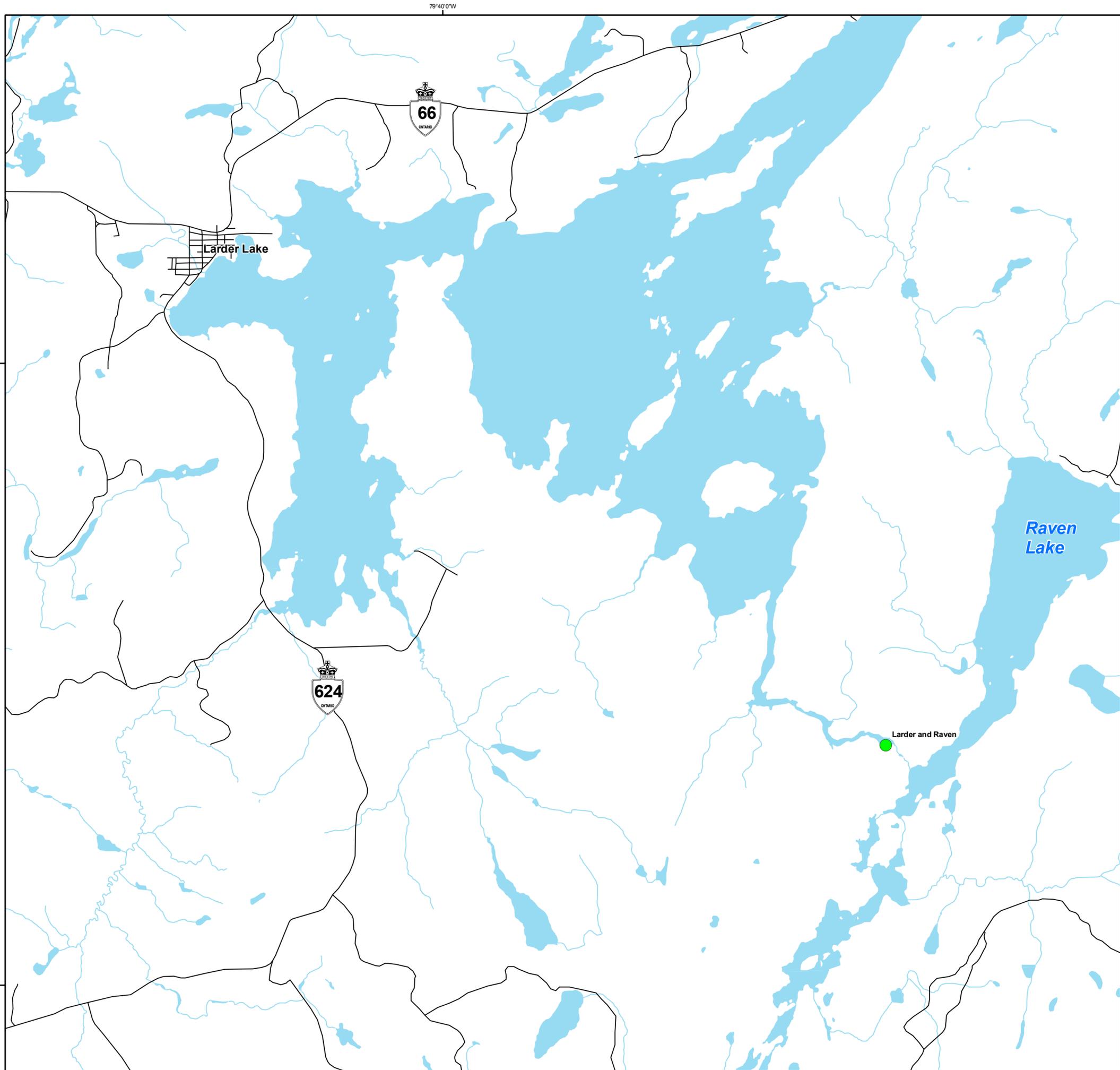
In order to meet these objectives, Xeneca will try to maximize the use of existing infrastructure to connect to the existing distribution grid and to the provincial power grid.

#### **1.1.4 Economic Benefits**

The proposed Larder and Raven generating station will have a total installed capacity of approximately 1.25 MW.

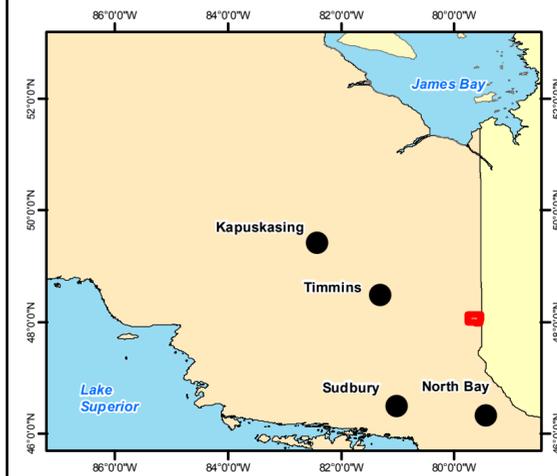
**Waterpower creates jobs, generates revenue to the taxpayers of Ontario and is the longest lived and most reliable source of clean, renewable electricity.**

- Approximate economic activity (direct) to build in Ontario is \$5 million per megawatt, about half of which is spent locally procuring everything from consulting and legal services to concrete, steel, trucking and other services such as hotels, restaurant and fuel.
- Direct job creation (construction only) 10,000 person hours per MW. Indirect jobs multiply by 1.5.
- Local/Regional economic boost of \$2.5 million per MW – about \$12 million.
- First Nations and non aboriginal community participation incentives. For overview see Xeneca Website.
- Significant return to the people of Ontario with approximately \$5 million per MW (\$24 million over the 40 year lifespan of the project) paid through Gross Revenue Charges (GRC) and Provincial and Federal Income taxes.
- May assist mining companies or local industry by providing more reliable power with some potential cost savings.
- Waterpower lasts... many power plants built in the early 1900s are still in operation and with regular maintenance and upgrades can last for generations to come. In comparison the life span for other sources of clean power are: nuclear 40 years, wind 20 years, solar 20 years.



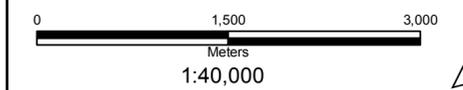
**LEGEND**

- Site Locations
- Roads
- Water Features



**REFERENCE**

Note: MNR & Geogritis Data Services (2010)  
UTM Zone 17



**PROJECT**

LARDER & RAVEN GS

**TITLE**

SITE LOCATION MAP

PROJECT No.		
DESIGN	KC	06/10/2010
GIS	KC	06/10/2010
CHECK	TS	06/10/2010
REVIEW	KF	06/10/2010

**FIGURE**

1

### **1.1.5 Parties who Received the Project Description**

This Project Description has been submitted to the Canadian Environmental Assessment Agency (CEAA) for distribution to relevant federal agencies including:

- Environment Canada (EC)
- Fisheries and Oceans Canada (DFO)
- Health Canada (HC)
- Indian and Northern Affairs Canada (INAC)
- Natural Resources Canada (NRCan)
- Transport Canada (TC)
- Other departments as identified by CEAA

The Project Description will also be submitted to the following provincial ministries, municipalities and Aboriginal communities:

#### Provincial Agencies

- Ministry of Aboriginal Affairs
- Ministry of Tourism and Culture
- Ministry of Energy and Infrastructure
- Ministry of the Environment
- Ministry of Municipal Affairs and Housing
- Ministry of Natural Resources
- Ministry of Transportation
- Ministry of Northern Development, Mines and Forestry
- Ontario Waterpower Association
- Ontario Parks- Larder Lake Provincial Park

#### Municipal Governments

- Town of Larder Lake and Township of Larder Lake
- Town of Englehart
- Township of McGarry
- Township of Evanturel
- Town of Kirkland Lake

#### First Nations

- Matachewan First Nation
- Beaverhouse First Nation
- Métis Nation of Ontario
- Wabun Tribal Council

### 1.1.6 Federal, Provincial and Municipal Agency and Stakeholder Class EA Consultations

The agencies and organizations shown in Table 1.1 will be engaged and consulted through the environmental screening process. These organizations and any additional stakeholders identified subsequent to the issuance of this project description have or will receive an introductory letter and copy of the Notice of Commencement.

**Table 1.1: Government Agencies and Organizations to Be Contacted**

<p><b>Federal Government</b>          Canadian Environmental Assessment Agency (CEAA)          Environment Canada (EC)          Fisheries and Oceans Canada (DFO)          Health Canada (HC)          Indian and Northern Affairs Canada (INAC)          Transport Canada (TC)</p>
<p><b>Provincial Government</b>          Ministry of Aboriginal Affairs          Ministry of Tourism and Culture          Ministry of Energy and Infrastructure          Ministry of the Environment (MOE)          Ministry of Municipal Affairs and Housing          Ministry of Natural Resources (MNR)          Ministry of Transportation          Ministry of Northern Development, Mines and Forestry          Ontario Parks- Larder Lake Provincial Park</p>
<p><b>Municipal Government</b>          Town of Larder Lake and Township of Larder Lake          Town of Englehart          Township of McGarry          Township of Evanturel          Town of Kirkland Lake</p>
<p><b>First Nations</b>          Matachewan First Nation          Beaverhouse First Nation          Métis Nation of Ontario          Wabun Tribal Council</p>
<p><b>Industry/Commercial and Public Stakeholders</b>          Ontario Waterpower Association          Raven and Wendigo Cottage Associations          Timiskaming Forest Alliance Inc.          Ontario Fur Managers Federation</p>

### **1.1.7 Environmental Assessment Processes**

As a new development with a nameplate capacity less than 200MW, this project is subject to the Class Environmental Assessment for Waterpower Projects (OWA, 2008), which is an approved Class EA under the *Ontario Environmental Assessment Act*. The proponent has categorized this undertaking as a ‘new project on a managed waterway’ in accordance with the definition for ‘managed waterway’ provided in the Class Environmental Assessment for Waterpower Projects (OWA, 2008). Confirmation that this categorization is accurate will be provided subsequent to a review of this project description by applicable regulatory bodies (MNR and MOE). The proponent will assess the project in accordance with the applicable designation.

EA provisions of other provincial Class EAs will be identified at the proponent-agency coordination meeting. Where necessary a coordinated approach will be sought during this meeting.

An authorization from DFO under the *Fisheries Act* and approval from Transport Canada under the *Navigable Waters Protection Act* (NWPA) will be required. Each triggers the need for an environmental assessment under the *Canadian Environmental Assessment Act* (CEAA). Since the proposed project is less than 200 MW, a screening level environmental assessment would be completed in accordance with the CEAA and all applicable guidelines.

No federal funding is involved in this project.

## **1.2 Contacts**

### **1.2.1 Proponent and Contact Information**

The project proponent is Xeneca Power Development Inc. At the time of this submission there were no co-proponents involved in this undertaking. Xeneca is presently pursuing the possibility of partnering with interested identified Aboriginal communities.

Contact information for Xeneca Power Development Inc is:

Patrick Gillette  
President  
Xeneca Power Development Inc.  
5160 Yonge Street #520  
North York, ON M2N 6L9  
Phone: 416-590-9362  
Fax: 416-590-9955  
Email: pgillette@xeneca.com

### **1.2.2 Proponent's Consultant**

Ontario Resource Management Group Inc. (ORMG) has been retained to conduct the field study program for this project. Contact information for ORMG is:

Kristi Beatty  
Ontario Resource Management Group Inc  
P.O. Box 1234  
Pembroke, ON K8A 6Y6  
Phone: 613-638-0283  
Email: ormgkb@ormg.org

OEL-HydroSys Inc. has been retained to conduct the Class EA for this project. Contact information for OEL-HydroSys Inc. is:

Tami Sugarman,  
OEL-HydroSys Inc.  
3108 Carp Road  
P.O. Box 430  
Carp, ON K0A 1L0  
Phone: 613-839-1453 x 229  
Fax: 613-839-5376  
Email: EAinfo@oel-hydrosys.ca

### **1.3 Land Ownership**

The project footprint and potential area of impact, (i.e. for the generating station, headpond, switchyard, control structure(s), access road(s) and power line corridor), are located on provincial land.

### **1.4 Authorizations Required**

Table 1.2 outlines a list of potential regulatory approvals (federal, provincial and municipal) that may be required during the construction or operation of this project. The list provided below is not meant to be comprehensive; site specific permitting requirements will be confirmed through the EA planning process and once a detailed design and construction plan is available.

**Table 1.2: Potential Federal, Provincial and Municipal Approvals**

<b>Permit and Legislative Requirement</b>	<b>Agency</b>
<b>Federal</b>	
Authorization for Works and Undertakings Affecting Fish Habitat - <i>Fisheries Act</i> [Section 35(2)]	Department of Fisheries and Oceans
Authorization for Destruction of Fish by Means other than Fishing - <i>Fisheries Act</i> (Section 32)	Department of Fisheries and Oceans
<i>Species at Risk Act</i> (SARA) – authorizations, as applicable	Department of Fisheries and Oceans; Environment Canada
Approval for Construction in Navigable Waters - <i>Navigable Waters Protection Act</i> (Section 5)	Transport Canada (Marine)
<i>Explosives Act</i> - Temporary Magazine Licence	Natural Resource Canada (NRCan)
<b>Provincial</b>	
<i>Lakes and Rivers Improvement Act</i> (LRIA) – Location Approval and Plans and Specifications Approval	Ministry of Natural Resources
<i>Lakes and Rivers Improvement Act</i> (LRIA) – Water Management Plan	Ministry of Natural Resources
<i>Public Lands Act</i> (PLA) – Work Permits (Parts 1-5, as required).	Ministry of Natural Resources
<i>Public Lands Act</i> (PLA) – Licence of Occupation	Ministry of Natural Resources
<i>Endangered Species Act</i> (ESA) – permits and agreements, as applicable	Ministry of Natural Resources
<i>Crown Forest and Sustainability Act</i> (CFSA) - Forest Resource Licence and Overlapping Licence Agreement	Ministry of Natural Resources
<i>Forest Fires Prevention Act</i> (FFPA) - Burn permit on Crown Land	Ministry of Natural Resources
<i>Ontario Heritage Act</i> and the <i>Ontario Heritage Amendment Act</i> (OHA and OHAA)- Cultural Heritage Clearances	Ministry of Tourism and Culture
Permit to Take Water – <i>Ontario Water Resources Act</i> (Section 34)	Ministry of the Environment
Certificate of Approval (Industrial Sewage) – <i>Ontario Water Resources Act</i> (Section 53)	Ministry of the Environment
Certificate of Approval (Air and Noise) – <i>Environmental Protection Act</i> (Section 9)	Ministry of the Environment
Waste Generator Registration – <i>Environmental Protection Act</i> [Section 18(1)], Ontario Regulation 347	Ministry of the Environment
Notice of Project and Registration of Contractors – Construction Regulation 213/91	Ministry of Labour
<i>Electricity Act</i> (EA) - Electricity Generation Licence	Ontario Energy Board
<b>Municipal</b>	
Permit for Noise (from Construction)	Municipality
Road Use Agreement	Municipality
Building Permit	Municipality
<i>Fire Protection and Prevention Act</i> (FFAPA) - Burn Permit	Municipality

## 2. Project Information

### 2.1 Description of Proposed Project

#### 2.1.1 General

The proposed project at Larder and Raven would capture the surveyed gross head of 18 m. The conceptual development incorporates the use of a sluiceway dam. A penstock will conduct flows from the river to an intake before directing them through a single turbine with a nameplate capacity rating of 1.25 MW.

The extent of lands involved in the project as well as general arrangement and details of the power facility and access roads are presented in Appendix A. The proposed site development is described in more detail in the following sections.

The proposed design of the project could be subject to change subsequent to the results of field investigation, regulatory agency input, First Nation and Aboriginal Community involvement, and comments received from other stakeholders. Project design changes may therefore be implemented based on the valued ecosystem components within the project area, including environmental, social or economic factors.

#### 2.1.2 Summary of Hydraulic Characteristics

Estimated existing water levels

- normal operating headwater level el 286 m
- normal tailwater level downstream of powerhouse el 268 m
- normal operating gross head el 18 m
- 1: 100 year maximum flood flow 25.4 m<sup>3</sup>/s
- 1: 100 year low flow 0.29 m<sup>3</sup>/s
- long-term average flow 3.45 m<sup>3</sup>/s

#### 2.1.3 Installed Capacity

The installed capacity at this site will be 1.25 MW provided by a single turbine unit.

#### 2.1.4 Site Access

The proposed site access would involve the upgrade of an existing 1.8 km road east of Hwy 624 followed by 7.3 km of new access running east from the highway (Appendix A).

#### 2.1.5 Headworks Structures

Appendix A shows the layout and details of the headworks structures. Headworks would consist of a single 134 m long earthen dam with a central 6 m wide concrete sluice gate as well as the 5.1 m wide and 1.7 m deep facility intake which would direct water through the penstock to the powerhouse.

### **2.1.6 Conveyance System**

A 257 m long penstock would be used to convey water from the dam to the turbine/generator set in the powerhouse. A plan and profile of the conveyance system is shown in Appendix A.

### **2.1.7 Powerhouse**

The powerhouse footprint will be approximately 5.5 m x 5.5 m. The powerhouse would be constructed with reinforced concrete floors and walls to a level above the historical flood level and existing ground levels. Construction above this defined line can be reinforced concrete, insulated steel panels or a combination of the two based on existing physical needs and constraints. A coffer dam would be required to make initial excavations of the powerhouse, draft tube and flow transition features, as these are below the tailrace water level. The water passage within the powerhouse will be constructed from a combination of concrete and steel conduits.

The headwork's structures may be constructed from any or all of the following materials within the engineering constraints for the same; concrete, RCC – rolled and compacted concrete, earthen/stone, clay and 'rubber' (impermeable barriers). Typical construction would feature a broad overflow weir topped by a control feature. (i.e.: an Obermeyer or similar, pneumatically operated dam). Headgate structures may be either included in the dam design or built as a separate riverside structure dependent upon penstock routing. In most cases, a coffer dam is required for temporary diversion of river flows around the intake/dam/weir construction areas.

### **2.1.8 Transmission**

A 16 km long 44 kV Hydro One power line, supported by wood poles for its total length, will connect to feeder line 16M62 originating from the Larder Lake DS (Appendix A). The required right-of-way (ROW) for the power line will be between 10-30m in width, depending on site conditions. One padmount transformer will be required at the site.

### **2.1.9 Area of Inundation**

Based on preliminary hydrological information, the proposed project would flood riparian lands up to 1.9 km upstream of the spillway dam. The project will inundate approximately 22 ha of additional land resulting in the creation of a head pond with a total surface area of 35 ha (Appendix A).

## **2.2 Operating Strategy for Project**

### **2.2.1 Type of Proposed Project**

Xeneca proposes to operate based on the natural run of water upstream of the plant with some daily flow modifications.

The OPA FIT program encourages power to be produced during daytime hours when Ontario households use power most. To this end, and where circumstances permit, some electricity production may be shifted from night time and weekend hours to daytime hours on weekdays. No long term storage of water is proposed. The Ministry of Energy and Infrastructure refers to this operation mode as “run-of-river with modified peaking”. Most of the year production will occur round the clock. Production shifting will occur

during periods of low flow when the natural run in the river drops below the plant capacity. These conditions occur predominantly in late summer and late winter. The amount of water that can be stored is limited by the amount of natural storage available and based on acceptable fluctuation of water levels upstream and minimum flow requirements downstream of the plant. Details of the operation will be determined during the Class Environmental Assessment for Waterpower based on environmental, stakeholder and economic constraints specific to the project.

### **2.2.2 Operating Strategy**

A dam operating strategy will be developed after due consideration of technical and economic aspects of the project and input from the public, agencies and the municipality. This strategy will be documented in a Dam Operating Plan (DOP) that will respect the requirements of the LRIA (Section 23.1).

### **2.2.3 Water Management Plan**

At this time no water management plan (WMP) for the Larder River exists. Xeneca will address water management planning issues for the Larder River through the development of the DOP.

## **2.3 Project Activities**

### **2.3.1 Construction Schedule and Activities**

Site preparation activity will commence in late 2011 and early 2012. Construction of the proposed facility is scheduled to take place between 2012 and 2013. Commissioning is scheduled for April 2014.

### **2.3.2 Operation**

The facility will operate as a run-of-the-river facility with modified peaking. The facility will be designed with the ability to be remotely operated in addition to having on-site controls. Typically, hydroelectric projects are designed for a 50 to 100 year lifespan. Upgrades and rehabilitation activities may extend their useful life.

### **2.3.3 Decommissioning**

At present, there are no plans being developed for decommissioning of the facility. The decision to decommission the facility or alternatively upgrade or rehabilitate the facility to extend its operational life at the time will depend on the structure, operational history of the facility as well as economic and other considerations. Responsibility for decommissioning the facility will be borne by the facility owner at such time as the facility is deemed no longer useful; at which point the decommissioning will be completed according to applicable legal requirements.

## **2.4 Resource Material Requirements**

### **2.4.1 Energy and Water Requirements and Sources**

On-site energy requirements during construction will likely be provided by portable diesel generators. Once operational, outside energy requirements for the facility will be supplied via a metered station service transformer. A back-up diesel generator will likely

be installed on site to provide emergency power to the facility during power outages and to enable black start capability.

On-site water requirements for construction are not known at the present time, although it is likely that water will be required during the construction process (i.e. wash water, etc). This water may be supplied from the Larder River via portable pumps. The quantities required are anticipated to be small and will likely 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 required.

Operational water requirements for the facility are not known at this time. Small amounts of cooling water may be withdrawn from the Larder River to cool powerhouse components. A PTTW will be obtained if the amount required exceeds the PTTW threshold. There will not likely be any requirement for potable water at the facility. Operation water requirements will be determined during the detailed design process.

#### **2.4.2 Excavation and Quantity of Fill**

Excavation will be required for the construction of the dam, canal, powerhouse and tailrace. The expected quantity of excavated material is unknown at this time. Excavated material will include topsoil, underlying soils and bedrock in terrestrial areas, and substrate material and bedrock within the watercourse. Excavated substrate material will be reused to the greatest extent possible to re-line the excavated portions of the channel downstream from the facility. Excess aggregate material will be stored for future use on roadways and other areas requiring fill or material. Any excess or unusable material will be disposed of in accordance with applicable 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.

Some fill materials may be required from approved commercial sources, but quantities are unknown at this time.

#### **2.4.3 Toxic/Hazardous Materials**

Fuels, hydraulic fluids and lubricants will be used in equipment during construction and operation of the facility. Storage of these materials will comply with all current regulations and guidelines (*Ontario Fire Code, O. Reg 347, and Occupational Health and Safety Act*). The storage of small amounts of hydraulic fluids and lubricants will be in a contained area, well away from the watercourse. It is not anticipated that any explosives will be manufactured on site for this project. It is unknown whether explosives magazines will be required for this undertaking. Should explosives be stored on site, the proponent will seek appropriate approvals for usage and storage of explosives in a manner compliant with NRCan requirements and applicable industry standards. Transport of explosives will be completed in accordance with federal legislative requirements (e.g. *Transportation of Dangerous Goods Act*).

#### **2.4.4 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 municipal landfill) or a recycling/composting facility as applicable/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 Transportation of Dangerous Goods Act*).

### 3. Project Site Information

#### 3.1 Project Location

Figure 1 shows the project location. Table 3.1 below provides the geographic coordinates of the site.

**Table 3.1: Geographic Coordinates of Site**

Site Name	MNR Site No.	Geographic Coordinates (Latitude, Longitude)		Drainage Area (km <sup>2</sup> )
Larder and Raven	2JC21- 2JC22	48°1'52.32	-79°34'49.87	263

The site is located in the geographic Township of McFadden, District of Timiskaming, approximately 13 km southeast of the Town of Larder Lake.

#### 3.2 Natural Environmental Features

##### 3.2.1 Physical Environment

###### Geology and Soils

The project study area is located in the Abitibi greenstone belt of the Canadian Shield. The area is dominated by bedrock covered by a thin veneer of glacial till, along with fine-grained deposits of glaciolacustrine clay. A small (~1km long by ~100m wide) swampy area extends off the Larder River near the project area. Bedrock consists of Precambrian clastic sedimentary rocks of the Gowganda Formation, including siltstone, arenite and conglomerate.

The area surrounding the proposed project site contains mesic to wet mesic mixed forest on moderately deep soils, dry mesic to mesic mixed forest on talus rock, dry mesic predominantly coniferous forest on rock outcrops, ridges and plateaus, and cliff faces and rims.

###### Surface Water Resources

The drainage area at Larder and Raven is approximately 275 km<sup>2</sup>.

The mean annual average flow at Larder and Raven is 47.8 m<sup>3</sup>/s. Monthly mean flows at the site are summarized below in Table 3.2.

**Table 3.2: Monthly Mean Water Flows**

Month	Mean Monthly Flows (m <sup>3</sup> /s)
January	1.72
February	1.48
March	2.82
April	8.98
May	10.57
June	3.67
July	2.21
August	1.73
September	1.18
October	1.65
November	2.62
December	2.66

### 3.2.2 Biological Environment

As a responsible developer of waterpower resources, the principles of the aquatic ecosystems guidelines within the *Water Management Planning Guidelines for Waterpower* as well as the *MNR Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects and Federal Requirements for Waterpower Development Environmental Assessment Process in Ontario – Practitioner’s Guide* are recognized and embraced. The operating plan that will be developed for this site will address the natural flow regime of the Larder River as well as several other environmental factors. The following natural environment features have been identified to be examined within the project area:

- habitat of endangered or threatened species
- fish habitat
- terrestrial and aquatic flora and fauna
- water quality
- trapping and bait fishing activities
- fish movement

A review of background information concerning the aforementioned natural features was conducted prior to any field surveys to ensure that any potential species occurrences were noted, and in the case of species of concern, appropriate survey methodologies can be incorporated into the field portion of the EA.

#### Habitat of Species at Risk

By legislation, species listed as Endangered (END), Threatened (THR) or Extirpated (EXP) under the federal *Species at Risk Act* (SARA) and/or provincial *Endangered Species Act* (ESA) receive protection under these Acts, and recovery strategies and habitat protection for listed species is mandated. Where a species is listed on both Acts, the protection afforded the species is determined by the more stringent legislation. If any

species at risk (SAR) are found to utilize the project site, additional surveys and considerations may be required. Consultation with Kirkland Lake Ministry of Natural Resources staff, the Natural Heritage Information Centre (NHIC) website, and other published documentation (COSEWIC status reports, Ontario Breeding Bird Atlas (OBBA), previous survey results, etc.) will assist in drafting a list of potential SAR for this site prior to drafting field survey schedules or methodologies.

There are no known confirmed fish species within the Larder River system that are listed in the *Species at Risk Act*. Potential habitat exists in and around the project area for several other provincially “at risk” species, including: Mountain Lion (*Puma concolor*) (END), Golden Eagle (*Aquila chrysaetos*) (END), Blanding’s Turtle (*Emydoidea blandingii*) (THR), Peregrine Falcon (*Falco peregrinus*) (THR), Whip-poor-will (*Caprimulgus vociferous*) (THR), and Milksnake (*Lampropeltis triangulum*) (SC). The provincially significant River Otter (*Lontra canadensis*) is confirmed within the downstream reaches of the Larder River, below the project site, and presumed present above. A 1976 report of a rare moth species (*Syngrapha altera*) in Larder River Provincial Park is the last known record of this species in the area (Brownell, 1992). Care will be taken during all surveys to note any insect species. Of these species, the Blanding’s Turtle and River Otter would be most affected by alteration to the Larder River watercourse and surrounding wetland areas. Habitat for all other species is considered broad and terrestrial and would be less immediately impacted by construction, provided a complete survey of potential building footprint areas is completed prior to development.

Additional conversations with MNR staff will determine whether other species of conservation concern potentially occur within the projected impact area of the proposed site.

### Fisheries

Background research as part of the overall information gathering for this site will provide evidence of fish species presence. Additional information will be collected via in-water sampling under approved procedures, as determined by Kirkland Lake MNR.

Due to varying regimes that exist between Larder Lake and Raven Lake, fisheries values are varied across the potential inundation and impact areas for this site. Larder Lake has a cold thermal regime, also known as a “cold water” lake. As such it harbours species more typical of this type of lake, including Lake Trout (*Salvelinus namaycush*), Brown Bullhead (*Ameiurus nebulosus*), White Sucker (*Catostomus commersoni*), Lake Whitefish (*Coregonus clupeaformis*), Northern Pike (*Esox lucius*), Yellow Perch (*Perca flavescens*), Walleye (*Stizostedion vitreum*), and Cisco (*Coregonus artedi*).

The Larder River, which incorporates the proposed project site, is a warm thermal regime river, and is known to contain White Sucker (*Catostomus commersoni*), Northern Pike (*Esox lucius*), Yellow Perch (*Perca flavescens*), and Walleye (*Stizostedion vitreum*).

Raven Lake, at the base of Raven Falls, and downstream of the proposed project, is also a cold water thermal regime lake. Species composition in this lake is similar to that of Larder Lake: Lake Trout (*Salvelinus namaycush*), White Sucker (*Catostomus*

*commersoni*), Lake Whitefish (*Coregonus clupeaformis*), Northern Pike (*Esox lucius*), Yellow Perch (*Perca flavescens*), Walleye (*Stizostedion vitreum*), and Cisco (*Coregonus artedi*) and Burbot (*Lota lota*).

Numerous minnows (*Cyprinidae* spp.) are also anticipated throughout the Larder River system.

Flows through the project site must be maintained at levels which will accommodate Walleye spawning sites known to occur within the impact area of the proposed project, as well as downstream.

#### Terrestrial and Aquatic Flora/Fauna

A preliminary assessment of the terrestrial and aquatic habitats in the immediate area of the proposed facility site is required in order to describe the habitats, assess the true potential for species at risk as well as all other species to be found in the area, and to assist in the component site selection and design process. Roadsides, boat launching areas, trailer camps, portages, and the Raven Falls old powerhouse site contain vegetation significantly disturbed by humans.

The requirements specifically related to aquatic species, fisheries habitat and navigable waters are specifically the mandate of Fisheries and Oceans and Transport Canada (Navigable Waters Protection Branch). Detailed information pertaining to these issues is addressed in Section 4.0 of this project description.

Overall, indigenous fauna is typical of the surrounding area, and is expected to include a wide variety of mammals, insects, reptiles, amphibians and avian species. According to a 1992 survey of neighbouring Larder River Provincial Park, a “total of 384 vascular plant taxa and 21 mammal, 64 bird, 1 snake, and 5 amphibian species” are noted for this area along the Larder River (Brownell, 1992). “One provincially rare plant, Clinton's Club-rush (*Scirpus clintonii*), 48 regionally rare and 25 notable plant species were discovered” (Brownell, 1992).

Of note, there is a known Moose (*Alces alces*) calving area within the surrounding area, and potential for Moose feeding habitat exists. Raptor nests are also likely in the surrounding forest, and an assessment of the forested areas on and around the project site is required to determine what species are present, and if any active nesting sites exist which may need to be considered during the planning process. All other species encountered during field surveys will be recorded.

### **3.3 Socioeconomic Features**

#### **3.3.1 Current and Past Land Uses**

The project is located in the Township of McFadden, District of Timiskaming. The Larder River, Larder Lake and Raven Lake are have been used in the past as a traditional canoe routes. The Larder River is valued for its recreational and tourism opportunities.

The project is located between General Use Area Larder Lake (G1852) and Larder River Provincial Park (P1625) (MNR 2006).

### Traditional Canoe and Fur Trade Route

According to the MNR's Site Description Package (SDP), Larder River is considered to be of cultural and historical significance as a traditional canoe route. Stage 1 and 2 archaeological assessments will be undertaken to establish the presence of any archaeological resources within the proposed project area.

### Forestry

The Timiskaming Forest Alliance Inc. Forest Management Plan (2006-2026) contains area of concern (AOC) protection for the Larder river waterway system. The area surrounding the proposed project site contains mesic to wet mesic mixed forest on moderately deep soils, dry mesic to mesic mixed forest on talus rock, dry mesic predominantly coniferous forest on rock outcrops, ridges and plateaus, and cliff faces and rims.

### Hunting/Harvesting

The Larder River is in the Wildlife Management Unit (WMU) 28 (MNR 2010). Popular game species in the area include moose, bear, fox, goose, duck and grouse. The proposed development is also located in the Bear Management Agreement Area KL-28-070.

According to the MNR's SDP, the proposed development is within the registered trap line KL073. Harvested furbearing species include beaver, mink, marten, otter, fisher, lynx, muskrat, fox and timber wolf.

Considering that the project site location exists in Central Ontario, it is anticipated that it may be located within licensed MNR trapping lines. Knowledge of trapping activities within the project area will be gathered through consultations with licensed trappers in the area, as well as the local MNR authorities. In order to ensure that all interest groups are involved, the Ontario Fur Managers Federation will also be invited to participate in consultations, if required. Subsistence trapping, hunting, and fisheries information will be collected in consultation with the local First Nations.

### Mineral Resources

There are at least two mining claims within one kilometre of the dam (Debicki 2010) (MNDMF, 2010).

### Recreation/Tourism

The river itself is valued based on its recreational and tourism opportunities. The river is on a known canoe route in Larder River Provincial Park and is extensively used by local residents and tourists for general recreation (e.g. boating, angling, hunting and canoeing). The Raven Falls old powerhouse site contains vegetation significantly disturbed by humans. There are snowmobile trails and other trails in the area of the project. It is unknown how much commercial tourism operations use Larder Lake and River and Raven Lake.

### Potential Contamination of the Site from Past Uses

No contamination of the proposed site from previous land use is known. No contamination is anticipated given the nature of the project.

#### Proximity to Aboriginal Reserves and Traditional Territory

The area is a traditional Aboriginal territory. There are identified Aboriginal values within the proposed project area.

#### Proximity to Important or Designated Environmental or Cultural Sites

There are known cultural heritage values in the area (Appendix A). A 2004 Report by Uneterman McPhail assessed and provided mitigation options for the former Raven Generating Station facility. Stage 1 and 2 Archaeological Assessments are scheduled to be undertaken by a licensed archaeologist to determine whether there is potential for archaeological resources to exist within the project area.

#### Proximity to Residential and other Urban Areas

The site is located within a rural area approximately 12.5 km southeast of the Town of Larder Lake.

### **4. Additional Requirements Related to Fish, Fish Habitat, Species at Risk and Navigable Waters**

#### **4.1 Biological Assessments**

The Larder facility is proposed as a run-of-river with modified peaking facility. Due to the cold water status and confirmed Lake Trout habitat within Raven and Larder Lakes, MNR Kirkland Lake has indicated that impacts from the proposed project must not adversely affect either of these water bodies.

The primary goal of the 2010 field season was to determine detailed descriptions of the aquatic and terrestrial habitat, representative floral and faunal communities, as well as a determination of habitat changes that can be expected in the immediate area of the Larder River waterpower project. The Larder River, both upstream and downstream of the proposed site, was assessed. The consulting team utilized various methods of data collection including background information queries, interviews with locals and experts, literature reviews, scientific field data collection, as well as GIS mapping, to determine what species of flora and fauna are present at the site, and what effects the proposed project may instill upon them. Upon determining the specific ecological communities that utilize the area, changes can be made in the planning phase that will assist to mitigate or even eliminate potential negative impacts.

A summary of the proposed surveys for the 2010 field season are outlined below:

##### **4.1.1 Background Review**

Available information for the site and surrounding area, gathered from the Ministry of Natural Resources Kirkland Lake District, Larder River Provincial Park, online and periodical sources, and the Natural Heritage Information Database, were reviewed prior to finalizing survey sites, methodologies or target species. Known natural heritage issues which must be addressed include:

- Walleye spawning near the proposed dam site
- Known lake trout habitat up and downstream of the proposed dam
- Other fish species that may use the proposed area for habitat or spawning
- Moose calving areas
- Species at risk, include turtles

Various environmental assessments were conducted, including:

- Aquatic and terrestrial habitat assessments both immediately upstream and downstream of the proposed dam site, utilizing the Forest Ecosystems Classification (FEC) system (Chambers et.al., 1997)
- Aquatic and terrestrial habitat mapping, including habitat mapping of the inundation area
- Bathymetric mapping of the waterway in the immediate vicinity of the project site
- Walleye spawning survey in the immediate vicinity of the proposed dam site.
- Determine all of the species of fish that utilize the project site for spawning
- Assessment of all of the fish species that utilize the project site for habitat
- Assessment of the substrate as well as benthic invertebrate communities both upstream and downstream of the proposed dam site
- Assessment of current water quality at the project site by obtaining water chemistry data (e.g. temperature, dissolved oxygen, pH, conductivity, turbidity)
- Comprehensive flora and fauna assessment, including species at risk that utilize the river and inundation area
- Assessment of access to the proposed project site

#### **4.1.2 Fisheries Habitat Assessment and Community Sampling Proposed by the Proponent**

The habitat assessments along with anecdotal information of fish communities utilizing the Larder River near the project site will be used to determine the potential impacts of the proposed project to these areas. The following terms of reference have been developed to address the environmental concerns of the project.

##### Background Data Collection

A request has been made on behalf of the proponent to the Ministry of Natural Resources, Kirkland Lake District, for any existing file information on the natural environment of the project site. The request was made for any information related to the following:

- Fisheries assessments
- Fish collection records and rare species
- Drain classifications
- Wetland evaluations
- Areas of Natural and Scientific Interest
- Provincially Significant Wetlands
- Environmentally Sensitive Areas
- VTE species, significant wildlife habitats (i.e. raptor nesting, colonial species nests, deer yards and feeding areas)
- General species lists relating to animals and vegetation
- Vegetation mapping, floristic inventories (FEC, FRI, etc.)

### Aquatic Investigations

Generalized fish sampling was conducted utilizing several approved techniques, including:

- Angling
- Trap netting
- Short-set Gill Netting
- Minnow traps
- Electro-fishing
- Seining
- Dip netting
- Night-time light reflectance observations

These surveys will help to determine fish species that utilize the Larder River both upstream and downstream of the proposed project. The generalized fish sampling will also serve as a method of determining if any federally or provincially listed fish species at risk are present at the site and vulnerable to impacts from the proposed project. As Walleye have been confirmed by MNR staff within this waterway, a targeted survey for this species was performed (night time reflectance observance, trap netting (access permitting)). Where possible, the fish sampling was conducted during the 2010 field season.

Benthic sampling was performed utilizing kick-and-sweep assessments upstream, at and downstream of the project site.

### Terrestrial Assessment

It is presumed that the majority of terrestrial impacts will be due to the construction of roadways, hydro lines, and buildings and that such impacts will be minimized where possible to affect only the footprint of the structure, and the immediate surrounding area.

All “footprint” areas were assessed on foot during at least 3 separate surveys, a minimum of 30 days apart. This allowed for varying life cycles and seasonally dependant species to be noted where present.

Habitat on site was evaluated utilizing the Forest Ecosystem Classification (FEC) system (Chambers, et.al., 1997). These evaluations will accompany observations of the potential value of said habitat for particular species, especially those considered to be “at risk” or of “conservation concern”.

### Wildlife Surveys

While there are no confirmed SAR species other than the aforementioned turtles, habitat for several potential “at risk” species exists within the proposed project area. Targeted species-specific surveys will not be performed for these additional species.

All incidental observations of *any* flora or fauna (including scat, tracks, eggs, fur/plumage, kill sites) were documented during any site visit. These observations will be transcribed into detailed species presence lists, and appended to the final report.

Reptilian surveys were done as incidental surveys in conjunction with habitat evaluations. Any observed reptiles or their sign (eggs, test scrapes, tracks) were noted, along with the surrounding habitat composition. Confirmed nesting sites photographed and GPS coordinates obtained.

Amphibians were surveyed as incidental observations during habitat assessments. In addition, call surveys were utilized to confirm the presence of any amphibians during the appropriate season (May-June) (e.g. Bullfrog (*Rana catesbeiana*) and Spring Peeper (*Pseudacris crucifer*)). All calls were documented including environmental conditions, time and date, and species heard.

Insects were documented as noted during all other surveys. Care was taken to examine shoreline substrate and vegetation for nymphs and exuviae of species such as Dragonflies, Damselflies and Stoneflies.

Avian assessment were done utilizing call surveys during the breeding season, to establish which species of breeding bird are utilizing the project area. Such surveys consisted of recording confirmed calls while walking the shoreline along the waterway, both upstream and down. Surveys were performed during the early morning optimal calling time, during the spring mating season when male territoriality is highest. All avian species observed or heard were recorded.

#### Life Stage Oriented Investigations

The proposed location of the Larder River Dam is a known to be upstream of a Walleye spawning area. To determine the potential impact of the project on Walleye spawning, an accurate account of the exact spawning habitat, time of spawning, and the number of fish spawning was required. In order to collect this information, a spawning survey was conducted during the spring freshet. For this species, spawning is dependent on water temperature (6-9C). The primary method to obtain the data included night-time visual observations using a light. Limitations exist with this method (depth, turbulence), so additional methods to determine quantities of spawning walleye included sampling through netting and angling, as well as strategic placement of egg collecting mats in suitable spawning habitat. The sexual maturity of any fish captured was noted to determine the timing and age of the spawn within the local population.

#### Water Quality Sampling and Physical Attributes

MOE has expressed a need for water quality samples to be collected to document the baseline water quality conditions in the study area. A list of standard water quality parameters which MOE expects to see included in the water quality program:

- Physical measurements including pH, dissolved oxygen, conductivity and temperature
- Alkalinity
- Suspended Solids and Total Dissolved Solids
- Cations including  $H^+$ ,  $Na^+$ ,  $K^+$ ,  $Ca^{+2}$ ,  $Mg^{+2}$ ,  $Fe^{+2}$ ,  $Fe^{+3}$
- Anions including  $OH^-$ ,  $Cl^-$ ,  $S^{-2}$ ,  $HCO_3^-$ ,  $CO_3^-$ ,  $SO_4^{-2}$ ,  $PO_4^{-3}$
- Nutrients including nitrate, nitrite, phosphorus and TKN
- Metals (ICP scan)

Two water sampling events were completed during the spring and summer of 2010.

### **4.1.3 Reporting**

Upon completion of the aforementioned surveys, a comprehensive report will be provided. The report will include a description of the aquatic and terrestrial habitat assessed, as well as a list of flora and fauna present at the project site and surrounding area. The report will also outline the potential impacts of the proposed dam, both negative and positive, including type, area affected, duration, and magnitude of the impacts.

Potential impacts associated with the construction and operations of a hydro-electric dam on the Larder River include, but are not limited to:

- Change in the aquatic habitat type directly upstream and downstream of the dam
- Localized impacts to fish habitat as a result of excavations and other activities during the construction of the dam
- Potential for fish fatalities as a result of entrainment in turbines
- Potential change in aquatic vegetation
- Loss of terrestrial vegetation along the inundation zone
- Disruption to various terrestrial fauna, including birds
- Potential for accidents during construction that may cause the release of contaminants or other deleterious substances into the Larder River system

The report will also include any recommended bio-monitoring of the area after the project is complete to determine the extent of the impacts associated with the project.

## **5. Potential Effects to the Environment**

### **5.1 Zone of Influence**

The construction of the dams and other headworks structures required to divert water to the proposed facility will result in the creation of a headpond and the inundation of riparian lands upstream of the dam on the Larder River. As a result it is anticipated that the facility's zone of influence will extend an estimated 1.9 km upstream from the spillway dam to the upstream limit of the proposed headpond.

The anticipated zone of influence of the operational facility on the downstream waterway is unknown at this time. Hydrological investigations of the waterway are underway and the results will be available by the end of 2010.

### **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 OWA Class EA document (OWA, 2008) 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 refined following completion of the baseline studies that are proposed and further refinements to the proposed engineering design of the facility.

The potential level of effect (positive or negative) is based on the guidance in the OWA Class EA (OWA, 2008). Accordingly, the following definitions of effects 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 could be assigned where the potential impact and/or benefit is believed to be considerable
- An '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 for Waterpower Projects (OWA, 2008).

**Table 5.1: Potential Effects Identification Matrix for Construction and Operation**

Criteria	Potential Level of Effect						Comments, Rationale	Mitigation Measures
	-H	-L	Nil	Unk	+L	+H		
<b>General Natural Environment Considerations</b>								
Air quality, including GHG Offsets		X				X	<ul style="list-style-type: none"> <li>• Potential adverse effects during construction due to equipment exhaust, smoke from burning waste materials and dust emissions.</li> <li>• Potential adverse effects during operations due to diesel generator emissions.</li> <li>• Potential positive effects due to GHG offsets.</li> </ul>	<ul style="list-style-type: none"> <li>• Standard construction site best management practices to minimize air emissions due to exhaust, waste burning and dust.</li> <li>• Diesel generator operates very infrequently (typically only in emergency situations).</li> </ul>
Water quality or quantity (surface water)		X					<ul style="list-style-type: none"> <li>• Potential adverse effects on water quality during construction due to erosion and sedimentation and accidental spills.</li> <li>• 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.</li> <li>• Change to flow volume through bypass reach.</li> <li>Potential for downstream impacts to fish habitat based on changes to the magnitude, frequency, duration and timing of flows relative to the existing condition</li> </ul>	<ul style="list-style-type: none"> <li>• Standard construction site best management practices to control erosion and sedimentation and prevent accidental spills from occurring.</li> <li>• Spill prevention and containment measures to be in place throughout operational period.</li> <li>• Areas of shoreline erosion susceptibility will be identified as part of the EA and the necessity for erosion monitoring and shoreline protection works will be determined.</li> <li>• shoreline erosion protection if necessary will be utilized on sensitive areas.</li> <li>• Increase above ambient river level and clearing of vegetation in proposed head ponds to limit nutrient availability in inundated area.</li> <li>• Determine volume required through bypass reach on basis of biological needs. Potential modification to the magnitude, frequency and duration of peaking events particularly as it relates to critical downstream habitats and the timing of flows in relation to critical life stage activities such as spawning</li> </ul>

Water quality or quantity (groundwater)		X				<ul style="list-style-type: none"> <li>• Potential adverse effects on groundwater quality during construction due to accidental spills.</li> <li>• Potential decreases in local groundwater quantity during construction due to groundwater leakage into project excavations.</li> </ul>	<ul style="list-style-type: none"> <li>• Standard construction site best management practices to prevent accidental spills and manage groundwater.</li> </ul>
Species at risk and their habitat				X		<ul style="list-style-type: none"> <li>• Search of the NHIC database indicates that there are only avian species at risk confirmed and no adverse impacts are anticipated to avian species.</li> </ul>	<ul style="list-style-type: none"> <li>• EA will determine whether suitable habitat is present in area of impact.</li> <li>• Baseline inventories will be conducted in 2010 to document the presence/ absence of species at risk – potential effects and required mitigation will be assessed subsequently in co-operation with MNR. ESA Agreements discussions to be initiated shortly after distribution of this document.</li> </ul>
Significant earth or life science features				X		<ul style="list-style-type: none"> <li>• It is currently unknown if any significant earth or life science features exist at the proposed development sites.</li> </ul>	<ul style="list-style-type: none"> <li>• Field investigations will be conducted to assess presence/ absence of significant earth or life science features.</li> </ul>
Land subject to natural or human-made hazards				X		<ul style="list-style-type: none"> <li>• It is currently unknown if any natural hazards exist at the proposed development sites.</li> </ul>	<ul style="list-style-type: none"> <li>• Field investigations will be conducted to assess presence/ absence of natural hazards (e.g., significant existing erosion areas).</li> </ul>
Terrestrial wildlife (including numbers, diversity and movement of resident or migratory species)	X					<ul style="list-style-type: none"> <li>• Terrestrial wildlife could be affected by loss/ fragmentation of habitat (associated with construction of site facility and associated infrastructure, head pond creation, etc.), and disturbance associated with construction and operations of the proposed facility. The project will inundate approximately 22 ha of additional land resulting in the creation of a head pond with a total surface area of 35 ha based on preliminary mapping; much of this is low lying habitat along the section of the Larder river between Larder Lake and Ravens Falls. The large area to be flooded may result in a high negative impact.</li> </ul>	<ul style="list-style-type: none"> <li>• Habitat loss associated with the project will be minimized to the greatest extent possible.</li> <li>• Mitigation measures will be developed to minimize potential effects on terrestrial wildlife from loss/ fragmentation of habitat and disturbance.</li> <li>• Analysis of habitat loss to inundation will consider the availability of equivalent habitat immediately outside of the zone of influence of the proposed undertaking</li> </ul>

Natural vegetation and terrestrial habitat linkages		X					<ul style="list-style-type: none"> <li>Natural vegetation and terrestrial habitats could be affected by clearing associated with construction of site facility, roads, transmission lines and associated infrastructure. Head pond creation, etc., accidental spills/malfunctions.</li> </ul>	<ul style="list-style-type: none"> <li>Extent of clearing associated with the project will be minimized to the greatest extent possible.</li> <li>Other best management practices including limiting corridor widths, signage for wildlife crossing etc. will be considered to minimize potential impacts.</li> </ul>
Soils and sediment quality		X					<ul style="list-style-type: none"> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>Construction site best management practices will be implemented for erosion and sedimentation control, dust management and prevention/ containment of accidental spills to limit the potential for adverse effects on soil and sediment quality.</li> </ul>
Significant natural heritage features and areas		X					Larder River Provincial Park exists immediately downstream of the proposed facility site, Park boundary extends part way up Raven's Falls.	<ul style="list-style-type: none"> <li>Field studies will be conducted in 2010 and significance of identified habitats will be determined.</li> <li>Mitigation measures will be developed to minimize potential effects on any representative features. Ontario Provincial Park staff consultation will continue for all environmental aspects of the project.</li> </ul>
Other (specify)				X			<ul style="list-style-type: none"> <li>No other components identified to date.</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>
<b>Aquatic and Riparian Ecosystem Considerations</b>								
Shoreline dependant species		X					<ul style="list-style-type: none"> <li>Shoreline dependant riparian vegetation will be impacted by the creation of an inundation area.</li> </ul> <p>See "Wetland dependant species" item below – may be no net gain of wetland area due to topography – low lying areas will be flooded, no additional low areas for shoreline habitat.</p>	<ul style="list-style-type: none"> <li>It is not possible to mitigate this effect.</li> <li>Natural regeneration of shoreline habitat will eventually restore these areas for use by shoreline dependent species.</li> </ul>

Wetland dependant species		X				There will be some potential inundation of wetland and tributary areas along the upstream river. Steep topography along these low lying areas to be flooded may limit the additional wetland area that will be created by the flooding.	<ul style="list-style-type: none"> <li>• Field investigations will be conducted to assess presence/ absence of wetlands.</li> </ul>
Fish habitat		X				<ul style="list-style-type: none"> <li>• Fish habitat could be affected by in-stream structures (e.g. dam, tailrace excavations, temporary cofferdams and dewatering, water crossings on access roads and transmission line), changes in flow (bypass reach) and water level (head pond) and sedimentation.</li> <li>• Approximately up to 1.9 km of riverine habitat will be replaced by lacustrine habitat due to inundation associated with the head pond.</li> <li>• Walleye spawning sites do exist within 2km of the downstream end of Raven's Falls, which could be affected by changing water flows due to peaking operations.</li> <li>• There maybe tributaries where the backwater effect of the head pond inundation could alter stream habitat at the mouths of these tributaries.</li> </ul>	<ul style="list-style-type: none"> <li>• Fish habitat mitigation and compensation measures will be developed in discussions with MNR and DFO to ensure no net loss of the productivity of fish habitat as a result of the project.</li> <li>• Bypass flow to be determined based on biological need with MNR/DFO.</li> <li>• It is not possible to mitigate this effect. The compensation agreement with DFO will need to consider this change in habitat type as part of the overall strategy for dealing with fish habitat loss.</li> <li>• The EA fieldwork will document if this habitat is being used by spawning walleye. Compensation for habitat loss may be required.</li> <li>• These tributaries will be investigated to determine the significance of habitat and whether significant habitat would be altered. Where habitat alteration is predicted, it is not possible to mitigate this effect. The compensation agreement with DFO will need to consider this change in habitat type as part of the overall strategy for dealing with fish habitat loss.</li> </ul>
Fish migration			X			Fish passage and movement are already impeded by the dam at Larder Lake on the upstream side, and by Raven's Falls downstream of /at the project site. Potential movement of fish over the Larder Lake dam and downstream over Raven's Falls would be the only passage currently occurring, and this is doubtful.	

Fisheries					X	<ul style="list-style-type: none"> <li>• Head pond may result in an overall increase in the amount of aquatic habitat available.</li> </ul>	
Erosion and sedimentation		X				<ul style="list-style-type: none"> <li>• Potential for erosion and sedimentation due to construction activities.</li> <li>• Potential for long term bank erosion due to water level and flow management activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Standard construction site best management practices to minimize erosion and sedimentation potential during construction.</li> <li>• Bank stabilization measures, as required, on very susceptible erosion sites.</li> </ul>
Fish injury or mortality (impingement and entrainment)		X				<ul style="list-style-type: none"> <li>• Potential for some impingement on trash racks and entrainment and mortality through turbine flows.</li> </ul> <p>Provided the proposed operation does not impact the dam at Larder Lake (upstream), fish entrainment is likely to be low due simply to low fish numbers within the river above the project site and below the Larder Lake Dam</p>	Consultation with the MNR and DFO is required. Standard impact management measures will be applied if warranted.
Flows and movement (surface or groundwater)		X				<ul style="list-style-type: none"> <li>• Flows through bypass reaches will be reduced due to diversion of flow through the powerhouse.</li> </ul> <p>Flows downstream will be impacted due to the proposed limited peaking operation strategy</p>	<ul style="list-style-type: none"> <li>• Field investigation to determine amount and function of habitat in bypass reaches and downstream during limited peaking operations.</li> <li>• Flow in bypass reaches established on basis of maintaining biological function.</li> </ul>
Drainage, flooding and drought patterns		X				<ul style="list-style-type: none"> <li>• Minor changes in local drainage will occur due to facility, lay down, access road and transmission line construction.</li> <li>• Extreme flood levels may be somewhat higher in the head ponds due to the water level increase.</li> </ul>	<ul style="list-style-type: none"> <li>• A drainage network will be installed around the facility to ensure adequate site drainage.</li> <li>• Facility will be constructed to meet flood passage requirements.</li> </ul>
Water temperature		X				<ul style="list-style-type: none"> <li>• Changes in water temperature in head pond due to increased surface area and slower flow velocity anticipated to be negligible.</li> </ul>	<ul style="list-style-type: none"> <li>• No mitigation required – overall thermal regime of the river not likely affected.</li> </ul>
Other (specify)				X		<ul style="list-style-type: none"> <li>• No other components identified to date.</li> </ul>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>

<b>Aboriginal Community Considerations</b>								
First Nation reserves or other Aboriginal communities				X			<ul style="list-style-type: none"> <li>• It is not known at this time if operation of the project will have an adverse effect on local Aboriginal communities.</li> </ul>	<ul style="list-style-type: none"> <li>• Potentially affected First Nations will be consulted and mitigation undertaken as required.</li> </ul>
Spiritual, ceremonial, cultural, archaeological, or burial sites				X			<ul style="list-style-type: none"> <li>• Disturbance to spiritual, ceremonial, cultural, archaeological or burial sites could occur during construction and operation activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Aboriginal consultation to identify local resources will be conducted to mitigate potential negative issues. A Stage 1 and if necessary Stage 2 Archaeological Assessment will be completed to identify local resources (or resource potential).</li> </ul>
Traditional land or resources used for harvesting activities				X			<ul style="list-style-type: none"> <li>• Effects to the aquatic and terrestrial environment (discussed above) may result in negative effects to traditional lands and resources used for harvesting activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Mitigation measures, as appropriate, are provided above.</li> </ul>
Employment					X		<ul style="list-style-type: none"> <li>• Construction and operation of the project near an Aboriginal community will result in opportunities for employment of community members.</li> </ul>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
Lands subject to land claims				X			<ul style="list-style-type: none"> <li>• There is no known land claim in the area of the project.</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation with government agencies (provincial and federal) and the Aboriginal communities will be undertaken to confirm that no land claims exist.</li> </ul>
Economic development					X		<ul style="list-style-type: none"> <li>• Unknown</li> </ul>	To be determined through consultation.
Other (specify)				X			<ul style="list-style-type: none"> <li>• No other components identified to date.</li> </ul>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
<b>Land and Resource Use Considerations</b>								
Access to inaccessible areas (land or water)		X					<ul style="list-style-type: none"> <li>• Access road and transmission line route will result in improved access to the areas by land. Access to the area by water will remain as is. This area is not currently accessible by water except by portaging.</li> </ul>	<ul style="list-style-type: none"> <li>• Public access to the site will be prohibited to ensure public safety. The necessity of barriers to access along power line routes and roads and by portaging will be discovered in the consultation program</li> </ul>

Navigation			X				The area is not currently accessible or travelled often as can be reached only by portaging.	Consultation with Transport Canada will be undertaken.
Riparian rights or privileges		X					<ul style="list-style-type: none"> <li>The project area, including the head pond shoreline will exist on provincial and private lands. At present, the degree of effects to riparian resource use are not known but can be assumed to be low.</li> </ul>	<ul style="list-style-type: none"> <li>Consultation with stakeholders will determine appropriate mitigation.</li> </ul>
Recreational use – (land or water)			X				Very little current usage for recreational purposes occurs in the reach below Larder Lake dam and above Raven Falls	<ul style="list-style-type: none"> <li>Consultation with project stakeholders.</li> </ul>
Angling and hunting opportunities		X					Angling in the proposed inundation area is limited, but hunting is confirmed (waterfowl, moose, deer)	<ul style="list-style-type: none"> <li>Effects to hunting opportunities will be determined in consultation with project stakeholders.</li> </ul>
Trapping activities				X			<ul style="list-style-type: none"> <li>If the project is located within licensed trapping area(s), project construction and operation, including head pond filling may result in adverse effects to harvest success.</li> </ul>	<ul style="list-style-type: none"> <li>The current use of the area for trapping will be determined during stakeholder consultation</li> <li>Appropriate mitigation measures will be determined based on stakeholder consultation.</li> </ul>
Baitfish harvesting activities				X			<ul style="list-style-type: none"> <li>Current harvesting sites are unknown. If harvesting is going on some effects could occur during construction.</li> </ul>	<ul style="list-style-type: none"> <li>Consultation will be required with bait fishermen to identify harvesting areas and assess effects.</li> </ul>
Views or aesthetics		X					<ul style="list-style-type: none"> <li>Construction and operation of the project will result in a change to aesthetics of the area. The determination of this effect as positive or negative is subjective.</li> </ul>	<ul style="list-style-type: none"> <li>Requirements for compensation flow or other aesthetic requirements will be determined in consultation with project stakeholders and in consideration of area usage (based upon a visitor usage survey).</li> </ul>
An existing land or resource management plan				X				<ul style="list-style-type: none"> <li>To be determined</li> </ul>
An existing water management plan		X					<ul style="list-style-type: none"> <li>Larder Lake water levels are managed by MNR for Lake Trout as a cold water Lake Trout lake. No adverse impacts to this cold water regime will be considered by MNR.</li> </ul>	<ul style="list-style-type: none"> <li>Consultation with the MNR for this plan will be undertaken.</li> </ul>
Protected areas				X			<ul style="list-style-type: none"> <li>Unknown at this known</li> </ul>	<ul style="list-style-type: none"> <li>To be determined.</li> </ul>
Other (specify)				X			<ul style="list-style-type: none"> <li>No other components identified to date.</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>

<b>Cultural Heritage Resources Considerations</b>								
Archaeological sites				X			<ul style="list-style-type: none"> <li>Archaeological sites are unknown within the project area.</li> </ul>	<ul style="list-style-type: none"> <li>A Stage 1 and if required Stage 2 Archaeological Assessment will be completed to determine potential effects.</li> <li>Appropriate mitigation measures will be proposed based on assessment findings as required.</li> </ul>
Buildings or structures				X			No buildings but current historic dam at Raven Falls (proposed to be replaced by current structure), and current water management dam at Larder Lake (MNR operated).	<ul style="list-style-type: none"> <li>Appropriate mitigation measures will be proposed as required.</li> </ul>
Cultural heritage landscapes				X			<ul style="list-style-type: none"> <li>It is unknown whether a cultural heritage landscape assessment will be required for the project.</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate mitigation measures will be proposed based on assessment findings as required.</li> </ul>
Other (specify)				X			<ul style="list-style-type: none"> <li>No other components identified to date.</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>
<b>Social and Economic Considerations</b>								
The Location of people, businesses, institutions, or public facilities				X			<ul style="list-style-type: none"> <li>Social economic resources to the community will be identified. Potential effects will be determined in consultation with local residents, business owners and other stakeholders.</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate mitigation measures will be determined based on stakeholder consultation.</li> </ul>
Community character, enjoyment of property, or local amenities				X			<ul style="list-style-type: none"> <li>Effects to community character, enjoyment of property and local amenities are unknown.</li> </ul>	<ul style="list-style-type: none"> <li>To be determined</li> </ul>
Employment					X	X	<ul style="list-style-type: none"> <li>The construction and operation of the project will require local and non-local employment based on qualification.</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>

Public health and/or safety		X					<ul style="list-style-type: none"> <li>• Construction and operation of the project will pose public safety concern and risk.</li> </ul>	<ul style="list-style-type: none"> <li>• Prevention of public access to the construction site through use of mitigation measures such as signage, gates and fencing and/or other security procedures as required.</li> <li>• Proper barriers and warning devices installed following construction to restrict public access to intake/tailrace areas during operation may include such safety measures as safety booms, fencing and signage.</li> </ul>
Local, regional, or provincial economies				X	X	X	<ul style="list-style-type: none"> <li>• Economic benefits will include employment, expenditures on materials, equipment and services, contribution of renewable energy to the Provincial supply mix.</li> <li>It is unknown if there is potential to effect any local businesses related to recreational or other activities that may be impacted by the facility</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation program with local or regional recreational businesses will be undertaken.</li> </ul>
Tourism values				X			<ul style="list-style-type: none"> <li>• See “Recreational Use” above.</li> </ul>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
Water supply				X			<ul style="list-style-type: none"> <li>• It is currently unknown whether the Larder River is a water supply for local individuals or communities. For potential effects to water quality, please see “Water Quality or Quantity” above.</li> <li>It is also unknown if groundwater is used in the area for water supply</li> </ul>	<ul style="list-style-type: none"> <li>• Water supply information will be collected. Appropriate mitigation measures will be proposed as required.</li> </ul>
Aesthetic image of the surrounding area				X			<ul style="list-style-type: none"> <li>• See “Views or Aesthetics” above.</li> </ul>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
Other (specify)				X			<ul style="list-style-type: none"> <li>• No other components identified to date.</li> </ul>	<ul style="list-style-type: none"> <li>• N/A</li> </ul>
<b>Energy/Electricity Considerations</b>								
Reliability (e.g. voltage support)					X		<ul style="list-style-type: none"> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• N/A</li> <li>• Appropriate mitigation technical measures will be proposed in protection and control to minimize a power outage.</li> </ul>

Security (e.g. Black Start)					X	<ul style="list-style-type: none"> <li>• 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 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.</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>
Electricity flow patterns				X		<ul style="list-style-type: none"> <li>• Operation of the new power generation units will redistribute power flow in the existing distribution system.</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriate mitigation technical measures will be proposed in the control system of the power grid and new generation units if required.</li> </ul>
Other (specify)		X			X	<ul style="list-style-type: none"> <li>• Operation of the new power generation units will affect existing protection and control settings in the distribution system.</li> <li>• Oil filled electrical and mechanical equipment can potentially spill oil into the Environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriate mitigation technical measures will be proposed in protection and control system of the power grid.</li> <li>• Appropriate preventive measures will be proposed to eliminate the risk.</li> </ul>

## 6. References

Acres International Ltd. 2001-2002. Larder Lake Dam Class Environmental Assessment Documents.

Acres International Ltd. 2001-2002. Raven Lake Dams Class Environmental Assessment Documents.

Ayer, J.A. and Trowell, N.R. 2000: Geological compilation of the Kirkland Lake area, Abitibi greenstone belt; Ontario Geological Survey. Preliminary map P3425, scale 1:100 000.

Baker, C.L. 2000. Quaternary geology, Larder Lake area, Ontario Geological Survey. Map 2647, scale 1:50 000.

Brownell, V. 1992. A Biological Inventory and Evaluation of the Larder River Provincial Park. Queen's Printer for Ontario. 74 pp.

Chambers, B.A., B.J. Naylor, J. Nieppola, B. Merchant, P. Ulhig. 1997. Field guide to forest ecosystems of Central Ontario. SCSS Field Guide FG-01. Queen's Printer for Ontario. Ontario, Canada.

Debicki, R.L. July 8, 2010 Letter from Ministry of Northern Development, Mines and Forestry to Xeneca Power Development with Attachment 1 Xeneca Power Development Inc.'s Proposals MDNMF Comments-Resident Geologist Program.

Environment Canada. The Ecological Framework of Canada.  
<http://www.ecozones.ca/english/zone/index.html>

Hoag, C. July 13, 2010 Letter from OWA to Xeneca Power Development. Potential intersection of waterpower facilities and species listed under the Endangered Species Act.

Jackson, S.L. 1995. Mineral occurrences and Precambrian geology, Larder Lake area, Ontario Geological Survey. Preliminary map P3320, scale 1:50 000.

Ministry of Northern Development, Mines and Forestry. 2010 Information on Mining Claims. Website: [http://www.mndm.gov.on.ca/mines/claimaps\\_e.asp](http://www.mndm.gov.on.ca/mines/claimaps_e.asp)

MNR. 2006. Crown Land Use Policy Atlas Policy Report G1852: General Use Area Larder Lake. Website: <http://www.lio.ontario.ca/imf-ows/sites/clupa/xmlReader.jsp?xsl=XML/web-primary.xsl&polid=G1852>

MNR. 2006. Crown Land Use Policy Atlas Policy Report P1625: Larder River Provincial Park. Website: <http://www.lio.ontario.ca/imf-ows/sites/clupa/xmlReader.jsp?xsl=XML/web-primary.xsl&polid=P1625>

MNR. 2008. Direct Site Release-Larder and Raven River: File # DSR-09-06. Site Description Package. March submission to Xeneca.

MNR. 2010. Crown Land Use Policy Atlas. Website:  
<http://crownlanduseatlas.mnr.gov.on.ca/>

MNR. 2010. Wildlife Management Unit Maps. Website:  
<http://www.mnr.gov.on.ca/en/Business/FW/2ColumnSubPage/256933.html>

Ontario Waterpower Association. 2008. Class Environmental Assessment for Waterpower Projects.

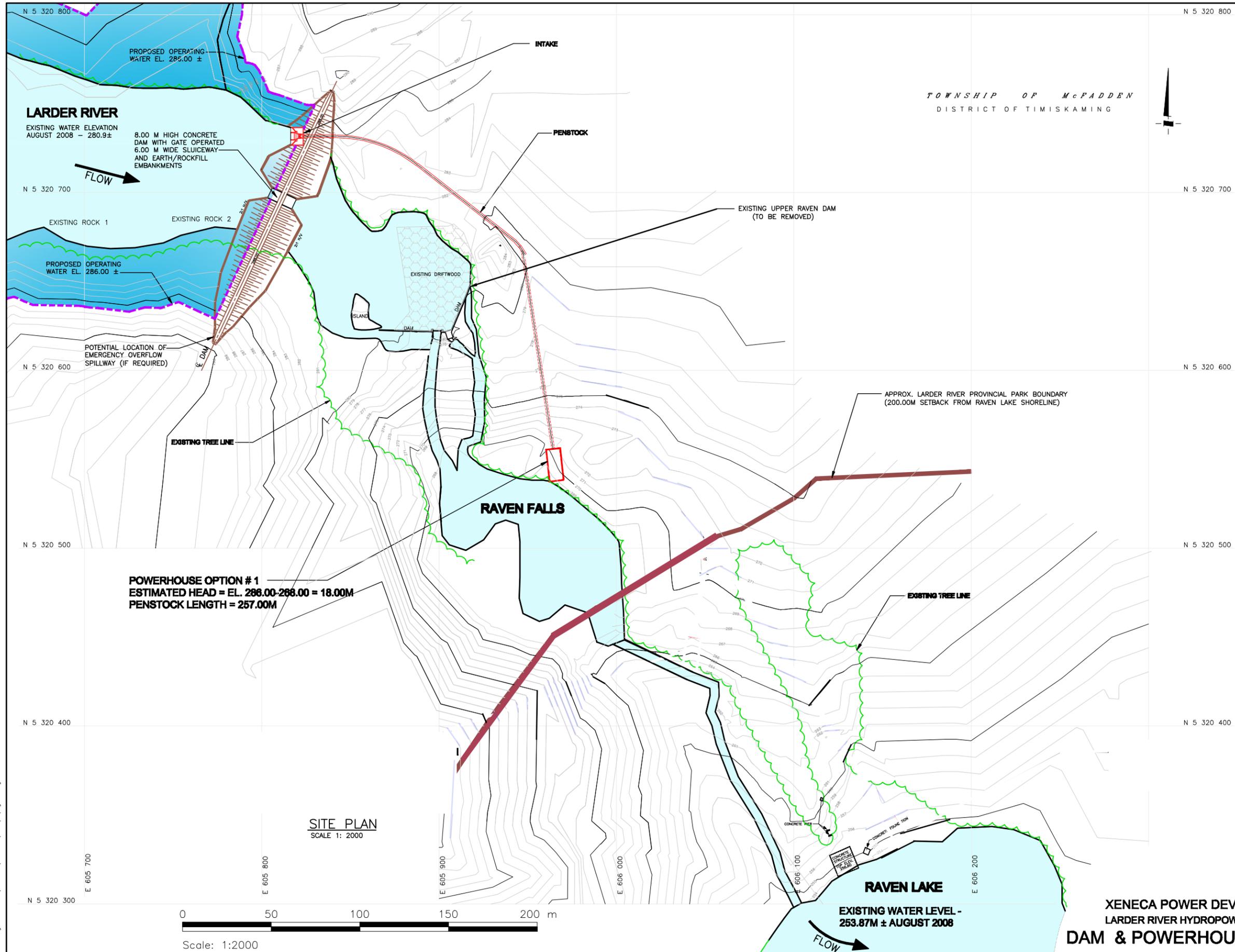
Rowe, J.S. 1972. Forest Regions of Canada. Canadian Forest Service Publication No. 1300.

Unterman McPhail Assoc. 2004. Mitigation Options Report for Raven and Corset Generating Stations. Submitted to Acres International Ltd.

Wickware, G.M. and C.D.A. Rubec. 1989. Ecoregions of Ontario. Environment Canada Ecological land Classification Series No. 26.

## **APPENDIX A**

### **Conceptual Figures and Maps for Larder and Raven**

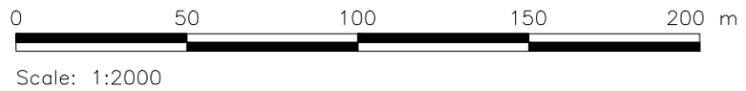


TOWNSHIP OF McFADDEN  
DISTRICT OF TIMISKAMING

- NOTES :**
1. TOPOGRAPHIC BASE INFORMATION FROM AUGUST 2008 SURVEY PROVIDED BY SUTCLIFFE RODY QUESNEL INC., ENGINEERS & SURVEYORS
  2. UPPER-RAVEN DAM CUT CROSS ON DAM (POINT 1) Elev. 281.38 USED AS BASE STATION FOR PRECISE REAL TIME KINEMATIC ELEVATION DETERMINATION FOR ALL TOPO INFORMATION.
  3. ELEVATIONS SHOWN HEREON ARE GEODETIC, REFERRED TO MTO 1st ORDER BENCHMARK NO.'S 798199, 798200 AND 768272. CONNECTIONS FROM POINT 1 (CUTCROSS - SITE BENCHMARK) TO THE AFOREMENTIONED MTO BENCHMARKS WERE MADE BY PRECISE SIMULTANEOUS POST-PROCESSED GPS FIXED INTEGER BASELINE SOLUTIONS.
  4. GRID SHOWN HEREON IS THE UNIVERSAL TRANSVERSE MERCATOR (UTM), ZONE 17(NAD83 ELLIPSOID) PROJECTION. GRID ACCURACY IS +/- 2 METRES.
  5. ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

**POWERHOUSE OPTION # 1**  
ESTIMATED HEAD = EL. 286.00-268.00 = 18.00M  
PENSTOCK LENGTH = 257.00M

**SITE PLAN**  
SCALE 1: 2000

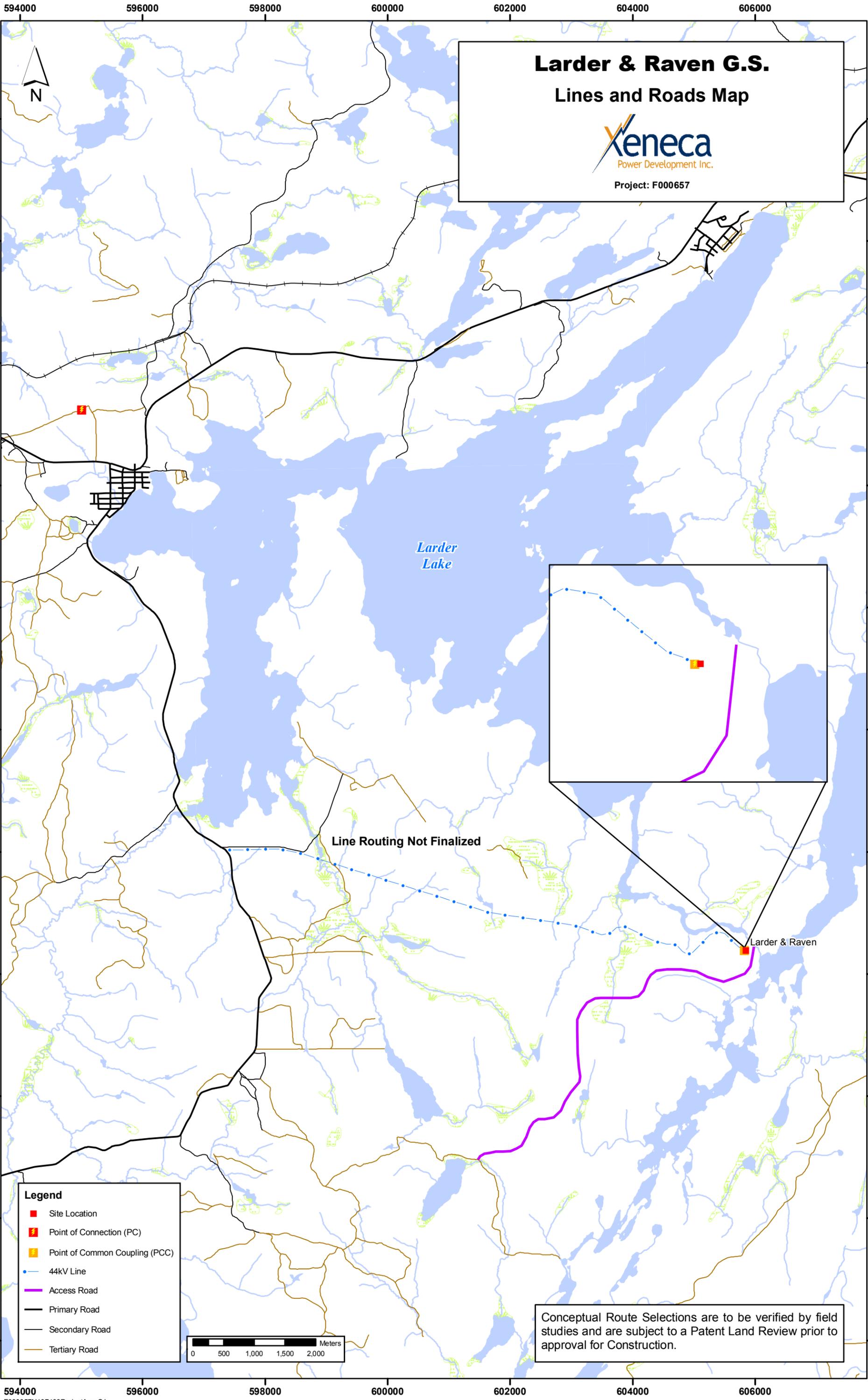


**XENECA POWER DEVELOPMENT INC.**  
LARDER RIVER HYDROPOWER DEVELOPMENT  
**DAM & POWERHOUSE LAYOUT**



Fig. 2

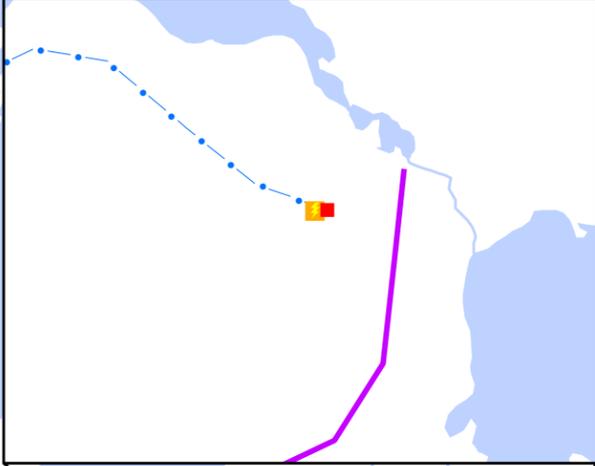
Plot Scale  
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Drawing Name: P:\ORIECH\329875\CAD\C\Fig-1.dwg



**Larder & Raven G.S.**  
**Lines and Roads Map**

**Xeneca**  
 Power Development Inc.

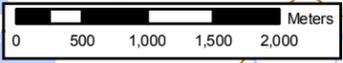
Project: F000657



Line Routing Not Finalized

Larder & Raven

- Legend**
- Site Location
  - ⚡ Point of Connection (PC)
  - Point of Common Coupling (PCC)
  - 44kV Line
  - Access Road
  - Primary Road
  - Secondary Road
  - Tertiary Road



Conceptual Route Selections are to be verified by field studies and are subject to a Patent Land Review prior to approval for Construction.