Environmental Report

Serpent River - Four Slide Falls

Hydroelectric Generating Station Project

Xeneca Power Development Inc.

FOREWORD

Xeneca Power Development Inc. (Xeneca) is pleased to provide a copy of the Class EA for the proposed project: Four Slide Falls Hydroelectric Generating Station on the Serpent River. This represents the culmination of a considerable joint effort by our scientists and engineers working in co-operation with agencies and stakeholders.

The completion of the Class EA is not the end of the environmental review and permitting process. A series of regulatory approvals will be required post EA under various Federal, Provincial and municipal statutes. For example, Xeneca must provide detailed design information to the Ministry of Natural Resources ("MNR") which would consider approvals under the *Lakes and Rivers Improvement Act.*

The purpose of a Class EA is to ensure that positive and negative impacts of the proposed project are identified, evaluated and considered in the planning and execution stages and to undertake meaningful engagement of all interested stakeholders who may wish to be involved in the project planning and development process. In this context, the environment being considered includes the natural/physical, socio/economic and cultural/human landscape.

In order to meet the Milestone Date for Commercial Operation as set out the Feed-In-Tariff ("FIT") contract requirements, Xeneca would need to commence site preparation in mid-2012, followed by the construction of the facility between 2012 and 2014. This approach allows the Agencies to complete the necessary environmental review required by the conceptual planning period in the Class EA and subsequently focus on detailed design, permitting and approvals.

Process and Approach

The Class EA document suggests a timeline of 12-18 months to prepare a project specific Class EA document. Xeneca began work on notification of Agencies immediately upon issue of FIT contract and began Class EA activities in the summer of 2010. It should be noted that certain preliminary work on the project dates back to 2007-8 with an application for site release from the MNR.

The Class EA process suggests the collection of field data for a minimum of one season including a spring freshet which, for the project, was completed in 2010. As a proactive position, Xeneca is continuing environmental studies in 2011 and, to some extent beyond 2011, to develop a fuller information database for use in post-EA permitting and EA verification purposes. This work will also be invaluable to support any requirement for Adaptive Mitigation if any unplanned effects arise during construction or operation. This document identifies work and field studies which are either underway or that are planned through 2011. An Adaptive Management workshop is proposed in the early post-EA period well in advance of any potential major permitting or

construction activities. Xeneca is continuing to implement this study program in anticipation of timely issue of a Statement of Completion (MOE) and Notice to Proceed (OPA).

Under the waterpower process, detail design is undertaken following issue of a Statement of Completion. Xeneca continues to work with agencies, municipalities, the public and stakeholders in a collaborative manner to address issues that may arise during the project review process.

Review of detail designs and associated issues will be considered through the post-EA approvals process under *the Fisheries Act*, *Lakes and Rivers Improvement Act*, *the Navigable Waters Protection Act*, *the Public Lands Act*, and, if applicable, the *Endangered Species Act* using results from engineering studies, Class EA conformance and verification work and permitting activities. Adaptive Management Planning has been applied to ensure every appropriate level of review is performed at each stage of the project planning, execution and operating period. This is a practical approach arising from the Ontario Power Authority's FIT schedule to simultaneously ensure the objectives of the *Environmental Assessment Act* and the Class EA. This approach allows progressive review by Agencies before construction and operation as information becomes available from detail design or other work. This will allow Agencies opportunity to review detail design and incorporate Agency input into approvals.

The *Ontario Environmental Assessment Act* obligates a project proponent to adhere to the requirements of the Class EA and the commitments made in the Class EA. As such the Class EA forms a binding commitment between Xeneca, the government and the citizens of Ontario. Xeneca is fully committed to this process and will continue to work co-operatively with Agencies after the Class EA submission to see completion of approved post-EA studies and address any findings in refining our plant operating plans, as required.

Xeneca is providing a 30-day period for receiving comments on the ER as provided in the Class EA. The Xeneca is committed to ensuring compliance with the Class EA and will develop assurance and verification measures to progressively assess conformance with Class EA commitments and environmental requirements throughout the project planning, execution and operational periods.

Xeneca is committed to continuing to engage specific stakeholders on issues of relevance to that particular stakeholder after the issuance of the Statement of Completion and into the project detail development phases.

Government Agency Engagement Process:

During this Class EA, Xeneca has engaged with a number of federal, provincial and municipal governments, ministries and agencies and each has its mandate and mechanisms for permitting/authorizations processes towards ensuring the proponent has met all legal requirements. These processes may have required explicitly or implicitly the involvement of First

Nations. It is helpful to understand the role of the agencies in reviewing this Class EA and providing context to the information:

(a) Ontario Ministry of the Environment:

The MOE has various primary responsibilities provided by the *Environmental Assessment Act* for the Class EA process and post-EA responsibilities for the Ontario *Water Resources Act* and the *Environmental Protection Act*. The MOE is responsible for the issuance of the Permit to Take Water - Category 2 prior to construction, Category 3 prior to commissioning, and any required Certificates of Approval prior to construction or commissioning of the facility. The MOE is responsible for the administration of and compliance with the *Environmental Assessment Act*.

(b) Ontario Ministry of Natural Resources:

The MNR plays a key role in permitting and approvals of this project because it is being built on provincial Crown lands. Two key acts govern MNR's processes are:

- *Lakes and River Improvement Act*,
- *Public Lands Act.*

Under the *Lakes and Rivers Improvement Act* prior to permitting the proponent must request Location Approval at which time the MNR can request certain activities to be completed which include an:

- Class EA with a Statement of Completion,
- A Letter of Advice from the Federal Department of Fisheries and Oceans ("DFO"), and
- Any Crown Land related issues.

(c) Department of Fisheries and Oceans:

As noted above, DFO works in a complementary relationship with the MNR. After the DFO Letter of Advice is issued to MNR, the MNR may choose to issue Location Approval. Upon granting Location Approval and detail design is complete, DFO will review and determine whether to issue an Authorization under the *Fisheries Act* for a HADD ('Harmful Alteration, Disruption or Destruction') of fish habitat.

As a result of these dependent processes, Xeneca is required to ensure both MNR and DFO are continually satisfied by the project detail design prior to construction occurring. Oversight by each agency will continue through the construction and operation period.

(d) Transport Canada:

Transport Canada ("TC") has an important role under the *Navigable Water Protection Act* to review construction of a dam in a waterway and deal with any water way crossing for the project. Final detail engineering designs are reviewed by TC and require approval under this Act.

(e) Other:

Many other agencies are also important: Health Canada, Natural Resources Canada, Ontario Ministry of Energy and Infrastructure and the Ontario Ministry of Tourism and Culture, to name a few, have an important role in the post-EA detail design and permitting process. The Ontario Ministry of Tourism and Culture ("MTC") oversees the *Ontario Heritage Act* towards the protection of archaeological sites and heritage properties. The MTC will review all archaeological investigation reports completed in support of this undertaking.

Xeneca is committed to working with these agencies to facilitate the completion of these many processes and will cooperate in responding to reasonable requests for additional information. A table outlining potential regulatory permits, approvals and authorizations that may be required for the proposed project is provided in Section 9 of this Class EA.

First Nations and Aboriginal Communities

The development of waterpower resources on Crown Land will necessarily involve First Nations and Aboriginal communities as part of the Crown's duty to consult and as part of the specific requirements of certain regulatory processes. Prior to the Class EA process, the MNR's site release policy and procedures required the proponent to engage First Nations and Aboriginal communities. This Class EA summarizes Xeneca's efforts to seek input from and consult with the appropriate communities.

Xeneca has been respectful of each First Nations and Aboriginal communities' culture, governance and desired manner of communication in order to foster a long-term relationship throughout the lifecycle of the project. The Class EA is being submitted to the First Nations and Aboriginal communities and Xeneca will follow-up, and if requested, meetings with the First Nation and Aboriginal communities will occur during the review period as required and will be on-going to project commissioning.

The Aboriginal Consultation Plan and the record of Aboriginal Consultation and Engagement are appended to this Class EA. Additional discussion on consultation with First Nations and Aboriginal communities is provided in Section 4.5 of the Class EA.

Other Stakeholders

Xeneca is also sensitive to stakeholders whose primary vehicle to express concerns is through the environmental assessment process. Communication with the various stakeholders occurred during the Public Information Centres and Project Information Meetings, through public notices, Xeneca's website, individual meetings, conversations and communications. Stakeholder engagement is discussed in Section 4 of the Class EA, and a detailed consultation record is provided in the ER appendices of the Class EA. Table 4 of the Class EA includes a tabular presentation of the issues raised during the public consultation process and the proposed management strategies towards the resolution of those issues.

Based on the information presented above, Xeneca is confident that issues have been addressed or can be addressed through mitigation measures applied in the final project design. Xeneca believes there is good support for the project within the community. Further, Xeneca will continue to meet with and communicate with stakeholders throughout the development of the project.

Conclusion

The Four Slide Falls Class EA provides a review of the potential effects, both positive and negative, of the project. The Class EA also incorporates the information and views expressed by First Nations and other Aboriginal communities, local residents, stakeholders and regulatory agencies and ministries. This is the beginning of the planning and development process and the Class EA will be used to inform the subsequent permitting and approval processes. If approved, the Class EA will provide the basis for the binding commitment of the proponent as to how it will proceed through development and detail design of the project.

Overall, this Class EA and the conceptual plans for the proposed project meet requirements of the Ontario and Federal environmental assessment process and the objectives of the *Green Energy and Green Economy Act, 2009.* It creates positive environmental and socio-economic benefits for the people of Ontario.

Xeneca looks forward to comments provided by reviewers of this Class EA and if written comment is being submitted to the MOE, requests that it is copied.

Thank you to all participants in advance for your kind consideration of this Class EA.

EXECUTIVE SUMMARY

Xeneca Power Development Inc. (Xeneca) proposes to construct a 7.3 MW hydroelectric power generating station (GS) at the site known as "Four Slide Falls" on the Serpent River. The project site is located in north-eastern Ontario, approximately 15 km east of Elliot Lake and 7 km downstream of Pecors Lake.

The project received a Feed-in Tariff contract from the Ontario Power Authority which stipulates facility commissioning no later than October 2014. The project represents a significant socio-economic benefit to the local community at the construction phase and operations phase. The initial capital construction cost is estimated to be $5 million per megawatt, returning approximately $36.5 million in tax revenues to the province during the life of the 40 year OPA contract.

This Environmental Report (ER) describes the environmental assessment (EA) carried out as part of the planning process for the proposed project. This EA was completed in accordance with provincial and federal requirements, and was undertaken to meet the collective needs of:

- The Class Environmental Assessment for Waterpower Projects as required under the *Ontario Environmental Assessment Act*;
- The Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects as required under the *Ontario Environmental Assessment Act*;
- A federal screening as required under the *Canadian Environmental Assessment Act.*

The purpose of an environmental assessment is to ensure that potential effects are identified, evaluated and considered in the planning of a project, allowing for the avoidance or minimization of the negative impacts and the optimization of the positive impacts before construction begins. Furthermore, the EA process requires that the proponent of a project undertake meaningful engagement of all stakeholders who wish to be involved in the planning process. In this context, the environment being considered includes the natural/physical, socio/economic, and cultural/human landscape in which the project is proposed to be developed and operated.

Impacts may be either positive or negative, and are assessed for their significance and potential cumulative effects of other known (occurring) or foreseeable effects to a specific area or resource from future development. Negative impacts can then be mitigated through planning and further refinement of the proposed project, or afforded compensation in alternate ways in accordance within the mandatory regulatory approvals framework. Significant negative impacts which cannot be mitigated against or compensated for may lead to project redesign or rejection of the proposal.

This Environmental Report has been organized in the following format:

- Introduction and project overview;
- Description of the regulatory framework under which the project is being assessed;
- Identification of the existing conditions of the environment in which the project would be developed;
- A technical description of the proposed project, including its physical makeup, construction requirements, and operational regime;
- Discussion of stakeholder engagement efforts undertaken throughout the EA process, and the results of those engagements;
- Identification of the likely effects of the project both positive and negative, proposed mitigation measures to avoid the negative impacts, residual effects (those which cannot be mitigated), and any requirements for future monitoring;
- Identification of regulatory approvals which will be required as part of this undertaking;
- Conclusions and recommendations.

The process is meant to inform and enhance the project plan through investigation and consultation with affected landowners, stakeholders, First Nations and Aboriginal communities and the general public. At the EA stage, conceptual project design information is presented to ensure that stakeholders are informed about the general scope and extent of the project, particularly as it relates to understanding the socio-economic benefits of the project and how the project may potentially affect other uses of the river and the environment.

The identification of effects and mitigation plans has been developed in close liaison with environmental regulatory agencies at the Federal and Provincial level. Xeneca will continue to work closely with these agencies during the regulatory review of this document, and into the detail design, construction, and operational periods of the project. Xeneca is committed to confirm and verify the implementation of all effects and mitigation measures identified in the ER. As part of this effort, Xeneca will regularly issue an Project Implementation Report to agencies to update the project status, provide results of on-going environmental assurance and verification programs, and results of monitoring and mitigation programs.

A summary of the existing conditions at the proposed project site, the project details and the findings of the environmental assessment is presented below.

Physical Environment

The topography of the area is generally characterized by lowlands and flats interrupted by rugged outcrops of bedrock. In proximity to the project site, the Serpent River flows through a steeply banked valley. A bedrock ledge runs across the entire width of the valley which creates a chute with an elevation drop of approximately 6 metres.

The overburden in the area around the Four Slide Falls consists of water-modified tills and lacustrine silts and sands. River substrates typically consist of cobbles and fine silts and sands layered between bedrock outcrops.

Generally, bedrock in the project area is composed of a wide variety of rock types even within a short radius (1-2 km) of the project study area: Archean tonalite, granodiorite and quartz monzonite and granitic gneiss cut by aplite, pegmatite, and diabase dykes, metamorphosed mafic to intermediate volcanic rocks, and Proterozoic mafic intrusive rocks such as gabbro and diorite.

The Serpent River flows south through the Elliot Lake area to Lake Huron passing through multiple large lakes and wetlands. The Serpent River is fairly sinuous with distinct meander which is typical of a low gradient watercourse. The project site is located approximately 7 km downstream of Pecors Lake and 4 km upstream of McCarthy Lake.

Uranium mining has historically occurred in the Elliot Lake area for the past 40 years. Though most of the mines ceased operations in the early 1990's, the decommissioned mining operations and tailing deposits have impacted the water in the Serpent River.

Monitoring within the watershed over the last 10 years has shown a steady improvement in surface water quality since the closure of the mines and mining-related parameters are now generally at levels which are protective of aquatic life. Sediments within the watershed continue to reflect the historical mining activity with elevated concentrations of certain parameters in some lakes but, generally, recent biological monitoring has shown little or no detectable effects in fish and benthic invertebrates

Ecology

The MNR SDP identified several vulnerable, threatened or endangered species, both aquatic and terrestrial, within 10 km of the project area.

- Peregrine falcon, bald eagle, Blanding's turtle, milk snake and monarch butterfly.
- Unconfirmed potential for eastern cougar to be present in the vicinity of the project area.

The project team began conducting fisheries and aquatic habitat, and terrestrial habitat investigations in support of the proposed generating station project in 2009 to supplement the information provided by the Ministry of Natural Resources. These studies were continued through 2010 and are ongoing in 2011.

No significant vegetation species are known to exist in the project area.

The MNR identified two significant bird species, peregrine falcon (*Falco perigrinus*) and bald eagle (*Haliaeetus leucocephalus*), as potentially being present within the study area. No observations of peregrine falcons were made during any of the field investigations completed in 2009, 2010 or spring 2011. Osprey nesting, foraging and perching habitat, and bald eagle nesting and foraging habitat are confirmed to be significant wildlife habitat present within the project area. The Ontario Breeding Bird Atlas identified two other significant bird species, Canada warbler (*Wilsonia candensis*) and Eastern whip-poor-will (*Caprimulgus vociferus*), from the vicinity of the study area. No Eastern whip-poor-wills or other nocturnal birds were observed during targeted nocturnal surveys completed in June 2011. Chimney swift habitat is considered to be Significant Habitat of Endangered and Threatened Species (OMNR 2010). During the 2011 breeding bird survey, chimney swifts were seen on multiple occasions throughout the study area in small groups.

Twenty-two herpetofauna species are located within the vicinity of the study area. Five species of frogs and toads were observed during field surveys during the spring and summer of 2010, all of whom are common species with secure populations. Four significant species can be found within the study area: the common snapping turtle (*Chelydra serpentina serpentina*), Blanding's turtle (*Emydoidea blandingii*), northern map turtle (*Graptemys geographica*) and eastern milksnake (*Lampropeltis t. triangulum*). Blanding's turtle trapping, visual surveys and habitat assessments were completed in May and June 2011 in order to determine the potential for Blanding's turtles to be present within the study area. While no Blanding's turtles were directly observed, preferred habitat for the species is present and a Blanding's turtle was observed within the study area for the proposed McCarthy Chute site, 5.5 km downstream of the Four Slide Falls generating station.

Thirty-two mammal species have been identified as being potentially present within the study area. Evidence of five species was observed during field visits, all of whom are common species with secure populations within Ontario. The MNR Site Description Package and the Ontario Mammal Atlas indicated that significant mammal species, the eastern cougar (*Puma concolor*) and the northern long-eared bat (*Myotis septentrionalis*), may be present in the study area, although these were not observed during field visits.

Field surveys confirmed the presence of sixteen fish species, none of which are provincially listed as Species at Risk or of provincial significance. The majority of the fish species are relatively common and are moderately to highly tolerant of environmental change and perturbation, and are widespread in their Ontario distribution. The fish community is composed primarily of

generalist species that are not highly dependent on specific habitat requirements for spawning or life history processes. Walleye, Brook trout, Rainbow trout and Lake trout (Pecors Lake and McCarthy Lake located downstream from the project site are designated naturally reproducing Lake Trout lakes) were judged by the EA team to be the primary valued ecosystem components within the study area.

With the exception of Brook trout, which require specific habitat characteristics for spawning and cold, well-oxygenated water for survival, the fish community is typical of cool/warm water temperature regimes, the distribution of which is primarily dependent on flow regime/water levels within the watershed and water temperatures. The Brook trout is the most sensitive species observed within the study area and requires cold well oxygenated water for survival and specific habitat needs for spawning.

Archaeological Sites

There are no registered archaeological sites within or near the project site. However, the site was determined to have archaeological potential due to its proximity to the waterway (within 150 m of a major water source (Serpent River)) and the existence of rapids. A Stage I archaeological assessment was completed and recommended a Stage II assessment be undertaken; a Stage II assessment is underway to assess archaeological potential. Archaeological assessments of the connection corridor will be conducted once final routing has been determined.

General Land and Water Use

The Serpent River is considered a managed waterway due to the presence of other water control infrastructure (i.e. the Camp Lake Serpent River GS and the Serpent River First Nation GS) on the waterway. At this time there is no water management plan for the Serpent River. A draft water management plan, covering both of the existing waterpower facilities is presently under review. The MNR has advised Xeneca that the draft water management plan will likely be finalized in accordance with the Water Management Planning Guidelines for Waterpower under the MNR's *Lakes and River Improvements Act* prior to the commissioning of the proposed facility at Four Slide Falls. If and when the proposed facility is completed an amendment to the Serpent River WMP would be required.

The river is a recognized canoe route between Whisky and Pecors Lakes, and is considered a navigable waterway as defined under the *Navigable Waters Protection Act*. The roads and trails around Pecors Lake are used recreationally for snowmobiling and hiking, and may also be used for recreational all-terrain vehicle use. A site on the lake has been identified as a potential location for a cottage lot development. Other uses of the general area include forestry, hunting, fishing, commercial trapping, bear management areas and baitfish harvesting.

No protected areas are located in the immediate vicinity of the proposed project. However, Four Slide Falls is located within an Enhanced Management Area and adjacent to another; the purpose of such areas is to protect recreational and natural values along the river while permitting compatible resource use.

Aboriginal Land and Water Use

There are no Reserves in the immediate vicinity of Four Slide Falls. The closest Reserve is the Serpent River Reserve located approximately 14 km southwest of the project. An Aboriginal Consultation Plan for the Serpent River sites has been forwarded to the Communities for their input. Community benefits are being discussed with Identified Aboriginal Communities as directed by the Ministry of Natural Resources. Consultation with individual community members to understand the land and water use of these communities will be undertaken in the next few years.

Project Description

The proposed hydroelectric facility would use a gross head of 28.5 m, and would have a total nameplate rating of 7.3 MW. A 44 kV connection line would extend approximately 6.5 km from the Four Slide Falls GS west to Highway 108. The line will then travel northwest for 8.8 km along the Highway to its point of connection at the Elliot Lake TS. Xeneca will continue to work with MNR to finalize the line route and seek further route and voltage efficiencies which may involve discussions with the Ontario Power Authority on the viability of alternate connection points.

Access to the project area will be via existing access roads and trails with a minimum amount of new road construction.

The detailed design will benefit from input by the public and regulatory agencies during the review of the Environmental Report. The proponent necessarily reserves the right to variances between the conceptual design presented herein and the detailed engineering design subsequent to the completion of the environmental assessment, provided that such variances do not materially and negatively impact the environment beyond the scope of the impacts described herein. Plan and Specification Approval (*Lakes and River Improvement Act*) will determine final design using the Class EA as its guideline.

Construction Strategy

Site preparation is presently proposed to begin in May 2012, followed by the construction of the generation facility during 2012 through 2014. The construction of the connection line corridor is currently proposed to start in 2013 with completion occurring later in the year or in 2014. As per the terms of the FIT contract, commissioning will follow no later than October 2014.

Construction activities will begin following the issuance of regulatory approvals and authorizations, and will meet the requirements of applicable legislation, industry guidelines and best management practices.

Operation Strategy

The operation strategy was developed based on the conceptual engineering design, available environmental data and the findings of various studies. A "modified run-of-river" mode of operation is proposed for Four Slide Falls, in which the operation of the facility would vary between run-of-river and intermittent depending on the flows in the river. This is in alignment with Ministry of Energy (formerly Ministry of Energy and Infrastructure) definition of run-of-river with modified peaking and their desire for electricity to be generated during peak hours in an environmentally sustainable manner to displace fossil fuel generation. When natural flows are below the maximum capacity of the turbines but above the required ecological flow, water will be stored during off-peak hours for use during peak hours, affecting water levels upstream and flows downstream. This approach allows for operating the facility in an environmentally responsible manner while maximizing waterpower potential of the site for the delivery of clean electricity that produces no aerial emissions and greenhouse gases to the province especially during peak demand periods. This is in alignment with the Ontario Ministry of Energy (the One Window) stated desire for clean electricity during peak demand periods. All electricity produced displaces the need for electricity from fossil or nuclear sources. Distributed generation to remote areas also "Islands" consumers against service interruptions (e.g., ice storms and black-outs) and provides positive benefits to the power grid. Long-term the electricity produced will provide positive financial benefits to local and provincial government and help reduce electricity costs.

Inundation and backwater effects are expected to span a distance of 6.8 km upstream of the dam; operations will have virtually no effect on Pecors Lake located approximately 7 km upstream. In order to minimize negative environmental impacts, limits will be set to the depth and area of the inundation zone, which in turn limits storage to less than 48 hours during moderate and low flows.

Upstream water levels may be managed by controlling various operating parameters, such as the maximum daily fluctuation and the rate of changes to the water level. Downstream flows and levels may be managed by the established environmental flow, and the compensatory bypass flow. The proposed operating parameters for the facility may be subject to change subsequent to regulatory and public review of this ER.

The operating plan of the facility at Four Slide Falls will ultimately be incorporated into the final Serpent River Water Management Plan (presently in draft) in cooperation with MNR as outlined in the *Lakes and River Improvement Act* after commercial operation.

Federal, Provincial, and Municipal Agency and Stakeholder Consultations

In accordance with the Class EA for Waterpower Projects, consultation was conducted with government agencies, public and Aboriginal communities to identify concerns and issues related to the proposed development.

Xeneca corresponded with the following First Nations And Aboriginal communities regarding the proposed undertaking:

- Mississauga First Nation (MFN)
- Sagamok Anishnawbek First Nation (SAFN)
- Serpent River First Nation (SRFN)
- Métis Nation of Ontario (MNO) - North Channel Metis

Xeneca continues the Aboriginal consultation dialogue by distributing an Aboriginal Consultation Plan to all communities. In the plan it was stated that the Aboriginal community engagement will formally begin after the issuance of the Notice of Completion at which time the final report will be provided to the communities. This action will be followed by a period of 30 days for review and engaged discussion on any issues that may arise.

Key concerns identified through public consultation include impacts from the operations at Four Slide Falls to water levels at McCarthy Lake and recreational use in and around the proposed inundation area. In addition, the project area is used by hikers and snowmobilers. It was relayed that the local snowmobile trail network otherwise known as District 13, covers both Serpent River project sites, in addition to Elliot Lake and Spanish. There are two parts to District 13; Elliot Lake which covers the Four Slide Falls site. It was noted that proposed inundation area intersects the snowmobile trail, and a request for discussion on re-routing the trail was issued. In addition, it was noted that snowmobilers do cross frozen water bodies and that safe watercrossing alternatives would be needed. When not being used by snowmobilers, the Elliot Lake section of the Trans Canada Trail is frequented by the Coureurs de Bois Hiking Club. Club members use a section that crosses over the rapids/falls located at the bottom of Pecors Lake which is immediately upstream from the extent of inundation for Four Slide Falls. The proponent will pursue additional consultation with representatives from the snowmobiling and hiking communities to seek resolution to these issues. On June 29, 30 and July 11, 2011 various stakeholders were contacted via e-mail and provided with a letter requesting any further comments or concerns in relation to the proposed undertaking. Recipients included;

- Elliot Lake Rod and Gun Club
- Elliot Lake ATV Club
- Elliot Lake Fly Fishing and Tying Club
- Penokean Hills Field Naturalists
- Elliot Lake Snowbirds Snowmobile Club

No responses to this inquiry were received in regards to the Four Slide Falls project.

Local anglers wanted to know how the project would impact ice fishing in the vicinity of the project since the sport is practiced at both McCarthy and Pecors lakes. Xeneca responded that the effects of the project on ice fishing would be determined through field investigations and the provision of mitigation measures.

Consultation was also carried out with the Sustainable Forest License holder Northshore Forest Inc. (Eacom) towards the design of access roads and connection lines for the project.

Notices of Commencement and project descriptions were sent to relevant federal and provincial agencies throughout the planning process; an EA Coordination meeting was held to discuss the undertaking, collect information on regulatory approvals and permitting requirements, and project scoping. The Canadian Environmental Assessment Agency is acting as the Federal Environmental Assessment Coordinator (FEAC) for the undertaking; Fisheries and Oceans Canada and Transport Canada have been identified as Responsible Authorities due to project triggers under the *Fisheries Act* and the *Navigable Waters Protection Act*. Other departments may be identified as Responsible Authorities or Expert Federal Authorities throughout the course of the planning process.

Key concerns identified by agencies during the planning process to date include potential impacts to fisheries and fish habitat; terrestrial wildlife; air and water quality; water levels in Pecors and McCarthy Lakes (designated lake trout lakes); and recreational and residential uses of the watercourses and surrounding land.

Xeneca has recorded all comments and concerns for the proposed Serpent River projects over the course of the EA planning process and will continue to do so throughout the development process.

Potential Project Effects

Negative Impacts:

The environmental assessment examined the project's potential environmental impacts. Where possible, adverse impacts will be avoided or prevented and mitigation measures will be implemented to minimize those impacts that cannot be avoided or prevented.

The proposed development will result in the creation of a head pond extending approximately 6.8 km upstream of the dam. The modified run-of-river operation of the facility will result in fluctuating water levels upstream of the dam.

In order to minimize erosion effects, the maximum daily fluctuations and the rate of change of upstream water levels will be limited. Measures have been incorporated into the conceptual design and the operational plan to minimize or avoid negative impacts to civil structures and private property.

The fluctuations in water levels upstream of the dam may also impact aquatic habitat along the shorelines and/or shallow water areas. In order to minimize negative impacts, the proposed daily fluctuations were established to be less than the magnitude of historic seasonal fluctuations experienced in the project area.

The proposed head pond at Four Slide Falls will have a depth of 29 m and will store water for 41 hours. As a result, water temperatures in the water column may stratify, with temperatures being warmer at the surface and decreasing with depth. Given that Pecors Lake is considered a cold water fishery that is primarily managed for lake trout, water withdrawal from the bottom of the head pond is preferred over withdrawal from the surface.

Modified run-of-river will also produce downstream variability in water depth, flow velocity and wetted perimeter until the river reaches a lake or a confluence with a major tributary. A downstream minimum environmental flow of 1.0 m^3/s during the summer and 0.5 m^3/s during the fall and winter is proposed to be continually passed over the dam spillway to maintain ecological habitat viability within the variable flow reach. Operations during spawning seasons will not be intermittent in order to ensure fish reproduction is not adversely affected.

The applicable regulations will be respected in order to ensure the health and safety of all contractors, construction crews and operational staff. For the safety of the public, access will be restricted during construction activities. Safety measures will be erected to restrict public access to the work areas. These measures will include fencing and signage while ensuring that routes are maintained to allow the public to bypass the construction area.

Once operational, access to the facility will be restricted to maintain public safety. Safety measures including signage, fencing, gates, barriers and warning devices will be considered during the development of a Public Safety Plan (PSP). The PSP will be completed prior to commissioning and will address both access and operational related safety issues. It is not the intent to restrict access to fishing or recreational uses where safety considerations are not an issue.

Consideration was also given to impacts specifically related to potential accidents and malfunctions that may occur during the construction and operation of the facility. The proper implementation of mitigation measures and best management practices will minimize the likelihood of accidents such as spills and leaks during the construction period. A spill response plan will be developed for the construction program to manage any accidental releases of contaminants required for the operation of construction equipment; any releases of contaminants will be reported to the Ministry of the Environment Spills Action Centre. A detailed list of

mitigation measures to be implemented during the construction program is provided in this Environmental Report.

In order to preserve the aesthetic quality of the project area, the proponent will strive to maintain and enhance vegetative buffers between the river, roads and any ancillary works. The proponent will seek to preserve or enhance recreational values in the area of Four Slide Falls.

Positive Effects of the Undertaking:

The construction and operation of the proposed facility will introduce employment opportunities in the City of Elliot Lake, the Town of Spanish and the surrounding region. Employment opportunities may also exist for the Serpent River First Nation and other First Nation and Aboriginal communities. Direct economic activity to build a waterpower project in Ontario is approximately $5 million per megawatt, half of which is generally spent locally in procuring construction labour and materials, consulting and legal services, trucking and other services such as accommodation, food and fuel. The initial capital construction cost is estimated to be a $36.5 million investment in Ontario with approximately $18 million spent in the region. A significant return to the people of Ontario paid through Gross Revenue Charges (GRC) and provincial and federal income taxes. Return to the people of Ontario will continue past the 40 year contract, likely as long as the facility is in operation. Direct and indirect job creation associated with the construction activities is estimated to be approximately 73,000 and 109,500 person hours of work, respectively.

Benefits to Aboriginal communities, including employment opportunities, are being discussed as outlined in the Aboriginal Consultation Plan (ACP). Discussions also include MNR's "Business to Business" relationship process for Identified Aboriginal Communities. Xeneca has voluntarily committed to support the Crown's consultation responsibilities to the Aboriginal Communities and its fiduciary obligations as defined within *Bill 150, Green Energy and Green Economy Act, 2009 (GEA) and* the Ontario Power Authorities Feed In Tariff process and other related Crown objectives.

Additional economic benefits will include revenue generated from local sourcing of materials, equipment and services (where available). The project will improve local infrastructure to the benefit of mines, forestry, and tourism and recreational users.

The project will provide to the region a source of reliable and clean electricity for 75+ years that will help meet local demand and support local supply during interruptions to service such as ice storm and blackouts.

As a lower cost source of electrical production, waterpower will provincially assist in keeping electricity prices economical and help displace fossil fuel and nuclear sources of generation and improve system reliability.

In terms of long term generation of jobs and prosperity the development of Four Slide Falls and other current projects will help support Ontario's existing waterpower industry that employs 1600 direct and 2000 indirect jobs within a renewable sector that has significant potential of global growth according to the International Energy Agency which is estimated to exceed all other renewable sources.

New projects such as Four Slide Falls will help Ontario's waterpower industry facilitate a generational knowledge transfer that will allow it to compete in the global market for the potential 575,000 MW of new supply and 875,000 MW of refurbishments. Domestic development of waterpower has been stagnant in Ontario since the 1990s and Four Slide Falls also provides this Ontario industry an opportunity to showcase its talents and expand so as to meet the growing global demand for equipment and talent for waterpower maintenance and development.

Positive environmental effects are the production of 17,600 MWh of clean electricity with no aerial emissions for 75+ years that provide a reliable source of electricity that is economical. Environmental benefits are estimated at:

- The displacement of 12,136 metric tons of carbon dioxide equivalent per annum;
- Reduction of annual greenhouse gas emissions equivalent to 2,380 passenger vehicles or, the sequestering of carbon from nearly 1047 hectares of pine or fir forests.

Effects of the Environment on the Project

As required for projects subject to the *Canadian Environmental Assessment Act*, the effects of the environment on the project were evaluated. Events such as flooding, extreme winter and summer conditions, lightning strikes, accidental fires, earthquakes and climate change were considered. Although the powerhouse will be equipped with a diesel-powered back-up generator, it is anticipated that such events may necessitate plant shut-down and result in an interruption to the delivery of electricity to the provincial supply grid. In the event of a power failure during peak flow periods, it will be the proponent's responsibility to ensure that peak discharge can be passed.

Residual Adverse Effects

The effects of a project that are expected to remain despite the application of mitigation measures are referred to as residual effects. The residual effects of the proposed Four Slide Falls development, both positive and negative, and their significances were evaluated.

A significant negative residual effect is anticipated for habitats (terrestrial and aquatic) currently existing in the headpond area which will be inundated as a result of the change in water levels and flow upstream of the project. The loss of the terrestrial habitat is deemed not to be

significant to shoreline species due to the small area to be impacted in relation to the abundance of these habitat types on the surrounding landscape, any loss of habitat would likely have a negligible effect on their overall regional populations. The extent of the significant residual effect on the fisheries habitat will be measured for discussions with DFO in the design and specifications phase of the project for federal permitting purposes and adaptive mitigation of habitats will be applied as required.

Positive residual effects are expected for local and regional employment, potential for economic development for First Nations pursuing a business-to-business relationship with the proponent, the reduction of aerial emissions, harvesting of merchantable timber during construction and for the reliability and security of electricity and energy in the region.

Cumulative Effects

Cumulative effects are the long term changes resulting from the combined effects of successive actions on the environment, and can result from the interaction of residual effects from multiple projects in a given area or multiple activities acting on a single ecosystem component.

The proponent may propose an additional generation station on the Serpent River at McCarthy Chute. Should this proposed undertaking receive regulatory approval to proceed, the cumulative effects of both projects will be considered in an additional Appendix within the McCarthy Chute ER.

Monitoring and Follow-up Programs

Monitoring programs have been proposed for the construction, post-construction and operation phases of the development. These programs will ensure that mitigation measures and industry best management practices are being properly implemented and adverse effects are minimized.

Commitments

The proponent is committed to:

- ensuring compliance with this Environmental Report;
- the adoption and application of the mitigation measures detailed in this document;
- abiding by commitments to the Community and Aboriginal Communities.

In cooperation with the regulators, the proponent has reached an agreement on flow parameters in the operating plan and will work with agencies to confirm and verify these parameters as the project proceeds. Xeneca will confirm the specific operational parameters and environmental protection measures for the facility and ensure that there will be no adverse effects on valued

environmental components of the Serpent River within the zone of impact of the project. In coordination with MNR, these measures will be incorporated into the Serpent River water management plan process.

The proponent will also regularly issue a Project Implementation Report to agencies, providing updates on the project status and results from ongoing environmental effects, monitoring and mitigation programs.

Conclusion

It is the conclusion of this environmental assessment that there will be a significant residual environmental effect after application of mitigation measures, and the proponent believes there will be a net -environmental and economic benefit of the project.

The identified adverse environmental effects that have been determined through professional judgment to have significance are associated with the inundation of the headpond at Four Slide Falls and the associated impacts to aquatic habitat.

There may be a requirement for an Authorization under Section 35 of the *Fisheries Act* for the harmful alteration, disruption or destruction (HADD) of fish habitat. If appropriate, a compensation measures plan will be developed for the Four Slide Falls development in consultation with the regulators once the engineering details for the project have been advanced during the permitting phase of the project.

There are also many positive environmental effects associated with the project which are considered to off-set any potential environmental impacts. These are: the tangible economic benefits for the local communities and the regional/provincial economy, employment and training opportunities, the creation of reliable and secure green energy for the province, and the generation of electricity through a renewable energy supply in support of the province's *Green Energy and Green Economy Act*.

The proponent believes the project provides net positive environmental and socioeconomic impacts to the region and the province. The EA Report and the project also meet the desired direction of the "One Window" on energy procurement and the objectives as defined within the *Green Energy and Green Economy Act*.

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Acronyms

AAND	Aboriginal Affairs and Northern Development (formerly INAC - Indian and Northern Affairs Canada)
ARD	Acid Rock Drainage
BMP	Best Management Practice
CEAA	Canadian Environmental Assessment Act
CEA Agency	Canadian Environmental Assessment Agency
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EC	Environment Canada
ESA	Endangered Species Act
ER	Environmental Report
FEAC	Federal Environmental Assessment Coordinator
FIT	Feed-In Tariff
GEA	Green Energy and Green Economy Act
GS	Generating Station
INAC	Indian and Northern Affairs Canada
LTAF	Long term annual flow, average annual mean
ME	Ministry of Energy
ML	Metal leaching
MNDMF	Ministry of Northern Development, Mines and Forestry
MNR	Ministry of Natural Resources
MOE	Ministry of the Environment
MTC	Ministry of Tourism and Culture
NOC	Notice of Commencement
NRCan	Natural Resources Canada
NWPA	Navigable Waters Protection Act
OBBA	Ontario Breeding Bird Atlas
OMNR	Ontario Ministry of Natural Resources
OPA	Ontario Power Authority
QP	Qualified Person
Q_{99}	Streamflow exceeded 99% of time
Q_{95}	Streamflow exceeded 95% of time
Q_{80}	Streamflow exceeded 80% of time
Q_{50}	Streamflow exceeded 50% of time
Q_{20}	Streamflow exceeded 20% of time
Q_{EA}	Downstream environmental flow target
Q_{COMP}	Compensatory flow (between dam and tailrace)
Q_{MED}	Median streamflow value

Q_{TMAX}	Maximum turbine capacity
Q_{Tmin}	Minimum turbine flow
Q_{TL}	Limited turbine flow – modified ROR
Q_{HWM}	Streamflow corresponding to high water mark
7Q2	2 year return period 7-day-average-low flow
7Q10	10 year return period 7-day-average-low flow
7Q20	20 year return period 7-day-average-low flow
Q1:2	High streamflow event; occurrence of 1 in 2 yr
Q1:100	High streamflow event; occurrence of 1 in 100 yr
RA	Responsible Authority
ROR	Run of River
ROW	Right-of-way
SAR	Species at Risk
SARA	Species at Risk Act
TC	Transport Canada
TS	Transformer Station
UTM	Universal Transverse Mercator Units

Units

kW	kilowatt
kWh	kilowatt hour
m	metres
m^2	square metres
masl	metres above sea level
m/s	metres per second
m^3/s	cubic metres per second
MW	megawatt
MWh	megawatt hour
r/min	revolutions per minute
µg	microgram
umho/cm	micromhos per centimetre

1. INTRODUCTION

This section presents an introduction to waterpower in Ontario, an overview of the proposed project, and the methods used to complete the work presented herein.

1.1 WATERPOWER IN ONTARIO

Waterpower (hydroelectricity) is generated from a naturally replenished source (water) making it both a renewable and sustainable resource. Hydroelectricity is considered the most widely-used form of renewable energy. Once constructed, hydroelectric generating station greenhouse gas emissions are effectively zero. Waterpower generation provides peak and base load energy, which replaces non-renewable sources of power such as coal and gas. Some waterpower facilities can store energy (water) until it is needed at peak periods of usage.

Hydroelectric generating stations are long-lived, lasting upward of 80 years; there remain operating waterpower facilities in the province that were constructed at the turn of the 20th century. In 2009, the Ontario *Green Energy and Green Economy Act* (GEA) was enacted with the aim of making the province a global leader in clean, renewable energy. The Feed-In-Tariff (FIT) Program administered by the Ontario Power Authority (OPA) was established under the GEA to encourage the development of renewable energy in Ontario while phasing out the province's coal-fired electricity by 2014. The FIT also promotes economic activity and the development of renewable energy technologies and the creation of new green industries and jobs.

1.2 INTRODUCTION TO PROJECT

Xeneca Power Development Inc. (Xeneca) is proposing the construction of a 7.3 MW hydroelectric generating station (GS) at the Four Slide Falls site on the Serpent River to meet government and energy regulatory goals and objectives to generate sustainable and reliable hydroelectric power. The proposed project was awarded a 40-year FIT contract from the OPA which, subsequent to a successful EA outcome, would see the facility commissioned and delivering electricity to the provincial supply grid by October 2014.

The proposed project is located on the Serpent River, approximately 15 km east of Elliot Lake, 7 km downstream of Pecors Lake and 4 km upstream of McCarthy Lake; a site location map is provided as Figure 1. Four Slide Falls GS site is located approximately 5.5 km upstream from Xeneca's proposed McCarthy Chute GS site which is being evaluated separately under the Ontario *Environmental Assessment Act* and the *Canadian Environmental Assessment Act*.

82°40'0"W
82°30'0"W
46°22'0"N
46°20'0"N
46°15'0"N

Elliot Lake

Pecors Lake

Four Slide Falls

McCarthy Lake

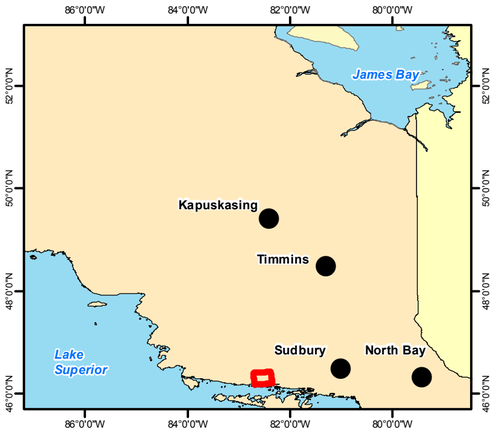
McCarthy Chute

108

17

LEGEND

- Site Locations
- Road
- Water Features



REFERENCE

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

0 2,500 5,000
Meters
1:65,000

PROJECT

FOUR SLIDE FALLS GS

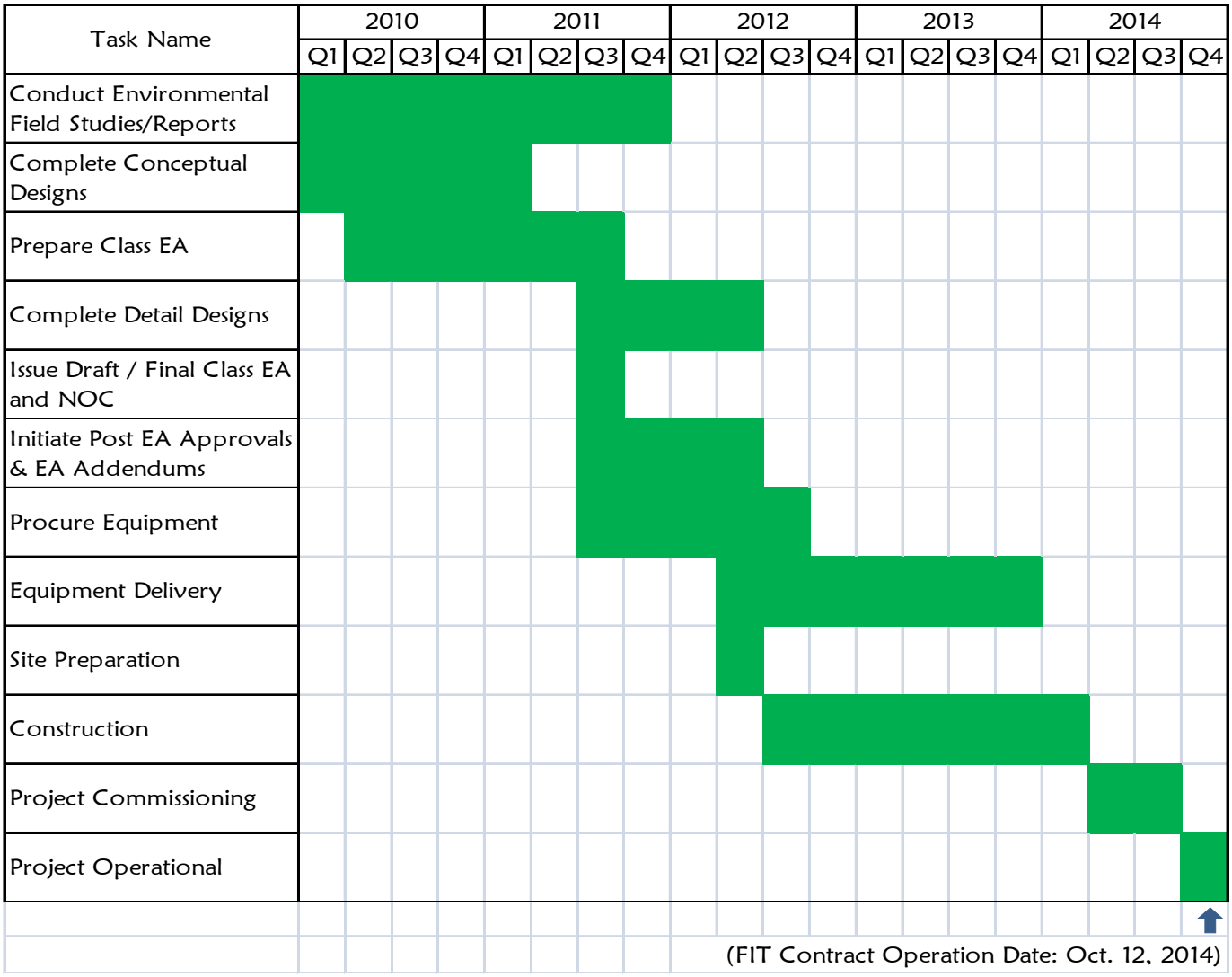
TITLE

SITE LOCATION MAP

PROJECT No.			FIGURE
DESIGN	KC	06/10/2010	
GIS	KC	06/10/2010	1
CHECK	TS	06/10/2010	
REVIEW	KM	06/10/2010	

A tentative project development schedule outlining key project phases which have been or will be completed is provided below in Figure 2.

Figure 2: Project Development Schedule



1.3 Overview of the Environmental Screening Process

The purpose of an environmental assessment (EA) is to recognize the potential effects of a project life cycle early in the project planning phase and take these effects into account during the development and design of the project. Environmental effects include both the positive and negative effects that a project would have, or could potentially have, on the environment at any stage in the project life cycle. The assessment also considers the effects of the environment on the

project. The environment is defined as a combination of natural/physical, socio-economic, and cultural-human factors.

The components of hydroelectric projects can include reservoirs or head ponds, water control structures, water conveyance structures (canals or penstocks), powerhouses, access routes, connection lines and transformer stations. For each of these components, there are three main life-stages of development: construction, operation and maintenance, and decommissioning. There are also indirect activities related to the maintenance and operation of these facilities, including small volumes of non-hazardous waste generation and their disposal, and a backup generating system powered by fuel.

The process of conducting this environmental assessment entailed the examination and evaluation of each component (i.e. dam) and life-stage (i.e. operation) of the proposed development and its potential effect on each aspect of the environment. Environmental effects may include, but are not limited to, alteration/loss/gain of natural features, flora or fauna and their habitat, ecological functions, natural resources, air and water quality, and cultural or heritage resources. Environmental effects may also include the displacement, impairment, or interference with existing land uses, land use and resource management plans, businesses or economic enterprises, recreational uses or activities, cultural pursuits, and social conditions and economic attributes.

The environmental assessment team (EA team) used a team consultative approach to avoid:

- attempts to quantify impacts which are dissimilar on a comparative basis;
- use of sophisticated matrix methods using mathematical calculations to weigh the importance of impacts;
- lack of balance in assessments due to factors such as the tendency for individual experts to concentrate on the areas of the assessment in which they are most familiar.

1.4 Approach to the Environmental Screening Process

The environmental assessment team (EA Team) retained by Xeneca included:

- OEL-HydroSys Inc.
- Natural Resource Solutions Inc. (NRSI)
- Woodland Heritage Services (WHS)
- ORTECH Consulting Inc.
- WESA Inc.
- KBM Resources Group

- Hatch
- Canadian Projects Limited
- BPR
- AMEC
- R.J. Burnside and Associates Limited
- Northern Bioscience
- Hutchinson Environmental Sciences Ltd.

1.4.1 Legal Framework

As a waterpower development with an installed capacity less than 200 MW, this project is subject to the Class Environmental Assessment for Waterpower Projects (herein referred to as the Waterpower Class EA) planning process developed by the Ontario Waterpower Association as approved by the Ministry of the Environment in October 2008 (revised in March 2011) under the Ontario *Environmental Assessment Act (EAA)*. The Serpent River has water control infrastructure in place in other sections of the waterway and the river is managed for water levels and flows. The proponent has categorized the proposed waterpower facility at Four Slide Falls site as a 'new project on a managed waterway' in accordance with the definitions found in the Waterpower Class EA (Appendix A-1).

The EA team also reviewed other applicable environmental assessment guidelines and legislation regulating small hydroelectric developments in the Province of Ontario, and determined that the following regulatory processes and guidelines may be applicable to this undertaking:

- The Screenings under the *Canadian Environmental Assessment Act (CEAA)*;
- Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects, Ministry of Natural Resources (MNR-RSFDP Class EA);
- The Federal Requirements for Waterpower Development Environmental Assessment Processes in Ontario – Practitioner's Guide (DFO-OWA); and
- The Water Management Planning Guidelines for Waterpower, Ministry of Natural Resources.

According to Ontario Regulation 116/01 (Electricity Regulation) connection lines less than 115 kV are Category A undertakings and therefore exempt from a provincial environmental assessment. As such, the Ministry of Natural Resources (MNR) notified the proponent that, where the disposition of Crown resources is required for the connection line, and where the project is not subject to an environmental assessment (Category A), a screening under the MNR Resource Stewardship and Facility Development Projects Class Environmental Assessment (MNR-RSFDP Class EA) would apply. The connection line is scoped into this planning process to meet the

federal and provincial requirements. As such, during the initial planning meeting (EA Coordination meeting) the Ministry of Natural Resources agreed to recognize this Waterpower Class EA planning process as long as the MNR-RSFPD Class EA screening criteria outlined in Section 3 of the MNR-RSFDP Class EA document are incorporated.

Subsequent to its review of the Project Description and other supporting documentation, such as a detailed location map of the proposed connection line route(s), MNR will categorize the connection line for Four Slide GS (Category A, B, or C) under the MNR-RSFDP Class EA. Given that connection lines less that 115 kV are categorized as Category A and therefore exempt from EA planning requirements within the *Electricity Regulation* and within other environmental assessment planning documents (i.e. Class Environmental Assessment for Minor Transmission Facilities) the proponent anticipates a similar categorization for this project.

The EA team worked closely with multiple stakeholders at the local, provincial and federal levels to ensure that the local environment including physical, social/cultural and economic aspects were well understood.

The EA team collaborated in the completion of the Potential Effects Identification Matrix [(Table 3, Class Environmental Assessment for Waterpower Projects (OWA, Revised March 2011)] included in the Project Description document developed by Xeneca and circulated to the regulators in order to begin the planning process.

The proposed project will also require an authorization from Fisheries and Oceans Canada (DFO) under the *Fisheries Act* and an approval from Transport Canada under the *Navigable Waters Protection Act* (NWPA). These federal approvals triggered the requirement for an environmental assessment under *CEAA*.

Based on the review of these documents and consultation with the key provincial and federal authorities assigned to the project, the EA team determined that there was an overlap of many of the requirements for the above noted processes. It therefore became an objective to harmonize the multi-jurisdictional regulatory requirements and present the results of the environmental assessment of the proposed undertaking in a single comprehensive document. All of the work presented herein was completed following the general intent of the above-noted processes while giving consideration to the other regulatory agencies, and Aboriginal and public stakeholders that have expressed an interest in the project.

1.4.2 Characterize Local Environment of Proposed Development

The EA team completed the following tasks to characterize the local environment in the proposed development areas:

- A detailed literature review of existing information available through provincial and federal databases. The documents are identified in the References section in this document and in the technical reports referenced throughout this document;

- Field investigations to supplement the terrestrial and aquatic biology record available for the site. The EA team undertook detailed field investigations throughout the project area to document existing conditions and assess the potential effects of the project on these conditions. The results of these studies are presented throughout this document. This information and the expert advice of the EA team members are presented throughout this document;

- Stage 1 Archaeological Assessment to supplement the available historical record for the site.

- Field investigations to supplement the topography, water depth and hydrology data. A statistical analysis of historical hydrological data was completed. Hydraulic modeling was also undertaken to assess flow depths and velocities. A one dimensional hydraulic model was developed using HEC-RAS. Detailed reports are found in Annex I.

- Aerial photography was undertaken from which connection line and access road routes were determined.

1.4.3 Identify Potential Environmental Effects

As noted above, the EA team used a consultative process to identify the potential effects of the project in the early stages of the planning process and to determine the data gathering and analysis program which was then used to identify the effects of the project on the environment. In examining the potential effects of this project, the EA team considered all stages of the project including construction, operation/maintenance and decommissioning (Appendix B).

1.4.4 Identify Required Mitigation, Monitoring or Additional Investigations

The EA team developed a summary of recommended actions to prevent or mitigate negative effects of the proposed undertaking on the environment. These mitigation measures were compiled based on the information collected during the study period (field and desktop), through consultation with government agencies, the public and Aboriginal communities and the EA team's knowledge of hydroelectric developments. The residual effects, those that cannot be prevented, avoided or mitigated, are identified and classified based on their significance. It

should be noted that residual effects also include the positive benefits that would be achieved through the lifecycle of this project to ensure that all potential net effects are afforded consideration.

The EA team has also provided recommendations for environmental monitoring, where on-going data collection will be required to confirm the short-term or longer term effects (i.e. those that would be experienced during construction and those that may be experienced subsequent to commissioning).

The proponent has made commitments related to the undertaking which may include additional data and information collection activities. A list of commitments proposed by Xeneca in support of Four Slide Falls waterpower development is presented within the main document and annexes.

1.4.5 Agency and Public Consultation and Aboriginal Communities Engagement

The objectives of the Consultation and Engagement Programs were to combine the public and Aboriginal community notification/engagement/consultation requirements of the federal and provincial environmental assessment planning and subsequent regulatory approval processes, and present the results of the initiatives within this document. The agencies, ministries, First Nations, other Aboriginal groups and other stakeholders that were identified during the EA planning process include:

Canadian Environmental Assessment Agency (CEA Agency)
Indian and Northern Affairs Canada (INAC) now known as Aboriginal Affairs and Northern Development Canada
Fisheries and Oceans Canada (DFO)
Transport Canada (TC)
Environment Canada (EC)
Natural Resources Canada (NRCan)
Health Canada (HC)

Ontario Ministry of Aboriginal Affairs
Ontario Ministry of the Environment (MOE)
Ontario Ministry of Energy (ME)
Ontario Ministry of Municipal Affairs and Housing
Ontario Ministry of Natural Resources (MNR)
Ontario Ministry of Northern Development, Mines and Forestry (MNDMF)
Ontario Ministry of Tourism and Culture (MTC)
Ontario Ministry of Transportation

Serpent River First Nation
Mississauga First Nation
Sagamok Anishnawbek First Nation
Métis Nation of Ontario
North Channel Métis Council

City of Sault Ste. Marie
Proctor Township
City of Elliot Lake
Town of Blind River
Town of Massey
Town of Spanish

A summary of the key consultation activities is provided below:

- A Notice of Commencement (NOC) and one subsequent revision to the Notice were issued by Xeneca. The NOCs were concurrently advertised in local media, specifically the Elliot Lake Standard. The first NOC was issued on July 14, 2010. The NOC was revised and re-issued on November 10, and 17, 2010.

- A Project Description for the hydroelectric generating station was issued on November 16, 2010 to provincial ministries, municipal stakeholders and the Ontario Waterpower Association and circulated federally through the Federal Environmental Assessment Coordinator (FEAC).

- On December 20, 2010, Xeneca distributed Project Descriptions to the Mississauga First Nation, Sagamok Anishnawbek First Nation and Serpent River First Nation.

- A Public Information Centre was held in Elliot Lake, Ontario on December 1, 2010, followed by a meeting with the Elliot Lake Town Council on December 2, 2010.

- A complete record of Agency consultation is provided and is summarized in Section 4.3. An EA Coordination meeting attended by federal and provincial regulators and municipal representatives was held on January 24, 2011.

- Public focus group consultation events held in support of this undertaking are detailed in Section 4.4.

- Aboriginal consultation and engagement events in support of this undertaking are detailed in Section 4.5.

- Copies of advertisements, notifications, and correspondences are provided in the appendices.

The formal Notice of Completion and this Environmental Report (ER) is being provided to the agencies, ministries, First Nations, Aboriginal groups and other local stakeholders that were identified during the EA planning process for a 30-day formal review period. The review will follow the steps below:

- Submission of ER document to regulatory agencies, First Nations and public for review.
- Notice of Completion issued for publication in local media, emailed to stakeholders and posted on the Xeneca and the Ontario Waterpower Association's websites.
- Stakeholders to review ER and provide written comment indicating outstanding issues and requests to meet with Xeneca.
- Xeneca and stakeholders attempt to resolve issues.
- If, at the end of the review period, the stakeholder is not satisfied with Xeneca's proposed resolution, the stakeholder may make a written request to MOE for a Part II Order, such requests to be compliant with requirements of the Waterpower Class EA.
- Once outstanding issues have been resolved or if Xeneca feels its proposals for resolution are satisfactory, Xeneca will ask the Crown to accept the Statement of Completion.

2. EXISTING CONDITIONS

This section provides a description of the existing environmental conditions in the proposed project area.

2.1 LOCATION AND LAND OWNERSHIP IN PROJECT AREA

The proposed project is located on the Serpent River, approximately 15 km east of Elliot Lake, 7 km downstream of Pecors Lake and 4 km upstream of McCarthy Lake; a site location map is provided as Figure 1. The site is located in Proctor Township. The project footprint and potential area of impact, (i.e. for the generating station, head pond, control structure, access road(s) and connection line are located entirely on provincial lands. Conceptual design details are found in Annex II.

The approximate geographic coordinates for the site are latitude: 46.3488°, longitude: -82.4611°. The watershed drainage area at Four Slide Falls is 593 km^2.

2.2 EXISTING INFRASTRUCTURE

There are two other hydroelectric generating stations on the Serpent River, the Camp Lake Serpent River GS and the Serpent River First Nation GS both of which are located downstream of the proposed project.

At this time there is no water management plan for the Serpent River. A draft water management plan, covering both of the existing waterpower facilities is currently under review. The MNR has advised Xeneca that the draft water management plan will likely be finalized in accordance with the Water Management Planning Guidelines for Waterpower under the MNR's *Ontario Lakes and River Improvements Act* prior to the commissioning of the proposed facility at Four Slide Falls. If and when the proposed facility is completed an amendment to the Serpent River WMP would be required.

2.3 TOPOGRAPHY

The topography of the area is generally characterized by lowlands and flats interrupted by rugged outcrops of bedrock. In proximity to the project site, the Serpent River flows through a steeply banked valley. A bedrock ledge runs across the entire width of the valley which creates a chute with an elevation drop of approximately 6 metres.

2.4 CLIMATE

In Northern Ontario the climate is primarily continental, with cold winters and mild summers moderated by the effects of the Great Lakes. Most precipitation falls in the form of summer showers and thunderstorms; winter snowfall amounts can be significant. During the winter months, Northern Ontario can have prolonged periods of extreme cold.

For the city of Elliot Lake, mean daily temperatures range from a high of 24°C in July to a low of -17°C in January. The hottest and coldest daily temperatures on record are 35.5°C (August 7, 2001) and -37°C (Jan 17, 1997). Annual precipitation averages 941 mm with 275cm of average annual snowfall. On average, August experiences the most precipitation and February is the least.

2.5 SOILS

The overburden in the area around the Four Slide Falls consists of water-modified tills and lacustrine silts and sands. River substrates typically consist of cobbles and fine silts and sands layered between bedrock outcrops.

2.6 GEOLOGY

Generally, bedrock in the project area is composed of a wide variety of rock types even within a short radius (1-2 km) of the project study area: Archean tonalite, granodiorite and quartz monzonite and granitic gneiss cut by aplite, pegmatite, and diabase dykes, metamorphosed mafic to intermediate volcanic rocks, and Proterozoic mafic intrusive rocks such as gabbro and diorite.

2.7 HYDROGEOLOGY

A review of Ontario Ministry of the Environment's electronic well records database revealed there are no water well records within a 1-km radius of the project site.

2.8 RIVER HYDROLOGY

The following information was sourced from existing background data and data collected during field investigations.

The Serpent River flows south through the Elliot Lake area to Lake Huron passing through multiple large lakes and wetlands. The Serpent River is fairly sinuous with distinct meander which is typical of a low gradient watercourse. The project site is located approximately 7 km downstream of Pecors Lake and 4 km upstream of McCarthy Lake.

The reader is referred to Figure 1 provided in the 2009 Hydrology Review for Serpent Hydropower Sites (Hatch) appended in Annex I-A.

2.8.1 Water Levels, Flow and Movement

Flow values for Serpent River at Four Slide Falls were prorated using drainage basin information data for the Serpent River and from Water Survey of Canada gauge 02CD004 (Serpent River at Pecors Lake). Hydrographs and flow duration curves have been developed for this site and are provided in Annex 1-B.

The development and operation of the proposed generating station will alter the existing river system and impact the hydrological characteristics of the Serpent River both upstream and downstream of Four Slide Falls. Regulatory agencies expect that the proponent will determine through study the flows required to maintain aquatic ecosystem integrity in the zone of influence of the project. The potential impacts of the proposed facility development and operation on the hydrological regime at Four Slide Falls are described within this environmental report.

2.8.2 Surface Water Quality

Uranium mining has historically occurred in the Elliot Lake area for the past 40 years. Though most of the mines ceased operations in the early 1990's, the decommissioned mining operations and tailing deposits have impacted the water in the Serpent River. In total there are eleven decommissioned mines within the Serpent River watershed in addition to a number of tailing management areas. Monitoring within the watershed over the last 10 years has shown a steady improvement in surface water quality since the closure of the mines and mining-related parameters are now generally at levels which are protective of aquatic life. Sediments within the watershed continue to reflect the historical mining activity with elevated concentrations of certain parameters in some lakes but, generally, recent biological monitoring has shown little or no detectable effects in fish and benthic invertebrates (Minnow Environmental, 2009).

A surface water quality investigation was undertaken in 2010 to establish ambient (baseline) characteristics of the waterway. Two sampling events (spring and summer) were conducted at three locations: SW1, SW3 and SW4 (summer only) shown in Annex III (Appendix VII, Maps 1, 3 and 5) at the Serpent (Four Slide Falls) site. During the sampling events, general observation and characteristics of each sampling location was assessed and recorded (i.e. water level, current, colour and odour). The spring event was undertaken on June 5th; the summer event was completed on August 26th, 2010.

The results were compared to the Provincial Water Quality Objectives (PWQO) to establish ambient (baseline) water quality conditions in the vicinity of the proposed project location. The PWQO were established by the Ministry of the Environment in 1994. Under the *Ontario Water Resources Act* the MOE has the supervision of all surface and ground waters in Ontario. The reader will note that several of the parameters subjected to analyses do not have a PWQO objective. In the spring sampling event, the pH of the sample taken at SW1 was marginally below the PWQO range. One of the duplicate samples also exceeded the PWQO for zinc.

During the summer sampling event all samples taken exceeded the PWQO for Chromium. Additionally, samples SW1 and SW3 also exceeded for zinc and SW1 exceeded PWQO for copper. The source of the elevated metal concentrations is unknown but may be linked to the impacts of mining activity on the Serpent River watershed. A copy of 2010 surface water monitoring investigation, including analytical results are provided in Annex IV.

Additional surface water collection events will be scoped with MOE, MNR and EC in 2011 to supplement information collected in 2010.

2.9 ECOLOGY

A Site Description Package (SDP) for Four Slide Falls was provided to the proponent by the Ministry of Natural Resources. In many cases the SDP noted that inventories or assessments of natural heritage features in the project area were not available. Key natural heritage features identified in the SDP for the project area are listed below.

Fish and Fish Habitat

A wide variety of species are found in Pecors Lake upstream of the Four Slide Falls project:

- Pecors Lake and McCarthy Lake located downstream from the project site are designated naturally reproducing Lake Trout lakes
- In addition to Lake trout, Walleye, Brook trout, Smallmouth bass, Rock bass, Northern pike, Yellow perch, Whitefish, Pumpkinseed, Burbot and Brown bullhead are found in Pecors Lake along with several sucker and minnow species.
- Specific fish species which may be found in the Serpent River in proximity to the site were not identified.

Terrestrial and Aquatic Flora and Fauna

According to the Ministry's SDP wildlife habitat has not been evaluated in the project area. Characteristic wildlife includes but is not limited to;

- White-tailed deer, black bear, snowshoe hare, beaver, lynx, bobcat, elk, muskrat, wolf, fisher, racoon, elk, skunk, weasel and various small mammals.
- The Ontario Breeding Bird Atlas documented evidence for over 96 bird species in the vicinity of the project.

Vulnerable, Threatened or Endangered Species

The MNR SDP identified several vulnerable, threatened or endangered species, both aquatic and terrestrial, within 10 km of the project area.

- Peregrine falcon, bald eagle, Blanding's turtle, milk snake and monarch butterfly.
- Unconfirmed potential for eastern cougar to be present in the vicinity of the project area.

A copy of the Site Description Package is provided in Appendix A-2.

2.9.1 Study Area and Scoping of Natural Heritage Investigations

The project team began conducting fisheries and aquatic habitat, and terrestrial habitat investigations in support of the proposed generating station project in 2009 to supplement the information provided by the Ministry of Natural Resources. These studies were continued through 2010 and are ongoing in 2011.

The proposed Four Slide Falls project is located on the Serpent River, approximately 15 km east of Elliot Lake, 7 km downstream of Pecors Lake and 4 km upstream of McCarthy Lake. The site is located approximately 5.5 km north of Xeneca's proposed McCarthy GS study area. The study area for the proposed project is considered to include the inundation area plus the downstream 'variable flow reach' plus adjacent lands within 120 m. There are also three tributaries which flow into the Serpent River between Pecors Lake and Four Slide Falls. Two of the larger tributaries were assessed and sampled to identify potential habitats and the fish species utilizing them.

The preliminary assessment of the distribution line and access roads study area includes the proposed route based on layouts dated January 26th, 2011 as well as an additional 250 m area on either side. The most up-to-date information regarding the proposed connection line and access road options is presented in Annex II-A and Annex II-B.

The initial location of the proposed Four Slide Falls generating station was located approximately 1.5km upstream of its current location. In early 2011, Xeneca identified the larger natural feature at the current location which has resulted in a shift in the project site and study area. Additionally, the downstream extent of the variable flow reach has been extended from what was initially determined and now encompasses the entire channel downstream of the Four Slide Falls to the river outlet at McCarthy Lake 4 km downstream due to the proposed modified run-of-river operating strategy.

Field investigations were conducted for this proposed project in 2009, 2010 and 2011 and include the updated dam location and the full extent of the variable flow reach associated with the proposed operating strategy.

Xeneca has committed to a 2011 acquisition strategy for the natural heritage environment data and information required for the previously unstudied area. A copy of the 2011 work plan is appended to the Natural Environment Characterization Report provided in Annex III of this document.

The detailed findings of the field investigations to date are provided in Annex III of this document. A brief summary of the findings are presented below.

2.9.2 Terrestrial Habitat and Species

The Four Slide Falls study area is dominated by alternating maple-hardwood and coniferous communities. A total of 9 ecosite types were identified within 120 m of the proposed development activities and inundation area: 5 forest communities, 1 shrub community and 3 wetland communities. No significant vegetation species are known to exist in the area.

According to the Ontario Breeding Bird Atlas, a total of 96 bird species have the potential to regularly occur and/or breed within the vicinity of the study area. Field observations in 2010 confirmed the presence of 58 bird species. Of these, 29 species demonstrated potential breeding evidence, and 26 species displayed probable breeding evidence. Two species were confirmed to be breeding in the area (Sandhill crane (*Grus canadensis*) and ruffed grouse (*Bonasa umbellus*)). One species, the turkey vulture (*Cathartes aura*) was observed but exhibited no evidence of breeding. During surveys in 2011 a total of 72 bird species were observed with 53 demonstrating possible breeding evidence and 5 demonstrating probable breeding evidence. Four species demonstrated confirmed breeding evidence including the Canada goose (*Branta canadensis*), swamp sparrow (*Melospiza georgiana*), American robin (*Turdus migratoius*) and the common merganser (*Mergus merganser*). The chimney swift (*Chaetura pelagica*), a significant bird species, was observed during the 2011 breeding surveys.

The MNR identified two significant bird species, peregrine falcon (*Falco perigrinus*) and bald eagle (*Haliaeetus leucocephalus*), as potentially being present within the study area. The Ontario Breeding Bird Atlas identified two other significant bird species, Canada warbler (*Wilsonia candensis*) and Eastern whip-poor-will (*Caprimulgus vociferus*), from the vicinity of the study area. No Eastern whip-poor-wills or other nocturnal birds were observed during targeted nocturnal surveys completed in June 2011.

Twenty-two herpetofauna species are located within the vicinity of the study area. Five species of frogs and toads were observed during field surveys during the spring and summer of 2010, all of whom are common species with secure populations. Four significant species can be found within the study area: the common snapping turtle (*Chelydra serpentina serpentina*), Blanding's turtle (*Emydoidea blandingii*), northern map turtle (*Graptemys geographica*) and eastern milksnake (*Lampropeltis t. triangulum*). Blanding's turtle trapping, visual surveys and habitat assessments were completed in May and June 2011 in order to determine the potential for Blanding's turtles to be present within the study area. While no Blanding's turtles were directly observed, preferred habitat for the species is present and a Blanding's turtle was observed within the study area for the proposed McCarthy Chute site, 5.5 km downstream of the Four Slide Falls generating station.

Thirty-two mammal species have been identified as being potentially present within the study area. Evidence of five species was observed during field visits, all of whom are common species

with secure populations within Ontario. The MNR Site Description Package and the Ontario Mammal Atlas indicated that significant mammal species, the eastern cougar (*Puma concolor*) and the northern long-eared bat (*Myotis septentrionalis*), may be present in the study area, although these were not observed during field visits.

For a full description of the results of the terrestrial ecological assessments, including complete lists of all documented species and assessment methods, please refer to the Natural Environmental Characterization and Impact Assessment Report which is appended to this document as Annex III.

2.9.3 Aquatic Habitat and Species

Walleye spawning surveys were conducted in the spring of 2009. Although no eggs were found on the deployed egg mats, young-of-the-year Walleye were observed at the outlet of Pecors Lake. Based on the revised location of the generating station, further Walleye spawning surveys were conducted in May of 2011. Walleye eggs were collected from mats 750 m downstream of Four Slide Falls and this area is considered to be viable Walleye spawning habitat; however no Walleye were directly observed.

Summer fish surveys were conducted in 2009 and 2010 using Backpack electrofishing. Individuals from 16 fish species were caught: Bluntnose minnow (*Pimephales notatus*), Brook stickleback (*Culaea inconstans*), Central mudminnow (*Umbra limi*), Common shiner (*Luxilus cornutus*), Creek chub (*Semotilus atromaculatus*), Greenside darter (*Etheostoma blennioides*), Pumpkinseed (*Lepomis gibbosus*), Smallmouth bass (*Micropterus dolomieu*), White Sucker (*Catostomus commersoni*), Rainbow trout (*Oncorhynchus mykiss*), Brook Trout (*Salvelinus fontinalis*), Brassy minnow (*Hybognathus hankinsoni*), Eastern Blacknose dace (*Rhinichthys atratulus*), Iowa darter (*Etheostoma exile*), Rock bass (*Ambloplites rupestris*) and a single unidentified young of the year cyprinid.

2011 spring Rainbow Trout Spawning surveys did not identify any spawning activity or redds. While specific spawning locations were not observed on the Serpent River there is an abundance of preferred spawning habitat both upstream and downstream of the proposed dam site and the presence of multiple size classes of Rainbow trout in the fish sampling results demonstrate that spawning and recruitment are occurring.

Aerial surveys to identify potential habitat for Northern Pike were conducted in the spring of 2011 along the length of the Serpent River running from McCarthy Lake to Pecors Lake. Potential spawning habitat was identified along the river within 2.5 km of McCarthy Lake in backwater oxbows and slack water bays. The remainder of the river does not represent Northern Pike habitat and as such spawning potential is very limited.

None of the aquatic species identified though 2009 and 2010 are provincially listed as Species at Risk or of provincial significance. The majority of the fish species are relatively common and are moderately to highly tolerant of environmental change and perturbation, and are widespread in their Ontario distribution. The fish community is composed primarily of generalist species that are not highly dependent on specific habitat requirements for spawning or life history processes. With the exception of Brook trout, which require specific habitat characteristics for spawning and cold, well-oxygenated water for survival, the fish community is typical of cool/warm water temperature regimes, the distribution of which is primarily dependent on flow regime/water levels within the watershed and water temperatures. The Brook trout is the most sensitive species observed within the study area and requires cold well oxygenated water for survival and specific habitat needs for spawning.

Species that are known to occur in Pecors Lake, and which have a high potential to also inhabit the Serpent River, include Lake trout (*Salvelinus namaycush*), Yellow perch (*Percas flavescens*), Burbot (*Lota lota*), Lake whitefish (*Coregonus clupeaformis*), Cisco (*Coregonus artedi*) and Brown bullhead (*Ameirurus nebulosus*).For a full description of the results of the aquatic ecological assessment, including complete lists of all documented species and assessment methods, please refer to the Natural Environmental Characterization and Impact Assessment Report which is appended to this document as Annex III.

2.9.4 Other Wildlife

Field visits confirmed the presence of one additional wildlife species within the study area: the silver bordered fritillary (*Boloria selene*), a common butterfly species in Ontario with a secure population. The MNR Site Description Package also indicates the possible presence of monarch (*Danaus plexippus*), a species of Special Concern, within the study area. However, monarch were not observed during field visits, and based on their habitat requirements, are unlikely to be found within the study area.

2.9.5 Valued Ecosystem Components

Several wildlife species and habitats identified through the evaluation of the natural environment within the Four Slide Falls study area are considered key environmental components (also referred to as Valued Ecosystem Components (VECs)) based on their socioeconomic value. These species or habitats are summarized below and described in detail within Annex III of this document.

It should be noted that while Northern pike were initially identified as a VEC, it was determined, at a June 9, 2011 scoping meeting, that Northern Pike are considered an introduced species on the Serpent River and should not be considered a VEC nor should they specifically be managed for.

Walleye

Walleye populations on the Serpent River represent a VEC as they are a targeted species for recreational and subsistence fishing. Found in both lakes and rivers, they are tolerant of a broad range of environmental conditions.

During field studies in 2009 and 2010, three Walleye were observed directly downstream of Pecors Lake in a large deep backwater pool, but none were observed throughout the rest of the river down to McCarthy Lake. It is possible that these Walleye were merely washed downstream from the lake, as the Serpent River down to McCarthy Lake is not considered to have ideal habitat conditions for this species. In 2011, Walleye eggs were captured in egg mats 750 m downstream of the Four Slide Falls site though no adults were observed. Preferred spawning substrates are present within the Serpent River however additional habitat requirements (water depth, clarity, etc.) are not present. Isolated individuals present within the river are likely those flushed downstream from Pecors Lake and it is unlikely that a self-sustaining Walleye population is present within the study area.

Brook Trout

Brook trout populations are considered a VEC as they are an indicator species for high water quality as well as being a highly esteemed game fish requiring cold, well-oxygenated water for survival. Brook trout prefer to spawn over gravel beds in the shallow headwaters of streams though spawning may also occur in the gravely shallows of lakes or over sandy bottoms with groundwater upwelling. Preferred spawning habitat appears to be present within the Serpent River though the population of Brook trout is not well understood. A new hydroelectric generating station has the potential to impact trout spawning habitat through changes in water depths and velocities over spawning habitat within the inundation area.

Rainbow Trout

During the 2009 and 2010 sampling program, Rainbow trout (both adult and juvenile) a VEC, were observed both upstream and downstream of the proposed dam site. The Four Slide Falls study area is considered to be supporting a self-sustaining Rainbow trout population. Rainbow trout are often targeted in recreational and subsistence fishing. Tributaries located within the Four Slide Falls study area are insufficient to support Rainbow trout spawning. As a result, spawning, development, foraging and thermal refuge takes place within the main river channel.

Lake Trout

Lake trout populations downstream of the site within McCarthy Lake represent a VEC for the project as they are a commercially and recreationally important species. While the Serpent River

downstream of the proposed facility lacks the required habitat characteristics to support Lake trout, the project has the potential to affect the quality of water entering McCarthy Lake which is known to have a healthy self-reproducing Lake trout population.

2.9.6 Endangered and Threatened Species

For the purposes of this assessment, SAR are considered to be those species listed as Endangered or Threatened on the list of Species at Risk in Ontario. These species and their general habitats are afforded protection under the *Endangered Species Act*, 2007. The status of these species under the federal *Species at Risk Act* is also noted.

Peregrine Falcon

The peregrine falcon is recognized as being threatened provincially, the individuals and their general habitat are protected under the *Endangered Species Act*. While not protected under the *Species at Risk Act*, the species is of Special Concern federally. Their habitat is considered to be Significant Habitat of Endangered and Threatened Species (OMNR 2010). The peregrine falcon nests on rock cliffs and crags, especially when situated close to water, which are not present within the study area. No observations of peregrine falcons were made during any of the field investigations completed in 2009, 2010 or spring 2011.

Eastern Whip-poor-will

The eastern whip-poor-will is listed as Threatened at the national level but is not listed on Schedule 1 of *SARA* and is not afforded protection under the Act. Their habitat is considered to be Significant Habitat of Endangered and Threatened Species (OMNR 2010). However, the species is threatened provincially, affording individuals and their habitat protection under the *ESA*. While suitable interior forest habitat for the species is present within the study area, during species specific surveys eastern whip-poor-will were not observed.

Chimney Swift

Chimney swift is listed as threatened provincially and nationally, affording individuals and their general habitat protection under the *ESA*. Their habitat is considered to be Significant Habitat of Endangered and Threatened Species (OMNR 2010). Chimney swifts are generally associated with urban areas near buildings; however they have been known to nest in hollow trees and rock crevices (OMNR 2000). During the 2011 breeding bird survey, chimney swifts were seen on multiple occasions throughout the study area in small groups.

Blanding's Turtle

The Blanding's turtle is designated as Threatened both nationally and provincially. It is listed on Schedule 1 of *SARA* and individuals of the species and their general habitat are afforded protection under the ESA. Its habitat is considered to be Significant Habitat of Endangered and Threatened Species (OMNR, 2010).

Based on its preferred habitat it is possible that Blanding's turtle are present within the study area though it was not observed directly. A single Blanding's turtle was observed within the study area of the McCarthy Chute project site, located 5.5 km from the Four Slide Falls project area.

Eastern Cougar

The SDP indicates that eastern cougar may be present within the study area. Insufficient data ("Data Deficient") at the national level has resulted in the eastern cougar having no national status, or protection under *SARA*. Provincially, eastern cougar is designated as Endangered, affording individuals and their general habitat protection under the *ESA*. Their habitat is considered to be Significant Habitat of Endangered and Threatened Species (OMNR 2010). Eastern cougar are extremely rare in Ontario. Cougars have vast home ranges, and can travel over 1,000 km (OMNR 2010). Based on their ranging habits, it is possible that eastern cougar could be present within the study area. Eastern cougar were not observed within the study area.

Monarch Butterfly

The SDP indicates the possible presence of monarch within the study area. The monarch is listed as species of Special Concern both nationally and provincially. Species of Special Concern are of conservation concern, and their habitats are considered to be Significant Wildlife Habitat under the PPS (OMNR 2010). Monarch is not afforded protection under either the federal *SARA* or the provincial *ESA*. Based on their habitat requirements, monarch is unlikely to be found within the study area and none were observed.

2.9.7 Significant Wildlife Habitats

The project team has identified species of conservation concern candidate and confirmed significant habitats in accordance with the Significant Wildlife Habitat Technical Guide (OMNR, 2000). Specific discussions and rationale for the selection of these habitats are provided in Annex III. Based on the evaluations completed to date, the following candidate wildlife habitats have the potential to exist within the study area. Further work is required to assess the significance of these habitats.

- Snake Hibernacula;
- Canada Warbler Nesting and Foraging Habitat;
- Common Snapping Turtle Habitat;
- Northern Map Turtle Habitat;
- Eastern Milksnake Habitat; and
- Northern Long-eared Bat Habitat.

Based on the evaluations completed to date, the following confirmed wildlife habitats have the potential to exist within the study area;

- Osprey Nesting, Foraging and Perching Habitat
- Bald Eagle Nesting and Foraging Habitat;

This habitat has been confirmed as existing within the project study area based on observations of osprey and bald eagles within the project area and the strong likelihood that these species were using the Serpent River for foraging.

2.10 CULTURAL HERITAGE

A Stage 1 Archaeological Impact Assessment was completed for the proposed project by Woodland Heritage Services (WHS) to gain an understanding of the cultural heritage of the area. The report is appended in Annex V. A summary of key findings is presented below.

The location of the proposed dam at Four Slide Falls, as with most sites with waterpower potential, was determined to have high archaeological potential due to its proximity to a major water source and the existence of rapids. In the past, rapids would certainly have required river travellers to go around the rapids by means of a portage. It is therefore reasonable to assume that a portage trail exists at this location on one or both sides of the river.

2.10.1 Archaeological Sites

The registered site database maintained by the Ontario Ministry of Culture (MTC) indicated that there are no registered archaeological sites in or near the project area. However, in MTC's checklist for determining archaeological potential, areas in northern Ontario within 150 m of a major water source are considered to have high cultural heritage potential.

There are no previous archaeological studies on record for the project area. It is important to note, however, that the lack of archaeological studies does not indicate or suggest that there is no archaeological or cultural heritage potential within the project area. Rather, it should be interpreted to mean simply that no archaeologist has conducted a study in this area.

It was recommended by WHS that Stage 2 archaeological assessments take place at the location of the proposed Four Slide Falls hydropower development on the Serpent River. It was also recommended that Stage 2 field surveys be completed in other areas of high potential. Additionally, WHS recommended that the relatively gentle shoreline slopes along the Serpent River in the area to be inundated be subjected to a Stage 2 assessment.

It is also recommended that once the final location of new electrical connection corridors and any areas that will be disturbed as a result of construction be subject to Stage 2 assessments if they are determined to have high archaeological potential.

2.10.2 Buildings and Structures

Based on the results of the Stage 1 Archaeological Assessment, the potential for the presence of built heritage structures within the project area is expected to be negligible. This expectation will be confirmed through the Stage 2 Archaeological Assessment.

2.11 Current Land and Water Use

2.11.1 Access

Access to the project site is relatively limited. Several tertiary roads approach close to, but do not reach the site itself. The main public access to Pecors Lake upstream of the site is from Nordic Mine road. The road is also part of an ATV/Snowmobile trail route.

2.11.2 Navigation

The Serpent River between Whisky and Pecors Lakes and downstream is an official canoe route and a navigable waterway as defined under the *Navigable Waters Protection Act*. The Act prohibits construction in navigable waters unless an Approval is issued for the undertaking for the site, work and plans. Based on the observations of consulting team personnel during field studies, the stretch of river between Pecors and McCarthy presents multiple barriers to recreational navigation including high flows debris, shallow water, waterfalls and rapids. No portages around these features were noted. A discussion of recreational use and navigability of the Serpent River between Pecors and McCarthy Lake is provided in Annex VI.

2.11.3 Recreation Use and Commercial Tourism

The Ministry of Natural Resources has identified the Serpent River as a recognized canoe route (identified in Appendix A-2). Depending on the flow conditions, the Four Slide Falls site is travelled by watercraft. However, given the general barriers to navigation presented in Section 2.11.2, recreational navigation is sporadic and dependent on flow conditions. A discussion of

recreational use and navigability of the Serpent River between Pecors and McCarthy Lake is provided in Annex VI.

The main access road to Pecors Lake is also part of an Ontario Federation of Snowmobile Clubs (OFSC) trail and is maintained by OFSC members during the winter months. The trail may also use or cross Pecors Lake road along part of its length closer to the project site. The trail and roads may also be used for recreational all terrain vehicle (ATV) use and the City of Elliot Lake has an organized ATV club with an interest in the area.

The City of Elliot Lake has also identified a site on Pecors Lake as a potential location for a cottage lot development.

2.11.4 Forestry

The main commercial activity in the general area of the project is forestry and forestry activities are scheduled to be conducted in the immediate vicinity of the project area before 2015. The forest resources on Crown land adjacent to the site are currently allocated under a Sustainable Forest License to Northshore Forest Inc. (Eacom) (Northshore Forest Management Unit) and are managed under the Northshore Forest Management Plan (FMP). The FMP describes the project area as consisting of predominantly intolerant hardwood and mixed woods with limited stands of white and red pine.

2.11.5 Hunting/Fishing Opportunities

Common species hunted in this region include black bear, moose, deer, duck, partridge and grouse.

Major sport fish documented in the Serpent River include Smallmouth bass and Northern pike. The McCarthy Lake Management plan also identifies Lake trout, Whitefish, Yellow perch and Walleye as present in both Pecors and McCarthy lakes.

2.11.6 Trapping and Baitfish Harvesting

Commercial trapping, bear management areas and baitfish harvesting are all identified activities within the project area.

The site is located within a registered trap line area (BL-084).

The site is located within two Bear Management Areas BL-37-028 and EP-37-044, see Appendix A-2 for location or refer to the BMA map provided in the Supplemental Information folder.

Finally, there are also two registered commercial bait fish harvesting areas for Joubin and Gaiashk townships (Appendix A-2).

2.11.7 Protected Areas

There are no protected areas in the immediate vicinity of the proposed project however Four Slide Falls is located within an Enhanced Management Area; E222r: Serpent River, as per the MNR's Crown Land Use Policy Atlas. The primary intent of this area is to protect recreational and natural values along the river while permitting compatible resource use (MNR, 2005). The site is adjacent to the Enhanced Management Area E232a: Whiskey – Quirke Lakes. According to the MNR's Policy Report the area will be managed with consideration to remote lake tourism, recreation and resources. Traditional uses such as hiking, climbing, canoeing, hunting, angling, trapping and wildlife viewing will be encouraged. Timber extraction, mineral exploration, mining and aggregate extraction activities will be permitted provided that long term, all season or year-round public access is not improved (MNR, 2006b).

2.11.8 Mineral Resources

There is a renewed interest in mining and mining exploration in the area mainly resulting from the high prices for metals, particularly uranium, and there is the potential for increased mining activity in the near future.The Four Slide Falls project falls within an active mining claim owned by Pele Mountain Resources (Debicki, 2010).

2.11.9 Aboriginal Land and Water Use

Reserves, Communities and Land Claims

The MNR Site Description Package indentified the following First Nations and Aboriginal communities for consultation with respect to possible Business to Business Relationships, Serpent River First Nation, Mississauga First Nation and the Sagamok Anishnawbek First Nation. Local Aboriginal communities that may have a preliminary interest or concern with the proposed project as identified through correspondence include the North Channel Métis Council and the Métis Nation of Ontario.

There are no Reserves in the immediate vicinity of Four Slide Falls. The closest Reserve is the Serpent River Reserve located approximately 14 km southwest of the project. According to data obtained from Aboriginal Affairs and Northern Development Canada's website, the reserve covers an area of 10,879 hectares.

Spiritual, Ceremonial, Cultural and Burial Grounds

All waterways are viewed in traditional Aboriginal culture as the 'veins or lifeblood of Mother Earth'. Water quality and water ecosystem health and function are typically mentioned as concerns by Aboriginal people in relation to natural resource management and development projects.

Xeneca has engaged with Aboriginal communities from the onset of the project and continues to do so. Our work in engagement continues and it is considered very important by Xeneca.

Information on the engagement of members of the Aboriginal communities during the project development is provided in Section 4.5.

To date no environmental information specific to lands and water has been provided by individual Aboriginal community members. Xeneca is working to complete agreements with Serpent River FN and has a signed MOU with the Sagamok Anishnawbek First Nation. These agreements are important mechanisms that support First Nation input into EA consultation. Engagement continues with Mississauga FN.

2.12 SOCIAL AND ECONOMIC

The Statistics Canada 2006 Population Census lists the population of the City of Elliot Lake to be 11,550 persons. The Stats Can census tabulated a population change in Elliot Lake between 2001 and 2006 of -3.4 % (compared with the Ontario average of + 6.6%). The population of the city began declining well before 2001 and has been declining for the last 20 years.

The Statistics Canada 2006 Population Census determined the population for the Serpent River Indian Reserve to be 340 persons, with a 5.3% increase in population between 2001 and 2006.

2.12.1 Employment & Economic Setting

The Elliot Lake area is in a state of economic recovery due in large part to tourism and construction industries. There is also an increased interest for the development of mining in the region. Despite this growth, the unemployment rate is more than twice the provincial average.

The Statistics Canada 2006 Population Census reported employment rates of 33.2 and 29.4% for the City of Elliot Lake and the Town of Spanish, respectively, compared to a provincial employment rate of 62.8%.

The City of Elliot Lake was created in 1955 following the discovery of a large uranium ore body. The mines in this area produced most of the world's uranium until interest in uranium declined with the end of the Cold War (City of Elliot Lake, 2010). Since the end of operations at its last

mine in 1996, the city has diversified its economy, focusing on its retirement living program, substance abuse treatment centre, tourism industry and forest products harvesting (MAH, 2007). The city's residents currently have access to health care, emergency services, a transit system, municipal infrastructure and recreation opportunities (MAH, 2007).

The major industries in the Town of Spanish are agriculture, mining, logging, construction, commercial fishing and tourism. Tourism is currently the main source of employment in the town, running year-round, with sport fishing, hunting, snowmobiling and bird watching being some of the major attractions (Corporation of the Town of Spanish and the Spanish Public Library, 2005).

2.12.2 Water Supply

As noted in Section 2.7, a search of the Ministry of Environment's electronic Water Wells database did not return any well records within a 1 km radius of the project site. An October 2010 land title search in the vicinity of the project area noted that there are no private lands in proximity to the project area. Therefore, permanent or seasonal domestic water supplies that might draw from the Serpent River as a source are non-existent.

The river, both upstream and downstream of the project site is used predominantly for recreation (fishing, swimming, boating, etc). It is possible that recreational users are taking river water for personal consumption.

2.12.3 Area Aesthetics

The area has been used for many years by residents of the region for various recreation activities and nature appreciation. The Four Slide Falls area and the Serpent River itself are valued based on their provision of recreational and tourism opportunities.

3. DESCRIPTION OF PROPOSED PROJECT

This section provides a description of each element of the proposed development. The reader is referred to Annex II for diagrams showing relevant features of the development.

The intent and purpose of the Environmental Assessment planning process is to describe the project and its potential impacts on the natural, social and economic environment, to determine suitable mitigation measures (i.e. project design modifications) which can reduce or eliminate negative impacts, and to identify suitable compensation measures for impacts that cannot be mitigated. The process is meant to inform and enhance the project plan through investigation and consultation with stakeholders, First Nations and the general public. At the time the

Environmental Assessment is undertaken, preliminary project information is presented to ensure that stakeholders are informed about the general scope and extent of the project, particularly as it relates to understanding how the project may impact other uses of the river and the environment. At this stage conceptual plans for the project have been developed. Detailed engineering design and specification work will occur after the Environmental Assessment is completed.

The proponent necessarily reserves the right to variances between the conceptual design presented herein and the final detailed engineering design, provided that such variances do not materially and negatively impact the environment beyond the scope of the impacts described herein.

Possible variances from conceptual to final design include:

1. Detailed design may incorporate changes that are specifically meant to address and/or accommodate stakeholder issues agreed to during the consultation process.
2. Construction materials may vary from those shown on conceptual drawings. Earth material may be interchanged with concrete or steel material as required in the final engineering design. Where alternative material is specified, volumes and footprints may be adjusted to reflect safe engineering design requirements.
3. Physical sizes and orientation of structures.
4. Physical size of construction site areas may be adjusted where it is required for safe site management.
5. Specifications of mechanical and electrical equipment may vary, including the physical size, number of units, and total rating.
6. Design specifications for protection of fish, such as inflow velocities and inlet spacing of trash racks.
7. The powerhouse angle and alignment may be adjusted. The location of spillway and powerhouse structures may be adjusted along the dam axis to optimize engineering design and safety.
8. Road and connection line routes may be refined.

3.1 Description of Proposed Hydroelectric Facility

Xeneca is proposing to construct a hydroelectric facility at the Four Slide Falls site, located on the Serpent River, approximately 15 km east of Elliot Lake, 7 km downstream of Pecors Lake and 4 km upstream of McCarthy Lake (Figure 1).

The proposed project at Four Slide Falls would utilize a gross head of 28.5 m. The conceptual development for the facility incorporates a spillway dam that will direct flow from the river to an intake structure which will conduct water through one or more turbines with a total nameplate rating of 7.3 MW.

A road upgrade as well as new road construction will be required to access the site.

A 44 kV connection line would extend approximately 6.5 km from the Four Slide Falls GS west to Highway 108. The line will then travel northwest for 8.8 km along the Highway to its point of connection at the Elliot Lake TS. Power line and access road mapping is detailed in Annex II-B.

3.2 Design Options and Rationale

Due to the regional topography and shoreline profile at the site, only a single design option has been considered for the facility and connection line.

3.3 Generating Station Components

The following is a description of the generating station components. The reader is referred to Annex II-A for conceptual engineering drawings in support of the information detailed below. It should be noted that final engineering drawings for the components of the proposed undertaking must be submitted for applicable regulatory approvals prior to issuing of provincial permits to construct and federal authorizations. The details presented below are based on conceptual engineering design calculations and subject to some modification at the final design stage.

3.3.1 Installed Capacity and Annual Energy Output

The approximate installed capacity of this project will be 7.3 MW and will provide approximately 17,600 MWh of renewable energy annually. The production of 17,600 MWh of renewable energy represents the equivalent of:

- The displacement of 12,136 metric tons of carbon dioxide equivalent; or
- The annual greenhouse gas emissions from 2,380 passenger vehicles; or
- The sequestering of carbon from nearly 1047 hectares of pine or fir forests.

3.3.2 Headworks Structure

The proposed headworks structures will include two concrete dams. The main dam will be 137.5 m in length while the auxiliary dam will measure 140 m in length. The main spillway dam and intake structure will have a combined footprint of 1900 m^2. The auxiliary dam will have an approximate footprint of 4500 m^2.

The dam and embankment may be constructed from any or all of the following materials within the engineering constraints for the same; reinforced concrete; RCC – rolled and compacted concrete; earthen/stone, clay and 'rubber' (impermeable barriers). Typical construction will 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 water conveyance routing.

3.3.3 Intake and Conveyance System

A 300 m^2 area upstream of the powerhouse will be excavated for the facility intake. The excavation will start approximately 30 m upstream of the powerhouse and slope down to reach an approximate elevation of 266 masl at the intake.

A penstock measuring approximately 163 m in length will convey water from the dam to the powerhouse.

3.3.4 Powerhouse

The proposed powerhouse will have a footprint of approximately 200 m^2. The powerhouse will be constructed with reinforced concrete floors and walls to a level above the historical flood level. Construction above this defined line can be reinforced concrete, insulated steel panels or a combination of the two based on physical needs and constraints. The water passage within the powerhouse will be constructed from a combination of concrete and steel conduits.

3.3.5 Turbines

Turbine selection is based on the project site head, flow and economics. In instances of low head and intermediate to large flows, Kaplan, Propeller or Cross Flow (Banki-Ossberger) type turbines are deemed most efficient. For very low heads, a horizontal Kaplan is the preferred option as it requires less excavation than the vertical turbine and can maximize turbine efficiency over a wide range of flows. Regarding additional economics of the turbine selection, cost varies directly with the maximum operating flow, but because a large component of cost is fixed for a development regardless of the flow, an optimum size results through balancing the cost versus the revenue generated from turbines of various sizes (diameters).

Based on the rationale described above, a horizontal or vertical Kaplan turbine will be selected for the Four Slide Falls site due to the available head (28.5 m); intermediate flows (Long Term Annual Flow 9.5 m^3/s) and economic concerns.

3.3.6 Tailrace

Due to the layout of the site and the conceptual design of the facility, the expected requirements for the excavation and construction of the facility tailrace are minimal. As a result, the tailrace footprint and construction requirements have been combined into the construction of the powerhouse

3.4 ANCILLARY WORKS

The following describes the ancillary works proposed for the project.

3.4.1 Connection Line Route

A Connection line Summary Report for Four Slide Falls has been prepared and is included in this document in Annex II-B. A summary of the report is provided below.

The preliminary connection line route was prepared based on the location of the facility. The point of common coupling (PCC) and the point of connection (PC) are identified in the conditionally approved FIT application. The proposed line location was then overlain with assembled values layers and a summary of the potentially impacted values was compiled and summarized. Data layers used for this exercise included:

- Land Information Ontario dataset
- NRCan Topographic data
- 2008 Forest Resource Inventory data
- Medium resolution SPOT panchromatic orthoimagery from Natural Resources Canada
- NRVIS Data Layers (circa Feb 2011)

Consultation with the Sustainable Forest Licenses holders linked to the project was also undertaken and most of the license holders provided GIS datasets including all road networks, planned harvest block locations and aggregate pit locations.

The line route was reviewed using all available information and revised where appropriate in an effort to:

- reduce environmental impact (i.e. streams & wetland crossings);
- minimize landscape footprint and fragmentation;
- coincide with existing road corridors; and
- reduce total line length.

A 44 kV connection line would extend approximately 6.5 km from the Four Slide Falls GS west to Highway 108. The line will then travel northwest for 8.8 km along the Highway to its point of connection at the Elliot Lake TS. The total line length is approximately 14.7 km, of which 56% will be along pre-existing roads. The line would require four water crossings along Highway 108 and four new crossings along new corridor on crown land. The line would also skirt 3 wetlands. While the majority of the line route is located on crown land the line will cross approximately 5.4 km of patent land.

Further operational ground truthing of specific sensitive areas of the proposed lines and access routes is planned following the processing of digital aerial photography captured in fall 2011.

3.4.2 Electrical Substation

A 44 kV transformer substation will be required and located adjacent to the powerhouse in the powerhouse yard. The transformer area will be surrounded by security fencing.

3.4.3 Access Roads

Access road planning to the project site was determined in close consultation with the forest management companies which hold Sustainable Forest Licenses (SFL) for the project area. The goal is to merge Xeneca's road access needs with the SFL holder's current and future operational access plans and develop with the forest management companies a long term cost sharing and road maintenance plan. Further consultation with government agencies will be required to ensure that regional and provincial access policies and guidelines are met.

Access to the Four Slide Falls project will be constructed using existing access roads and trails with a minimum amount of new construction. Approximately 21 km of existing mining/logging roads will be used to access the area from Highway 17. The existing road will require some surface upgrade work and potentially drainage improvements to allow the roads to accept construction traffic. A review of the loading capacity of any existing bridges will be required.

From the end of the 21 km logging road, an additional 10 km of trail initially leading NE leads to within 5 km of the Four Slide Falls project site. A 4 km ATV/snowmobile trail leads from here to within 1 km of the site and it is expected that this trail will require significant surface improvements and possibly water crossing works to accept construction traffic. A new access road will need to be built along the final 1 km to access the project site.

Access to the non-powerhouse (west) side of the river will be made available through a temporary bridge and approximately 500 m access road. These temporary works will be removed after construction of the main dam and spillway and auxiliary dam are completed.

New road construction will require the clearing of a 10 – 30 m ROW. Access road details are provided in Annex II-B. It is planned that the majority of new and upgrade road construction will be conducted using excavators, haul trucks and other earth moving equipment. Some drilling and blasting may be required, depending on the bedrock elevation.

3.4.4 Other Civil Works

There is an existing forest access road bridge across the Serpent River at the outlet of Pecors Lake, approximately 6.9 km upstream of the proposed development site at the upper extent of the inundation area. The road forms part of the TransCanada Trail and the bridge is maintained by the Elliot Lake Snowbirds snowmobiling club.

3.5 CONSTRUCTION STRATEGY

The following is a summary of the construction activities and temporary works required during the construction of the project. A construction management plan, including conceptual drawings, has been prepared and is presented in Annex II-C. It should be noted that final engineering details for these temporary works will be submitted for applicable regulatory approval in advance of the construction stage of the undertaking. The details presented below are based on conceptual engineering design calculations and subject to some modification at the final design stage.

Site preparation activity will commence in May 2012. Construction of the proposed facility is scheduled to take place between 2012 and 2014 with commissioning of the facility anticipated by October 2014. Under the terms of the FIT contract awarded to Xeneca, the facility must be commissioned no later than October, 2014.

Tentative dates for the commencement and completion of various project components are presented in Table 1:

Table 1: Project Component Construction Schedule

Component	Dates	
Roads and Bridges	Start	May 2012
	Finish	August 2012
Powerhouse	Start	Sept 2012
	Finish	April 2013
Control Structures	Start	Sept 2012
	Finish	Feb 2013
Intake and Penstock	Start	Oct 2012
	Finish	Feb 2013
Connection Line and Associated Components	1st Phase	Jan 2013 to Mar 2013
	2nd Phase (if required)	Jan 2014 to Mar 2014
Civil/Mechanical Equipment	Installed	June 2013
Water-to-Wire Equipment	Installed	Dec 2013
Final Construction and Commissioning	Finish	Jan 2014 to Sept 2014
FIT Contract Operation Date	-	Oct 12, 2014

The following construction stages are proposed for the construction of the generating station and its appurtenant facilities:

- clearing and grubbing of the site, including work area and laydown areas
- road upgrades and construction of new permanent road access;
- construction of phase 1 cofferdams (intake and powerhouse);
- construction of portion of main dam (intake) and penstock as well as powerhouse and excavation of tailrace;
- construction of temporary road access and bridge;
- removal of phase 1 cofferdam at intake
- construction of auxiliary dam and phase 2 coffer dam opposite intake to direct flows through intake;
- completion of main dam and spillway;
- complete penstock, mechanical/electrical work in powerhouse
- construct substation and connection line
- reclaim temporary access road and bridge
- removal of cofferdam at main dam and spillway;
- close intake gate and fill headpond
- remove remaining cofferdams and temporary works
- facility commissioning
- site rehabilitation

Construction will be initiated once all applicable regulatory approvals and authorizations have been issued. The construction program will be advanced to meet the requirements of relevant legislation, industry guidelines and best management practices aimed at ensuring the highest level of protection of the environment. Specific proposed mitigation measures that will be integrated into the site's construction strategies are presented in Section 5 and explained in further detail throughout the supporting Annexes of this report. In-water construction related timing restrictions will be stipulated by the regulatory agencies during the permitting and approvals stage. Some general construction strategies are presented below.

3.5.1 Clearing and Grubbing

Trees cut within the inundation area and along the ROW for the connection line and access roads right-of-way will have their roots left intact wherever possible.

Merchantable timber will be segregated for removal by the sustainable forest license holder within the area to be inundated, along new access road corridors and along the connection line route. Clearing will be managed in accordance with applicable forestry management guidelines and best management practices. All clearing of timber will conform to the *Crown Forest Sustainability Act*, The Forest Operations and the Silviculture Manual.

3.5.2 Aggregate Borrow and Laydown Areas

Project construction will require use of granular materials for roads, embankments, cofferdams and backfill which will be primarily sourced from re-used granular material created during road construction and site excavation. The volume of material required is not yet known and will depend on final engineering design. No specific borrow areas have been identified though observation of road cuts indicated that sand and gravel deposits are located within proximity to the site though it is expected that road construction and excavation will be plentiful. Geotechnical testing of materials will determine if they are suitable for engineering purposes. Should additional borrow material be required, additional blast rock material could be generated by extending excavation areas for foundation or powerhouse excavations. It would be preferential to consider borrow areas upstream of the Four Slide Falls project within the extent of the headpond to reduce costs associated with clearing and reclamation of the borrow pit.

A 1000 m^2 laydown area will be cleared to service the primary worksite of the intake/powerhouse and the penstock. This area will be used for construction material and equipment storage, offices and parking. An additional 1000 m^2 laydown area will be located on the opposite side of the river adjacent to the auxiliary dam. An additional stockpile area(s) up to 5000 m^2 will be created for the permanent storage of unsuitable overburden materials that are not used in the construction phase.

3.5.3 Cofferdams

Cofferdams will be required to allow for the construction of all components which are below existing or final water levels. Drawing No. 10-151, in Annex II-C identifies the proposed cofferdam locations.

Cofferdams will be constructed of cargo bags filled with clean, granular material re-used from excavation activities and/or transported to site in trucks or trailers (see Annex II-C, Drawing 00-151). They are installed using an excavator and/or a crane to place the bags sequentially in the river. Cofferdams will be between 40 to 80 metres long with footprints that will depend on the height of elevation of the dam required to manage the 1:20 year flow rate and the depth to suitable substrate within the river.

3.5.4 Dewatering

Water that accumulates behind the cofferdams will be discharged in accordance with the *Environmental Protection Act*. Category 2 Permits to Take Water (PTTW) and Certificates of Approvals for Discharge of Sewage Waste Water to the environment will be required from the Ministry of the Environment prior to the initiation of in-water construction activities.

3.5.5 Excavation of Powerhouse and Tailrace Canal

Excavation for the powerhouse and tailrace will be completed using appropriate methods. Tailrace excavation at the intersection with the river will be completed within the in-stream work window. The excavation will be carried out from the powerhouse working towards the water course so that flowing water does not infiltrate the cut until the final phase of excavation.

3.5.6 Concrete Production

A concrete batch plant will be required for the production of concrete for the construction of the facility. Once the locations of potential nearby borrow areas are identified a decision can be made regarding the best locations of the concrete batch plant.

3.5.7 Connection Line

The connection line will consist of an indeterminate number of wood poles extending approximately 10 m above the ground surface. The construction of a 20 m (approximate) wide ROW is required for the connection line which will be completed in the least impacting and most cost effective way. As a result, the ROW will run parallel to existing access roads wherever possible. Where this method it unavailable the line will be constructed by tracked vehicles working through the winter as this allows for easier access across frozen ground.

3.5.8 Management of Waste Materials during Construction

Solid nonhazardous construction waste (e.g. material packaging) generated during the construction process will be removed from the site to an approved disposal location.

No gaseous wastes other than construction equipment emissions are anticipated. Industrial liquids such as paints, sealants, fuels and lubricating fluids will be stored in secure containment areas and disposed of in accordance with provincial and federal liquid waste disposal regulations (e.g. *Environmental Protection Act*, *O. Reg. 347*, and *Transportation of Dangerous Goods Act*).

3.5.9 Water Crossings

Access to the project site and Serpent River will be along existing Eacom forest access roads and will require approximately 3 km of new road construction. Upgrades to access roads, including upgrades for drainage (culverts, ditches, etc) may be required to allow for the increased volume of construction related traffic. It is also expected that the connection line route will make four new water crossings as well as crossings at four existing points along its length.

Documentation of the proposed access and connection routes by air photo analysis was completed in summer 2011; a final determination will be made regarding water crossing requirements based on that analysis.

The DFO Overhead Line Construction Operational Statement (v. 3.0, 2007) will be adhered to in order to minimise impacts to fish and fish habitat associated with construction or upgrades to all water crossings.

3.5.10 Construction Camp

It is expected that, based on the distance of the Four Slide Site from Espanola and Elliot Lake, that it will be necessary to house workers at a temporary construction camp during the construction of the Four Slide Falls facility. This camp could also be used to house workers for the construction of the McCarthy Chute project downstream of Four Slide Falls but would likely be located closer to Four Slide as it is expected to involve more workers and materials. The location of the construction camp has not yet been determined and is not pictured on any drawings. It is estimated that the required area for the shared temporary construction camp for the two projects would be approximately 8,000 m^2 to 10,000 m^2. It may also be possible to negotiate with the town of Spanish to secure an appropriate area for the establishment of a construction camp within town limits.

3.6 OPERATION STRATEGY

This section summarizes how the facility will be operated and how the operation will be modified to address potential effects on the river including seasonal considerations, proposed operating rules and target limits. The full draft operating plan for Four Slide Falls is presented in Annex I-C.

The operations strategy is based on the conceptual engineering design and environmental data available at the time of writing and was developed subsequent to data analysis collected through various studies, including:

- Lidar Survey: detailed topographic mapping of the upstream and downstream river reach;
- Conceptual Design: drawings of the structures as conceptually proposed for the project;
- Hydrology Study: an analysis of the natural river flows;
- Bathymetric Study: a field study of water depths upstream and downstream of the project location and a spot measurement of flows required for hydraulic model calibration;
- HEC-RAS Study: a hydraulic engineering model was carried out under separate cover (i.e. a 1-dimentional HEC-RAS model) to better understand the various hydraulic parameters relevant to assess operational and environmental matters;
- Erosion Survey: a desktop analysis of upstream locations that could be sensitive to future shoreline erosion after the project is built;
- Sediment Study: a review of available sediment transport data and an assessment of the potential for sedimentation concerns related to the project;
- Environmental field studies: studies of environmental areas and aspects of interest as documented in other parts of this environmental report.

As the engineering design is finalized and other environmental information becomes available this strategy may be adjusted to ensure that potential impacts are mitigated.

3.6.1 Site Operating Strategy

The electricity generated from this project has been contracted to the Ontario Power Authority under a FIT Contract. The terms and conditions of the FIT Contract encourage the facility to generate electricity between the hours of 11 am and 7 pm (on-peak hours) from Monday to Friday, when needed most in Ontario.

It is proposed that Four Slide Falls will operate as a "*modified run-of-river*" generating facility. Effectively, the operations of the facility would vary between run-of-river and intermittent operation depending on the flows present in the river. This mode of operation takes into account the objective of building and operating the project in an environmentally sensible manner, while trying to achieve the socio-economic objective of generating power when it is needed in the Province.

When natural flows exceed the amount of water that can be passed through the turbine excess water would be bypassed through/over the dam. The combined flow of the water used in the turbine to generate electricity and the water bypassed over the spillway will therefore be equal to the natural flow of the river. This situation occurs primarily during spring run-off conditions and during/after significant precipitation events in the spring, summer and fall.

At low flow periods of the year when natural flows are so low that any available water must be released downstream to protect the environment, flows will be too low to allow for electricity generation. All available water will be passed through/over the dam to maintain aquatic habitat downstream. This situation occurs primarily in late summer and late winter when natural flows are typically very low.

At other times, the facility would "modify" the natural flow in the river by storing some of the natural river flow during off-peak hours to be used during on-peak hours (i.e. intermittent operation) when the need for electricity in the Province is greater.

Modified run-of-river operation would occur during moderate and low flows when the natural flow in the river is significantly below the maximum capacity of the turbines but above the minimum flow required to protect the environment. During these flow conditions, some of the natural river flow during off-peak hours can be saved and used to produce electricity during on-peak hours.

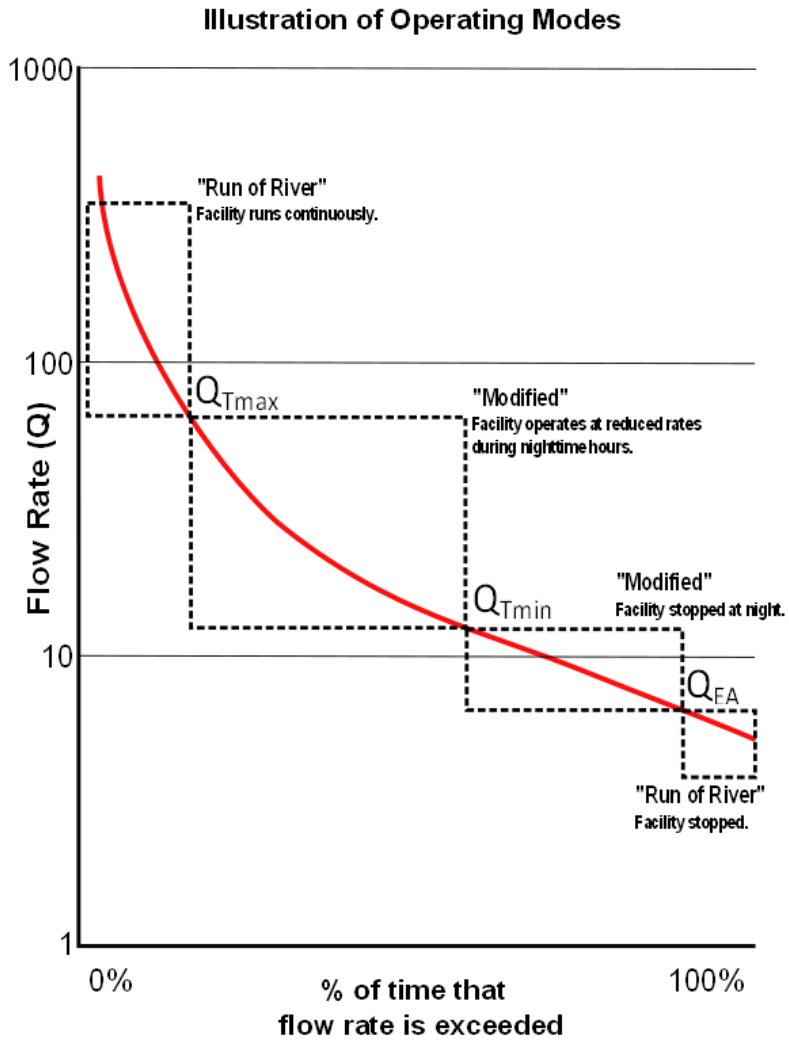
When natural river flows are between the minimum and maximum turbine capacity, the facility runs continuously, but some of the water is saved during off-peak hours. This operation results in downstream flows that are smaller than natural river flows during off-peak hours and larger than natural river flows during on-peak hours when electricity use is higher. It is expected that the difference in flow rate would be up to four times greater during on-peak hours in this operating mode. Downstream flows during the off-peak hours can be reduced to less than half of natural river flows.

When natural river flows are below the minimum turbine capacity, the facility will need to stop operation during some off-peak hours to store water until operation is again possible. The lower the natural river flow, the longer the period of stoppage will be. When the facility operates, it operates at a rate less than maximum turbine capacity. To ensure that the river downstream of

the facility receives enough water flow to protect the environment, an appropriate amount of water is released through a bypass while the turbine operation is stopped. Typically, the facility operation will be stopped at night to allow the head pond to fill in preparation for the following day.

Figure 3 below illustrates the mode of operation that occurs depending on the amount of natural flow in the river.

Figure 3: Modes of Operation



An important factor in modified run-of-river operation is the availability of water storage upstream of the facility. Based on the dynamic modeling (HEC-RAS) of the river channel completed to date, The Four Slide Falls facility may result in inundation and backwater effects up to 6.8 km upstream of the dam to Pecors Lake.

To achieve the objective of building a project with limited environmental impact, the conceptual design of the facility limits the height of the dam structure, and therefore the depth and the area of inundation upstream. Consequently, the amount of storage available for operation is inherently limited in relation to the natural flow in the river, thereby limiting the storage to less than 48 hours during moderate and low flows. The ability to use this storage is further controlled by environmental constraints outlined in other parts of the environmental assessment document. It is the limited storage in head ponds that differentiates modified run-of-river projects from hydroelectric projects that create large storage reservoirs with the ability to store water for weeks or seasons to "peak" when seasonal periods of hot or cold weather raise the need for extra electricity production. Typically, modified run-of-river projects have significantly less environmental impact than peaking hydroelectric projects. The proposed Four Slide Falls GS will be operated as a modified run-of-river facility.

3.6.2 Summary of Hydraulic Characteristics

Estimated water levels:	
Normal operating headwater level	284 masl
Normal tailwater level downstream of powerhouse	255 masl
Normal operating gross head	28.5 m
1:100 year flood flow	92.6 m^3/s
1:100 year low flow	0.03 m^3/s
Long-term average flow	9.59 m^3/s

3.6.3 Operating Parameters for Water Control Structures

In selecting the operation parameters for the facility, the environmental aspects outlined in the previous sections were considered so as to provide a reasonable balance among operational constraints, environmental aspects and mitigation of possible impacts.

It should be noted that changes in upstream levels and downstream flows related to operation occur only when the facility is in modified run-of-river operations mode. While the facility is in run-of-river mode and subject to the amount of natural flow in the river, the upstream levels will be maintained at a constant level and downstream flows will equal the natural flow in the river.

The definition of operating parameters affecting the channel upstream and downstream of the facility has not been completed. These parameters will be developed following the completion of the environmental assessment, based on discussions with key regulators and stakeholders. Xeneca is committed to the construction and operation of the project in an environmentally sensible manner while realizing the socio-economic objective of generating power when it is needed in the Province.

Operation Parameters

The operating parameters that can be used to manage upstream water levels are:

- Maximum Daily Fluctuation of Upstream Water Levels: Under normal operation and during normal river flows, upstream water levels can be controlled as required by the rate of water use and hence electricity production. In modified run-of-river facilities, a portion of the normal river flow is typically stored during off-peak hours causing water levels to rise upstream until the rate of production is increased again during on-peak hours when electricity demand is higher. The range of daily water fluctuation in the inundated area upstream of the facility will be determined to mitigate upstream impacts.

- Rate of upstream water level change: To a limited degree, the rate of change of upstream water levels within the daily fluctuation range can be managed by the rate of electricity production while the facility is operating. The possible production rates range from the minimum to maximum turbine flow capacity. The rate of water level and flow increase/decrease within the maximum daily range of fluctuation will be acceptable to protect shorelines and habitat.

- Minimum Upstream Operating Water Level: The minimum upstream operating water level is the water level below which no power is generated during normal operations. It should be noted that the need to provide environmental flows may result in drops of upstream water levels below the minimum water level even if no power is generated. This situation can occur during prolonged periods of drought and cannot be controlled by plant operation.

- Maximum Upstream Operating Water Level: The maximum upstream operating water level is the water level beyond which water is bypassed through the spillway during normal operations to avoid further water level rise upstream. During flood conditions (i.e. the spring freshet), water levels may rise above this level due to natural factors. Various engineering documents or drawings may refer to this level as the "Normal Operating Level (NOL)" or the "Full Supply Level (FSL)".

The operating parameters that can be used to manage downstream flows/levels are:

- Upper Turbine Limit (Q_{TL}): The maximum amount of flow generated by the facility operation while intermittent turbine operation is occurring. The turbine(s) can be operated in a range of flows and outputs ranging from minimum turbine capacity to the maximum turbine capacity. When it is desirable to minimize the difference between on-peak and off-peak flows, the upper limit of turbine operation can be set as an operating parameter. Setting the upper limit has to take into account that the turbines do not operate very efficiently below roughly 65% of their maximum capacity.

- Turbine Ramp Time: This parameter defines how quickly a turbine can shift from being stopped (i.e. not operating) to the desired operating flow. Turbine start up involves going from being stopped to the minimum turbine capacity in a very short period of time. Once the turbine is operating, the turbine capacity can then be increased gradually to the desired operating flow. By increasing the flow gradually, downstream impacts can be reduced.

- Turbine Down Ramp Time: Essentially the reverse of Turbine Ramp Time. The time during which a turbine is taken down to minimum turbine capacity prior to shut down. By decreasing the flow gradually, downstream impacts can be reduced.

- Environmental Flow: The amount of flow that is provided to the Variable Flow Reach during intermittent operation when the turbine is stopped. It should be noted that the environmental flow provided through operations cannot be larger than the natural flow upstream in the river.

- Compensatory Bypass Flow: The amount of flow that is provided at all times to the river reach between the control structure and the powerhouse tailrace outflow. This flow is only relevant where the final design involves a separation between the containment structure and the powerhouse tail water outflow (i.e. where the design creates a section of river that is by-passed by the facility). This flow is not applicable where the final design involves a close coupled design where the powerhouse tailrace outlet is immediately downstream of the containment structure. Where this parameter is applicable it is independent of the facility operation mode.

Potential operational impacts to environmental components vary significantly depending on the mode of operation and flow conditions which are in turn typically dependent on seasonal conditions. For the purposes of the operating plan, the operating seasons have been determined by reviewing a hydrograph of average annual flows and periods of special environmental significance (i.e. fish spawning). Table 2 summarizes the start and end dates for each season as they relate to the operations of the Four Slide Falls facility.

Table 2: Seasonal Hydrological Periods

Spring	March 23th – June 30th (99 days)
Summer	July 1st – October 9th (100 days)
Fall	October 10th – January 14th (96 days)
Winter	January 15th – March 22nd (67 days)

Table 3 provides a description of the proposed operating parameters which have been determined for the facility. As mentioned above, these parameters will be further refined following the completion of the environmental assessment, based on discussions with key regulators and stakeholders.

Table 3: Four Slide Falls Proposed Operating Parameters

Description	Acronym	Project & Streamflow Conditions (m^3/s)			
		Spring	Summer	Fall	Winter
Streamflow Exceeded 99% of the time	Q_{99}	3.89	0.25	0.19	1.28
Streamflow Exceeded 95% of the time	Q_{95}	5.22	0.49	0.59	3.16
Streamflow Exceeded 80% of the time	Q_{80}	7.70	1.63	2.17	4.56
Streamflow Exceeded 50% of the time	Q_{50}	14.1	3.62	7.72	6.17
Streamflow Exceeded 20% of the time	Q_{20}	26.0	6.34	14.3	8.98
Downstream environmental flow target	Q_{EA}	No Int. Op.	1.0	0.5	0.5
Compensatory flow (between tailrace and dam)	Q_{COMP}	0.2	0.2	0.2	0.2
Maximum turbine flow capacity	Q_{TMAX}	17.0			
Minimum turbine flow capacity	Q_{TMIN}	5.7			
Limited turbine flow – Modified ROR	Q_{TL}	11.1			
Long term annual flow, average annual mean	LTAF	9.59			
Median streamflow value	Q_{MED}	6.80			
2 year return period 7-day-average-low flow	7Q2	1.16			
10 year return period 7-day-average-low flow	7Q10	0.304			
20 year return period 7-day-average-low flow	7Q20	0.208			
Streamflow corresponding to high water mark	Q_{HWM}	25.0			
High streamflow event; occurrence of 1 in 2 yr	Q1:2	33.3			
High streamflow event; occurrence of 1 in 100 yr	Q1:100	59.1			
Turbine Ramp Time	N/A	20 min			
Turbine Ramp Down Time	N/A	20 min			

3.6.4 Special Event Operation

Operation during special events, such as floods, droughts and safety emergencies may need to deviate from the normal operating parameters to manage flows and mitigate impacts.

- Normal Flood Operation: Normal flood events are defined as flows that exceed the maximum capacity of the plant up to and including the one in two year flood event level. Flood events of this magnitude are normal occurrences in the river and present minimal concern for public safety or environmental impacts. During these periods, the facility is operated to manage water levels upstream below the maximum upstream operating water level where possible. This is achieved by allowing any water that is in excess of the maximum turbine capacity to bypass the facility through the spillway.

- High Flood Operation: High flood events are defined as events that exceed the one in two year flood event level but are within the safe design level of the facility. Flood events of this frequency are anticipated to occur only infrequently over the life of the facility. The objective of this type operation is to ensure public safety. This is typically achieved by allowing any water that is in excess of the maximum turbine capacity to bypass the facility through the spillway and by operating the spillway and the power generation facility in a manner that achieves this objective.

- Extreme Flood Operation: Extreme flood events are defined as events at which the facility cannot be attended safely by operators and where the risk of flooding of the generation equipment is possible. The emphasis on operation is on ensuring public and operator safety. Where advance warning is received that an extreme event may occur, the operation of the facility will be adjusted in advance of the flood peak to maximize its ability to pass water and provide minimal obstruction to the passing of flood waters.

The inundation map and river profile mapping provided in Annex I-A show the water depths and extents for various flood conditions. The objective of flood operation for the spillway, turbine and bypass is to ensure that the backwater inundation effect is minimized and kept within the projected distance limits.

3.6.5 Compliance Considerations

The operation of the facility will be aligned with the existing Serpent River WMP during a comprehensive review of the WMP in 2014. The Four Slide Falls Operating Plan will be available to all identified stakeholders (please see the Plan in Annex I-C and reference to stakeholder list), and will become part of the Serpent River WMP. Xeneca will have the right and obligation to participate in the Serpent River WMP process.

In relation to variances in water levels and flows on the system, there is one stakeholder upstream of the proposed generating station: a privately owned dam is located at the outlet of Dunlop Lake on the Serpent River. The Four Slide Falls' operating plan does not consider changes to the management of lake levels at Dunlop Lake. There are no cottage owners on Pecors Lake though there is a proposal for a new cottage development by the City of Elliot Lake. The privately owned dam at Dunlop Lake and Pecors Lake are both outside the area of influence of the project and will not be impacted by this development proposal.

However, there are a number of users downstream including:

- the proposed 2.0 MW McCarthy Chute Generating Station (located 5.5 km downstream);
- four residential cabins situated on Camp Lake;
- the 7 MW Serpent River Generating Station;
- a heavily used Ministry of Transportation rest area located adjacent to the Serpent River Falls, near the Highway 17 bridge; and
- the Village of Serpent River's municipal water intake.

The operating plan for Four Slide Falls should not result in any adverse effects on identified downstream users. In anticipation of a comprehensive review of the WMP, Xeneca will work with the downstream stakeholders to ensure the updated WMP will consider their input.

3.6.6 Provisions for Plan Reviews, Amendments and Plan Renewals

An amendment to the Serpent River WMP will be required to include the new facility and operator and to incorporate the approved operation plan for the facility/dam. Once this is completed, Xeneca will adhere to any provisions for plan reviews, amendments and plan renewals required by the Serpent River WMP.

4. FEDERAL, PROVINCIAL AND MUNICIPAL AGENCY AND STAKEHOLDER CONSULTATIONS

This section presents the methods and scope of stakeholder consultation conducted for this proposed development.

4.1 CONSULTATION GUIDELINES

One of the main objectives of the Waterpower Class EA process is to coordinate and integrate the requirements of regulatory agencies under the provincial *EAA* and the federal *CEAA*. This involves gathering information from public, private and Aboriginal stakeholders to identify environmental concerns and to inform project decision makers.

To meet this objective and to effectively engage with agencies and stakeholders, the Waterpower Class EA builds on the public notification requirements mandated under the *EAA*, and other EA processes (i.e. MNR-RSFDP Class EA) which recommend that consultation and engagement planning be incorporated as an integral component of the planning process. Xeneca also designed its consultation and engagement plans to meet the requirements of the *CEAA* federal screening process.

Xeneca's consultation programs are designed to provide the outreach to identify potential stakeholders, engage stakeholders and provide the means and opportunity for participation in the development planning process. The goals of the consultation programs are to:

- Identify and notify potentially interested and affected stakeholders;
- Identify and assess the range of positive and negative environmental and socio-economic effects of the project;
- Address the concerns of adjacent property owners, local and regional interest groups, individual members of the public and Aboriginal communities that may be directly affected by the project.

To achieve these goals, the consultation programs strive to:

- Identified potentially affected stakeholders;
- Described how the project may affect the natural and socio-economic environment;
- Provided notification to identified stakeholders as prescribed by CEAA and the Waterpower Class EA;
- Inform the public, Aboriginal communities and regulatory agencies where, when and how they can engage in the process;
- Identify public and Aboriginal community benefits, concerns and issues related to the project;
- Address public, Aboriginal community and regulatory agency concerns and issues raised regarding the development and operation of the project;
- Document public, Aboriginal community and regulatory agency input and how concerns were addressed, issues avoided and mitigation measures put into place during project planning.

The records of public, government agency and aboriginal community consultation undertaken in the planning of this development proposal are provided in Appendices C, D and E, respectively.

4.2 CONSULTATION STRATEGIES

The consultation programs undertaken by Xeneca were intended to meet all mandatory consultation requirements as well as to assist in the identification and resolution of environmental concerns relating to the project. Xeneca was responsible for direct consultation with First Nations and Aboriginal communities and the public at large. Public and Aboriginal Community Consultation Plans were prepared by Xeneca for the proposed development and are presented in Appendices D and E, respectively. Key components of the consultation plans including the specific tools and approaches to consultation are described below.

4.2.1 General Print and Mailing

General mailing of reports, notices and letters through postal, courier and electronic methods were used. To promote environmental sustainability, the EA team did attempt to minimize printed media; however, hard copy print was used where electronic formats were not guaranteed to reach the intended target audience and where specifically requested.

4.2.2 Print Media

All print advertising in support of the undertaking was circulated in the Elliot Lake Standard to ensure broad formal notification of key project milestones and key meeting dates to members of the public. Public Information Centres (PICs) advertisements were circulated in advance of meeting dates. Advertisements were placed in the Elliot Lake Standard in both English and French; copies of the advertisements issued in support of this undertaking are presented in Appendix D. The Public Information Meeting held in Elliot Lake on December 1, 2010 was advertised in the Elliot Lake Standard on November 19, 2010.

4.2.3 Web Media

Throughout the planning process Xeneca has provided regular project status updates through emailing and through its website to complement the consultation and engagement program for the project. Key documents (Project Descriptions, etc) and notifications were provided through emailing and Xeneca's website at www.Xeneca.com; preliminary distribution of Project Descriptions was through the OEL-HydroSys Inc. website at www.wesa.ca. In some cases, Xeneca personnel also employed other social media communication tools to garner and provide feedback to the public.

4.2.4 Meetings

Direct and/or teleconference meetings with various stakeholders such as municipalities, and public interest groups were a component of the consultation initiative intended to assist in the identification and resolution of environmental concerns. A summary of these events is presented in Section 4.3.3 and 4.4.

Meetings were held with identified Aboriginal communities as part of the business to business aboriginal consultation initiative. As part of these meetings, considerations to the concerns of First Nations and other Aboriginal communities located in the vicinity of, and/or having a potential interest in the project was afforded. To help facilitate these activities, Xeneca assisted interested Aboriginal communities in accessing government programs and funding.

First Nations and other Aboriginal communities located within or having traditionally used the project area were identified in the MNR Site Information Package provided to the proponent and through dialogue with the Ministry. A copy of all notifications of the proposed undertaking provided by the proponent to First Nation and Aboriginal communities is provided in Appendix E. In addition, Xeneca solicited participation of Aboriginal communities in the Stage II archaeological study for the site and requested their participation in project planning.

4.2.5 Public Information Centres (PICs)

In addition to direct correspondence, one public information centre (PIC), as well as community meetings and interest group meetings were held to collect information on concerns and to allow the EA team to inform members of the public and to provide direct and immediate feedback. The date and time for the PIC was advertised in a local publication and notification was sent either electronically or via post to participating members of stakeholder groups and government agencies well in advance of the scheduled date. Members of Xeneca staff as well as key experts from the EA team were on hand to answer public questions and to address concerns related to the development. The PIC featured posters and maps with information about the project, a copy of which is provided in Appendix D. Attendees of the meeting were asked to provide their name and contact information, to identify whether they wished to be provided with project updates, and to provide feedback on the project. A summary of these events is presented in Section 4.4.

4.3 GOVERNMENT AND AGENCY CONSULTATION

The EA team was responsible for regulatory agency and government consultation. Xeneca issued a Notice of Commencement for the proposed undertaking which was advertised on July 14 and 16, 2010. The Project Description document was provided to regulators on November 16, 2010. A revised Notice of Commencement was issued and advertised on November 10 and 17 2010. A

copy of each NOC is provided in Appendix D. A complete record of contact and evidence of the provincial and federal government consultation effort is presented in Appendix C.

The EA team engaged federal, provincial and municipal agencies during an EA Coordination meeting on January 24th, 2011 to introduce the project and collect feedback for regulatory approvals, permitting and requirements and project scoping.

A summary of the consultation events with government regulators and stakeholders is presented below. For the reader's convenience, a summary of the issues identified during the regulatory agency and public consultation process is provided in tabular format as Table 4 (Identified Issues and Management Strategies). The table also identifies whether and how resolution of the identified issue was or may be addressed, and which issues remain unresolved. Future efforts to resolve these issues are outlined in Section 5 of this report.

4.3.1 Federal

Canadian Environmental Assessment Agency

The Canadian Environmental Assessment Agency (CEA Agency) was provided with an introductory letter and project overview by Xeneca in June 2010. In a July 12, 2010 response to Xeneca, the CEA Agency acknowledged receipt of the project overviews for several Xeneca proposed waterpower projects including Four Slide Falls and McCarthy Chute on the Serpent River. The proponent was advised that the Agency would be acting at the Federal Environmental Assessment Coordinator (FEAC) for the proposed projects. The CEA Agency requested a detailed Project Description and clarification as to whether federal funding was being contemplated for the project. The proponent was advised that federal agencies to be contacted through the FEAC would include Environment Canada, Fisheries and Oceans Canada, Health Canada, Indian and Northern Affairs Canada, Natural Resources Canada, and Transport Canada. Xeneca was informed that documents may be made available to the public, and that information related to the EA will be included in the Canadian Environmental Assessment Registry.

A copy of the Project Description was provided to the FEAC and each of the above referenced federal agencies on November 16th 2010.

At the EA coordination meeting for both of Xeneca's proposed Serpent River waterpower projects, on January 24, 2011, the CEA Agency noted that federal scoping of the projects was not yet completed, and that all CEAA requirements needed to be satisfied before any federal agency could issue an approval for the undertaking.

In a March 17, 2011 letter, the CEA Agency recommended that Xeneca follow a coordinated EA process, which would result in the submission of a single body of documentation for each project that satisfies both federal and provincial EA requirements. The Agency advised the proponent that the collection of adequate baseline data was required to support the assessment of potential environmental effects, noting that this information would be required before a responsible authority could reach an EA decision. In response to a proposed timeline for the issue of Environmental Reports, Xeneca was advised that the federal review process would be determined in part by the quality of the report, the complexity of project specific issues and the level of associated public and Aboriginal community concerns.

Fisheries and Oceans Canada

Fisheries and Oceans Canada (DFO) attended the natural environment scoping meeting held on July 9, 2009, during which the status of the two Serpent River developments was discussed. Along with the MNR and the MOE, DFO cautioned that the meeting was occurring earlier in the process than typical, noting that this type of meeting would normally occur subsequent to the issue of Applicant of Record. The proponent was cautioned that owing to this early process stage, the provision of comprehensive list of project requirements was not possible, and any work undertaken was at the risk of the proponent.

In a letter dated August 5, 2009, DFO informed the proponent that the Serpent River projects will involve a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat, and will therefore require an Authorization under the *Fisheries Act*, triggering the *Canadian Environmental Assessment Act*. A response from Xeneca to the DFO noted that the projects would involve only minimal changes in the water level in McCarthy Lake and requested that the agency explain its rationale for determining that a HADD will occur.

At the January 24, 2011 EA coordination meeting DFO confirmed its role as a Responsible Authority for the undertaking. DFO staff stated that the assessment of all identified issues/effects related to the projects must be completed before the agency could sign off on the EA or issue any *Fisheries Act* Authorizations. Concerns noted by DFO included impacts to fisheries and fish habitat and the provision of fish migration and fish passage. The proponent suggested that meeting one-to-one habitat compensation/restoration requirements would likely not be possible given the extent of the project zone of influence and the existing habitat. In response, the agency indicated their preference for Xeneca to conform to standard compensation hierarchy practices but that during the data review process they would consider the possibility of alternative compensation strategies.

On February 11, 2011, a meeting was held between the agency and the proponent regarding the possibility of applying larger scale fish habitat compensation strategies in lieu of site-specific compensation. Several action items arose, and as of late April 2011, negotiations were ongoing.

At the biological scoping meeting on June 9, 2011, DFO noted that it would prefer to see all required studies completed in the Environmental Report, including those for the connection line corridor as it may result in approval delays later on. The proponent informed that the connection line route would attempt to avoid watercourses and would use exiting crossings wherever possible.

Future consultation with DFO will be required as the project moves forward in the development process.

Transport Canada

On September 28, 2010, Transport Canada (TC) provided comments to the CEA Agency on the draft Project Descriptions issued by the proponent. TC noted that where there is a proposal for new works including dams, booms, and watercrossings, the *Navigable Waters Protection Act* (NWPA) will be triggered. TC requested that when required to confirm its role under CEAA prior to receiving a Request for Project Review under NWPA (from the proponent) it was that advised that navigability inquiry to the Navigable Waters Protection Office be submitted in advance of the issue of the Project Description. The agency could provide an opinion as to the navigability of the waterway and whether or not the NWPA will apply to the project. The proponent was advised to include the results of this navigability assessment in the Project Description if possible.

TC was provided with a Four Slide Falls Project Description on November 16, 2010 and was invited to the January 2011 EA Coordination Meeting. The agency confirmed its role as a Responsible Authority for the project under the *Navigable Waters Protection Act (NWPA)* which prohibits the construction or placement of any "works" in, on, over, under, through or across navigable waters without first obtaining approval.

TC attended the EA coordination meeting on January 24, 2011. TC requested that Xeneca provide the ministry's Aboriginal Consultation Unit with a written summary of its First Nations consultation plan for their review, which would also allow for the determination of whether the proponent adequately addressed consultation requirements under the federal assessment process. TC confirmed that an Approval(s) under the *NWPA* would be required, and detailed data requirements which would be needed before the agency can sign off on the environmental assessment report.

Future consultation with TC will be required as the project moves forward in the development process. The final detailed engineering drawings will be submitted to TC for Approval under the *NWPA*.

Environment Canada

Environment Canada (EC) attended the January 2011 EA Coordination Meeting. EC confirmed its role as an expert Federal Authority for the EA, and indicated its concerns regarding the potential impacts of the project to air and water quality, toxic substances, species at risk under the *Species at Risk Act* (SARA), and migratory birds. EC also indicated that the agency would require analysis of low level methyl-mercury and the potential for acid rock drainage (ARD) as a result of clearing and excavation activities associated with the projects. EC noted that it would coordinate ARD analytical and mitigation requirements with Natural Resources Canada. EC subsequently provided ARD sampling protocols to provide assistance for geotechnical investigations at project sites.

A surface water monitoring program was conducted during the 2010 field season at the proposed project site. The results of the program were summarized in baseline surface water quality investigation reports (Annex IV), which EC received on March 15, 2011. EC was also informed of the proponent's timeline for releasing additional supporting documentation. EC reviewed the water quality report and provided feedback to the Responsible Authorities on April 11, 2011, the details of which are provided below.

EC requested mapping noting sampling locations for the fish species inventory survey and surface water sampling locations. Also requested was a reference sampling area prior to headpond creation to ensure appropriate water quality data analysis. The agency recommended that baseline studies be conducted to determine mercury concentrations in sport fish and in the study area detailing specific parameters. It was noted that further analysis was required since the undertaking would result in the creation of an upstream reservoir presenting the potential for increased mercury levels in both surface water and fish tissue.

An estimate of the expected temperature and volume of the thermal discharge from the powerhouse was requested, as was clarification as to whether this discharge would be released into the Serpent River. Additional information was requested by EC, a copy of which is provided in Appendix C.

EC provided additional surface water quality investigation comments on April 18, 2011. It was recommended that actual measurements of water levels, water currents and hardness be conducted at all water quality sampling stations.

In response to EC's requests the proponent has committed to consultation with the agency in 2011 in order to scope and undertake a surface water quality characterization study and impact assessment during subsequent field seasons leading up to the construction phase, in order to determine any potential effects of the proposed project on this regime.

Health Canada

In correspondence dated December 21, 2010 Health Canada (HC) confirmed non participation in the January 2011 EA coordination meeting given that the agency does not have a regulatory function in the EA process. It was noted that should HC receive a specific request from a Responsible Authority for expert advice, participation would follow.

Natural Resources Canada

Natural Resources Canada (NRCan) attended the January 2011 EA Coordination Meeting. It was confirmed that EC and NRCan would coordinate ARD requirements with provincial ones. NRCan did not have any specific comments regarding the projects, but they indicated that they would provide expert advice at the request of the Responsible Authorities.

4.3.2 Provincial

Key provincial ministries were provided copies of an introductory letter and the Project Description on November 16, 2010, a Notice of Commencement on July 14, 2010 and a revised Notice of Commencement on November 10, 2010 for the Serpent River. A record of government agency consultation is provided in Appendix C.

The following is a synopsis of the provincial ministry consultation activities.

Ontario Ministry of Natural Resources

The Ontario Ministry of Natural Resources (MNR) with a mandate to manage natural resources and to promote renewable energy in the province, has a legislative role in this undertaking with regards to natural heritage and water management planning policies.

The proponent's notification and consultation with the ministry includes the provision of early notices of the project, requests for background/baseline information on Natural Heritage information in the vicinity of the project site, scoping consultation, and requests for Scientific Collectors Permits to undertake terrestrial and aquatic baselines surveys within the anticipated project zone of influence.

Prior to the EA planning phase of the project, the Ministry of Natural Resources, Sault Ste. Marie District office, provided instructions specific to site release issues which included MNR's requirements for Aboriginal consultation and the procedures associated with the Site Release Policy for Site 2CD14, including the provision of a Waterpower Declaration Form. Throughout the consultation process issues pertaining to the project that the ministry would like to see addressed through the Waterpower Class EA were identified, a summary of which is provided below:

- May 15, 2009, the Ministry of Natural Resources was provided with a Waterpower Site Strategy (WSS) to satisfy the Site Release requirements for the proposed Four Slide Falls and McCarthy Chute projects.

- December 21, 2009, following the ministry's review of the Four Slide Falls WSS, the proponent responded that the intent of the proposed Four Slide Falls GS is not to significantly alter water levels in Pecors Lake. Xeneca noted that field studies to date indicated very low Lake trout densities in the Serpent River, and that Four Slide Falls is a natural barrier to fish passage. The proponent suggested that by increasing water depths in the river, the Four Slide Falls project may, in fact, create a more suitable environment for Lake trout and other cold water species. The proponent also addressed other questions raised by the MNR in their review, regarding topics such as the selection of minimum flow requirements, flow simulations and the consultation process.

- February 11, 2010 the proponent was informed that scientific research permits for conducting field studies may be denied until a the issue of Feed-in-Tariff contracts for the projects. Given time constraints surrounding timing dependant field investigations, the proponent requested a meeting to resolve the permitting issue in a March 11, 2010 email.

- March 8, 2010 Site Information Package received from MNR.

- July 12, 2010 letters to MNR in which the proponent committed to addressing the ministry's Lake trout lake concerns, policies and regulations during the Class EA for both proposed Serpent River projects. The proponent confirmed awareness that the MNR may withhold Location Approval if the Lake trout issue is not appropriately addressed. Xeneca stated that it will complete all necessary studies and seek expert opinion to quantify the Lake trout issue in the upstream and downstream areas. Potential impacts will be highlighted and mitigation measures outlined in the Environmental Report, including the potential benefits of the undertaking to the species.

Over the course of the Class EA planning process, meetings were held between the EA team and the Ministry of Natural Resources to develop field study work plans and investigation protocols, data information and reporting requirements and eventually to negotiate issues surrounding the results of these actions.

- July 9, 2009, natural environment scoping meeting. The EA team biologists described field work to date and described additional proposed field investigations. The MNR, MOE and DFO began the discussion with the disclaimer that the meeting was taking place earlier than typical in the process and as such they could not yet provide a comprehensive list of what was required. Each agency discussed its requirements which would be subject to change.

- November 18, 2010 meeting was held between MNR (Sault Ste Marie District), and the EA team regarding endangered species at Four Slide Falls. It was noted that the Blanding's Turtle would be a concern at the project site necessitating the requirement for permits under *the Endangered Species Act* and supporting studies.

- January 24, 2011 Environmental Assessment Coordination Meeting in which a number of topics were discussed; meeting minutes are provided in Appendix C. The following key planning considerations included:

    - The environmental assessment will be undertaken as a harmonized process in order to integrate federal and provincial EA planning requirements. Under the CEAA, subsequent to a recent Supreme Court decision (*MiningWatch Canada v. Canada (Fisheries and Oceans)*, all components associated with the undertaking, including the connection line right-of-way, will be scoped into the assessment. The *Canada - Ontario Agreement on Environmental Assessment Cooperation (November 2004)* was discussed. The agreement requires the federal and provincial governments to coordinate the environmental assessment processes whenever projects are subject to review by both jurisdictions. The proponent will follow the Waterpower Class EA process as approved under the Ontario *Environmental Assessment Act*, and incorporate additional information necessary to satisfy the requirements of the *Canadian Environmental Assessment Act*. The Agreement requires that under this harmonized approach the proponent will present its findings on the predicted environmental effects of the project in a single body of documentation. In keeping with this agreement which encourages efficient and comprehensive planning, the proponent has decided to incorporate the connection line ROW into the environmental assessment of the undertaking even though under the provincial process, a <115 KV line is a Category A undertaking is exempt from an EA. The MNR agreed that dispositions that may be required under the MNR-RSFDP Class EA may be embedded into the Waterpower Class EA if the proponent can demonstrate they have adhered to MNR-RSFDP Class EA planning principles

    - The Potential Regulatory Permits and Approvals List provided in the Project Description was deemed incomplete and MNR requested an expanded list of all activities that will occur during construction and operation, so as to provide the ministry with sufficient detail to identify all applicable permits and approvals.

    - MNR outlined their regulatory responsibilities related to the project, noting the *Lake and Rivers Improvement Act* (LRIA) which requires consideration for minimum flows. The approvals and requirements under the LRIA and ESA were discussed. Key study and permitting requirements were identified, and can be found in Appendix C

- MNR emphasized that the Applicant of Record status for Serpent projects was dependent on the proponent being able to demonstrate that the projects would be hydrologically independent of both McCarthy Lake and Pecors Lake.

- Both the MNR and the MOE requested that the Environmental Report address plans for facility decommissioning or abandonment. The proponent explained that the facility could be in operation for more than a century, so specific plans would be difficult to establish; however, they would include a tentative decommissioning/abandonment strategy in the report.

- MNR advised that the proponent identify water management planning on all public notices, be it the intent to develop a plan or where a project requires an amendment to an existing plan. Notices should also contain reference to the RSFDP Class EA.

- It was determined that discussion and decisions surrounding the classification of the project as a "managed waterway", would be deferred to the Focus Group meeting to be arranged between MNR, MOE and the Ministry of Energy.

- MNR raised concerns in regards to the proposed project timelines since the information collected during the 2011 field season would not be ready in time for inclusion in the draft Environmental Report, set to be released in the summer of 2011. The ministry was of the opinion that the proponent's approach may not meet regulatory requirements, complicating any disposition of Crown land which requires a successful EA outcome. Additionally, MNR noted that any post EA investigations would be subject to public consultation. The EA team explained that the proponent's approach would be to identify clear commitments in the Final ER to complete any outstanding studies thereafter, and to develop impact management strategies that would have to be agreed by the various agencies and honoured by the proponent moving forward.

- It was agreed between the proponent and the MNR that the zone of influence of the project would be clearly identified in the Operating Plan and through HEC-RAS modeling as part of the environmental assessment (see ER -Annex I-C and I-B).

- A meeting was held on February 11, 2011, between Xeneca, MNR, DFO and EA team members to discuss *Fisheries Act* Authorizations for the proposed project, potential impacts on fish habitat and habitat compensation (on the Serpent River and elsewhere).

- On April 15, 2011 a meeting was held between MNR, MOE, the proponent and EA team biologists to discuss hydraulic, hydrology, engineering and modeling methodology, details are provided in Appendix C.

- On April 28-29 2011, a meeting to discuss the operational strategy for the proposed facility was held between the proponent and members of the EA team with district and regional level staff of the MNR, MOE and DFO. The proponent presented the conceptual engineering design for the site, and the proposed Operation Plan, which included maps of the upstream inundation zone of influence for the Four Slide Falls site. EA team biologists presented information on environmental aspects of the project which led to discussion on methodology for collecting field data and upcoming studies. Issues raised included:

    - MNR stated that as Pecors Lake and McCarthy Lake are designated Lake trout lakes, as such provincial policy requires that the Four Slide Falls project demonstrate "no impact" on these two water bodies. There is no leeway to mitigate or minimize, the proponent must neutralize the impact showing that there is no project effect on the lakes. The proponent stated that the project would adhere to the Lake trout policy.

    - The ministry informed the proponent that any changes to project information and documentation must be communicated to the public.

- On May 18, 2011, the MNR returned their comments on the Four Slide Falls Project Description, concerns raised included:

    - The report does not provide sound data demonstrating that Pecors Lake (a designated Lake trout lake) will not be impacted by fluctuating water levels nor will it be used as a reservoir.

    - Concern that the large extent of the inundation area will impact water quality in Pecors Lake, in turn impacting McCarthy Lake. The MNR subsequently suggested having a limnologist or water quality technician/analyst present at the biological scoping meeting, scheduled for June 9, 2011. The ministry clarified that the reason for not yet issuing Applicant of Record to Xeneca for the Four Slide Falls site was due to the proponent not yet having met all the requirements of the Site Release process, and due to the ministry's concerns regarding water levels in Pecors Lake. The proponent was reminded that ministry permits will not be issued without Applicant of Record status, and that any EA work conducted before Site Release is at the proponent's risk.

  - MNR expressed disagreement with the site being categorized as a managed waterway. In addition, the proposed generating station is located within Fisheries Management Zone 10, for which a series of Lake Trout Operational Objectives and Management Strategies should be respected.

  - MNR cautioned that, if the McCarthy Chute site is also developed, the cumulative effects of the projects may be difficult to predict, particularly if the two developments undergo different modes of operation, as such varied peaking proposals are viewed less favourably.

- In May 27, 2011 correspondence to the ministry, the proponent debated that the Lake trout policy, including the prohibition against structures on a Trout lake, appeared to have been established after the two Serpent River sites were accepted for waterpower development. Furthermore, expert opinion suggested that the proposed developments will have no negative impacts on Lake trout. The proponent maintained that, despite MNR's firm belief that the developments will use the lakes as reservoirs, lake levels will in fact remain within their seasonal norms. The proponent commented that it was of the opinion that the MNR's Fisheries Management Plans were being used for impeding their project sites not only on the Serpent River, but at all of their other FIT sites. The proponent therefore requested that the MNR work with them towards achieving positive solutions for the proposed projects.

- In a June 6, 2011 letter to Xeneca, the MNR expressed reluctance to proceed with a scheduled biological scoping meeting for the two Serpent River sites, given their belief that McCarthy Lake will be used as a reservoir (which would be contrary to policy) as well as their continued concerns regarding the proposed Four Slide Falls project relative to the Lake trout lake policy. The following day the ministry confirmed that they would proceed with the biological scoping meeting as planned.

- The biological scoping meeting was held on June 9, 2011. An overview of operations was presented along with the approach to the creation of a by-pass reach and the indication that there could be a 6 km stretch downstream that could potentially be affected. Discussions were conducted regarding the minimum flow that must be maintained for ecological integrity. A summary of issues raised is detailed below, meeting minutes are provided in Appendix C.

  - The proponent commented that as the dam is not hydraulically connected to McCarthy Lake and will have virtually no effect. It was further stated that there will be no backwater effect on Pecors Lake as a result of the project.

- MNR made reference to the 2011 work plan submitted and approved in April 2011 and requested an update. EA team biologists responded that they had experienced some difficulties with data collection for the Blanding's Turtle but would continue to survey the identified species at risk and of special concern to determine their presence.
- The methodology for assessing impacts on wetlands was discussed and the proponent agreed to adhere to available technical guidelines as well as provide field methodology for any other studies.
- A discussion on specific species followed with MNR stating that Pike, although previously identified as a Valued Ecosystem Component was no longer a concern in this project.
- The 6 km stretch upstream zone of influence at Four Slide Falls was noted as a concern since the habitat would experience significant changes (riverine to lacustrine) and no longer be suitable habitat for Rainbow trout. DFO was asked if this was an acceptable loss to fish habitat, DFO responded that it will support MNR's decision in this matter which is dependent on ministry fish management objectives.
- MNR noted that the creation of the headpond and change in habitat conditions may result in an increase in Smallmouth bass which is considered undesirable under the fisheries management objectives.
- The EA team limnologist commented that the creation of a headpond would alter nutrient and water quality upstream and downstream, affecting fish habitat and dissolved oxygen levels. Water sampling for nutrient quality was proposed, with a response from the regulators that the MOE would be required to participate in any water quality investigation discussions.
- The proponent requested a clear statement on policy and objectives from the ministry. To which they responded that a committee review is required.

As the MNR is a key agency in the EA process Xeneca is committed to ongoing consultation throughout the permitting and approvals stage.

Ontario Ministry of the Environment

A project overview and draft Notice of Commencement was provided to the Ministry of the Environment (MOE) on June 10, 2010 by the proponent. A response was received from the MOE's Regional Environmental Assessment Coordinator - Northern Region on August 9, 2010. The MOE cautioned the proponent that by proceeding with the Class EA for Waterpower Projects prior to having secured Applicant of Record status from the Ministry of Natural Resources, Xeneca was facing possible risks by not having the same level of information that is provided once Applicant of Record is awarded. The proponent was urged to discuss the classification of the waterway as unmanaged with both the MOE and MNR. Additionally, the

proponent was advised that in the MOE's opinion the Draft Notice of Commencement (NOC) provided in the project information package failed to meet the minimum requirements for such a Notice. Detailed comments for the NOC were provided. The Ministry recommended that the proponent host an Agency coordination meeting prior to the release of the NOC.

The ministry referred the proponent to various resources aimed at ensuring that Aboriginal communities that should be consulted regarding the undertaking were identified. The MOE recommended that the proponent provide information directly to the Aboriginal communities that may be directly affected by, or have an interest in the undertaking as early as possible.

The MOE also provided comment on the Environmental Report, consultation and issue resolution requirements, permits and approvals and federal triggers for waterpower projects. A copy of the letter issued to the proponent by the MOE is provided in Appendix C.

On September 27, 2010, the proponent issued a reply clarifying its position on various issues and acknowledging MOE's recommendations. The proponent explained their rationale for classifying the Serpent River as a managed waterway, and asked for clarification on the MOE and the MNR's belief that the river's classification should be reconsidered.

MOE was sent a revised Notice of Commencement and Public Information Centre (PIC) Announcement on September 30, 2010. MOE responded by advising against holding PICs before meeting with the relevant agencies, as the approach to public consultation is typically discussed during such a meeting. On November 16, 2010, MOE was provided with the project description for the Four Slide Falls site.

At the January 24, 2011 EA coordination meeting, the proponent stated the intention to have a draft environmental report ready for the regulators' review by June 2011. Given that data gathered through the 2011 field season would not be ready for inclusion in the report, the proponent planned to address any identified issues through commitments for follow-up data collection or monitoring. Information gaps in the baseline biological reports would be addressed through the 2011 field season. MOE expressed concern regarding this approach, indicating that the proponent would be increasing their risk with regard to the potential for a Part II Order following the issuance of the project's notice of completion.

MOE indicated during the coordination meeting that it would need to be notified if any other First Nations or Aboriginal communities are identified. This would assist the ministry in determining whether additional consultation is required, and whether the Crown has a duty to consult.

MOE attended the biological scoping meeting held on June 9, 2011. Issues were raised regarding nutrient loading and the effects on water quality. The ministry has provided surface water quality parameters in the past, it is anticipated that the Ministry will work with the EA team to devise a water quality sampling plan to address the nutrient issue.

The EA team explained that there remain investigations to be completed subsequent to the submission of the Environmental Report. The proponent's approach will be to identify clear commitments in the ER to complete any outstanding studies thereafter, and to develop impact management strategies that would have to be agreed by the various agencies and honoured by the proponent moving forward, otherwise an amendment to the EA will be required.

Ontario Ministry for Municipal Affairs and Housing

In response to the request for comments on the proposed project, the Ontario Ministry for Municipal Affairs and Housing advised the proponent on July 20, 2010 (Appendix C) that their Ministry did not intend to comment specifically on any of the projects proposed by Xeneca as it was understood that consultation efforts with potentially affected communities was being undertaken by the proponent.

The Ministry of Municipal Affairs and Housing (MAH) received the Project Description documents for the two Serpent River sites on November 16, 2010. MAH noted that the two proposed project sites are located entirely within the Municipality of Elliot Lake, and that the developments may cause conflicts with the existing residential and recreational uses of the watercourses. As such, the MAH commented that the developments should be reviewed with the City of Elliot Lake. Similarly, both locations are situated within traditional aboriginal hunting and fishing areas, and therefore the local First Nation and Métis should be contacted. Aside from these recommendations, the MAH indicated that it did not intend any further involvement on the Serpent River projects.

Ontario Ministry of Northern Development, Mines and Forestry

In correspondence dated July 8, 2010, the Ministry of Northern Development Mines and Forestry (MNDMF) provided a response to the review of Xeneca's project proposals. MNDMF detailed the status of land tenure and mining-related hazards at the dam sites, whether past mineral exploration activity has been reported in the vicinity of the sites, and conditions in regards to various policies and acts. MNDMF indicated that a similar review will be required for the connection corridors for all the projects as they range in length from 1.1 to 22 km.

The MNDMF was provided with the Project Description River on November 16, 2010. MNDMF attended the EA coordination meeting on January 24, 2011, during which it indicated that the Four Slide Falls project was within an active mining claim, and identified the claim holder.

Xeneca has contacted the claim holder and an exchange of information occurred through the signing of a non disclosure agreement April 8, 2008 (Appendix C).

The claim is based on the presence of uranium, but mineral deposits have not been developed beyond test drilling. While some of the claim lands may be affected by inundation, the claim would remain accessible and workable by the owner. The presence of hydro electric generation and electricity distribution infrastructure at the project site make the claim more valuable.

Further, changes to the *Mining Act* in Ontario now recognizes waterpower and other resource development and provision exists for the claim holder to cede first right of refusal on surface rights to the developer of a renewable energy facility (note excerpts from Mining act and attached letter from Ministry of Northern Development and Mines stating terms of the mining act as it applies to renewable energy development Appendix C).

To properly close this file, the mining claim holder must sign off on surface rights. Xeneca will send a letter to the claim holder and an agreement for signature that will acknowledge the project and the terms under which Xeneca will develop the site.

Ontario Ministry of Energy

The Ministry of Energy requested additional information on Xeneca's proposed approach to fostering Aboriginal and First Nation partnerships within the development proposal via an e-mail on December 21, 2010 (Appendix C). ME noted that although the Ministry might not participate in all planning meetings, the ME would like to be kept abreast of the planning process developments. Additionally, ME confirmed on January 5, 2011 (Appendix C) that they wanted to be included in the distribution of all technical documents and the ER in order to provide comment where appropriate.

The ME attended the January 2011 EA Coordination Meeting. Following discussions regarding the appropriateness of classifying the Serpent River as a managed waterway, it was suggested that a focus group meeting be arranged for further discussion. The focus group was to include; MNR, MOE, ME Renewable Energy Facilitation Office, Xeneca and the EA team.

As a follow up to determining the classification of the waterway, Xeneca provided legal documentation (Appendix A-1) providing justification for the "managed waterway" classification.

Ontario Ministry of Transportation

The Ministry of Transportation (MTO) provided a response to several of Xeneca's proposed undertakings on February 18th, 2011. Information was provided as per the *Public Transportation and Highway Improvement Act* and applicable permits (C). MTO identified the requirements for any project that requires modification to a highway entrance. The Ministry identified that all

connection lines must be placed outside of existing MTO right-of-way (ROW), and that permits will be required for all proposed ROW crossings or for lines located within 45 metres of MTO ROW limits.

Ontario Ministry of Aboriginal Affairs

The Ministry of Aboriginal Affairs attended the January 2011 EA Coordination Meeting. The agency did not raise any issues or provide comment on the project as it was explained that their role was observatory in nature.

4.3.3 Municipal

The project site is located within the Municipality of Elliot Lake. The City of Elliot Lake was provided with an introductory letter from the proponent on June 16th, 2010. A Notice of Commencement for the proposed undertaking was issued on July 14, 2010. A revised Notice of Commencement was issued on November 10th 2010. The Project Description document was provided on November 16th, 2010 to the cities of Elliot Lake and Sault Ste. Marie and the towns of Blind River, Massey and Spanish. Municipal consultation was managed by Xeneca's Corporate Affairs and Communications team, a copy of each NOC is provided in Appendix D along with a complete record of contact.

Invitations were sent out via e-mail and local advertising to attend a public information centre on December 1, 2010 in Elliot Lake. Members of the Elliot Lake Council responded with a request for a project briefing prior to the PIC from the proponent.

A resolution was adopted by the Town of Spanish on December 10, 2010 and the proponent was invited to a meeting with council.

The Elliot Lake and District Chamber of Commerce corresponded via e-mail on December 22, 2010 acknowledging their support for the proposed undertaking. The proponent was subsequently invited on February 16, 2011 to a seminar entitled "Engaging the First Nations and Industry and Economic Development Challenge", but was unable to attend.

The proponent sent a letter to the mayor of Elliot Lake dated August 2, 2011 requesting a meeting with the Council to brief them on the Environmental Reports for the two Serpent River projects and provide clarification of the process. This will also allow for discussion on any relevant issues that the Council may have in relation to the projects. A teleconference call was subsequently planned for August 3, 2011.

4.4 PUBLIC CONSULTATION

Public Consultation was undertaken by the proponent in the form of a public information centre (PICs) and focus group meetings where requested. The PIC was advertised in local publications at least ten days prior to the event; copies of the print advertising is provided in Appendix D. Information collected at the events including signed attendance sheets and completed comment forms are also provided in Appendix D along with a detailed record of consultation.

Copies of media advertising in advance of all public consultation events is provided in Appendix D as are signed attendance sheets and comment forms.

A brief summary of the public consultation process is presented below.

A public information centre (PIC) was held in Elliot Lake, Ontario on December 1, 2010, approximately 17 participants attended. Background project information, including information on the proponent, the site and the Waterpower Class EA process was presented as a poster display session. Hand-out material, including comment forms were available to those in attendance. An overview of the information provided at the PIC is attached as Appendix D.

Members of the EA team were available at the December 1st meeting to address questions or concerns expressed by the attendees. A general summary of issues raised through conversation at the meeting and the completion of comment cards follows.

At the PIC and through ongoing correspondence a riparian landowner expressed concerns regarding the effects of the Four Slide Falls project will have on McCarthy Lake levels. It was detailed that during the May to September period the level gradually in McCarthy Lake decreases resulting in the landowner having to relocate his dock. He raised the question as to whether operations at the proposed Four Slide Falls project would hold back the inflow to the lake making the situation worse. He requested that the lake be stabilized as high as possible during the summer period and that this be incorporated into water management planning.

Attendees of the PIC included a member from the snowmobiling community and a representative from the Coureurs de Bois Hiking Club, stating stated that the project area is used by hikers and snowmobilers. It was relayed that the local snowmobile trail network otherwise known as District 13, covers both Serpent River project sites, in addition to Elliot Lake and Spanish. There are two parts to District 13; Elliot Lake which covers the Four Slide Falls site and the upper part of McCarthy Chute site and the southern area called the Spanish section which covers the lower area of the McCarthy Chute project. It was noted that proposed inundation area intersects the snowmobile trail, and a request for discussion on re-routing the trail was issued. In addition, it was noted that snowmobilers do not want to cross water bodies and that safe watercrossing alternatives would be needed. When not being used by snowmobilers, the Elliot Lake section of

the Trans Canada Trail is frequented by the Coureurs de Bois Hiking Club. Club members use a section that crosses over the rapids/falls located at the bottom of Pecors Lake which is immediately upstream from the extent of inundation for Four Slide Falls. The proponent will pursue additional consultation with representatives from the snowmobiling and hiking communities to seek resolution to these issues.

A representative from Rio Algom, which operates several mines in the area, raised a number of water quality issues. It was stated that sulphate levels in local surface water is 50 mg/L. Rio Algoma has a small 15 kW siphon turbine at their mine effluent water treatment discharge site. The discharge water has a high sulphate concentration which corrodes the epoxy coated turbine blades, necessitating that they be replaced with stainless steel blades. The Rio Algom representative wanted to advise the proponent of this matter for design consideration.

Local anglers wanted to know how the project would impact ice fishing in the vicinity of the project since the sport is practiced at both McCarthy and Pecors lakes. Xeneca responded that the effects of the project on ice fishing would be determined through field investigations and the provision of mitigation measures.

On June 29, 30 and July 11, 2011 various stakeholders were contacted via e-mail and provided with a letter requesting any further comments or concerns in relation to the proposed undertaking. Recipients included;

- Elliot Lake Rod and Gun Club
- Elliot Lake ATV Club
- Elliot Lake Fly Fishing and Tying Club
- Penokean Hills Field Naturalists
- Elliot Lake Snowbirds Snowmobile Club

A response from the Penokean Hills Field Naturalists was received via e-mail on July 14, 2011 requesting further information on the impact of McCarthy Chute site on Depot Lake. The proponent assured that only a small area downstream of McCarthy Lake and McCarthy Chute project site will be flooded and therefore there will be no impact on Depot Lake.

Xeneca has recorded all public comments and concerns for the proposed Serpent River projects over the course of the EA planning process and will continue to do so throughout the development process. A record of public participation compiled by Xeneca is provided in Appendix D along with all meeting notes and minutes. A summary of the identified issues and concerns raised during the public consultation process is provided in Table 4. At the time of writing this report a final PIC is scheduled for early September 2011.

4.4.1 Industry

KBM Resource Group (KBM) undertook consultation with the Sustainable Forest License holder Northshore Forest Inc. (Eacom) under the Northshore Forest Management Plan towards the design of access roads and connection lines for the project. GIS datasets including all road networks, planned harvest block locations and aggregate pit locations were referenced along with specific information based on KBM's extensive knowledge with forestry management and the land base.

4.5 ABORIGINAL ENGAGEMENT

Aboriginal communities hold a unique position in Canada, and have a legally protected right to participate in the development and review of resource management strategies or plans in areas they assert to be traditional territories, including Crown lands outside areas where treaties apply.

While it is understood that consultation with Aboriginal communities is the responsibility of government and that consultation is deemed to be a government to government mandate, Xeneca supports the approach harmonizing government duty to consult and the proponent's engagement and consultation requirements as directed by the Waterpower Class EA planning process. Corporately, Xeneca also supports the development of business to business relationships with identified Aboriginal communities and the company believes in providing economic opportunities to Aboriginal communities in support of GEA and Ministry of Natural Resources Site Release Process objectives.

A complete list of involved Aboriginal communities, a record of engagement to date and an Aboriginal Consultation Plan is presented in Appendix E. A brief summary of the consultation outcomes to date is presented below.

Xeneca corresponded with the following identified First Nations regarding the proposed undertaking:

- Mississauga First Nation (MFN)
- Sagamok Anishnawbek First Nation (SAFN)
- Serpent River First Nation (SRFN)
- Métis Nation of Ontario (MNO)

On May 30, 2008, a formal request was mailed to the Mississauga First Nation, Sagamok Anishnawbek First Nation and Serpent River First Nation to meet and discuss the potential benefit sharing for the two Serpent River developments. The Serpent River First Nation and Xeneca signed a Letter of Intent on April 1, 2010, declaring their intent to move forward in developing a business relationship.

Mississauga First Nation, Sagamok Anishnawbek First Nation and Serpent River First Nation were sent letters on February 2, 2009, regarding consultation and the decision to move forward with the Waterpower Site Strategy.

In an email sent to Xeneca on August 24, 2010, the Sagamok Anishnawbek First Nation indicated that they would not be overly involved with the Serpent River sites, as these sites fell within Serpent River First Nation territory. In a later email (November 24, 2010), Sagamok Anishnawbek First Nation expressed reluctance in taking the lead in bringing together involved First Nations in regards to the Serpent River projects (as well Xeneca's other proposed developments on the Vermillion River), as the communities have intricate interrelationships and bonds that they felt could not be risked by purely economic interests.

Throughout May 2010, the dilemma surrounding the Lake Trout Lake policy, which was presenting a hurdle to the proposed Serpent River developments (particularly McCarthy Chute), was discussed between Xeneca and the SRFN via email. Xeneca encouraged SRFN's cooperation in addressing the lake trout issue, believing it to be in the best interest of both parties.

On June 10, 2010, Xeneca mailed letters to the above listed First Nations and the Métis nation of Ontario announcing that it had received Feed-in-Tariffs contracts for eighteen project sites throughout Ontario. At the time, Xeneca invited the above noted First Nation communities to enter into discussion regarding those projects falling within their traditional lands. A request for the Aboriginal communities to share information about the project site area was also made at that time.

Subsequent to receipt of the Site Description Package (SDP), which categorizes First Nations and Métis communities into "Identified" and "Local" designation, the final list of communities involved at Four Slide Falls were determined to be:

Identified	Local
Mississauga First Nation	Serpent River First Nation
Sagamok Anishnawbek First Nation	North Channel Métis
Serpent River First Nation	Métis Nation Ontario

An explanation of the planned archaeological assessments was provided in a September 16, 2010 letter to the First Nations listed above, along with an invitation to these communities to participate in these studies. Invitations were also sent to these communities as well as the Métis

Nation of Ontario on October 13, 2010 to participate in Public Information Centres, which were planned for the winter of 2010-2011.

Following the invitation, the MFN indicated, via email (October 20, 2010), a preference for Xeneca to come visit the community; Xeneca replied, agreeing to the request.

On October 1, 2010, the Métis Nation of Ontario sent Xeneca a letter of support for the decision to issue Notices of Commencement for 18 of its FIT contracts.

On December 20, 2010, Xeneca distributed Project Descriptions to all the three First Nations listed above. At that time Xeneca noted that a proponent-led EA Coordination meeting would be undertaken in the spring of 2011 with key government agencies and requested that First Nation communities identify whether they had an interest in participating in this meeting. They were further informed in a June 8, 2011 e-mail that the archaeological studies would be conducted from July 4 to 11, 2011.

On May 13, 2011, further correspondences from Xeneca were distributed to continue the Aboriginal consultation dialogue along with a draft Aboriginal Consultation Plan. It was stated that the Aboriginal community engagement plan will formally begin after the issuance of the Notice of Completion at which time the final report will be provided to the communities. This action will be followed by a period of 30 days for review and engaged discussion on any issues that may arise.

On June 8, 2011, the SRFN was provided with the Stage 1 Archaeological Summary Report for both Serpent River projects.

5. EVALUATION OF POTENTIAL PROJECT EFFECTS

Environmental assessment legislation in Ontario defines an effect as:

"(a) any change that the project may cause in the environment, including any effect of any such change on health and socio-economic conditions, on physical and cultural heritage, on the current use of lands and resources for traditional purposes by First Nations persons, or on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance and (b) any change to the project that may be caused by the environment, whether any such change occurs within or outside of Canada."

The purpose of an environmental assessment is to identify all the ecosystem components that make up the environment (biological, social and economic) within the project area, and evaluate how the project would affect these valued ecosystem components during its construction, operation and end of life cycles. The EA team has adopted the conceptual hierarchy of

avoidance, prevention and mitigation for the project. Where an impact cannot be avoided or prevented, mitigation measures were considered.

Mitigation measures include:

- Reducing the magnitude and duration of the impact;
- Repairing the situation post-impact to return to a pre-impact state;
- Offsetting the impact through other means.

Investigations undertaken in support of this project identified the anticipated effects of the project, at both the generating station site and ancillary components as presented in Sections 3.2 and 3.3, respectively. Once identified, the EA team worked collectively to apply its expertise to finding solutions to avoiding, mitigating or minimizing the identified effects.

The results of the project life-cycle potential impact analysis based on available data and information and recommended mitigative measures are presented and discussed within this report. Additionally, the results of the technical investigations completed by the EA team members are provided in the Annexes which accompany this document. A summary of the recommended mitigative measures is presented in tabular format for the reader's convenience in Table 4.

5.1 IDENTIFIED POTENTIAL EFFECTS

Project effects and management strategies considered by the EA team during the preparation of conceptual site designs, construction plans and operation plans, and those identified through the consultation program, are discussed below. The discussion is divided into areas of the proposed development as indicated:

- identified zone of influence - upstream;
- area of impact of the facility site and ancillary components; and,
- identified zone of influence – downstream ("variable flow reach").

An additional assessment of effects will be undertaken subsequent to the 2011 field investigations, and further discussion is planned between the EA team and interested parties.

The results of the project life-cycle impact analysis and recommended mitigative measures have been presented and discussed within the main report as well as in the appended investigation reports. A summary of the recommended mitigative measures is presented in Table 4.

TABLE 4: Identified Issues and Management Strategies

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
General Natural Environment				
Air quality	Noise from operation of electrical generator and transformer at powerhouse/electrical connection	• design powerhouse to reduce level of noise outside the powerhouse building.	Low negative impacts - impacts mitigated or eliminated where ever possible through design	Yes
	Exhaust emissions from equipment and vehicles (construction and operation of facility)	• implement standard construction site best management practices • reduce equipment engine idling • limit the use of diesel generator during operation (typically only in emergency situations)	Low negative impacts - impacts mitigated or eliminated where ever possible, C of A for emergency generator will be required	Yes
	Odour	• utilize approved waste disposal sites and best practices for VOC/organic waste disposal • appropriate disposal containers will be available for the prompt disposal of waste • full disposal containers will be removed to the appropriate waste disposal facility on a regular basis • organic/food waste will be collected daily and stored in closed, animal resistant containers until disposed of at an approved waste disposal site or incinerated on-site according to project permitting standards • an attractant management policy to minimize the effect on wildlife from the storage, preparation and disposal of food products at the construction camp will be implemented	No impacts anticipated - proper management policy implementation and handling of VOC/organic waste onsite and offsite disposal at an approved disposal location will mitigate potential impacts	No
	GHG Offsets	• waterpower can offset GHG emissions from coal fired generation.	Positive effects due to GHG offsets by building a hydroelectric generating station to generate 17,600 MWh per year of renewable energy represents the displacement of 12,136 tons of carbon dioxide equivalent	Yes
	Dust emissions from construction activities and vehicles	• project personnel will control dust at work sites when it is warranted by the conditions • a water truck or alternate method will be used to suppress dust on all project roads and work areas when required as a result of dry or dusty conditions • dust control techniques will be implemented prior to reaching critical conditions • trucks will be required to use dust covers when traveling through populated areas	Low negative impacts - impacts mitigated or eliminated wherever possible.	Yes

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Water quality (surface and groundwater)	Surface water - general construction activities along shoreline of waterway at facility and water crossings along transmission line route and access roads	• implement standard construction site best management practices • construction machinery should arrive on site in a clean condition • ensure a spill response and contingency plan is in place • maintain appropriate emergency response measures • implement wet weather restrictions • stabilize all waste materials above the high water mark • use mechanical means (not chemical) to clear and manage vegetation within ROW • all concrete work will be completed in dewatered areas, water will not be reintroduced to dewatered areas until concrete is cured • project personnel will be made aware of safe concrete handling procedures. Concrete handling will employ watertight forms, spill contingencies, and designated truck clean out pits. • contractors will have prepared and will follow a Care of Water Plan • construction of earthworks will be scheduled to minimize duration of exposure • turbidity of water close to construction site will be monitored; • contain material when working near water bodies; cofferdam, silt curtains, sediment traps and settling ponds • removal of riparian vegetation should be minimised • no excavation or borrowing will be done without the appropriate plans, surveys, permits, and approvals in place • where practical, existing borrow sites and associated roads, trails or cut lines will be used instead of developing new sites • borrow sites for aggregate will be located in upland locations and separated from streams and lakes by a minimum 30 m wide buffer of undisturbed terrain in order to minimize potential for siltation • borrow area will be staked to prevent accidental over-extension of the affected area	Low negative impacts - impacts mitigated or eliminated wherever possible through implementation of mitigation measures	Yes
	Surface water - In-water works construction and removal of the cofferdam: potential for excess sediment to be suspended and carried downstream by river flow	• Ensure that all rock materials placed into the river have been prewashed. • Construct and remove the cofferdam during an appropriate low flow period. • Ensure that construction takes the least possible time by having all construction materials and necessary equipment available prior to construction or removal of the cofferdam. • Avoid construction and removal during the time typically associated with spawning and egg incubation times of warm water fish species (typically April 1 to July 15). Specific timing windows should be agreed to with the local MNR as part of the permitting process	Low negative impacts - Due to the velocities present in this section of river, it may not be possible to isolate the cofferdam construction from the channel using a silt curtain or equivalent, in this case; Adhere to all applicable standard best management practices available to the industry as applicable	Yes
	Contamination from spills or leaks of hazardous substances	• spill prevention and containment measures to be put in place throughout operational period • ensure that workers are adequately trained in the implementation of a prepared spill response plan • personnel will be trained in the requirements for the storage and transport of hazardous material • ensure availability of spill control equipment and materials • store hazardous materials at least 150m away from water bodies • provide impervious dikes and liners around oil, fuel and chemical storage areas • avoid in-water works during periods of high precipitation • refuel machinery on impermeable pads or pans designed to allow full containment of spills a minimum of 30m from water bodies • fuelling and maintenance activities should occur within an area where sediment erosion control measures and all precautions have been made to prevent oil, grease, antifreeze or other materials from inadvertently entering the ground or the surface water flow • monitor area for leakage; in the unlikely event of spillage the supervising engineer would halt all construction activities and corrective measures would be implemented; any spills would be immediately reported to the MOE Spills Action Centre (1.800. 268.6060) • All hydrocarbon fuels, oils, and lubricants will be stored in a secondary containment area • Drip pans will be installed on equipment to intercept minor leaks • Sumps will be installed including an oil trap to prevent contaminated water from being pumped into a water course • All fuel or lubricant contaminated materials will be collected and trucked to an approved regional disposal facility, or will be treated with in situ bio-remediation techniques approved by the Proponent and Regulators	Low negative effect - impacts possible in the event of accident/malfunction; impacts mitigated or eliminated wherever possible through implementation of mitigation measures	Yes

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Water quality (surface and groundwater)	Surface water - Fluctuation of inundation area upstream and fluctuation in flows downstream due to intermittent operation of facility increasing suspended sediment (may include resuspension of sediments that may be impacted from decommissioned uranium mining operations within the watershed)	• maximum suspended sediment concentration should not decrease the Secchi disc reading by more than 10% • Limit maximum daily fluctuations of upstream water levels (1 m) • Limit the rate of change of upstream water levels • Where the erosion survey has identified potential for shoreline erosion or ice scour, inspect and monitor for signs of erosion in year one and year five of operation to document degree of erosion and develop and implement additional mitigation measures as required • Facility will operate as a modified run of river facility (run of river operation during extreme high and low flow periods of the year • Monitoring within the watershed over the last 10 years has shown a steady improvement in surface water quality since the closure of the mines and mining-related parameters are now generally at levels which are protective of aquatic life. • Sediments within the watershed continue to reflect the historical mining activity with elevated concentrations of certain parameters in some lakes but, generally, recent biological monitoring has shown little or no detectable effects in fish and benthic invertebrates	Negative impacts possible - impacts mitigated or eliminated wherever possible through use of mechanical and vegetative erosion controls at key points along shoreline. Monitoring undertaken to document continued effectiveness of mitigation measures. Additional mitigation measures will be developed as required. The proponent will meet with regulators in order to determine further sampling (fish tissue, soil, surface water) and follow-up monitoring requirements and establish a mitigation and monitoring plan to address requirements and mitigation	Yes
	Surface water - Inundation area at Four Slide Falls site may alter water quality (methyl-mercury) in reservoir and in turn, the water flowing downstream into McCarthy Lake	• woody debris will be removed from inundation area prior to headpond filing • headpond created in association with the project will be relatively small when compared to other hydropower projects where mercury enrichment has occurred • pre- and post-development monitoring for mercury in fish tissue will be conducted	The proponent will meet with regulators in order to determine further sampling (fish tissue, soil, surface water) and follow-up monitoring requirements and establish a mitigation and monitoring plan	Yes
	Surface water - Inundation area at Four Slide Falls site may alter water quality (phosphorus) in reservoir and in turn, the water flowing downstream into McCarthy Lake	• modeling shows minimal and temporary effects associated with the creation of the reservoir at Four Slide Falls • effects on McCarthy Lake will decrease naturally with time	The proponent will meet with regulators in order to determine further sampling and follow-up monitoring requirements and establish a mitigation and monitoring plan, if required	Yes
	Surface water - Inundation area at Four Slide Falls site may alter water quality (dissolved oxygen) in reservoir and in turn, the water flowing downstream into McCarthy Lake	• modeling shows minimal and temporary effects associated with the creation of the reservoir at Four Slide Falls • effects on McCarthy Lake will decrease naturally with time	The proponent will meet with regulators in order to determine further sampling and follow-up monitoring requirements and establish a mitigation and monitoring plan, if required	Yes
Hydrology	Four Slide Falls project must be hydrologically isolated from Pecors Lake (designated Lake trout lake)	• The headpond will extend approximately 6.8 km upstream to the outlet of Pecors Lake during the LTAF and the 1:100 year flood. The project will have virtually no effect on water levels in Pecors Lake	No impacts anticipated	No

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Species At Risk - Blanding's Turtle	Four Slide Falls site are within the range of the Blanding's Turtle. Main threats come from road mortality and illegal harvesting/capture rather than a loss of habitat.	• the GS footprint does not include preferred habitat for the Blanding's turtle • workers will be informed on how to identify Blanding's turtles and a discovery protocol will be in place should a turtle be encountered • If impacts are anticipated/confirmed, a Permit under Section 17(2)C of the *Endangered Species Act* will be required and an overall benefit to the species will be required/discussed. • Additional alternatives/mitigation strategies include: - Gating and limiting access along roadways - Road signage/warnings for reduced speed during key periods of the year where and when the turtles are active - Operational constraints for the headpond - Public education programs - Artificial nest creation (nest boxes/covers) and monitoring - Eco passages under roadways and roadside barriers	Proponent will continue to monitor for the presence of Blanding's turtles within the project zone of influence and will contact the MNR to discuss requirements should individuals be identified	No
Species at Risk - Chimney swift	Impact to breeding and habitat due to clearing of riparian forest for headpond creation during construction	• a permit under Section 17(2)C of the *Endangered Species Act* will be required and an overall benefit to the species will be required/discussed. • once operation commences an Agreement for Operation and monitoring protocols under the *Endangered Species Act* will be required/discussed with the MNR. • Clearly delineate the area for clearing/grubbing to ensure that only required areas are cleared. • Woody vegetation would be removed outside of the breeding bird period, April 15th to July 10th inclusive • If trees must be removed during the breeding bird nesting period, a professional biologist should be present to conduct nest searches in any tree that will be removed or indirectly impacted by tree removal. • area of impact will be relatively minimal when related to the amount of comparable habitat available in the surrounding landscape	Low negative impacts possible - impacts mitigated or eliminated where ever possible, Permit/Agreement required for construction/ operation.	Yes
Species at Risk - Peregrine Falcon	Impact to breeding and habitat due to construction and operation of facility	• No peregrine falcon were observed during natural environment characterization surveys • suitable breeding habitat is not present within the study area	Proponent will continue to monitor for the presence of Peregrine Falcon within the project zone of influence and will contact the MNR to discuss requirements should individuals be identified	No
Species at Risk - Eastern Cougar	Impact to habitat due to construction and operation of facility	• Eastern cougar are extremely rare in Ontario • Cougars have vast home ranges and can travel over 1,000 km • No Eastern cougar were observed during natural environment characterization surveys	No impact anticipated	No
Species at Risk - Monarch Butterfly	Impact to habitat due to construction and operation of facility	• Monarch's preferred habitat (green open areas that support Milkweed (Asclepius spp.) and other wild flowers) is not present within the project area	No impact anticipated	No
Species at Risk - Eastern whip-poor-will	Impact to breeding and habitat due to construction and operation of facility	• species specific surveys did not reveal the presence of Eastern whip-poor-will within study area • suitable forest breeding habitat is present within the study area	Proponent will continue to monitor for the presence of Eastern whip-poor-will within the project zone of influence and will contact the MNR to discuss requirements should individuals be identified	No
Significant earth or life science features	No issues	• No ANSI identified in project area as indicated by MNR Site Information Package	N/A	No
Land subject to natural or human made hazards	No issues	• No land subject to natural or human made hazards identified	N/A	No

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Terrestrial wildlife (numbers, diversity, distribution)	General disturbance to habitat during construction and maintenance of facility (dam, powerhouse, etc)	• limit use of machinery in and around watercourses and sensitive terrestrial areas • clearly define access and transportation routes to minimize disturbance • use woody debris and non-merchantable logs from corridor clearing to establish brush piles and downed logs adjacent to the cleared right-of-way to improve habitat • allow for detour around sensitive habitat areas • use mechanical means (not chemical) to clear and manage vegetation within ROW • limit removal of vegetation during construction/maintenance to maintain habitat connectivity • all construction traffic should adhere to speed limits and construction crews should be aware of the potential for wildlife crossings • any roadway mortalities of herpetofauna should be reported and a reduction in speed limits should be imposed in specific areas to prevent additional mortalities • the area of disturbance within the overall site boundaries will be kept to a minimum and clearing will only occur where necessitated by construction. • high visibility snow fencing will be installed to restrict heavy equipment traffic to the area identified for clearing. • travel paths, stockpile areas and staging areas will be carefully planned and followed. • Where possible, avoid important habitats • Where possible, activities will be scheduled to avoid sensitive nesting, rearing, mating, or staging periods • All food and food waste will be properly stored and disposed of to prevent attracting wildlife • All Project personnel will use proper care and caution when operating vehicles to avoid collisions with wildlife •Wildlife are relocated as required during the work and after the work has been completed	Low negative impact - Construction Management Plan will be finalized to include protocols and procedures for minimizing the disturbance to wildlife during the construction program. The clearing and grubbing of land will result in a loss of some vegetation and in turn potential wildlife habitat. In-direct impacts also have potential to occur during active construction and during operation of facility (i.e. noise, human presence and activity)	Yes
	Access road construction - habitat fragmentation, increased predation, introduction of invasive species	• gating roads to prevent further human access • re-claim temporary/unused access roads following completion of work • enforce speed limitations on construction vehicles along access roads to limit road kills • inform workers on potential for road mortality of wildlife	Once the access road alignment is finalized it is Xeneca's intention to conduct detailed field surveys along the alignment in order to identify specific impacts and develop appropriate mitigation.	Yes
	Connection line construction	• The existing natural environment features along the proposed route have been reviewed from a biological perspective by the EA team in a screening study including route refinement analysis to avoid sensitive areas. This work was completed on preliminary route options and is presented under a separate report entitled Xeneca Power Hydroelectric Developments Transmission Line and Access Road Natural Environment Preliminary Analysis (see Annex III). • Additional work was then undertaken by the EA team to determine more refined route options (i.e. desktop database search GIS mapping). These results are presented under separate report entitled Distribution Line Summary for the Four Slide Falls and McCarthy Chutes Hydroelectric Projects (Serpent River) (see Annex II-B). • Additional work (flyover mapping and a Rapid Assessment Technique (RAT) review) of the entire length of the refined route options is being undertaken to determine the preferred route, further reporting will be issued to agencies as it becomes available and as routes are refined.	As the routing studies currently underway conclude and the alignment is finalized, it is Xeneca's intention to conduct field surveys (ground truthing and specific ecosite mapping) in identified areas of special concern along the preferred route and where there is significant potential for identified species in order to resolve potential impacts and develop appropriate adaptive mitigation.	Yes, expected, however additional data is required to complete the determination of the significance of the residual effect
	Construction of terrestrial based facility components (powerhouse, penstock auxiliary dam, etc) occupying an approximate footprint impact area of 5500m^2	• Potentially impacted terrestrial communities will be confirmed during further ELC field work as an extension of work completed in 2010.	Site specific surveys of vegetation to be cleared will be undertaken	Yes, expected, however additional data is required to complete the determination of the significance of the residual effect

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Terrestrial wildlife (numbers, diversity, distribution)	Construction of facility and headpond creation - impacts to general and Significant Wildlife Habitats	• Auxiliary dam is intended to prevent further headpond inundation and so is from an impact perspective, avoiding further terrestrial impacts from the creation of the headpond • For snake habitat - artificial hibernacula (rock and log piles that, under direction of a professional biologist are deemed sufficient to sustain overwintering snakes) should be created within the surrounding vicinity that provides the same ecological functions as those of the lost habitat. Material used to construct hibernaculum structures should be derived from the general vicinity of the project area and can include rock and wood materials removed for headpond creation.	Studies conducted in 2010 continue in 2011 in inundation area to confirm the riparian impact. The ZOI has been assessed and the general surroundings are known. Due to the small area to be impacted in relation to the abundance of these habitat types on the surrounding landscape, any loss of habitat would likely have a negligible effect on their overall regional populations. Restored hibernacula will be monitored for structural integrity and use by reptile species, particularly species of conservation concern.	Yes
	General disturbance to wildlife	• Where possible, avoid important habitats • Where possible, activities will be scheduled to avoid sensitive nesting, rearing, mating, or staging periods • All food and food waste will be properly stored and disposed of to prevent attracting wildlife • All Project personnel will use proper care and caution when operating vehicles to avoid collisions with wildlife •Wildlife are relocated as required during the work and after the work has been completed	Construction Management Plan will be updated to include findings from ELC survey and other terrestrial studies. Minimize the disturbance to wildlife during the construction program.	Yes
Natural vegetation and habitat linkages	Effects on vegetation and habitat during connection line and access roads ROWs construction and maintenance	• schedule construction during winter months, when possible, to minimize habitat disturbance • limit use of machinery in and around watercourses and sensitive terrestrial areas • clearly define access and transportation routes to minimize disturbance • allow areas of exposed soil to naturally regenerate with native species • use mechanical means (not chemical) to clear and manage vegetation within ROW • limit removal of vegetation during construction/maintenance to maintain habitat connectivity	Low negative effects anticipated - construction Management Plan will be finalized to include instructions and protocols for minimizing the disturbance to terrestrial ecosystem during the construction program.	Yes
	Access road and connection line construction - increased potential for forest fires	• gating roads to prevent further human access and reduce the risk of forest fires • re-claim temporary/unused access roads following completion of work • project personnel will be prepared and be familiar with the site Fire Preparedness Plan • fire fighting equipment will be available to all workers and the location of such equipment will be outlined in the Fire Preparedness Plan • Locations of equipment and muster points will be advertised as necessary around the site • project personnel will be familiar with fire-fighting techniques and the use of supplied equipment • uncontrolled fires will be immediately reported to the nearest fire emergency service and the MNR in the case of an uncontrolled fire on Crown land • smoking will only be permitted in designated smoking areas equipped with fire extinguishers • disposal and storage of waste will be into proper waste containers to prevent fires	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible.	No
	Access road and connection line construction - habitat fragmentation, increased predation and introduction of invasive species	• restrict construction vehicles to existing access routes and staging areas • minimize access requirements around wetlands to minimise disturbance • retain vegetation to the extent practicable • During clearing, trees will be felled into the proposed site wherever possible • Clearing will comply with the requirements of all applicable permits and approvals, the Crown Forest Sustainability Act, The Forest Operations and the Silviculture Manual • Wildlife trees and other significant trees will be marked for protection; marked trees will only be removed if they are a safety concern that cannot be addressed in other practical ways • Brush will be disposed of by burning or chipping. When burning is carried out, it will be under permit with the MNR and according to the Forest Fires Prevention Act • gating roads to prevent further human access to reduce habitat fragmentation • re-claim temporary/unused access roads following completion of work to reduce habitat fragmentation	As the routing studies currently underway conclude and the alignment is finalized, it is Xeneca's intention to conduct field surveys (ground truthing and specific ecosite mapping) in identified areas of special concern along the preferred route and where there is significant potential for identified species in order to resolve potential impacts and develop appropriate adaptive mitigation .	Yes, expected, however additional data is required to complete the determination of the significance of the residual effect

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Natural vegetation and habitat linkages	Construction of laydown areas, stockpile areas and temporary construction camp - removal of terrestrial significant wildlife habitat	• ELC studies are underway in 2011. If possible, no laydown areas will be developed in areas of significant wildlife habitat.	Laydown areas will be selected to avoid identified significant wildlife habitat.	No
Soil and sediment quality	Soil compaction in construction footprint and ROW for connection line and access roads	• schedule construction of temporary access road and connection line ROW to minimize ground disturbance (winter) • stop activities when ground conditions could potentially severely disturb soil profile (high precipitation, etc) • be prepared to alter construction activities as a result of sudden thaw conditions • stabilize high traffic areas with gravel surface layer or other suitable cover material • establish a designated construction access route to minimize area of impact • time construction activities to minimize effects on surface vegetation and subsurface rooting zones • vehicles and equipment access will be restricted to the minimum area necessary • conduct site reclamation activities as soon as possible following the disturbance	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible. Soil compaction will reverse naturally over time if left undisturbed.	No
	Management of excavated materials (blast rock, fill, aggregates, etc)	• transport blast rock to lay down area for stockpile and/or crushing; laydown areas will be situated at acceptable distances from water bodies (i.e. greater than 30 m) • install mechanical erosion control measures at blast rock storage site near water body • re-use blast rock for aggregate and shoreline stabilization • apply water to dry soil/rock to minimize dust • instruct workers and equipment operators of dust control methods • install mechanical barriers to prevent run off from dust piles into water bodies • If Acid Rock Drainage (ARD) is determined to be an issue, an ARD Management Plan will be prepared including measures for avoidance, mitigation, and treatment methods for ARD as well as long-term storage methods for acid-generating spoils which would entail isolation of spoils from water and air to prevent leaching	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible. A Sediment and Erosion Control Plan will be prepared prior to construction. If required, an ARD Management Plan will be adhered to.	No
Aquatic and Riparian Ecosystem				
Shoreline Dependent Species	Shoreline dependant Fish Species - *See Fish Habitat Section below*			
	Inundation effects on aquatic mammals (beaver and otter, etc) and their habitat	• Planning for flooding of new reservoirs should avoid the winter/ice over period when filling could cause direct mortality by drowning furbearing mammals in their dens	No impacts anticipated - proper construction and operations planning will mitigate impacts to aquatic mammal species	No
	Facility construction activities impacts on shoreline habitats	• ELC studies underway in 2011 • impacts largely isolated to localized clearing and grubbing of riparian vegetation • specific mitigation to be developed once impact assessment is complete	Develop mitigation using full results from 2010 and 2011 ELC studies.	Unknown due to outstanding data and information
	Loss of emergent vegetation within headpond as a result of water level fluctuations during intermittent operations	• water level fluctuations will be limited to a maximum of 1 m (normal operating level of 284 masl down to 283 masl) at the dam site and will gradually decrease moving upstream • emergent vegetation will not re-establish itself along the headpond shoreline but is abundant in the surrounding landscape. • Xeneca has revised their operating plan to limit the maximum daily fluctuations of upstream water levels. • Limits have been adjusted to less than the amount of seasonal and inter-annual fluctuation that has been occurring naturally over time in the upstream river reach prior to construction	Low negative impacts - impacts mitigated to the greatest extent possible while maintaining the socio-economic benefit of increased electricity production during periods of high usage	Yes

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Wetland Dependent Species	Potential for habitat destruction/ displacement and effects on aquatic feeding areas as a result of construction activities, inundation and water level fluctuations	• restrict construction vehicles to existing access routes and staging areas • minimize access requirements around wetlands to minimise disturbance • retain vegetation to the extent practicable • During clearing, trees will be felled into the proposed site wherever possible • Clearing will comply with the requirements of all applicable permits and approvals, the Crown Forest Sustainability Act, The Forest Operations and the Silviculture Manual • Trees cleared during headpond preparation and site preparation will be felled into the proposed site wherever possible and will not be felled into the water • Wildlife trees, Culturally Modified Trees and other significant trees will be marked for protection; marked trees will only be removed if they are a safety concern that cannot be addressed in other practical ways • Brush will be disposed of by burning or chipping. When burning is carried out, it will be under permit with the MNR and according to the Forest Fires Prevention Act • Connection line poles should be situated at either end of a wetland to eliminate the need for pole installation within the wetland limits	Negligible impacts anticipated - Construction Management Plan will be finalized to include instructions and protocols for minimizing the disturbance to aquatic ecosystem during the construction program. The loss of emergent vegetation associated with water level fluctuations will result in the loss of aquatic feeding areas, however, these areas are common in the surrounding region.	Yes
Fish Habitat	Potential effects on habitat associated with water crossings on ROWs for access roads and connection line	• Impacts to local fish populations and their habitats will be discussed with DFO and MNR as part of overall strategy for dealing with fish habitat at water crossings • DFO Operational Statement for Overhead Line Construction will be adhered to in order to minimise impacts to fish and fish habitat.	As the routing studies for access roads and connection line ROWs currently underway conclude and the alignment is finalized it is Xeneca's intention to conduct field surveys along the alignment, especially at key water crossings, in order to identify potential impacts and develop appropriate mitigation.	Unknown due to outstanding data and information
	Walleye spawning habitat within the variable flow reach 750m downstream of the facility.	• Ensure that minimum ecological flows are maintained over this habitat during key life history stages for Walleye to ensure that it continues to function adequately for spawning and egg incubation. • The hydraulic modeling (depth, velocity and wetted width) and the surveying required to fully assess the impacts will be extended to fast water areas.	Additional hydraulic modeling (depth, velocity and wetted width) will be conducted to determine the flow required to eliminate impact	No
	Impacts to habitat and productivity within bypass reach (250m between facility intake and tailrace)	• Ensure that minimum ecological flows are maintained over this habitat during key life history stages for fish and invertebrates to ensure that it continues to function adequately. • Operating plan indicates that a minimum flow will be passed at all times over the course of the year.	Xeneca will meet with MNR and DFO to determine minimum flow requirements, impacts and (if required) compensation requirements in order to mitigate impacts	No
	Inundation effects on fish and invertebrate habitat in proposed headpond as a result of the transition from river to lake-like conditions	• The necessity to compensate for shift in fish community and affects on spawning habitat has been explored on a preliminary basis with DFO during biological scoping meetings • Further discussion is required with MNR and DFO to determine if the expected shift in habitat and fish population dynamics will constitute a HADD and develop appropriate adaptive mitigation.	Xeneca will meet with MNR and DFO to determine impacts and develop compensation requirements for inundation of Rainbow Trout spawning areas and shift in fish population diversity	Yes
	Impacts to Northern Pike and their habitat	• Northern Pike spawning habitat has been identified through aerial and ground level reconnaissance as occurring within 2.5 km of McCarthy Lake within backwater oxbows and slack water bays. The remainder of the Serpent River in the project ZOI does not contain suitable spawning habitat for Northern Pike • It was determined at the June 9th, 2011 biological scoping meeting with MNR that Northern Pike are an introduced non-native species in the Serpent River and should not be specifically managed for in this area.	N/A - Northern Pike habitat is limited within the project area and management for Northern Pike is not required	No
	Impacts to Brook trout and their habitat	• Work by Xeneca has confirmed the presence of Brook trout within project zone of influence and preferred habitat is present.	Further fish community sampling will be completed through the 2011 field season to determine potential project impacts on this species.	Unknown due to outstanding data and information

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Fish Habitat	Impacts to Lake trout and their habitat in McCarthy Lake	• Maintain/enhance water quantity/quality, sediment quality, and water levels of lake trout lakes within natural ranges suitable for lake trout • Plan for new roads and trails in a manner that does not significantly improve access to self-sustaining lake trout lakes. • Minimize the introduction and spread of aquatic invasive species, including both exotic and native species. • McCarthy Lake currently supports an end-of-summer weighted hypolimnetic dissolved oxygen concentration that represents a substantial capacity to assimilate water quality changes brought on by the Four Slide development. • Based on current information it is anticipated that there will not be an impact on the amount of usable habitat for Lake trout in McCarthy Lake.	Findings from QP assessments indicate that no impacts are anticipated. The final report will be issued in September 2011 and provided in support of this assessment.	No
	Construction activities in general	• respect all-in water timing restrictions • isolate in-water construction area before or after in-water timing restrictions to avoid impacts • placement of intakes near natural barriers to migration • ensure a qualified person is on hand to oversee de-fishing activities prior to dewatering • design habitat mitigation and compensation measures through discussion and guidance with relevant authorities • employ best management construction practices including fish relocation plan, work site isolation and sediment control measures • blasting will occur outside of appropriate fish spawning and incubation periods (specific requirements to be established with DFO and MNR) • other blasting mitigation measures may include bubble curtains, isolation and dewatering of blast area, use of smaller charges, staggering of blasts • adhere to DFO operational statements for application during crossing of waterways for construction of transmission line, including Overhead Line Construction, Temporary Stream Crossings and Maintenance of Riparian Vegetation in Existing Right-of-Ways • conduct environmental monitoring to ensure that predicted conditions are accurate • Prompt and effective clean up and restoration once construction is complete	No impacts anticipated - impacts mitigated or eliminated wherever possible. Construction Management Plan will be finalized to include instructions and protocols for minimizing the disturbance to aquatic ecosystem during the construction program.	No
	Construction of facility components; headrace (intake channel), powerhouse, penstock, tailrace and auxiliary dam	• The majority of the headrace (intake channel), powerhouse, penstock, tailrace and auxiliary dam are all to be located and constructed in the dry outside of the riverbed along the east shore of the river resulting in limited aquatic impacts to existing habitat. • Limited impacts are expected where the intake and tailrace channels are connected to the river but will be restricted to the immediate shoreline areas.	No impacts anticipated - impacts for these components to aquatic habitats is limited and will be restricted to limited impacts to shoreline habitats within the project footprint	No
	In-water facility components (intake, dam and spillway) will result in the permanent destruction of approximately 1900 m^2 of riverbed	• the excavation and placement of the dam and intake structures will occur in areas which are not considered spawning habitat for any species • Dam construction will take place in isolation from the river flow through the use of cofferdams. • During construction, flow will be maintained uninterrupted downstream through staging and sequencing of construction.	Negative impacts anticipated - construction of in-water facility components will result in the loss of aquatic habitat due to the permanent covering and infilling of river.	Yes
	Temporary impacts and loss of habitat related to the construction of cofferdams	• Phase 1 and 2 cofferdam construction will result in the temporary occupancy of river bed in the are of the dam, spillway facility intake, powerhouse and tailrace •The cofferdam is anticipated to be constructed in accordance with the appropriate in-water timing window dictated by the Ministry of Natural Resources. • During construction, the flow will be maintained uninterrupted downstream through staging and sequencing of construction. • Construction best management practices will be implemented to minimize the risk of off-site migration of sediments as well as adherence to in-stream timing window restrictions for construction activity.	Temporary negative impacts are anticipated - direct impacts to aquatic habitat may occur. The cofferdam is to be placed to minimize impacts and the size of the cofferdam to be installed and how long the cofferdam remains in place will be kept to a minimum.	Yes

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Fish Habitat	Potential effects on habitat and spawning from dewatering operations	• Dewatering activities will be done in a controlled manner so as not to discharge turbid water to the receiving watercourse. • Materials such as filter bags, straw bales, filter fabric and Paige wire fencing will be on site to create a dewatering corral for waste water as a contingency plan in the event that groundwater is encountered and additional filtering properties are required. • Suitable containment/treatment areas will be identified by the Contract Administrator. • The discharge point in the receiving watercourse will be carefully chosen as an area with low scour potential (i.e. bedrock bottom). • If scour potential does exist, the contractor will use energy dissipation in the form of a splash pad or rock protection for the stream bottom.	No impacts anticipated - Effects will be mitigated through construction best management practices and the ultimate discharge point to the receiving watercourse will be monitored to ensure that the filtering is effective in removing excess sediment.	No
Fish migration	Construction of the dam represents a potential barrier to the upstream movement of fish	• Upstream movement of other non-jumping fish species or those with swimming speeds below Rainbow Trout is unlikely	To be resolved at the permitting phase of the project for approval of detailed design.	No
	Downstream passage of larval and adult fish	• Downstream movement of larval fish and adults is quite likely • MNR has identified the requirement to maintain the downstream fish (larval and adult) movement through the operation of the spillway at Four Slide Falls	To be resolved at the permitting phase of the project for approval of detailed design.	No
Fisheries	Impacts to fisheries within the project zone of influence	• the Serpent River within the projects zone of influence is only sporadically utilised for recreation and no commercial fisheries are known	The project will not have any impact on fisheries within the projects zone of influence. The project's capacity to generally impact fisheries on the Serpent River is limited to impacts to fish habitat and movement within the project zone of influence. These issues are described in the relevant sections of this table.	No
Fish injury or mortality	Fish impingement or entrainment resulting in injury or mortality	• Engineer facility intake and design velocities to account for fish swimming capabilities to minimise potential for impingement or entrainment through turbine(s) • If significant entrainment potential is identified, consider diversion methods for vulnerable fish species including lighting, electrical barriers, air bubbling and sound barriers to prevent entrainment • Possible strategies to mitigate injury/mortality of entrained fish include: - Minimize the number of blades or amount of blade leading edge; - Maximize the open space between blades and other structures; - Use blunt leading edges instead of sharp ones; - Minimize runner speed; - Direct fish toward the runner hub and not the runner periphery; - Minimize gaps between fixed and moving parts.	Specific turbine information such as diameter, number of blades, operational speed (r/min) and hydraulic capacity ranges (cms) is required for determining turbine mortality and needs to be determined. However, recent DFO position on waterpower facilities anticipate that market turbines may not prevent some fish kill as a result *Fisheries Act* determination under Section 32.	Yes
	Fish injury or mortality as a result of cofferdam placement and dewatering	• Placement of the cofferdam will be so as to minimize mortality. Fish salvage will be carried out during the dewatering process to relocate species.	CMP will consider this potential effect and fish salvage will be carried out during the dewatering operation.	Yes

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Erosion and sedimentation	Construction related impacts related to the relocation of sediments and soils - Surface water overland flow paths within the construction areas have the potential to carry construction-related sediment to the watercourse.	• Areas will be identified in advance of construction and receive added protection and scrutiny during routine construction inspections particularly during the periods before and after rain events. • Sediment and erosion control measures will be installed prior to construction and maintained diligently throughout the construction operations. • Planting of vegetative cover will then follow in the next growing season. • Maintenance and inspection of the vegetative cover will continue until such time as the disturbed areas are sufficiently stabilized through vegetative growth to prevent overland runoff of suspended materials. • If construction finishes in a cleared area, with insufficient time left in the growing season to establish vegetative cover, an overwintering treatment such as erosion control blankets, fibre matting or equivalent will be applied to contain the site over the winter period. • Stockpile and staging areas will be well removed from the watercourse and be isolated with sediment and erosion control measures to prevent migration of material to the watercourse and natural areas. • Excess material from in-water excavation will be removed immediately from the channel area and temporarily stockpiled in suitable locations identified by the design drawings and on-site areas approved by an environmental inspector.	No impacts anticipated - Adhere to all applicable standard best management practices available to the industry. A Sediment and Erosion Control Plan will be prepared prior to construction.	No
	Operation - Increased shoreline erosion and sediment deposition due to inundation area and variable flow reach water level fluctuations	• Limit maximum daily fluctuations of upstream water levels (1 m fluctuation) • Limit the rate of change of upstream water levels • Facility will operate as a modified run of river facility (run of river operation during extreme high and low flow periods of the year • Where the erosion survey has identified potential for shoreline erosion or ice scour, inspect and monitor for signs of erosion in year one and year five of operation to document degree of erosion and develop and implement additional mitigation measures as required	Negative impacts possible - at areas identified in Erosion Potential Assessment and any subsequent investigations as having a moderate/high potential for erosion that will be intercepted by inundation/flow effects Operations will be established to minimise erosion where possible. Follow-up monitoring will be completed to determine where erosion and sedimentation are occurring as a result of operations.	Yes
Water levels, flows and movement (surface water)	Creation of headpond and fluctuation in levels/flows - project will result in the inundation of approximately 147 ha of riparian and terrestrial habitat resulting in a total headpond area of 165 ha (including the existing surface area of the river) and extending 6.8 km upstream to the outlet of Pecors Lake.	• auxiliary dam is intended to prevent further headpond inundation and so is from an impact perspective, mitigating further terrestrial impacts from the creation of the headpond • Four Slide Facility will not be hydrologically linked to Pecors or McCarthy Lake	Creation of headpond required for the operation of the facility	Yes
	Variation in flows within downstream variable flow reach	• Facility will operate as a modified run of river facility (run of river operation during extreme high and low flow periods of the year (approximately 3-4 months of the year) • A downstream minimum environmental flow is proposed to be continually passed over the spillway of the dam and/or through the powerhouse to maintain ecological habitat viability within the variable flow reach • Further consultation with regulators will be conducted to confirm this minimum environmental flow value	DFO authorization and provincial water management planning for seasonal minimum environmental flow in variable flow reach will be sought following consultation with DFO with MNR and incorporated into the approved operating plan for the facility	No
Water Temperature	Changes to thermal regime of waterway within headpond as a result of inundation and temporary storage	• Temporary storage would occur during night time hours when additional solar absorption is limited • The proposed head pond at Four Slide Falls will be relatively deep with a proposed head of 29 m and a storage capacity of 41 hours. • Water from the Serpent River enters the epilimnion of McCarthy Lake and does not mix with the hypolimnion minimizing effects on the lake's thermal regime	No impacts anticipated - Water withdrawal from the bottom of the headpond will minimize changes to thermal regime in the variable flow reach downstream.	No

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Drainage, flooding and drought patterns	Alteration from natural patterns	• Limit maximum daily fluctuations of upstream water levels • Limit the rate of change of upstream water levels • Facility will operate as a modified run of river facility (run of river operation during extreme high and low flow periods of the year • Final facility design to ensure flood passage capacity and public safety issues are adequate to meet the requirements of the *Lakes and Rivers Improvement Act* approval following the completion of the EA	Low negative impacts anticipated - dynamic modeling shows facility will modify normal flooding patterns	Yes
Aboriginal Community				
First Nations reserves or other aboriginal communities	Local Aboriginal Communities (LAC), Identified Aboriginal Communities (IAC) have expressed an interest in engagement in regards to the project and potential impacts	• Proponent has corresponded with identified and Local Aboriginal communities in the EA process • Proponent commits to engage in discussion after the issuance of a Notice of Completion at which time EA will be provided to communities for review for a minimum of 30 days	Ongoing engagement and consultation with Aboriginal communities will continue after completion of EA	No
Spiritual, ceremonial, cultural, archaeological or burial sites	Impacts to these environmental components have not yet been identified	• Proponent has corresponded with identified and Local Aboriginal communities in the EA process • Proponent commits to engage in discussion after the issuance of a Notice of Completion at which time EA will be provided to communities for review for a minimum of 30 days • A request for identified and local Aboriginal communities to enter into discussions regarding projects within their traditional lands and an invitation to share information about the project site was issued in June 2010 • Stage 1 Archaeological Summary Report distributed to the Serpent River First Nation	Ongoing engagement and consultation with Aboriginal communities will continue after completion of EA. In addition, a Stage 2 archaeological survey will be conducted in 2011 to identify the presence of and assess impacts to cultural heritage in the footprint of the project. Participating Aboriginal community members will be engaged during this assessment.	Unknown pending completion of Stage 2 investigations
Traditional land or resources used for harvesting, hunting, fishing, trapping	Impacts to these environmental components have not yet been identified except to note that the Serpent River projects fall on the traditional lands of the Serpent River First Nation	• Proponent has corresponded with identified and Local Aboriginal communities in the EA process • Proponent commits to engage in discussion after the issuance of a Notice of Completion at which time EA will be provided to communities for review for a minimum of 30 days • A request for identified and local Aboriginal communities to enter into discussions regarding projects within their traditional lands and an invitation to share information about the project site was issued in June 2010 • keep trap lines and trails clear of slash • minimize alteration and turbidity of fish habitat • minimize harassment of wildlife • keep staging areas tidy and free of litter	Ongoing engagement and consultation with Aboriginal communities will continue after completion of EA	Unknown pending completion of consultation with Aboriginal communities
Lands subject to land claims	None identified	• Xeneca legal department indicate that their inquiries have not revealed land claims in the projects area of impact	N/A	No
Economic Development	Business to business relationships	• Formal request issued to leadership of Mississauga First Nation, Sagamok Anishnawbek First Nation and Serpent River First Nation to meet and discuss the potential benefit sharing for the two Serpent River developments	The Serpent River First Nation and Xeneca signed a Letter of Intent on April 1, 2010, declaring their intent to move forward in developing a business relationship in which effects on economic development in this community will be determined.	Yes
Land and Resource Use				
Access to inaccessible areas	Facilitation of access as a result of upgrades/maintenance of area access roads and bridges New roads can act as vectors leading to increased exploitation and introduction of new species	• install gates, fencing and signage to limit unauthorised public access • operational staff to monitor for signs of unauthorised access and report to appropriate local authorities/MNR • one of the objectives of the Serpent River Enhanced Management Area is to enhance remote recreation activities, and access roads may be considered an improvement from that perspective	Low negative impacts - road upgrades and ongoing maintenance activities could result in increased access to the area	Yes

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Navigation	The Serpent River is a recognized canoe route and construction/inundation/variable flows may alter navigational access within the project zone of influence	• observations of river between Pecors and McCarthy Lakes by team members indicate that there are several locations where the channel would be difficult or impossible to navigate under certain flow conditions. No portages were noted during field studies • consult with MNR and local boaters to determine periods of use and minimum flow and water level requirements to maintain downstream access • provide for and maintain portage and canoe passage around the site and within the zone of influence to ensure safe passage and area to be inundated and variable flow reach (if required) • portage routes will be subject to review under the *Navigable Waters Protection Act*	No impacts known or anticipated - Serpent River between Pecors and McCarthy is only sporadically utilised for recreational navigation under certain flow conditions; construction and maintenance of portages (if required) will allow access around facility and given the nature of the rapids that they are not typically navigated.	No
Riparian rights or privileges	Impacts associated with inundation	• the project will operate as a modified run-of-river facility and inundation area and variable reach is located entirely on Crown Land	N/A	No
Recreational use	Snowmobile, ATV and Trans Canada Hiking Trail access - trails overlap with inundation area	• consult with MNR and local users to determine periods of use and potential mitigation strategies • trail crosses inundation area at Pecors Lake outlet (extreme upstream extent) and is unlikely to be affected by inundation or flow effects	No impact anticipated - Location of the trail at far upstream extent of inundation zone limits potential impact local trails affected within inundation area will be maintained.	No
	Impacts to general recreational enjoyment quality on Pecors and McCarthy Lake	• facility will operate as a modified run of river facility (run of river operation during extreme high and low flow periods of the year (approximately 3-4 months of the year)) • intermittent operation would only occur during low flows, most of which occur during the winter months when the river is frozen and recreational uses are limited. • Operations of Four Slide Falls will have no adverse effects on recreation on Pecors Lake or McCarthy Lake.	No impact anticipated	No
Angling, hunting opportunities	Projects fall within Bear Management Areas - effects on bear hunting	• keep trap lines and trails clear of slash • minimize harassment of wildlife • keep staging areas tidy and free of litter	No impact anticipated - impacts to the habitat of targeted species is anticipated to be negligible in proportion to the availability of suitable habitat surrounding the area.	No
Trapping	Projects fall within registered trap line areas	• keep trap lines and trails clear of slash • minimize harassment of wildlife • keep staging areas tidy and free of litter	No impact anticipated - impacts to the habitat of targeted species is anticipated to be negligible in proportion to the availability of suitable habitat surrounding the area.	No
Baitfish harvesting activities	Projects fall within registered commercial baitfish harvesting areas	• see Fisheries and Fish Habitat issues and mitigation above • minimize alteration and turbidity of fish habitat • keep staging areas tidy and free of litter	No impact anticipated	No
Views or Aesthetics	Potential impacts due to project construction and operation on McCarthy Lake, a popular recreational area	• while the Serpent River between Pecors Lake and McCarthy Lake is a registered canoe route, this section of the river is only sporadically utilized and is difficult to navigate • consult with MNR and local users to determine periods of use and potential mitigation strategies • facility will be hydrologically isolated from McCarthy Lake • facility will operate as a modified run of river facility (run of river operation during extreme high and low flow periods of the year (approximately 3-4 months per year)) • intermittent operation would only occur during low flows, most of which occur during the winter months when the river is frozen and recreational uses are limited.	No impact anticipated	No
An existing land or resource management plan	Forest resources on Crown Land in the vicinity of the site are allocated under a Sustainable Forestry License to Northshore Forest Inc. - Eacom; clearing of resource in alignment with FMP and knowledge of SFL	• negotiate with SFL holder and MNR to permit for the harvesting/clearing of forest resources within the proposed inundation area/road construction/connection line ROW prior to construction/flooding	Ongoing engagement and consultation with SFL holder will continue after completion of EA; agreement will be sought with SFL to ensure first rights to merchantable wood and improved access routes.	No

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
An existing land or resource management plan	If and when the facility is commissioned, an amendment to the Serpent River WMP will be required	• The operation of the facility will be aligned with the existing Serpent River WMP during a comprehensive review in 2014 • Water management planning principles taken into account during project planning and incorporated into operating plan for the facility	Engagement and consultation with Serpent River WMP SAC will continue after completion of EA	No
Protected areas	No protected areas identified	N/A	N/A	No
Forestry	Harvesting of merchantable timber during construction	• restrict clearing to approved right-of-way to minimize area of impact • negotiate with SFL holder and MNR to permit for the harvesting/clearing of forest resources within the proposed inundation area/road construction/connection line ROW prior to construction/flooding • stumpage fee for merchantable timber on Crown land	Positive impact - Timber removal represents a potential benefit to local SFL holder by sale/processing of merchantable timber.	Yes
	Processing of non-merchantable timber	• make useable fuel wood available to local communities • chip brush and slash to minimize fire hazards • site ROW along existing access where possible to limit soil/habitat disturbance • ROW maintenance should be completed using mechanical (not chemical) controls	No impacts anticipated - following removal of merchantable timber, ROW maintenance will be required every 4-5 years.	No
Mine claims	Four Slide Falls project Zone of Influence is within an existing mine claim (inundation only)	• verification of claims in the vicinity through CLAIMS (checked July 6, 2011) • Xeneca has contacted the claim holder and an exchange of information occurred through the signing of a non disclosure agreement • the claim is based on the presence of uranium, but has not been developed beyond test drilling • some of the claim lands may be affected by inundation however the claim would remain workable by the owner • presence of hydro electric generation and connection lines may make the claim more valuable. • changes to the Mining Act in Ontario now recognizes waterpower and other resource development and provision exists for the claim holder to cede first right of refusal on surface rights to the developer of a renewable energy facility	No impacts anticipated - claim remains undeveloped though presence of hydropower facility may benefit development of the claim at some point in the future.	No
Cultural Heritage Resources				
Archaeological sites	Disturbance or destruction to archaeological resources	• Stage 1 archaeological review identified areas or high archaeological potential within the project area • Stage 2 when completed may identify existence of archaeological resources in project area and determine whether additional archaeological investigations/management strategies are required. • If archaeological or heritage resources are discovered during clearing or construction, work will be stopped until an archaeologist has assessed the find and a course of action is determined. • A Discovery Protocol will be prepared and implemented for project construction	Incorporate the results of the Stage 2 Archaeological Assessment.	Unknown pending completion of Stage 2 investigations
Buildings or structures	Disturbance or destruction to heritage buildings or structures	• Stage 1 archaeological assessment did not identify potential for built heritage structures within the project area. Stage 2 field investigation will determine the whether any existing buildings or structures in project area may require built heritage assessment.	Stage 2 survey to be conducted in 2011/2012 and any findings will be shared with Ministry of Culture. Mitigation will be developed, as appropriate.	Unknown pending completion of Stage 2 investigations
Cultural heritage landscapes	Disturbance or destruction to cultural heritage landscapes	• Stage 1 did not identify potential for cultural heritage landscapes within the project area. Stage 2 study will be conducted in 2011/2012.	Stage 2 survey to be conducted in 2011/2012 and any findings will be shared with Ministry of Culture. Mitigation will be developed, as appropriate.	Unknown pending completion of Stage 2 investigations

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Social and Economic				
The location of people, businesses, institutions or public facilities	Disruption to access, schedules and activities	• limit disruptions to traffic flow by maintaining adequate access along travelled routes, and alternate access if required • avoid sensitive time periods and advise residents of planned activities that may cause a disruption in access • construction materials and equipment should be segregated in staging areas during off hours • monitor condition of gravel roads and if construction traffic is causing damage, ensure that repairs are undertaken promptly	No impacts anticipated - the project site is remotely located and accessed via logging access roads which are not widely utilized	No
Community character, enjoyment of property or local amenities	Potential effects on property enjoyment, recreational water use, tourism values, aesthetic image	• project Zone-of-Influence is located entirely on Crown land and remotely located • while the Serpent River between Pecors Lake and McCarthy Lake is a registered canoe route it is only sporadically utilized • consult with MNR and local users to determine periods of use and potential mitigation strategies to minimize effects • facility will operate as a modified run of river facility (run of river operation during extreme high and low flow periods of the year) • intermittent operation would only occur during low flows, most of which occur during the winter months when the river is frozen and recreational uses are limited.	No impacts anticipated - project location and operations will not be readily accessible or visible	No
Employment - Local and regional labour supply	Construction activities will support direct and indirect local employment	• promote contract bids and offers of service from local communities including Spanish and Elliot Lake	Positive impact - construction and operation represents a potential benefit to local communities	Yes
Public health and/or safety	Forest or brush fires caused as a result of project activities	• project personnel will be prepared and be familiar with the site Fire Preparedness Plan • fire fighting equipment will be available to all workers and the location of such equipment will be outlined in the Fire Preparedness Plan • Locations of equipment and muster points will be advertised as necessary around the site • project personnel will be familiar with fire-fighting techniques and the use of supplied equipment • uncontrolled fires will be immediately reported to the nearest fire emergency service and the MNR in the case of an uncontrolled fire on Crown land • smoking will only be permitted in designated smoking areas equipped with fire extinguishers • disposal and storage of waste will be into proper waste containers to prevent fires	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible.	No
	Impacts associated with facility construction	• Restriction of public access to the site during construction (fencing, signage, etc) • provide and maintain routes for the public to be able to bypass the site (portage, etc) • proper barriers and warning devices installed following construction to restrict public access to intake/tailrace areas during operation, including safety booms, fencing and signage	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible.	No
	Impacts for navigation and recreation associated with facility operation	• A public safety measures plan will be developed for the site to identify hazards and suggest mitigation measures to address identified safety issues • proper barriers and warning devices installed following construction to restrict public access to intake/tailrace areas during operation, including safety booms, fencing and signage	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible.	No
	Production of waste in and around work site	• Appropriate disposal containers will be available for the prompt disposal of waste • full disposal containers will be removed to the appropriate waste disposal facility on a regular basis • Organic/food waste will be collected daily and stored in closed, animal resistant containers until disposed of at an approved waste disposal site or incinerated on-site according to project permitting standards • keep staging areas tidy and free of litter • Bear awareness training will be provided to all Project personnel.	No impacts anticipated - proper implementation of construction management plan and best management practices will mitigate impacts wherever possible.	No
Water Supply	Impacts to local water supply	• Ministry of the Environment well records search revealed no private or municipal ground water wells within 1 km of the site • It is possible that recreational users are taking river water for personal consumption - see Water Quality	No impacts anticipated	No

Environmental Component	Issue	Mitigation	Resolution / Result	Residual Effect (Yes/No)
Aesthetic image of the surrounding area	No issues identified	• N/A	N/A	No
Construction Camp	General impacts associated with the establishment of the construction camp (waste, traffic, etc.)	• Construction camp would be shared with that required for the McCarthy Chute project • Required approvals will be obtained from the MOE and the Ministry of Health and the Ministry of Labour. • The construction camp will be set up and operated according to the requirements of the *Health Protection and Promotion Act.* • The Proponent will prepare and implement measures to minimize the effect on wildlife from the storage, preparation and disposal of food products at the camp. • Bear awareness training will be provided to all project personnel to provide information on minimizing human-bear interactions and appropriate response training if an interaction does occur. • An alternative option would entail the establishment of the camp within the Town of Spanish, subject to securing an agreement with the Town	No impacts anticipated - the construction camp will be developed as indicated in the CMP.	No
Energy/Electricity				
Reliability	Voltage support	• Capacity of new power generation units are relatively small; the power from the facility will be routinely available and measures will be introduced in the facility for Black Start capability to support the province in the event of an emergency.	Operation of facility in parallel with the existing power grid will provide minor impact on the overall power system reliability and power quality (voltage and frequency), the facility will have a high reliability to the local power grid.	Yes
Security	Black Start capability	• 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.	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.	Yes
Electricity flow patterns	Power flow system	• Appropriate mitigation technical measures will be proposed in the control system of the power grid and new generation units if required	Operation of the new power generation units will redistribute power flow in the existing distribution system.	Yes
Other	Protection control settings	• Appropriate mitigation technical measures will be proposed in protection and control system of the power grid.	Operation of the new power generation units will affect existing protection and control settings in the distribution system.	Yes

A summary of Table 4 results which indicate the residual effects identified through the assessment is provided below:

- Air Quality
  - Noise from operation of facility
  - Exhaust from vehicles and equipment
  - Greenhouse Gas Offsets
  - Dust from vehicles and equipment
- Water Quality
  - Contamination from construction activities
  - Increased levels of suspended sediment
  - Contamination from accidental spills
  - Elevated levels of mercury from head pond flooding
  - Elevated levels of nutrients (phosphorus) from head pond flooding
  - Reduced dissolved oxygen levels from head pond filling
- Species at Risk
  - Impacts to Chimney Swift habitat
- Terrestrial Wildlife
  - General disturbance to wildlife and wildlife due to construction and maintenance activities
  - Effects on habitat during ROW and access road construction and maintenance
  - Effects on habitat during facility construction
  - Habitat disturbance and destruction resulting from inundation
- Natural Vegetation and Habitat Linkages
  - Effects on habitat during ROW and access road construction and maintenance
- Shoreline Dependant Species
  - Water level and flow fluctuations
  - Loss of emergent vegetation within headpond
- Wetland Dependant Species
  - Loss of aquatic feeding areas
- Fish Habitat
  - Loss of riverbed related to facility construction
  - Alteration of habitat due to transition from riverine to lacustrine conditions associated with reservoir filling
  - Temporary loss of riverbed habitat related to the installation of cofferdams
- Fish Injury or Mortality
  - Entrainment and impingement effects due to facility operation
  - Fish injury or mortality as a result of cofferdam placement and dewatering

- Erosion and Sedimentation
    - Increased shoreline erosion and sediment deposition due to inundation and water level fluctuations, including ice scouring
- Water levels, flows and movement
    - Creation of headpond
    - Variation in flows within downstream variable flow reach
- Drainage, flooding and drought patterns
    - Alteration from natural patterns
- Aboriginal Community Economic Development
    - Business to business relationships
- Access to Inaccessible Areas
    - Effects of increased access as a result of upgrades/maintenance of access roads
- Employment
    - Construction activities will support direct and indirect local employment
- Energy and Electricity

An extended discussion of the key issues are provided in the following sections.

5.1.1 Inundation

Hydraulic modeling with HEC-RAS has indicated that the construction of the water control structures required to divert water to the proposed facility will result in the creation of a head pond extending approximately 6.8 km upstream of the dam to the outlet of Pecors Lake. The headpond would inundate 147 ha in addition to the existing surface area of the river, resulting in a total headpond area of approximately 165 ha.

The approach to evaluating the potential effects to these areas and any required mitigation were developed by the project team and regulators during meetings held through the EA process (see Appendix C). Further HEC RAS assessments will be completed through the 2011 field season and prior to permitting and construction.

5.1.2 Flow Effects

Those effects and management strategies associated with the operation of the facility, especially in the head pond and variable flow reach, are summarised in the Proposed Operating Flows and Levels report found in Annex I-C and the Natural Environmental Characterization and Impact Assessment report found in Annex III.

<u>Erosion</u>

In order to minimize erosion effects, the maximum daily fluctuations of upstream water levels will be limited. The operating plan parameters proposed in Annex I-C for daily fluctuation have

been selected to be less than the amount of seasonal and inter-annual fluctuation that has been occurring naturally over time in the upstream river reach. By limiting the daily fluctuation, vegetation will be able to naturally re-establish along the shoreline, thereby limiting the erosion potential.

Rapid changes in shoreline water levels can increase erosion. Where pore water in the soil dissipates too quickly, pore pressure can loosen soil grains and cause loss of stability in the soil structure, thereby enhancing erosion. By limiting the rate of change upstream water levels, this erosion mechanism is avoided.

5.1.3 Aquatic Habitat (Ecological Flow/Water Level Requirements and Effects)

A discussion of identified potential effects and general mitigation measures can be found in the Natural Environmental Characterization and Impact Assessment report found in Annex III, and have been summarized in Table 4.

Water Temperature in Head Pond

The proposed head pond at Four Slide Falls will be relatively deep with a proposed head of 29 m and a storage capacity of 41 hours. With this head and length of storage, water temperatures may stratify within the water column resulting in surface water being warmer than the bottom water. Thus, different locations of water withdrawal may result in a difference of water temperature downstream during operation. Water withdrawal from surface may increase water temperature while that of the bottom may decrease it.

According to the Pecors Lake fisheries management objectives (MNR 2011), Pecors Lake is considered a cold water fishery that has been designated as a Naturally Reproducing Lake Trout Lake, and the lake is primarily managed for Lake Trout. Thus, water withdrawal from bottom of the head pond is the preferred option, especially in the summer months when river temperatures can reach over 19°C (Minnow Environmental 2009).

Mitigation for Impacts Associated with Operation

To reduce the potential for negative habitat impact upstream during modified run-of-river operation, the maximum daily fluctuations of upstream water levels will be limited. The operating plan parameters proposed herein for daily fluctuation have been chosen to be less than the amount of seasonal and inter-annual fluctuation that has been occurring naturally over time in the upstream river reach. This does not eliminate the potential for effects, but it limits the potential extent of impact while still maintaining the socio-economic benefit of shifting some electricity production to times when electricity usage is high in the Province.

The design of the facility is intended to minimize the environmental footprint of the project and, in combination with the proposed operating parameters, is believed to avoid significant impacts on the upstream habitat that has been studied.

To reduce the potential for impact within the Variable Flow Reach during intermittent operations, the following approach was employed when selecting operating parameters:

1. Timing of event: Special attention was given to the timing of aquatic habitat events and the relationship to the range of natural flows that could occur during these periods. Where intermittent operation may occur during the identified periods, the bypass flow to be provided while the facility is stopped was given special consideration.

2. Sizing of bypass flows: Bypass flows were considered in the context of the associated water depth, flow velocity and wetted perimeter in the Variable Flow Reach. The objective is to minimize the amount of water released during times when the facility is stopped, while providing enough water to minimize stress on the aquatic environment.

3. Controlled ramping of flows: To minimize the sudden release of water that occurs during start up, a ramping procedure was developed. The ramping procedure requires the facility to start at minimum turbine capacity and gradually ramp up output until the desired operating rate is reached.

4. Limiting maximum turbine flow: During intermittent operation, the turbine flow will be set to not exceed an upper limit to minimize the amount of flow variability that occurs on a daily basis.

The proposed operating parameters have been designed with the objective of avoiding significant impacts on the downstream habitat associated with the project. It should be noted that operating parameters for turbine flows depend on the final design and equipment selected at construction. As such, some variation in the identified parameters may occur, however the objectives of the mitigation and ecological flows provided will not change.

5.1.4 Rainbow and Lake Trout

Due to the presence of preferred substrates (gravel and cobble), the entire reach of the Serpent River between Pecors Lake and Four Slide Falls this entire section of river is considered ideal for Rainbow trout spawning. While spawning activity was not observed and the population is assumed to be small the presence of multiple size classes of Rainbow trout within the system indicated that recruitment is occurring somewhere in the system. The creation of the headpond will result in a conversion of riverine habitat suitable for Rainbow trout into lacustrine habitat more suited to warm water generalist species. Further discussion is required with MNR and DFO

to determine if the expected shift in habitat and fish population dynamics will constitute a contravention of MNR fisheries management objectives and, as a result, be considered a Harmful Alteration, Disruption or Destruction of fish habitat under the *Fisheries Act*.

The creation and storage of water within the headpond may also impact on Lake trout habitat found within McCarthy Lake downstream through changes to water quality (primarily dissolved oxygen) and temperature. Like Pecors Lake, McCarthy Lake is a designated naturally reproducing Lake trout lake. A current study indicates that any temperature change in the Serpent River is small and is unlikely to impact on Lake Trout habitat in McCarthy Lake. Lake Trout occupy the cooler bottom water of the lake for the majority of their life cycle and incoming water from the Serpent River is circulated only into the upper, warmer layer of the lake.

Studies indicate that McCarthy Lake has the capacity to assimilate water quality changes and potential reductions in dissolved oxygen levels brought on by the Four Slide Falls development. Based on preliminary information it is anticipated that there will not be a substantial impact on the amount of usable habitat for Lake trout in McCarthy Lake.

5.1.5 Project Footprint

Those effects and management strategies associated with constructing and maintaining the facility and ancillary components are predominantly associated with the natural heritage aspect of the overall environment, and are therefore identified in the Natural Environmental Characterization and Impact Assessment Report found in Annex III. These have been summarized in Table 4.

5.1.6 Fish Entrainment and Impingement and Turbine Mortality

A discussion of identified potential effects and general mitigation measures in regards to fish entrainment and impingement will be undertaken with the regulators once the type of turbine, detailed design of the intake structure and approach velocity are known. A preliminary discussion of the potential for fish entrainment, impingement and mortality is included in the Natural Environmental Characterization Report provided in Annex III. Operational management measures that can be considered to reduce the potential risk to fish upstream of the intake can be found in Table 4.

5.1.7 Navigation

The river is not used for commercial navigation but is used sporadically for recreational purposes. The MNR SIP (see Appendix A-2) identifies the Serpent River as a recognized canoe route. The construction of a dam across a navigable waterway will require an approval by Transport Canada under the *Navigable Waters Protection Act*. The proposed facility will require the re-establishment of portages to mitigate impacts in relation to flooding and the project footprint.

Special arrangements will be made during the construction phase of the project in order to ensure public safety during this time.

Recreational use and enjoyment of the waterway was discussed during the Public Information Centres and other stakeholder consultation events. Members of the public in attendance appeared to be satisfied with these management strategies.

Navigation impacts downstream of the site could result during times of modified run-of-river operation in the Variable Flow Reach. During certain periods, the flows and water depths would be lower than those presently experienced. At other times, flows and water depth would be greater than normal.

Intermittent operation would occur only in periods while flows are low, some of which occur during the winter months when the river is frozen and not navigable. During summer months, the proponent is committed to the determination of minimum flows that would occur when the facility is stopped to mitigate potential restrictions to watercraft.

5.1.8 Public Safety

Public safety during construction and operation of the project has been identified as a concern. Those effects and management strategies associated with the construction and operation of the facility are summarised in the Proposed Operating Flows and Levels report found in Annex I-C and in the Construction Management plan found in Annex II-C.

5.1.9 Civil Structures and Private Property

The following steps were taken in developing the proposed operating parameters for the Project to mitigate impacts to Civil Structures and Private Property:

The maximum upstream operating water level was carefully set based on the results of the HEC-RAS Study.

Civil structures are not expected to be affected by the changes in daily flows related to the modified operation. The range of flows associated with the daily variation of turbine discharge is well within the range of flow for which civil structures are designed. The maximum downstream river flows associated with maximum turbine capacity that occur when the facility is stopped are in the range of normal river flows and well below the flood flows experienced during spring freshet or major rain events. Impacts on civil structures and private property located in the Variable Flow Reach downstream of the facility are not anticipated.

During flood passage, where the natural flow exceeds the maximum turbine capacity, the facility will be operated to minimize flood impacts upstream by operating the spillway, turbine and bypass structures accordingly. The spillway and bypass structures will be sized and designed to provide the amount of flood passage capacity required to meet the objectives of the operating plan. This step will be assessed in more detail in the detailed engineering design stage.

5.1.10 Surface Water Quality

Consideration was given to the effects of the project on surface water quality, including the potential use of the waterway as a potable water supply.

There are potential adverse effects on water quality during construction due to erosion and sedimentation, accidental spills, clearing, backfilling, contouring and excavation. As a result, standard construction and industry best management practices, including applicable DFO Ontario Operational Statements, will be maintained during the construction program to prevent accidental spills, control erosion and sedimentation, and to manage any groundwater that must be removed from excavations. Spill prevention and emergency fuel supply containment measures (as required by Technical Standards and Safety Authority) will be required within the facility throughout the operational period; mitigation measures are described in detail in Table 4.

During operation, potential effects on water quality may occur as a result of accidental spills and sedimentation as a result of shoreline erosion caused by inundation and water level fluctuation in the head pond.

5.1.11 Area Aesthetics

Preserving the natural aesthetics of the waterway and surrounding area will be considered as part of the proposed development. As mentioned previously, the area is sporadically utilised for recreation though it does have value with local residents and tourists as well as Aboriginal community members. People may engage in canoeing, boating, camping, hiking, fishing and other associated outdoor pursuits.

Maintaining or enhancing vegetative buffers between the river, roads, and any ancillary works should be a consideration during detailed design to preserve the aesthetic quality of the area; proposed mitigation measures are provided in Table 4.

5.1.12 Employment & Economic Effects

Construction and operation of the project will generate a positive economic effect in the City of Elliot Lake, Town of Spanish and the surrounding region resulting in opportunities for employment of community members. Similar employment opportunities will also exist for the Serpent River First Nation and other Aboriginal communities.

Economic benefits will include employment, expenditures on materials, equipment and services and contribution of renewable energy to the Provincial supply mix. The proposed Four Slide Falls generating station will have a total installed capacity of approximately 7.3 MW. Waterpower creates jobs, generates revenue for the taxpayers of Ontario, and is the longest lived and most reliable source of renewable electricity:

- Direct economic activity to build a waterpower project in Ontario is approximately $5 million per megawatt (approximately $36.5 million in the case of this project). Generally, about half of this amount is spent locally, in procuring construction labour & materials, consulting and legal services, trucking and other services such as accommodation, food and fuel.

- Direct job creation (construction) is estimated to be approximately 73,000 person hours of work. Indirect job creation is estimated to be approximately 109,500 person hours of work supporting the project and personnel.

- A significant return to the people of Ontario paid through Gross Revenue Charges (GRC) and provincial and federal income taxes. Return to the people of Ontario will continue past the 40 year contract, likely as long as the facility is in operation.

Waterpower lasts. Many power plants built in the early 1900s are still in operation and with regular maintenance and upgrades can last for many generations. In comparison, the life span for other sources of renewable power is: nuclear 40 years, wind 20 years, solar 20 years.

5.2 Specific Consultation Issues and Resolutions

A summary of the specific issues identified during the regulatory agency, government department and public and Aboriginal consultation process is presented in tabular format as Table 4: Identified Issues and Management Strategies, for the reader's convenience. The table identifies how resolution to each identified issue has been or may be resolved, and whether any outstanding issues or concerns remain. The issues are presented by environmental consideration.

5.3 Consideration of Accidents and Malfunctions

This section presents the issues identified specifically related to potential accidents and malfunctions during operation.

Under *CEAA*, the federal environmental assessment of the undertaking must consider the effects to the environment if an accident or malfunction were to occur during the construction or operation of the project. Consideration must be given to such events as spills and leaks, power failures, toxic substances, and worker and public health and safety.

As the mitigation measures and best management practices detailed in Table 4 of this document will be implemented, it is unlikely that spills and leaks would occur during the construction period. The engagement of an environmental monitor to oversee construction activities should further ensure the prevention of releases of deleterious substances to the environment. Additionally, the health and safety of all contractors and construction crews on both federal and provincial lands will be subject to *Ontario Regulation 213/91* which governs construction projects in Ontario. The health and safety of operational staff at the generating station will be governed by the *Occupational Health and Safety Act*. Public access will be restricted during the construction activities at both the GS site and along the connection line.

Toxic substances are rarely employed at hydroelectric generating stations. Generally, only small quantities of normal industrial lubricants are required for operation. A diesel generator for emergency power supply at the generating station will be required, necessitating the installation of an above- ground storage tank (AST) for diesel fuel. The installation and operation of the AST will be subject to the *Technical Standards and Safety Act*, Ontario Reg. 213/01 (fuel oil).

A power failure at the generating station will result in the inability of the powerhouse to discharge water which will affect project revenues. Should this power failure occur during peak flow periods, the proponent will be responsible for ensuring that peak discharge can be passed downriver.

5.4 Effects of Environment on the Project

For projects subject to the *CEAA*, there is a requirement to consider the effects of the environment on the project. These effects may be of short duration such as a heavy rainfall event, or longer duration such as the anticipated effects of climate change on the project.

Disruptions in energy transmission and generation would result in decreased economic returns for the proponent. The powerhouse will be equipped with a back-up generator to ensure that station service power can be restored to the facility should a grid failure occur. However, the facility cannot be operated (i.e. generation cannot recommence) until the electrical grid can accept the power generated. In this situation no water would be passed through the powerhouse but would be directed through the by-pass designed into the facility. The design of this by-pass will represent at least the pre-project capacity of the natural falls. This aspect of the approval process will be dealt with after the environmental assessment process is completed, as the detailed engineering design is being finalized.

5.4.1 Precipitation and Flooding

Operations during extreme events, such as floods, droughts and safety emergencies may need to deviate from the normal operating parameters to manage flows and mitigate impacts. Proposed operational changes in response to floods are described in Section 3.6.4.

It should be noted that the facility is not designated to mitigate the effects of naturally occurring events such as floods and droughts. However, there are circumstances where the existence of the facility can either aid in managing such an event or pose an additional risk. The flood risk aspects are managed, in part, through the government approval under the *Lakes and Rivers Improvement Act* of the engineering plans and specifications for the design of the facility. The purpose of this process is to ensure that the flood passage capacity of the facility is adequate and that the risk to property and public safety is duly considered. This aspect of the approval process will be dealt with after the environmental assessment process is completed and when the detailed engineering design is being finalized.

5.4.2 Extreme Winter Conditions

Extreme cold weather conditions may lead to a build-up of ice at the intake that could necessitate plant shut-down and an interruption to the delivery of electricity to the provincial supply grid.

5.4.3 Extreme Summer Conditions

Drought conditions could necessitate the shut-down of the facility and an interruption to the delivery of electricity to the provincial supply grid as a result of reduced flows within the river.

5.4.4 Lightning Strikes

A direct hit on the facility may lead to facility shut-down and prolonged interruption to the delivery of electricity to the provincial supply grid.

5.4.5 Accidental Fires

Lightning strikes as well as manmade fires could result in uncontrolled forest/brush fires which may interrupt the operation of the facility and the delivery of electricity to the provincial supply grid. Forest fires may also limit the ability of personnel to access the facility to conduct operations or maintenance.

5.4.6 Earthquakes

The continual shifting of large segments of the earth's crust, called tectonic plates, causes more than 97% of the world's earthquakes. Eastern Canada is located in a relatively stable continental region within the North American Plate and, as a consequence, has a relatively low rate of earthquake activity. Nevertheless, large and damaging earthquakes have occurred here in the past, and will inevitably occur in the future.

The project area is located in the Northeastern Ontario Seismic Zone, and according to Natural Resources Canada (http://earthquakescanada.nrcan.gc.ca) this zone experiences a very low level of seismic zone activity. NRCan reports that from 1970 to 1999, on average, only one or two magnitude 2.5 or greater earthquakes were recorded in this area, and two magnitude 5 earthquakes (northern Michigan and northwest of Kapuskasing) have occurred in this region. The location of the project in this low seismic activity area presents a low potential for the facility to be affected by this type of geological event.

5.4.7 Climate Changes and Other Weather Related Effects

According to the National Round Table on the Environment and the Economy (www.nrtee-trnee.com), widespread impacts are expected across Canada as a result of increasing temperatures and moisture levels. Among the changes predicted, the Round Table is forecasting that Ontario will experience increased disruptions to energy generation and transmission. Among the many predictions offered, there includes a doubling in the frequency of extreme rain events and increasing costs to providing community services in Canada during the 21st century.

6. RESIDUAL ADVERSE EFFECTS AND SIGNIFICANCE

A summary of the specific issues identified during the regulatory agency and public consultation process is presented in Table 4. The final column in Table 4 indicates whether an issue remains unresolved and is therefore considered a residual effect.

The residual effects of a project are those that are expected to remain despite the application of mitigation measures. The Ministry of the Environment's *Guide to Environmental Assessment Requirements for Electricity Projects (*March 2001) provides criteria for assessing significance:

- the value of the resource affected;
- the magnitude of the effect;
- the geographic extent or distribution of the effect;
- the duration or frequency of the effect;
- the reversibility of the effect;
- the ecological/social context of the effect.
-

By applying these criteria, the residual effects can be then be classified as either **not significant**; the residual effect is minor or insignificant, or **significant;** no additional mitigative measures can be applied to reduce the impact of the effect so the effect remains significant.

An assessment of the residual effects (including the positive impacts) of the proposed undertaking and their significance are presented in Table 5.

TABLE 5: Residual Environmental Effects and Significance

Environmental Component	Issue	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/ Social Context	Likelihood of Effect	Significance
General Natural Environment									
Air quality	Noise from operation of electrical generator and transformer at powerhouse/electrical connection	High	Low	< 1	Continuous	Reversible	Relatively Pristine	High	Not Significant
	Exhaust emissions from equipment and vehicles (construction and operation of facility)	High	Low	1-10	Effects possible during construction. During operation, would only occur as a result of operation of the generator during emergency situations.	Reversible	Relatively Pristine	High	Not Significant
	GHG Offsets	High	Low	> 10,000	Continuous	Reversible	Previously Impacted	High	Positive
	Dust emissions from construction activities and vehicles	High	Low	1-10	13-36	Reversible	Relatively Pristine	High	Not Significant
Water quality (surface and groundwater)	Surface water - general construction activities along shoreline of waterway at facility and water crossings along transmission line route and access roads	High	Low	1-10	13-36	Reversible	Previously Impacted	Low	Not Significant
	Surface water - In-water works construction and removal of the cofferdam: potential for excess sediment to be suspended and carried downstream by river flow	High	Low	1-10	1-12	Reversible	Previously Impacted	Low	Not Significant
	Contamination from spills or leaks of hazardous substances	High	Low	11-100	13-36	Reversible	Previously Impacted	Low	Not Significant
	Surface water - Fluctuation of inundation area upstream and fluctuation in flows downstream due to intermittent operation of facility increasing suspended sediment (may include resuspension of sediments that may be impacted from decommissioned uranium mining operations within the watershed)	High	Low	1-10	possible for up to 9 months of every year	Reversible	Previously Impacted	Low	Not Significant

Environmental Component	Issue	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/ Social Context	Likelihood of Effect	Significance
Water quality (surface and groundwater)	Surface water - Inundation area at Four Slide Falls site may alter water quality (methyl-mercury) in reservoir and in turn, the water flowing downstream into McCarthy Lake	High	Unknown	1-11	Elevated concentrations may be present for years	Reversible	Previously Impacted	High	Not Significant
	Surface water - Inundation area at Four Slide Falls site may alter water quality (phosphorus) in reservoir and in turn, the water flowing downstream into McCarthy Lake	High	phosphorus load will exceed background concentration +50%	1-10	13-36	Reversible	Previously Impacted	High	Not Significant
	Surface water - Inundation area at Four Slide Falls site may alter water quality (dissolved oxygen) in reservoir and in turn, the water flowing downstream into McCarthy Lake	High	0.4 mg/L decrease in McCarthy Lake	1-10	13-36	Reversible	Relatively Pristine	High	Not Significant
Species at Risk - Chimney swift	Impact to breeding and habitat due to clearing of riparian forest for headpond creation during construction	High	Low	1-10	Continuous	Irreversible	Relatively Pristine	High	Not Significant
Terrestrial wildlife (numbers, diversity, distribution)	General disturbance to habitat during construction and maintenance of facility (dam, powerhouse, etc)	Medium	Low	11-100	Continuous	Reversible	Relatively Pristine	High	Not Significant
	Access road construction - habitat fragmentation, increased predation, introduction of invasive species	Medium	Low	11-100	Continuous	Reversible	Previously Impacted	Medium	Not Significant
	Construction of facility and headpond creation - impacts to general and Significant Wildlife Habitats	Medium	Low	1-10	Continuous	Irreversible	Relatively Pristine	High	Not Significant

Environmental Component	Issue	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/ Social Context	Likelihood of Effect	Significance
Terrestrial wildlife (numbers, diversity, distribution)	General disturbance to wildlife	Low	Low	11-100	During construction period and then once every few years for maintenance along the connection line corridor	Reversible	Relatively Pristine	Medium	Not Significant
Natural vegetation and habitat linkages	Effects on vegetation and habitat during connection line and access roads ROWs construction and maintenance	Medium	Low	11-100	During construction period and then once every few years for maintenance along the connection line corridor	Reversible	Relatively Pristine	High	Not Significant
Aquatic and Riparian Ecosystem									
Shoreline Dependent Species	Loss of emergent vegetation within headpond as a result of water level fluctuations during intermittent operations	Low	High	1-10	Continuous	Reversible	Relatively Pristine	High	Not Significant
Wetland Dependent Species	Potential for habitat destruction/ displacement and effects on aquatic feeding areas as a result of construction activities, inundation and water level fluctuations	Low	Low	1-10	Continuous	Irreversible	Relatively Pristine	High	Not Significant
Fish Habitat	Inundation effects on fish and invertebrate habitat in proposed headpond as a result of the transition from river to lake-like conditions	High	High	1-10	Continuous	Irreversible	Relatively Pristine	High	Significant
Fish Habitat	In-water facility components (intake, dam and spillway) will result in the permanent destruction of approximately 1900 m^2 of riverbed	Low	High	< 1	Continuous	Irreversible	Relatively Pristine	High	Not Significant
	Temporary impacts and loss of habitat related to the construction of cofferdams	Medium	Medium	< 1	13-36	Reversible	Relatively Pristine	High	Not Significant
Fish injury or mortality	Fish impingement or entrainment resulting in injury or mortality	High	Low	< 1	Continuous	Irreversible	Relatively Pristine	High	Not Significant

Environmental Component	Issue	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/ Social Context	Likelihood of Effect	Significance
Fish injury or mortality	Fish injury or mortality as a result of cofferdam placement and dewatering	Medium	Low	< 1	< 11	Irreversible	Relatively Pristine	Medium	Not Significant
Erosion and sedimentation	Operation - Increased shoreline erosion and sediment deposition due to inundation area and variable flow reach water level fluctuations	Medium	Low	11-100	possible for up to 9 months of every year	Irreversible	Relatively Pristine	Low	Not Significant
Water levels, flows and movement (surface water)	Creation of headpond and fluctuation in levels/flows - project will result in the inundation of approximately 147 ha of riparian and terrestrial habitat resulting in a total headpond area of 165 ha (including the existing surface area of the river) and extending 6.8 km upstream to the outlet of Pecors Lake.	Medium	High	1-10	Continuous	Irreversible	Relatively Pristine	High	Significant
Drainage, flooding and drought patterns	Alteration from natural patterns	Medium	Medium	1-10	frequency dependant on flood event frequency	Irreversible	Relatively Pristine	Low	Not Significant
Aboriginal Community									
Economic Development	Business to business relationships	High	Medium	Local	Continuous	N/A	Previously Impacted	High	Positive
Land and Resource Use									
Access to inaccessible areas	Facilitation of access as a result of upgrades/maintenance of area access roads and bridges New roads can act as vectors leading to increased exploitation and introduction of new species	High	Low	1-10	Continuous	Reversible	Previously Impacted	High	Not Significant
Forestry	Harvesting of merchantable timber during construction	High	Medium	11-100	13-36	Irreversible	Relatively Pristine	High	Positive
Social and Economic									
Employment - Local and regional labour supply	Construction activities will support direct and indirect local employment	High	High	101-1000	13-36	Reversible	Previously Impacted	High	Positive
Energy/Electricity									
Reliability	Voltage support	High	Low	> 10,000	Continuous	Reversible	Previously Impacted	High	Positive

Environmental Component	Issue	Value of Resource	Magnitude	Geographic Extent (km)	Duration (months) or Frequency	Reversibility	Ecological/ Social Context	Likelihood of Effect	Significance
Security	Black Start capability	High	Low	> 10,000	< 11	Reversible	Previously Impacted	High	Positive
Electricity flow patterns	Power flow system	High	Low	1001-10,000	Continuous	Reversible	Previously Impacted	High	Not Significant
Other	Protection control settings	High	Low	1001-10,000	Until installed	Reversible	Previously Impacted	High	Not Significant

7. CUMULATIVE EFFECTS

Cumulative effects can be defined as long term changes that may occur as a result of the combined effects of each successive action on the environment. Cumulative effects may result from interacting effects of multiple projects in a given area, or multiple activities acting on a single ecosystem component. The assessment of the potential cumulative effects posed by a project is a requirement under the *CEAA*. *CEAA* requires that the assessment of cumulative effects examines past, present and "reasonably foreseeable" future activities in addition to the activities posed by the project, and how these would affect the valued ecosystem components within the project area, and beyond, if necessary.

The assessment of cumulative effects outlined below is based on a precautionary approach and the professional judgement of the EA team. As additional information about Four Slide Falls and other projects and activities in the area becomes available, the characterization and assessment of cumulative effects will be further discussed through the impact assessment, detailed design, and permitting stages of the project.

The potential cumulative effects of the proposed development are discussed in the following sections:

7.1 IDENTIFICATION OF OTHER PROJECTS AND ACTIVITIES

There are known activities within the area that should be considered along with any residual effects of the Four Slide Falls project in order to undertake an assessment of cumulative effects. These projects or activities are described below;

McCarthy Chute GS

The proponent is proposing the construction of another hydroelectric project (McCarthy Chute GS) located approximately 5.5 km downstream from the Four Slide Falls project site at the outlet of McCarthy Lake. Should the proposed Four Slide Falls GS undertaking receive regulatory approval to proceed, the cumulative effects of both projects will then be considered and addressed in the Environmental Report documenting the McCarthy Chute Hydroelectric Project.

Forestry Harvesting

The study area is located within a forest management area. The forest resources on Crown land adjacent to the site are currently allocated under a Sustainable Forest License to Northshore Forest Inc. (Eacom) (Northshore Forest Management Unit). According to the Northshore Forestry Management Plan, forestry operations are planned within the general area before 2015.

Access Roads

Approximately 21 km of existing mining/logging roads will be used to access the area from Highway 17. The existing road will require some surface upgrade work and potentially drainage improvements to allow the roads to accept construction traffic. A review of the loading capacity of any existing bridges will be required. From the end of the 21 km logging road, an additional 10 km of trail initially leading NE leads to within 5 km of the Four Slide Falls project site. A 4 km ATV/snowmobile trail leads from here to within 1 km of the site and it is expected that this trail will require significant surface improvements and possibly water crossing works to accept construction traffic. A new access road will need to be built along the final 1 km to access the project site.

Access road planning to the project site was determined in close consultation with the forest management companies with the purpose of incorporating access with existing forestry roads wherever possible. Access road details are provided in Annex II-B.

Mining Activity

Elliot Lake and the surrounding area have a long history of mining activity. However, the last mines in the region closed in the early 1990s for economic reasons. In the last ten years there has been a resurgence of interest in mining exploration in the region and Pele Mountain Resources is pursuing the development of the Eco Ridge Mine. At this time it is not possible to anticipate what cumulative effects Four Slide Falls will have with future mining activity in the region and it is assumed that any future projects will assess the potential for cumulative effects with the Four Slide Project during their assessment.

7.2 Assessment of Potential Cumulative Effects

An analysis was undertaken to determine cumulative effects associated with the interaction between each known residual effect of the project and other past and present projects and activities within the study area, as well as any future projects that have completed their EA planning. The result of this assessment as well as the significance of each cumulative effect is presented in Table 6: Cumulative Environmental Effects and Significance.

Table 6: Cumulative Environmental Effects and Significance

Component	Four Slide Falls Confirmed Net Impacts	Access Roads	Forestry Harvesting	Past Mining Activity	Assessment of Significance: Value of Resource	Magnitude	Geographic Extent (km^2)	Duration (months) or Frequency (events/year)	Reversibility	Ecological/ Social Context	Likelihood of Cumulative Effect	Significance
General Natural Environment												
Air quality	Exhaust emissions from project equipment and vehicles during construction	✓	✓		High	Low	11-100	13-36	Reversible	Relatively Pristine	Low	Not Significant
	Dust from construction activities and vehicles during construction	✓	✓		High	Low	11-100	13-36	Reversible	Relatively Pristine	Low	Not Significant
Water quality (surface and groundwater)	Surface water - general construction activities along shoreline of waterway at facility and water crossings along transmission line route and access roads	✓			High	Low	11-100	13-36	Reversible	Previously Impacted	Low	Not Significant
	Surface water - Fluctuation of inundation area upstream and fluctuation flows downstream caused by intermittent operation of facility increasing suspended sediment (may include resuspension of sediments that may be impacted from decommissioned uranium mining operations within the watershed)			✓	High	Low	11-100	possible for up to 9 months of every year	Reversible	Previously Impacted	Low	Not Significant
	Contamination from spills or leaks of hazardous substances	✓	✓	✓	High	Low	11-100	13-36	Reversible	Previously Impacted	Low	Not Significant
Species at Risk - Chimney Swift	Impact to breeding and habitat due to clearing of riparian forest for headpond creation during construction	✓	✓		High	Low	11-100	Continuous	Irreversible	Previously Impacted	Low	Not Significant
Terrestrial wildlife (numbers, diversity, distribution)	General disturbance to habitat during construction and maintenance of facility (dam, powerhouse, etc)	✓	✓		Medium	Low	11-100	Continuous	Reversible	Previously Impacted	Low	Not Significant
	Access road construction - habitat fragmentation, increased predation, introduction of invasive species	✓	✓		Medium	Low	11-100	Continuous	Reversible	Previously Impacted	Low	Not Significant
	Construction of facility and headpond creation - impacts to general and Significant Wildlife Habitats	✓	✓		Medium	Medium	11-100	13-36	Reversible	Relatively Pristine	Low	Not Significant

Component	Four Slide Falls Confirmed Net Impacts				Assessment of Significance							
		Access Roads	Forestry Harvesting	Past Mining Activity	Value of Resource	Magnitude	Geographic Extent (km^2)	Duration (months) or Frequency (events/year)	Reversibility	Ecological/ Social Context	Likelihood of Cumulative Effect	Significance
Terrestrial wildlife (numbers, diversity, distribution)	General disturbance to wildlife	✓	✓		Low	Low	11-100	During construction period and then once every few years for maintenance along the connection line corridor	Reversible	Previously Impacted	Medium	Not Significant
Natural vegetation and habitat linkages	Effects on vegetation and habitat during connection line and access roads ROWs construction and maintenance	✓	✓		Medium	Low	11-100		Reversible	Relatively Pristine	Medium	Not Significant
Aquatic and Riparian Ecosystem												
Drainage, flooding and drought patterns	Alteration to natural patterns		✓		Medium	Medium	11-100	frequency dependant on flood event frequency	Irreversible	Relatively Pristine	Low	Not Significant
Land and Resource Use												
Access to inaccessible areas	Facilitation of access as a result of upgrades/maintenance of area access roads and bridges New roads can act as vectors leading to increased exploitation and introduction of new species	✓	✓	✓	High	Medium	101-1000	Continuous	Reversible	Previously Impacted	High	Not Significant
Forestry	Harvesting of merchantable timber during construction		✓		High	Low	11-100	Continuous	Irreversible	Relatively Pristine	High	Positive
Social and Economic												
Employment	Construction activities will support direct and indirect local employment	✓	✓		High	High	101-1000	37-72	Reversible	Previously Impacted	High	Positive

Air quality

Impacts to air quality associated with the project (dust, odour, exhaust, etc) are all expected to occur mainly during the construction phase of the project and will be curtailed during operation. Given the mitigative measures which will be taken and the remote nature of the project these impacts are anticipated to be both short term and minor and therefore not significant.

Additionally, as a modified run-of-river facility, the project will generate sustainable and renewable energy and, in combination with other green energy projects, contribute to the improvement of air quality and public health in Ontario by facilitating and compensating for the shutdown of coal fired generation facilities throughout the province.

Flow and inundation effects on water quality, movement and erosion

It is expected that there may be cumulative effects associated with inundation and the alteration from natural flow patterns as a result of Four Slide Falls. The creation of the headpond and operation associated with the Four Slide Falls facility may affect erosion and sedimentation patterns as well as water quality and quantity within the Serpent River and McCarthy Lake. Additionally, road and power line construction may result in similar impacts to water quality at proposed water crossings.

Disturbance to Species at Risk, terrestrial wildlife and vegetation

Chimney Swift, an identified Species at Risk, and their habitat has been found within the area to be inundated by the Four Slide Falls project. While impacts to this species are anticipated to be insignificant given the amount of available habitat in the surrounding region, it is possible that access road construction and forestry activities in proximity to the project could further impact this species.

The construction and operation of the Four Slide Falls facility will result in an increase in traffic in local access roads as well as the construction of additional roads and connection line ROW as well as a combined construction camp which will be used to house workers for the construction of both projects. In combination with the existing access roads and forestry activity these activities will have the potential to disturb terrestrial wildlife. While construction activity will result in higher traffic volume and activity, it will not continue once the project is operational. Route selection for connection lines and roads has been sited along existing roads wherever possible.

Given the relatively large area over which the disturbance will be distributed and the fact that wildlife in the area is disturbed through forestry activity regardless, the overall impacts are not anticipated to be significant.

Access to inaccessible areas; community character, enjoyment of local amenities; local, regional or provincial economies

While the Serpent River between Pecors Lake and McCarthy Lake is a designated canoe route observations made by the consulting team over the course of field investigations indicate that the channel is difficult to navigate and is only sporadically utilised. As a result of inundation, the section of river above the proposed Four Slide Falls GS will transition from a river like to a lake like environment and it is expected that this will result in a facilitation of navigational access for boaters. Access roads and power line ROW construction are also expected to facilitate access to terrestrial areas in proximity to the project.

The cumulative effects associated with the above mentioned components relate to the facilitation of access through the construction of new roads and road upgrades, increased use of the river, and ongoing operations.

Employment and Economic Development

There exists a potential benefit to the local and regional population in that the construction of Four Slide Falls may result in the prolonged or additional hiring of local labour and local construction material sourcing (i.e. aggregate).

Connection line construction will require the clearing of a 10 – 30 m ROW. The proposed connection line layout suggests that the ROW should follow exiting forestry roads where possible.

New road construction will require the clearing of a 10 – 30 m ROW. There may be sections along new access roads where more than 30 m of new ROW will be required. This also presents the potential increased benefit of timber harvesting which can provide local employment opportunities and merchantable wood.

The Serpent River First Nation and Xeneca signed a Letter of Intent on April 1, 2010, declaring their intent to move forward in developing a business relationship in which effects on economic development in this community will be determined but they are anticipated to be positive in nature.

8. MONITORING & FOLLOW-UP PROGRAMS

Proposed monitoring and follow-up programs are presented below. Additional programs may emerge through on-going consultation within the regulatory approvals stages of the development planning.

8.1 CONSTRUCTION MONITORING

Prior to construction, the Construction Management Plan (CMP) presented in Annex II-C will be enhanced to incorporate any construction management strategies outlined in the ER and supporting annexes as well as any permit application or federal approval/authorization requirements. The final CMP will be submitted to the regulators as supporting documentation for construction permits and approvals.

The proponent will:

- That all necessary regulatory permits and approvals (federal and provincial) have been obtained prior to the start of any site preparation or construction activities.
- That all contractors are familiar with and are applying the identified mitigation measures outlined in the CMP and industry/regulator best management practices.
- That controls to minimize environmental effects during construction (e.g. sediment fencing) are regularly inspected and functional, and conduct inspections after any event which might disturb the control measure (e.g. a heavy rainfall event).
- That the mitigation measures being applied are not creating adverse environmental effects, and that mechanisms are in place for corrective and remedial action to address these if they occur.
- That all signage and required traffic control measures, including posted speed limits, remain in appropriate locations as construction proceeds and in good visual condition.
- That all site restoration activities have been implemented.

8.2 POST-CONSTRUCTION / OPERATION MONITORING

Prior to commissioning, an Operation and Maintenance Plan will be prepared for the facility. The Operation and Maintenance Plan should include:

- The locations where the potential for erosion has been identified will be inspected and assessed at intervals after operation commences.

- Where monitoring reveals significant erosion and the potential for adverse environmental effects, further monitoring and/or mitigation strategies will be developed, as required.

Based on the results of the post construction monitoring, further mitigation strategies will be developed as required. Other items in the Operation and Maintenance Plan include:

- Emergency response plans for hazardous materials spills, fire, etc.
- Health and safety guidelines for powerhouse employees.
- Waste and hazardous materials handling, storage and disposal guidelines.

Shoreline Erosion

- The locations where the potential for erosion has been identified in the erosion survey will be inspected and assessed after operation commences to document whether and to what degree erosion has occurred.
- If significant erosion occurs, mitigation measures will be implemented in cooperation with the MNR.

Environmental Assessment Commitment Implementation and Review Plan

Xeneca will continue to work closely with federal and provincial agencies, during the EA review process and afterwards during the detailed design, construction, and operational phases of the project. As part of this effort, Xeneca will issue a regular Project Implementation Report to agencies to update project status, implementation of commitments, and results from effects and mitigation programs.

9. REGULATORY APPROVALS AND PERMITS

Following the successful completion of the EA and the completion of detailed engineering design, the proponent will make application to various federal, provincial and municipal agencies for regulatory permits, approvals and authorizations. These permits, approvals and authorizations are required before site preparation or construction, or prior to the commissioning of the facility. A list of the regulatory permits that may be required for this undertaking is presented below in Table 7.

Table 7: List of Potential Regulatory Approvals

Permit and Legislative Requirement	Agency
Federal	
Authorization for Works and Undertakings Affecting Fish Habitat - *Fisheries Act* [Section 35(2)]	Department of Fisheries and Oceans
Authorization for Destruction of Fish by Means other than Fishing - *Fisheries Act* (Section 32)	Department of Fisheries and Oceans
Requires construction of fish-ways – *Fisheries Act* (Section 20)	Department of Fisheries and Oceans
Requires fish guards or screens to prevent entrainment of fish at any water diversion or intake – *Fisheries Act* (Section 30)	Department of Fisheries and Oceans
Requires sufficient flow of water for the safety of fish and flooding of spawning grounds as well as free passage of fish during construction – *Fisheries Act* (Section 22)	Department of Fisheries and Oceans
Species at Risk Act (SARA) – authorizations, as applicable	Department of Fisheries and Oceans; Environment Canada
Approval for Construction in Navigable Waters – *Navigable Waters Protection Act* (Section 5)	Transport Canada (Marine)
Explosives Act - Temporary Magazine Licence	Natural Resource Canada (NRCan)
Provincial	
Lakes and Rivers Improvement Act (LRIA) – Section 14 - Location Approval and Plans and Specifications Approval	Ministry of Natural Resources
Lakes and Rivers Improvement Act (LRIA) – Section 23.1 - Water Management Plan amendment	Ministry of Natural Resources
Public Lands Act (PLA) – Work Permits (Parts 1-5, as required).	Ministry of Natural Resources
Public Lands Act (PLA) – Land Use Permit or Licence to Construct	Ministry of Natural Resources
Public Lands Act (PLA) – Licence of Occupation	Ministry of Natural Resources
Public Lands Act (PLA) – Water Power Lease Agreement	Ministry of Natural Resources
Public Lands Act (PLA) – Grants of Easements (Policy PL 4.11.04)	Ministry of Natural Resources
Endangered Species Act (ESA) – permits and agreements, as applicable	Ministry of Natural Resources
Crown Forest and Sustainability Act (CFSA) - Forest Resource Licence and Overlapping Licence Agreement	Ministry of Natural Resources
Crown Forest and Sustainability Act (CFSA) – Use/maintenance agreement	Ministry of Natural Resources
Forest Fires Prevention Act (FFPA) - Burn permit on Crown Land	Ministry of Natural Resources

Aggregate Resources Act (ARA) – Aggregate Permit	Ministry of Natural Resources
Ontario Heritage Act and the *Ontario Heritage Amendment Act (OHA and OHAA)*- Cultural Heritage Clearances and Registration to Database	Ministry of Tourism and Culture
Permit to Take Water – *Ontario Water Resources Act* (Section 34), Category 2 (construction) and 3 (operation)	Ministry of the Environment
Certificate of Approval (Industrial Sewage) – *Ontario Water Resources Act* (Section 53)	Ministry of the Environment
Certificate of Approval (Air and Noise) – *Environmental Protection Act* (Section 9)	Ministry of the Environment
Waste Generator Registration – *Environmental Protection Act* [Section 18(1)], Ontario Regulation 347	Ministry of the Environment
Notice of Project and Registration of Contractors – Construction Regulation 213/91	Ministry of Labour
Ontario Energy Board Act (OEBA) - Electricity Generation Licence Potentially leave to construct (section 92) and Wholesaler license if transmission connected. Note would also require market authorization from the IESO if transmission connected.	Ontario Energy Board
Municipal	
Road Use Agreement	Municipality
Building Permit	Municipality
Fire Protection and Prevention Act (FFAPA) - Burn Permit	Municipality

10. COMMITMENTS

The following commitments are made by the proponent, Xeneca Power Developments Inc. in order to ensure the development of a sustainable waterpower project;

General

- The proponent is committed to ensuring compliance with the ER as a contract with the people of Ontario.

- The proponent is committed to the adoption and application of the mitigation measures outlined within this document for both the construction and operation of the proposed undertaking according to applicable legislation (i.e. adherence to Construction Management Plan and best management practices, such as applicable DFO Ontario Operational Statements as listed at http://www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/provinces-territories-territoires/on/index-eng.htm). This may be achieved through the hiring of an environmental inspector for the duration of the construction program and through operator training on environmental issues within the operational phase of the project.

- The proponent is committed to developing appropriate compensation for any significant adverse impacts on fish habitat in cooperation with MNR, DFO and other Agencies as part of the detail design development. This will require advancement of detail design in the post EA period.

- The proponent is committed to the development and implementation of a regular reporting process including a Project Implementation Report.

Facility Operations

- The proponent is committed to verifying the specific operational parameters in consultation with regulators and to documenting any updates in the operational plan for the facility.

- Further operational ground truthing of the proposed lines and access routes is planned following the processing of digital aerial photography captured in early June, 2011.

- The operation of the facility will be aligned with the existing Serpent River WMP during a comprehensive review in 2014.

- The operating plan for Four Slide Falls should not result in any adverse effects on identified downstream users. In anticipation of a comprehensive review Xeneca will work with the downstream stakeholders to ensure there are no adverse affects on any user of the Serpent River and, within the existing Serpent River WMP, support positive change for all concerned.

- Downstream of Four Slide Falls the Serpent River discharges into McCarthy Lake. Operations of Four Slide Falls will have no adverse effects on the Lake Trout Lake or users of the Serpent River. Xeneca suggests that the Operating Plan be accepted based on the Class EA process. Additional issues raised by the Ministry of Natural Resources and stakeholders identified in the Serpent WMP will be addressed as part of a comprehensive review

- The proponent informed that the design would attempt to avoid watercourses and would use exiting crossing wherever possible.

- The operation of the facility will be aligned with the Serpent River WMP when it is finalized. The Four Slide Falls Operating Plan will be made available to all identified stakeholders (please see the Plan in Annex I-C and reference to stakeholder list) for consideration during the EA review process and for discussion in subsequent stages of the development. The approved Operating Plan will become part of the Serpent River WMP through a *Lakes and River Improvement Act*, Section 23.1, Water Management Plan amendment. After the approval of the amendment by the Minister, Xeneca will participate in the Serpent WMP process.

Consultation

- The proponent has agreed to address these issues by meeting directly with local recreational users

- Xeneca has recorded all public comments and concerns for the proposed Serpent River projects over the course of the EA planning process and will continue to do so throughout the development process.

- The proponent is committed to continuing to engage specific stakeholders on relevant issues after the issuance of the Notice of Completion and Statement of Completion.

- The proponent is committed to sharing all information from studies as well as the operational strategy proposed for the site with the interested First Nation, Aboriginal and other communities.

- Xeneca will work with the recreational fishing community, local tourism operators and other interested parties to ensure that access, fisheries, tourism values and aesthetics are not negatively affected by the project.

Further Investigations

- In response to EC's requests the proponent has committed to consultation with EC in 2011 in order to scope and undertake a surface water quality characterization study and impact assessment during subsequent field seasons leading up to the construction phase, in order to determine any potential negative effects of the proposed project on this regime.

- The proponent is committed to engaging in discussions to resolve the Lake trout lake issue that has been identified by the Ministry of Natural Resources during the development planning process. It is the professional opinion of a member of the EA team that McCarthy Lake will not be adversely impacted by the proposed Four Slide Falls development. However, the impact assessment of the proposed McCarthy Chute GS on McCarthy Lake will be undertaken in The McCarthy Lake Class EA and as part of that assessment will include a cumulative effects discussion of the combined impact of both projects on the lake and the Serpent River.

- Additional hydrological modeling (HEC-RAS) will be undertaken for areas upstream and downstream of the facility to assist with impact verification and adaptive mitigation work with DFO and MNR in the post EA period when detail design is assessed by the Agencies.

- Xeneca is committed to conducting further modelling on water quality and temperature on McCarthy Lake.

- The proponent will update the Construction Management Plan based on advanced project design to include instructions and protocols for minimizing the disturbance to valued ecosystem components.

- The proponent will document and verify impacts associated with inundation and flow effects within the expanded zone of influence upstream (inundation area) and downstream (variable flow reach) of the facility.

- The proponent will enhance shoreline erosion investigations completed to date through further studies of reservoir sedimentation during the detailed design phase of the project.

- The proponent will undertake Stage 2 assessments under the *Heritage Act* and, if required, Stage 3 and/or 4 archaeological investigations within the project area.

- The proponent will continue to actively solicit the involvement of participating Aboriginal communities in any cultural heritage assessment activities to be undertaken for the project.

11. CONCLUSIONS

Xeneca Power Development Inc. (Xeneca) proposes to construct and operate the Four Slide Falls hydroelectric power generating station (GS) on the Serpent River. This document describes the environmental assessment (EA) carried out as part of the planning process for the proposed project.

Throughout the environmental planning process, Xeneca has endeavoured to understand the environment in which the project would be built by undertaking an extensive information and data collection program. Data on areas of the environmental setting of the project was collected by discipline experts including:

- Stage 1 archaeological assessment;
- A natural environment characterization and impact assessment;
- Erosion study on the riverine system in the zone of influence;
- Database analysis and mapping exercise and wetland assessment and flyover to route the connection line and access roads;
- A statistical analysis of historical hydrological data;
- A hydraulic model study analysis;
- Conceptual engineering design; and
- Baseline surface water quality study

A comprehensive agency and public consultation program also contributed key information towards the identification of the potential adverse and positive environmental effects of the project. While Xeneca is committed to continuing the discussion with local groups it is anticipated that any identified issues can be resolved. Agency approval for the proposed operating strategy and permitting and authorizations in support of construction will be sought following consultation with regulators and incorporated into the final design of the facility and its' components.

Aboriginal and First Nation engagement was undertaken with each community's leadership as part of the business to business Aboriginal consultation initiative by the proponent. A comprehensive engagement initiative with each community located within, or having traditionally used the project area has been underway since issue of the Notice of Commencement and will continue beyond Notice of Completion and into project implementation.

Additionally, the Stage 1 archaeological assessment of the project determined the potential for cultural resources to be impacted by the project. As a result, a Stage 2 assessment is underway with participation by First Nation and Aboriginal communities. Further archaeological assessment requirements will be determined subsequent to the findings of the Stage 2 study in accordance with the *Ontario Heritage Act*.

The results of the HEC-RAS modeling of the inundation area revealed that the zone of influence of the inundation area will extend 6.8 km upstream of the proposed dam location. Additional scientific investigations and modeling exercises will be undertaken to assess and verify the potential impacts to the study area. The downstream variable reach will extend to the outlet of the Serpent River into McCarthy Lake, approximately 4 km downstream.

Throughout this document, management strategies have been developed and applied to known impacts in order to avoid, prevent or minimize any identified adverse environmental effects of the project. It is the conclusion of this environmental assessment that the planned undertaking will result in residual adverse effects. An analysis of the identified residual adverse environmental effects was undertaken to determine their significance, and commitments for any required additional measures for the further management of these potential residual effects have been made.

The majority of the identified adverse effects were determined to be "not significant", meaning that they are minor or insignificant and are not likely to cause unacceptable harm to environmental quality, productive capacity of the effected environment, or the socio-economic and cultural attributes of the area.

There are however identified adverse environmental effects that have been identified that were determined through professional judgment to have significance. These effects are associated with the inundation of the headpond at Four Slide Falls and the associated impacts to aquatic habitat.

The requirement for an Authorization under Section 35 of the *Fisheries Act* for the HADD of fish habitat and the proposed compensation for these anticipated impacts must be developed and discussed with Fisheries and Oceans Canada once the engineering details for the project have been advanced during the permitting phase of the project. It is expected that compensation for impacts to habitats that will be lost or altered as a result of the Four Slide Falls development will be required.

There are also many positive environmental effects associated with the project which are considered to off-set the adverse environmental effects associated with the project, these include:

- Tangible Economic Outcomes for the Local Communities and the Regional / Provincial Economy:
    - Benefit to the local SFL holder by sale/processing of merchantable timber along the connection line and access road ROWs, and the merchantable timber to be harvested from the area of inundation.
    - Job creation during construction both directly and indirectly in the near North Region of Ontario. Direct employment (construction only) for waterpower projects is estimated at 10,000 person hours per MW; indirect jobs multiply by 1.5; and up to two part time jobs will be available in the operation and maintenance of the facility.
    - An increase in economic activity (direct and indirect) to build the project procuring everything from consulting and legal services to concrete, steel, trucking and other services such as lodging, food and fuel. The majority of this activity will be created within the local/regional economy.
- Employment and training opportunities (planning, construction and operation phases of the project);
- Potential for economic development for First Nation pursuing a business relationship with the proponent;
- Creation of reliable and secure green energy for the province and reduced Greenhouse Gas emissions:
    - The project will reduce CO_2 emissions by eliminating the need for an equivalent amount of electricity to be produced through the combustion of fossil fuels.

- Benefits to the population, commerce and industries of Ontario by providing more reliable and consistent renewable power to the provincial grid for many years to come. Many power plants built in the early 1900s are still in operation and with regular maintenance and upgrades can last for generations to come.

- The operation of the facility in the existing power grid will be compatible with the overall power system reliability and power quality (voltage and frequency) objectives while improving distribution customer service reliability in this area, from a sustainable and consistent power source.

- The generation of electricity through a renewable energy supply in support of the province's *Green Energy and Green Economy Act*.

Preliminary planning discussions towards the development of various management strategies are outlined in this document, and the proponent will continue to work with the regulators and other interested parties in support of securing approvals for this undertaking. The application of the recommended management strategies and adherence to the identified commitments by the proponent will help to realize a sustainable renewable energy development project.

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