

Ontario Power Generation Inc.

PROPOSED CALABOGIE GENERATING STATION REDEVELOPMENT PROJECT

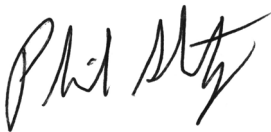
Public and Agency Consultation
Technical Support Document
Final

March 2020

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PROPOSED CALABOGIE GENERATING STATION REDEVELOPMENT PROJECT

Public and Agency Consultation
Technical Support Document – Final

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EXECUTIVE SUMMARY

Ontario Power Generation (OPG) is proposing to redevelop the existing Calabogie Generating Station (GS). Constructed in 1917, the original station had an installed capacity of 5 megawatts (MW). The existing Calabogie GS is over one hundred years old and was at the end of its life prior to the tornado that hit the GS in September 2018. The GS has not operated since that time. OPG intends to redevelop the site and increase the station's capacity to approximately 11 MW.

The proposed Project is located in the Village of Calabogie, Township of Greater Madawaska, Renfrew County, Ontario. The Project involves the demolition of the existing powerhouse and forebay inlet structure and the construction of a new powerhouse with integral intake structure and tailrace. Other ancillary facilities will also be constructed. The Project may also involve the construction of additional sluiceway capacity.

The proposed Project will result in an increase of slightly over 6 MW of power over the old station. In total 11 MW of power would provide energy for slightly over 11,000 homes in Ontario.

This Technical Support Document (TSD) assesses the public and agency consultation undertaken as part of the Class Environmental Assessment for the proposed project.

The consultation program included two sets of public open houses held in Calabogie Ontario (2018 and 2019), public notices, a Project website and the provision of opportunities for on-going consultation. Generally, public interest has been modest with approximately 30 individuals attending each open house.

The two open houses demonstrated that there is no public opposition to the proposed project. There was not a single individual indicating opposition to the project. A number of individuals indicated verbally and in writing that the project appears well planned.

The main public concern has been the historic and existing range of water level fluctuations during certain times of the year in the Calabogie GS to Stewartville GS reach. While this is an existing situation, OPG is of the view that the proposed project should slightly reduce the frequency of such fluctuations on some occasions and therefore in general should be preferred by the downstream property owners. OPG continues to communicate with any property owners that raise this concern. It is our opinion that all public comments to date have or are being addressed.

Consultation with agencies has included the: Ministry of Environment Conservation and Parks (MECP), Ministry of Natural Resources and Forestry (MNRF), Ministry of Tourism, Culture and Sport (MTCS); Department of Fisheries and Oceans (DFO); and Township of Greater Madawaska and Renfrew County. Agency consultation events have included: tours of the site; large OPG-agency meetings and informal communications. OPG has facilitated as much consultation as requested by the government agencies. Significant consultation will still be required following the environmental assessment with respect to specific permits and authorizations.

1 INTRODUCTION

1.1 Regulatory Framework and Environmental Assessment Process

In Ontario, proposed waterpower facilities are subject to the *Environmental Assessment Act (EA Act)*. The Ontario Waterpower Association (OWA, 2018) developed the Class Environmental Assessment for Waterpower Projects (OWA Class EA) process which was approved by the Ontario Minister of the Environment and the Lieutenant Governor in Council in 2008. The *EA Act* formally recognizes the OWA Class EA process which outlines the requirements for Environmental Assessment (EA) approval. The proposed Calabogie Station Re-Development Project (CSRP) is being carried out according to the eighth edition of the OWA Class EA.

Under the OWA Class EA, the proposed CSRP is classified as a “Project Associated with Existing Infrastructure”. Provided the requirements of the OWA Class EA planning process are met and a Part II Order request for a “bump-up” to an Individual EA is not made (or denied), a project is considered approved under the *EA Act*.

1.2 Other Environmental Approvals

Other permits, approvals and clearances will be sought as the proposed Project moves into the construction stage. Section 7.2.4 and Table 7.2 of the Environmental Report (ER) identify a range of possible approvals required during construction and or operations; however, specific permits and approvals will likely be required under the provincial *Lakes and Rivers Improvement Act (LRIA)*, *Environmental Protection Act (EPA)* and *Ontario Water Resources Act (OWRA)*.

1.3 Overview of the Public and Agency Consultation Technical Support Document

This document provides a summary of the public and agency consultation undertaken as part of the environmental assessment of the construction and operation of the proposed Project. The Environmental Report (ER) associated with the proposed Project provides a description of the undertaking, summarizes the overall baseline environmental setting and anticipated environmental effects, recommends appropriate mitigation measures to minimize or obviate these effects, and describes agency, public, and First Nation and Métis consultation.

This Public and Agency Consultation report is organized into six chapters:

- Chapter 1.0 – **Introduction** – this section;
- Chapter 2.0 – **Regulatory Framework, Project Description and Project Activities** – outlines the Environmental Assessment (EA) process and describes the proposed Project in detail;
- Chapter 3.0 – **General Consultation** – outlines the consultation plan that was prepared, databases developed and notices that were produced;
- Chapter 4.0 – **Public Consultation Open Houses and Meetings** – summarizes the various public consultation activities;

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- Chapter 5.0 – **Government Agency Consultation** – summarizes government agency consultation; and
- Chapter 6.0 – **Summary and Conclusions** – outlines the summary conclusions with respect to the proposed Project and public and agency consultation.

The Appendices provide supporting documentation showing the notifications, agency contact list and open house materials.

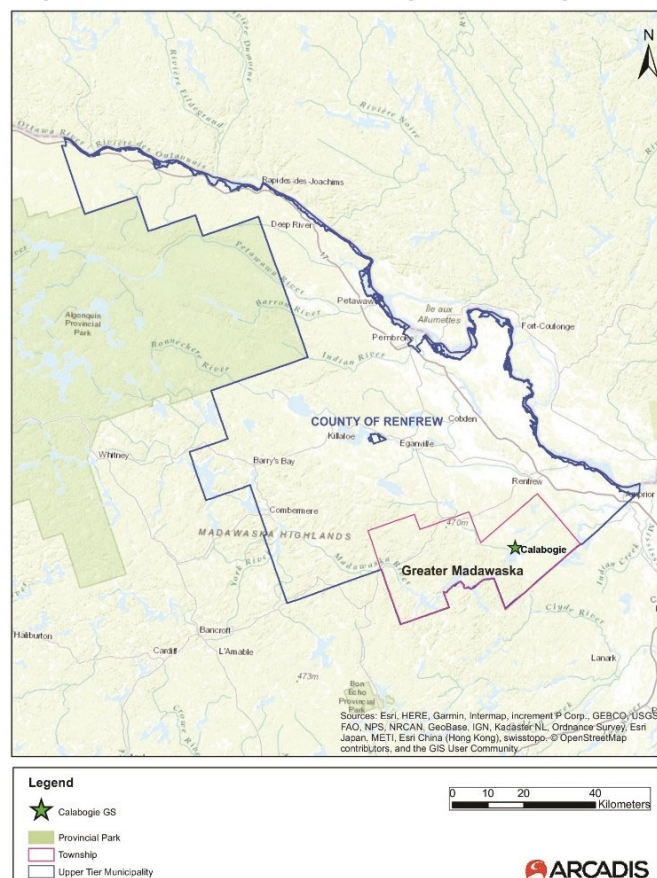
2 PROJECT DESCRIPTION

Ontario Power Generation (OPG) is proposing to redevelop the existing Calabogie Generating Station (GS). Constructed in 1917, the original station had an installed capacity of 5 megawatts (MW). The existing Calabogie GS is over one hundred years old and was at the end of its life prior to the tornado that hit the GS in September 2018. The GS has not operated since that time. OPG intends to redevelop the site and increase the station's capacity to approximately 11 MW. The Project involves the demolition and removal of the existing powerhouse and its structures including the forebay retaining walls and the forebay inlet structure and the subsequent construction of a new powerhouse and forebay embankment, with integral intake structure and tailrace. The Project will be constructed by a joint venture consisting of SNC-Lavalin and M. Sullivan and Son (the Contractor). OPG is advised by KGS Consultants (the Owner's Engineer) and Arcadis (the Environmental Consultant).

2.1 Project Location

The existing Calabogie GS is located within the Village of Calabogie, in the municipality of Greater Madawaska, Renfrew County, Ontario (Figure 2-1). It is located approximately 80 km northwest of Ottawa and 20 km southwest of Renfrew.

Figure 2-1. Location of the Calabogie Generating Station



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The Calabogie GS, located on the Madawaska River is approximately 10 km downstream of Barrett Chute GS and 20 km upstream of Stewartville GS, both OPG-owned hydroelectric facilities. Calabogie GS is part of OPG's Eastern Operations Group. The location of Calabogie GS relative to OPG's hydroelectric facilities on the Madawaska, Ottawa and St. Lawrence Rivers is shown on Figure 2-2.

Figure 2-2. Calabogie Generating Station within OPG's Eastern Operations



Source: <https://www.opg.com/building-strong-and-safe-communities/our-communities/eastern-ontario/>

2.2 Existing Calabogie Generating Station

2.2.1 History and Operations

Calabogie Generating Station was constructed in 1917 with an installed capacity of 4 MW utilizing two quadruple-Francis horizontal turbines operating at a gross head of just under 9 metres. With a maximum total turbine outflow of 66 cubic metres per second (cms), and only limited storage available in Calabogie Lake, the plant is significantly undersized in comparison to either typical mean flows or to both the upstream and downstream hydroelectric stations on the river, which have daily peaking flows up to 458 cms. Over the last 50 years several studies have investigated redeveloping the site or increasing generation at the existing plant.

As noted in the 2009 Madawaska River Water Management Plan:

“The Calabogie GS operates as a peaking plant in conjunction with the four other OPG owned GS on the Madawaska River. Although the generating units at the station have limited flow capacity, the units and sluice gates are integrated with the rest of the peaking system on the Madawaska River. Calabogie is a generation bottleneck on the Madawaska River. The small turbine capacity results in frequent spill past the station.

The operation of the GS is based on a daily/weekly cycle. The inflow is passed through the GS over a daily or weekly period. Operation of the GS takes into consideration energy demands, recreational opportunities as well as walleye spawning activities.”

The average historical inflow for the period between 1965 and 2017 at Calabogie is approximately 90 m³/s with a median of 72 m³/s. The flow duration curve and historic daily discharge record is presented below.

Figure 2-3. Calabogie Flow Duration Curve 1968 – 2018

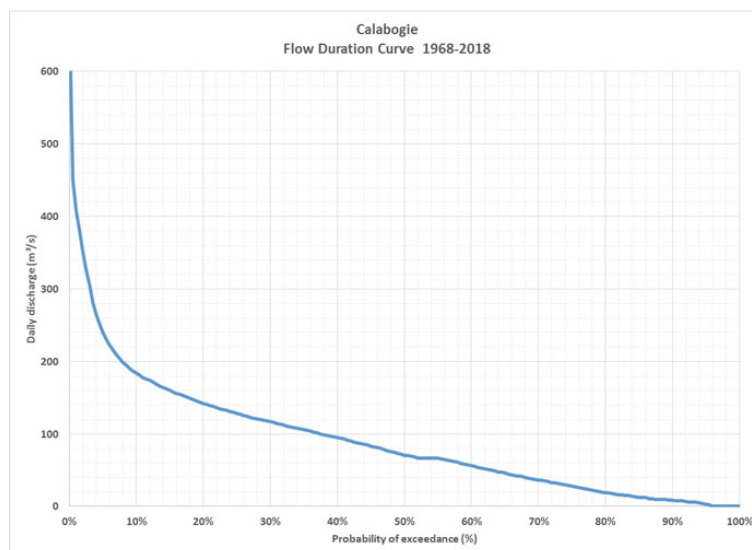
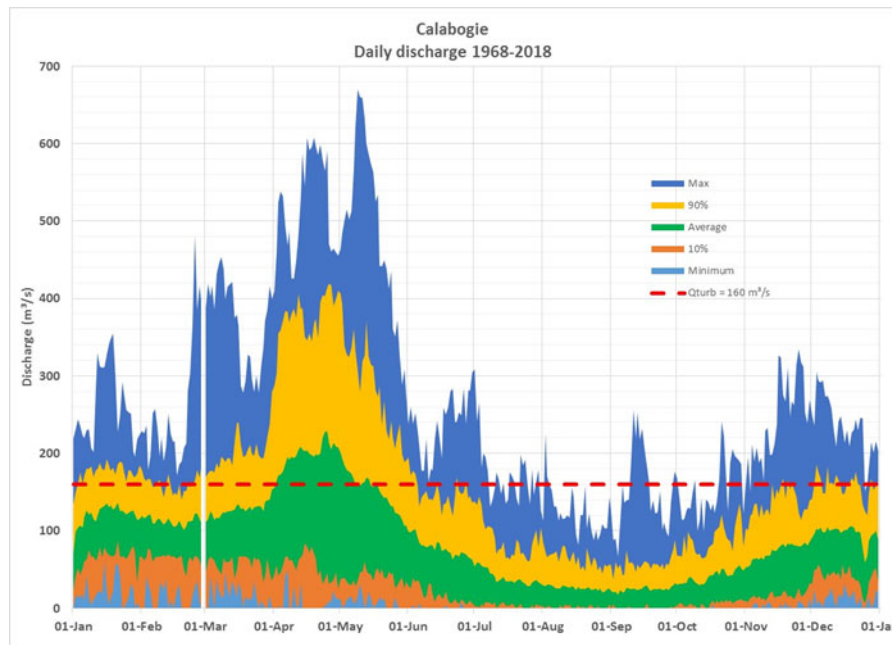


Figure 2-4. Calabogie Daily Discharge 1968 – 2018



The existing Calabogie GS is considered at end of life and OPG intends to redevelop the site with an increased capacity in order to take advantage of the existing water resources.

In September 2018, a tornado swept through the Calabogie area that resulted in significant damage to the GS. OPG began immediate repairs to the sluiceway to make it operable but the powerhouse roof was removed, rendering it unsafe. Calabogie GS has not operated since that time and will not be returning to services until completion of the redevelopment project.

2.2.2 Description of the Existing Calabogie Generating Station

While OPG intends to re-develop the power production component of the Calabogie GS, most of the other features and equipment at the site pertaining to water management will remain as is. Figure 2-5 below shows an aerial image of the Calabogie GS and key surrounding features. Figure 2-6 is a colour air photo focusing on the south branches of the River including the South Branch Main Dam.

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Figure 2-5. Calabogie Generating Station Site Map

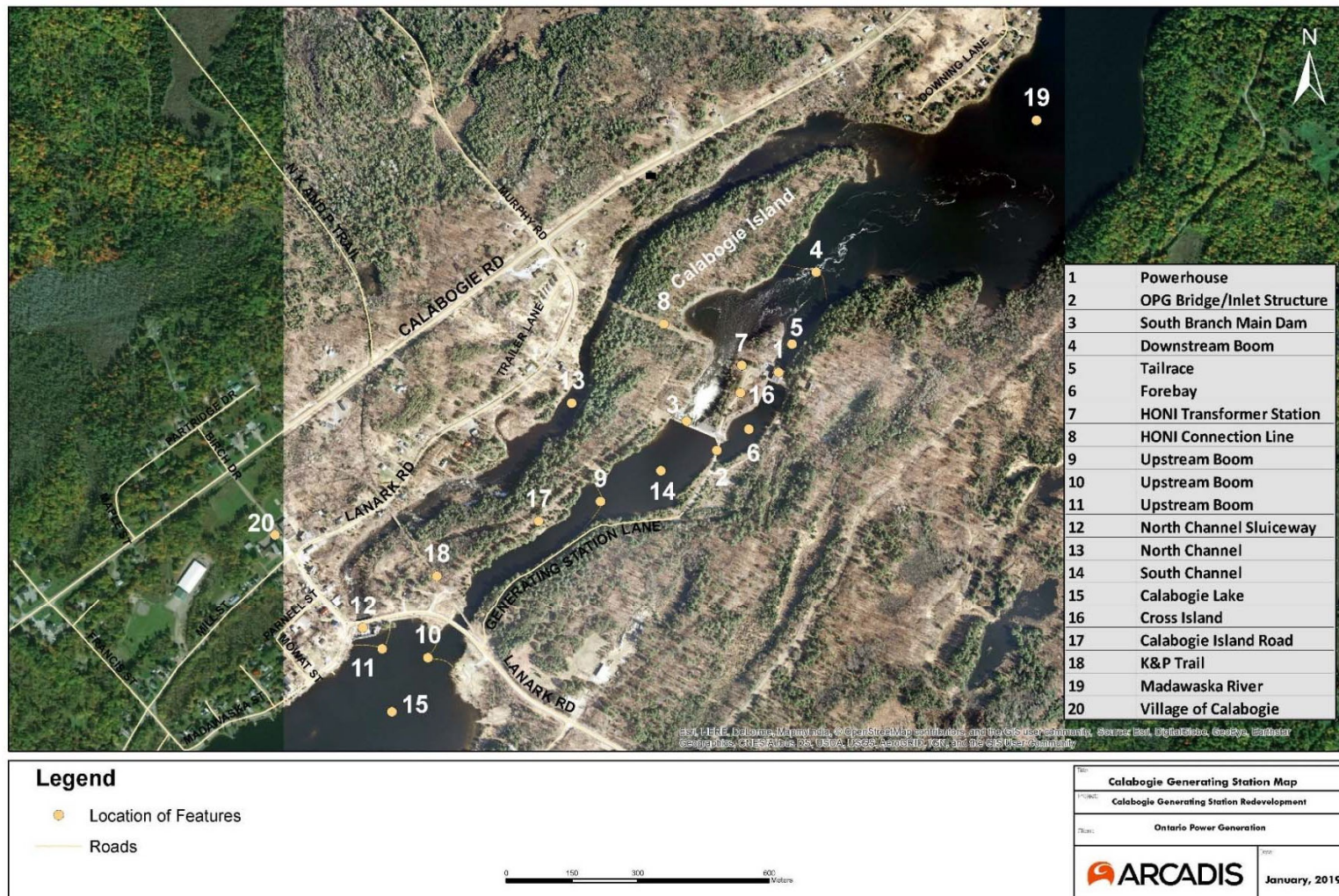
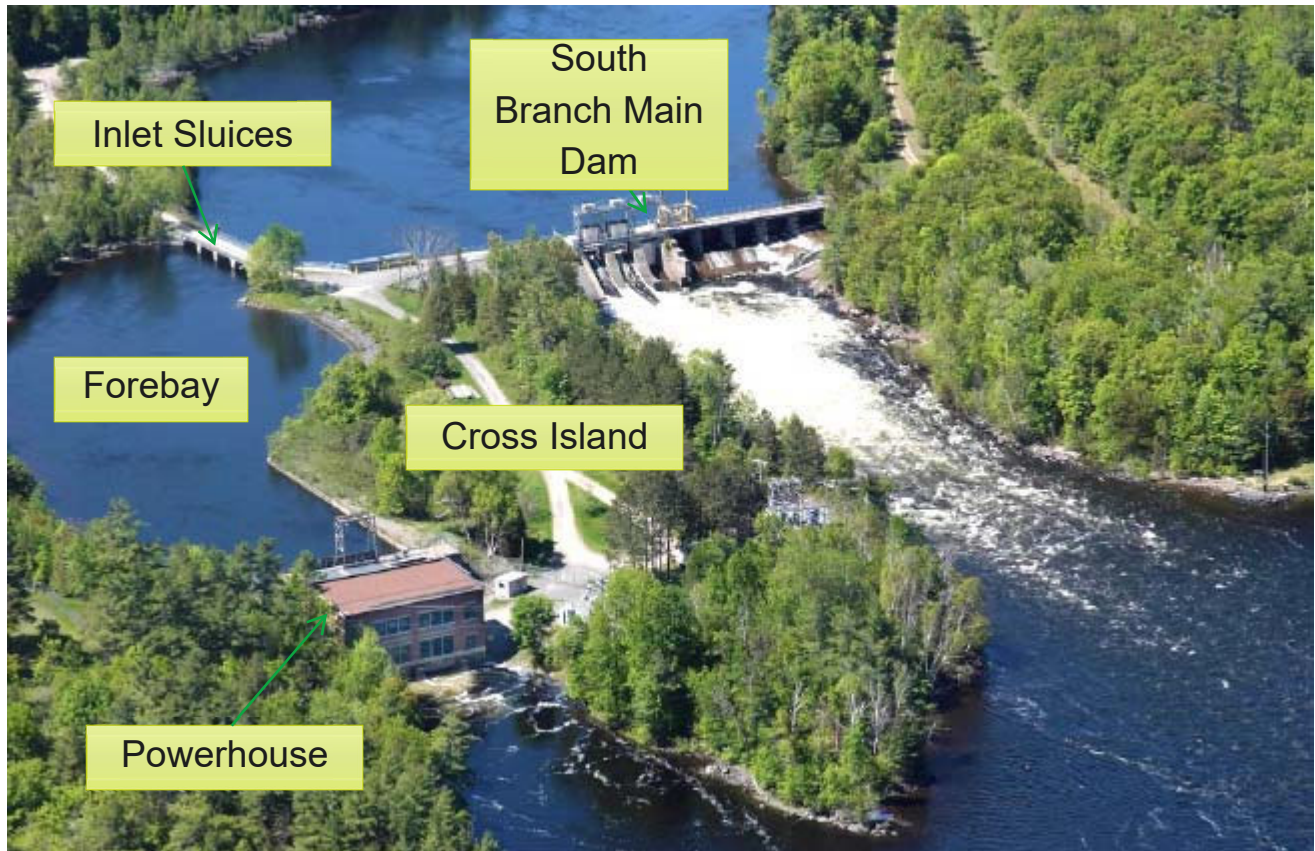


Figure 2-6. Calabogie Generating Station Colour Air Photo: Inlet, South Dam and Powerhouse



As shown in Figure 2-5, the Madawaska River immediately downstream of Calabogie Lake is characterized by three separate channels.

The northernmost channel is the North Channel that connects directly to Calabogie Lake. The North Channel is a natural river channel with flows controlled by the North Channel Sluiceway (owned and operated by OPG). The North Channel is not used for regular water management operations, however there is a compliance minimum flow of 0.8 cms. This flow has not been measured since the replacement of the wooden stop logs with steel stop logs. The 0.8 cms is an estimated flow. During the walleye spawn and incubation period the minimum flow is 5 cms subject to temperature conditions (described in more detail in Table 9.16 of the Madawaska River Water Management Plan).

The middle channel of the Madawaska River is the South Channel Sluiceway. This is the channel used to control the water management operations along with the Calabogie GS. There is no minimum flow requirement in the South Channel Sluiceway.

The southernmost channel of the Madawaska River is the forebay, powerhouse and tailrace of the existing and proposed GS. It is believed that this channel was excavated at the time of the original GS construction.

The Calabogie GS powerhouse is situated about 800 metres downstream of the outlet at Calabogie Lake.

As shown in Figure 2-5, two islands were formed by the three channels in this reach of the Madawaska River, the southern island (Cross Island) which is shown in greater detail and in full in Figure 2-6 and the larger northern island (Calabogie Island).

Cross Island is the hub of the Calabogie GS. It is accessed via Generating Station Lane, a private OPG owned gravel road that is accessible from Lanark Road, which is also known as Renfrew County Road 511 (formerly Highway 511). This road follows the southern channel of the River and then crosses over the entrance to the forebay. The OPG Bridge/Inlet Structure in this location serves two purposes: it first acts as a bridge to Cross Island; and second, it also integrates the inlet structure to the forebay with several sluices that control water flowing to the existing powerhouse. Cross Island also includes a trailer that serves as an office and washroom facilities. A Hydro One Networks Distribution Station (Calabogie DS) is also located on the island and connects to the powerhouse. Except for the eastern tip, Cross Island is largely cleared of trees. Along with all the infrastructures mentioned above, Cross Island included a cul-de-sac type road with parking areas and grassed areas for storage of equipment and materials. The tornado of September 2018 snapped a large percentage of the remaining trees on the island, which were subsequently cleared by OPG.

As shown in Figures 2-5 and 2-6 the South Branch Main Dam connects Calabogie and Cross Islands. The South Branch Main Dam provides the primary water management function at the GS and water in excess of the powerhouse discharge is passed through the dam.

Calabogie Island was also impacted by the September 2018 tornado, but the Island remains largely forest covered. The Island can be accessed by foot across the South Branch Main Dam or by vehicle on an OPG owned private gravel road that is also accessible from County Road 511. Near the South Branch Main Dam, and south of it, the Island has been disturbed by the dam construction and on-going operations. Calabogie Island is also bisected by HONI's connection line to the Calabogie GS. OPG maintains a boat launch with access to the Madawaska River downstream of the South Branch Main Dam sluiceway. The boat launch allows for operations and maintenance activities that need to occur by water on the downstream side of the facility.

Figure 2-5 also shows safety booms placed and maintained by OPG on both the upstream and downstream sides of the River.

2.3 Alternatives Analysis

Over the last 50 years several studies have investigated redeveloping the site or increasing generation at the existing plant. Studies from 1960 through to 2016 considered refurbishment and expansion of the existing plant or complete replacement with generating capacities that ranged from approximately 6 MW to 15 MW.

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The latest plant redevelopment options were optimized through a multi-stage refinement process, with an initial optimization by KGS Group for OPG, followed by more detailed project refinement by the Contractor. While numerous alternatives were considered through the re-development process, three primary alternatives emerged for final consideration. These were:

- Alternative #1 – Refurbishment of the existing powerhouse with minimal civil work.
- Alternative #2 – Refurbishment, expansion and redesign of the existing powerhouse.
- Alternative #3 – Construction of a new powerhouse.

Based on the analysis completed, Alternative #3 was selected as the preferred alternative to complete the Calabogie GS redevelopment. Alternative #3 will make best use of the available water resource at site and will result in the highest estimated annual energy generation. It also better addresses qualitative risk factors than the other alternatives.

Some of the qualitative benefits of this alternative over the other two included the following:

- Alternative #3 allows for the largest addition of green, carbon free capacity and energy to OPG's portfolio. This aligns with OPG's Strategic Direction.
- Alternative #3 is better equipped to manage the possibility of higher water quantities that are expected with future climate change.
- Alternative #3 allows for the safe removal of hazardous materials in the existing powerhouse, including, but not limited to, lead paint and asbestos. The new powerhouse will be free of these designated substances.
- Alternative #3 utilizes traditional turbine equipment, of which OPG has extensive operating experience.
- Alternative #3 with its larger plant flow capacity makes better use of available water in the Madawaska River to use more efficiently the resource and generate more energy and hydroelectric power.
- Alternative #3 with a new powerhouse allows the constructors to optimize design for constructability.
- Alternative #3 allows for optimal design to ensure accessibility and modern equipment. Alternative #3 will also be entirely new, leading to higher degree of reliability of operation with potentially less forced outages due to failures in the immediate future. Following the tornado of September 2018, significant damage occurred to the powerhouse rendering it inoperable and unsafe. Given that Alternative 3 will demolish the existing station, only minimal safe state investment is required to ensure safety and mitigate the risk of environmental spills/releases.

As the above analysis indicates, the preferred option is to construct a new powerhouse together with associated ancillary features. The existing water control facilities for both the north and south channels has been recently upgraded and is not considered part of this project.

2.4 General Layout and Description

2.4.1 General Layout

A new powerhouse will be constructed, approximately 50 metres upstream of the existing powerhouse within the existing forebay. The existing powerhouse will be demolished. The new station will have two horizontal-axis Kaplan type turbines and be rated at approximately 10.7 megawatts while both units are running. Implementation of this alternative will involve the following:

- Construction of a new powerhouse with all new turbine generator equipment.
- Removal of all existing power equipment and demolition of the existing powerhouse.
- Removal of the inlet structure to the forebay and widening of the inlet section, along with excavation in the forebay and tailrace, to allow for increased flow conditions.
- Construction of a new substation and interconnection to the existing transmission line.

The new powerhouse location was selected to be upstream of the existing powerhouse in the forebay to optimize the increased station flow and hydraulic conditions.

The re-developed GS will have the following characteristics:

- Effective Capacity of 10.7 MW;
- Estimated Annual Energy Generation with 98 % of availability – (on the order of 44 GWh to 47 GWh depending on operation);
- Number of Units – 2 horizontal turbines capable of producing approximately 5.4 MW each;
- Station Flow – 160 m³/s;
- Minimum Operating Flow – 20 m³/s;
- Average Annual Flow – 90.5 m³/s; and
- Average head of 8.6 m (range of 6.6 m to 9.9 m).

The proposed site plan for the new GS is shown below in Figure 2-7, while the powerhouse arrangement is presented in Figure 2-8. As already described, the proposed new powerhouse will be located in the forebay approximately 50 metres upstream of the existing one. The proposed undertaking will remove the current bridge and inlet structure over the forebay with access to the new powerhouse and existing sluiceway provided on the east side of the forebay.

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Figure 2-7. Proposed Site Plan for the Calabogie GS



Figure 2-8. Proposed Powerhouse Arrangement for Calabogie



2.4.2 Construction Sequencing

The construction of the new GS will be undertaken sequentially in the following stages as shown below.

Stage #1

In Stage #1 of the demolition and construction, the construction facilities and laydown areas will be set up, site trailers mobilized, access roads upgraded where necessary and the rock and overburn stockpile areas cleared. As of the fall of 2019, the existing inlet structure (located at the bridge) has been closed and the existing forebay channel de-watered. The following summer, the forebay sediment, soil and rock will be excavated in the dry for construction of the new intake forebay channel and new powerhouse substructure. During this time the existing powerhouse will be used as a downstream cofferdam.

While the existing powerhouse overburden is excavated out, hazardous material abatement will be completed within the existing powerhouse. The existing equipment will be removed, preparing for the powerhouse superstructure to be demolished. Throughout all stages of demolition, hazardous and recyclable materials will be separated from general waste and any potential waste requiring specialized treatment.

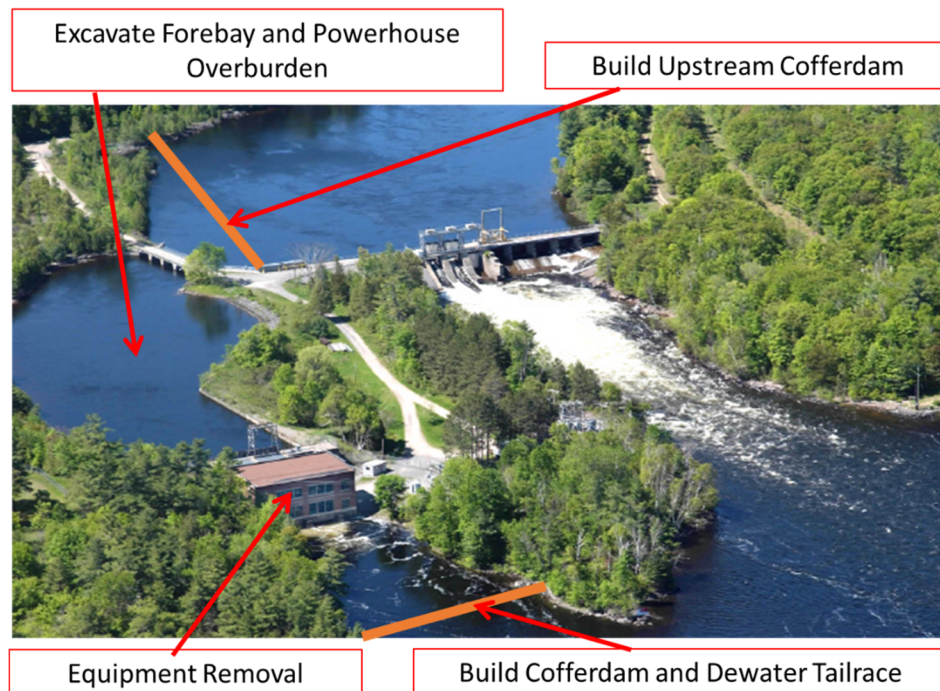
Prior to demolition of the existing Powerhouse, a cofferdam will be constructed downstream of the existing powerhouse and the existing tailrace de-watered. At the same time the downstream cofferdam is constructed, an upstream cofferdam will be constructed upstream of the inlet structure. The section between the upstream cofferdam and the inlet structure will be dewatered allowing overburden excavation to continue preparing for the rock excavation in Stage 2.

The existing inlet structure/sluices will allow the forebay to be isolated and excavation work to begin in the forebay at the start of construction. Following the July 15th fish window, the cofferdam will be constructed upstream of the inlet structure (as shown in Figure 2-9) to allow for removal of the existing inlet structure in the dry and rock excavation to continue. The upstream cofferdam will be constructed from blasted rock that has been excavated to accommodate the new powerhouse. Clean blast rock will be used to construct a 5.8 metres wide cofferdam, with a slope of 1.5H:1V up to elevation 155.17 masl. The upstream face of the cofferdam will be lined with a heavy-duty cofferdam membrane and sealed to the riverbed with a bentonite clay seal. Upon completion of the powerhouse, the liner, blasted rock and overburden will be removed, and the channel will be graded with rockfill.

The downstream cofferdam is required to isolate the downstream side of the construction and allow for the demolition of the existing powerhouse and construction of the new powerhouse and tailrace. The proposed cofferdam is a rockfill dam with an impervious geomembrane on the water side of the cofferdam. Seepage through the cofferdam will be collected and directed to a settling pond prior to discharge back into the river.

The bed material in the area where the downstream cofferdam will be constructed is primarily cobble/boulder/gravel across the main channel with some sand/gravel/cobble and bedrock/boulder/cobble distributed proximate to the river bank.

Figure 2-9. Work Sequence – Stage #1 – Excavation, Removals and Cofferdam Construction

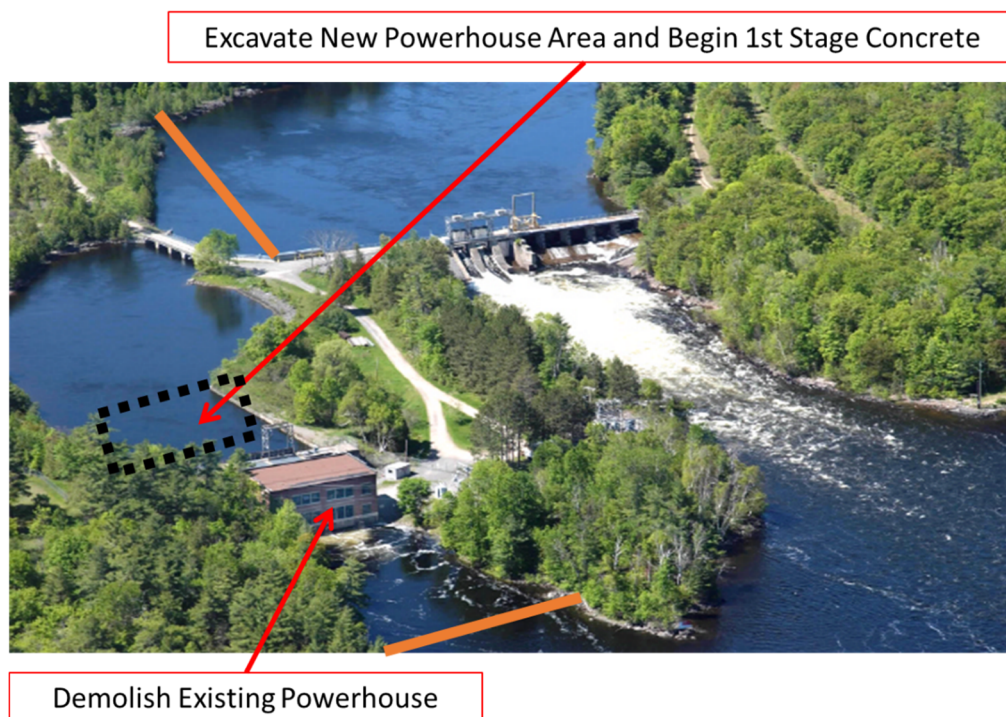


Stage #2

In Stage #2 the existing powerhouse superstructure will be demolished, followed by the existing powerhouse concrete substructure. Rock excavation for the foundation of the new powerhouse will be completed and the left embankment works will start.

Hazardous and recyclable materials will continue to be separated from general waste and any potential waste requiring specialized treatment. First stage concrete work will begin for the new powerhouse and the new embankments within the forebay and downstream of the existing forebay inlet structure will be constructed.

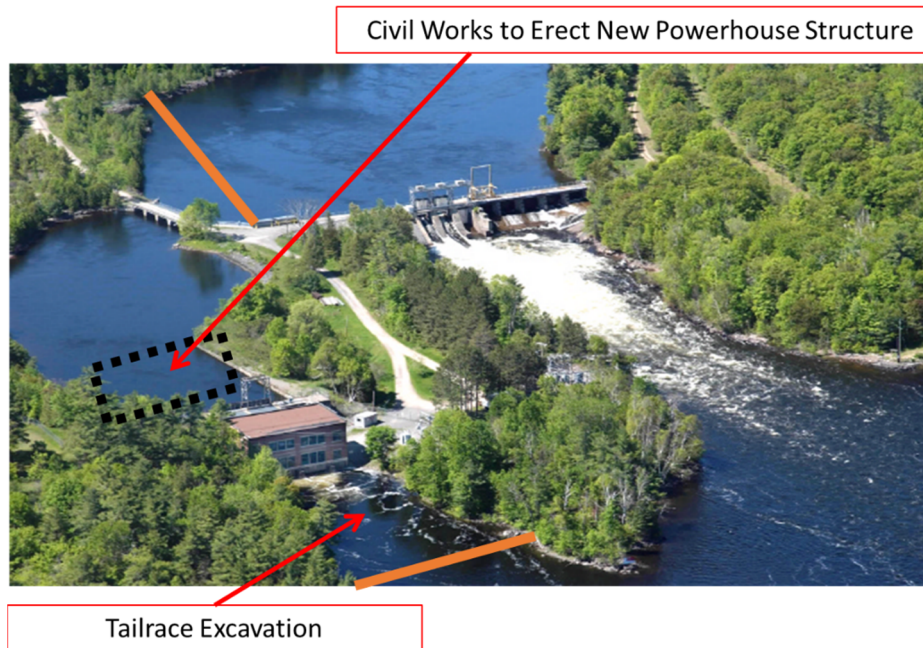
Figure 2-10. Work Sequence – Stage #2 – Powerhouse Demolition and Excavation of New Powerhouse



Stage #3

In Stage #3, the new powerhouse construction will include the remainder of 1st stage concrete works for the new powerhouse, installation of the embedded parts for hydro-mechanical equipment including gates and stoplogs, secondary concrete works, construction of the powerhouse superstructure, installation of the powerhouse crane and enclosure of the powerhouse. On the downstream side, the tailrace will be excavated down to the new elevation. The new substation equipment installation will commence, and the existing substation will be removed.

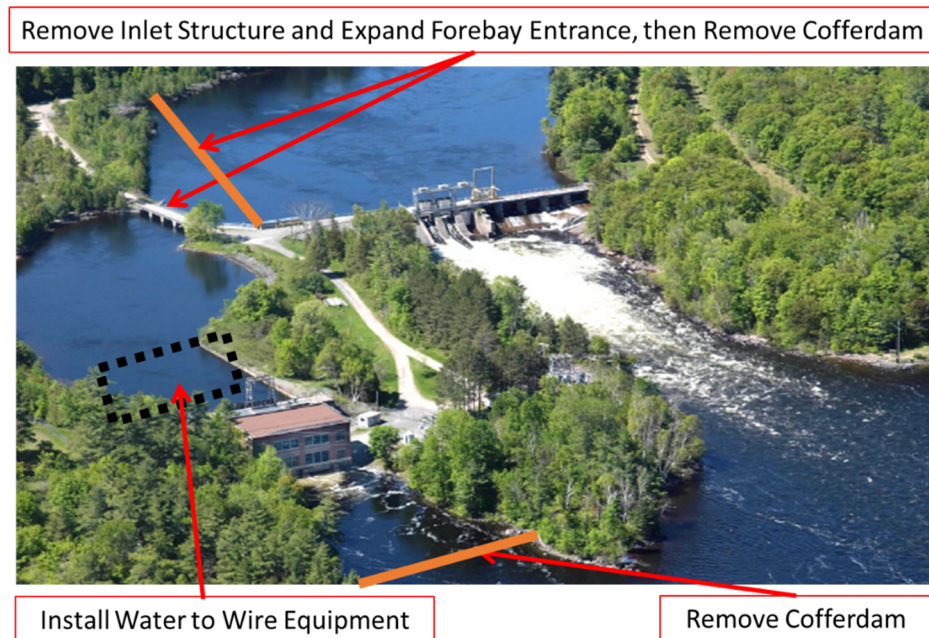
Figure 2-11. Work Sequence – Stage #3 – Construct Powerhouse and Excavate Tailrace



Stage #4

In Stage #4 the associated mechanical and electrical components for the Water to Wire turbines and generators will be installed as well as the balance of plant equipment. Sufficient work will have been completed in the new forebay and new tailrace. The entrance to the new forebay channel will have been widened to improve flow conditions to the new powerhouse and the tailrace will have been excavated as such to produce the required flow conditions specified. Once the existing forebay inlet structure is demolished and removed, the upstream and downstream cofferdams will be removed, and the systems commissioned.

Figure 2-12. Work Sequence – Stage #4 – Remove Inlet Structure and Cofferdams, Finish Powerhouse Installation



Stage #5

In Stage #5 the new units for the GS will be tested, commissioned and finally, put into commercial operation and transferred to OPG for operation.

Figure 2-13. Work Sequence – Stage #5 – Commission New Generating Station



2.4.3 Major Components

2.4.3.1 Forebay and Intake

Once the existing forebay inlet structure is removed, the forebay inlet will be slightly widened (by approximately 20 to 25 m) in order to improve the hydraulic conditions of the flow to the GS. The anticipated change to the forebay inlet is shown in Figure 2-8.

The existing forebay is shallow and contains simple fish habitat (this was defined as 'simple' due to the absence of shoreline features, bathymetric complexity, absence of aquatic macrophytes or coarse woody debris, and the absence of any unique or limiting habitat) and is shown in Figure 2-14 below.

Figure 2-14. Existing Forebay Substrate



Sediment, soil and excavated rock will be removed from the existing forebay to also improve flow and to allow for construction of the new GS. Forebay hydraulic optimization has dictated the extent of excavation upstream of the new powerhouse. Bedrock will be excavated in vertical cuts and overburden will be sloped and protected against erosion and sloughing. The new intake will have training walls on either side of it to contain the new embankments away from the intake structure. Upon completion of the forebay channel, the embankments will be provided with suitably sized rock protection to ensure bank stability against the forces of erosion and ice action.

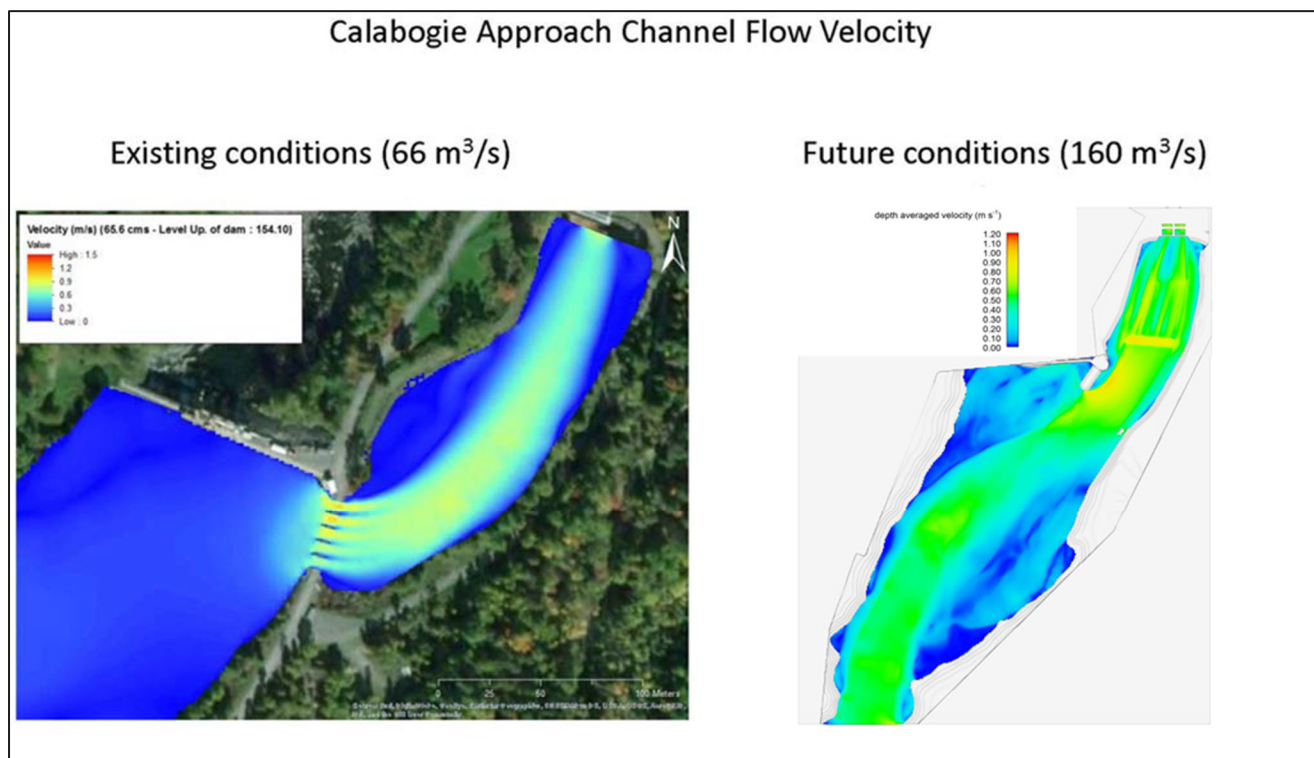
The new powerhouse intake will be integrated with the new powerhouse and will be constructed of reinforced concrete. The intake will be equipped with trashracks, suitably sized and with bar spacing to mitigate in as much as possible, fish entrainment. The trashracks will cover the complete area of the turbine water passage intakes. The new trashrack bar spacing will remain consistent with the trashrack spacing at the existing Calabogie GS, with 50 mm clear space between the trashrack bars.

The new trashracks will be periodically cleaned with rakes as well as using mobile crane, with space provided on the intake deck for a future trash rack cleaning machine, however, a trash rack cleaning machine will not be provided at this time. The trashrack slots will also be used interchangeably for stoplogs, to provide a means to perform periodic inspections and eventual repairs and servicing of the downstream emergency closure gates in the future. The intake will also include emergency close vertical lift intake gates operated from the intake deck.

The intake and the trashrack of the new powerhouse have been designed to minimize potential entrainment of fish with a trashrack velocity of less than 0.9 m/s (at a distance of 75 mm in front of screen). While the

future conditions will increase the plant flows through the new powerhouse from 66 m³/s to 160 m³/s, the velocities in the approach channel will be similar with velocities under 1 m/s as demonstrated by numerical flow modelling and as shown in Figure 2-15.

Figure 2-15. Comparison of Velocities – Existing and Proposed GSs



As shown above the proposed velocities in the approach channel at full flow are generally under 1 m/s and will vary along and across the channel between 0.25 and 1.0 m/s.

2.4.3.2 Powerhouse

The proposed new powerhouse will be situated approximately 50 metres upstream of the existing one. The powerhouse will be approximately 25 metres by 45 meters structure and will be 28 metres tall from the invert of the excavation to the top of the superstructure roof. The powerhouse will be excavated to a depth of approximately 12 metres to allow for proper submergence settings of the turbines. Hydraulic passages, both upstream and downstream of the units, will be appropriately sized to maintain machine performance.

It is currently anticipated that the powerhouse structure will be comprised of a cast-in-place concrete substructure and a metal clad steel superstructure. The switchyard will be constructed in close proximity to the new powerhouse on the left side of the new structure. Parking and a laydown area will also be provided in the same general vicinity.

2.4.3.3 Turbines

As previously indicated, the powerhouse will include the installation of two horizontal-axis Kaplan type turbines. Specifically, the turbines will be installed in an open pit, direct drive configuration. Each turbine will be capable of producing approximately 5.4 MW for a combined total capacity of 10.7 MW. The station will be capable of passing a flow of 160 cms with a minimum operating flow of 20 cms. Each turbine runner will have four blades and will operate at 156.5 rpm.

2.4.3.4 Tailrace

The existing channel downstream of the new powerhouse will be excavated to form the new tailrace. This new tailrace will be similar in width to the existing one as shown in Figure 2-8. A series of Figures below portray the existing and proposed tailrace hydraulic conditions (i.e. velocities) under various flow conditions.

The new tailrace channel is anticipated to be in the order of 25 m wide and will connect the powerhouse within the downstream river reach. The upstream portion of the tailrace channel (between the new powerhouse and the existing powerhouse) will be excavated in overburden for the first 5 to 7 m and in bedrock below. The downstream portion of the channel (downstream of the new powerhouse) will be excavated mostly in rock. Limited overburden excavations are expected in this portion of the channel. Bedrock will be excavated in vertical cuts and overburden will be sloped and protected against erosion and sloughing. For the purpose, the area will be dewatered using a downstream cofferdam.

Figures 2-16 and 2-17 depict the existing and proposed Calabogie GS Tailrace hydraulic conditions with no flow (velocity scale (meters per second) is shown in the bottom right of each figure).

Figures 2-18 and 2-19 depict the existing and proposed Calabogie GS Tailrace hydraulic conditions at flows of 66 cms, which is the capacity of the existing powerhouse. These two figures demonstrate that at this flow rate the proposed new powerhouse will eliminate the areas of high velocity that occur under the existing situation and instead disperse more moderate velocities over a wider area.

A tailrace water level survey program will be completed during the detailed design phase of the project to further define the hydraulic conditions downstream of the Calabogie site.

Figure 2-16. Existing Calabogie GS Tailrace Hydraulic Conditions. No Flow



Figure 2-17. Future Calabogie GS Tailrace Hydraulic Conditions. No Flow



Figure 2-18. Existing Calabogie GS Tailrace Hydraulic Conditions. 66 cms Flow (no spill)

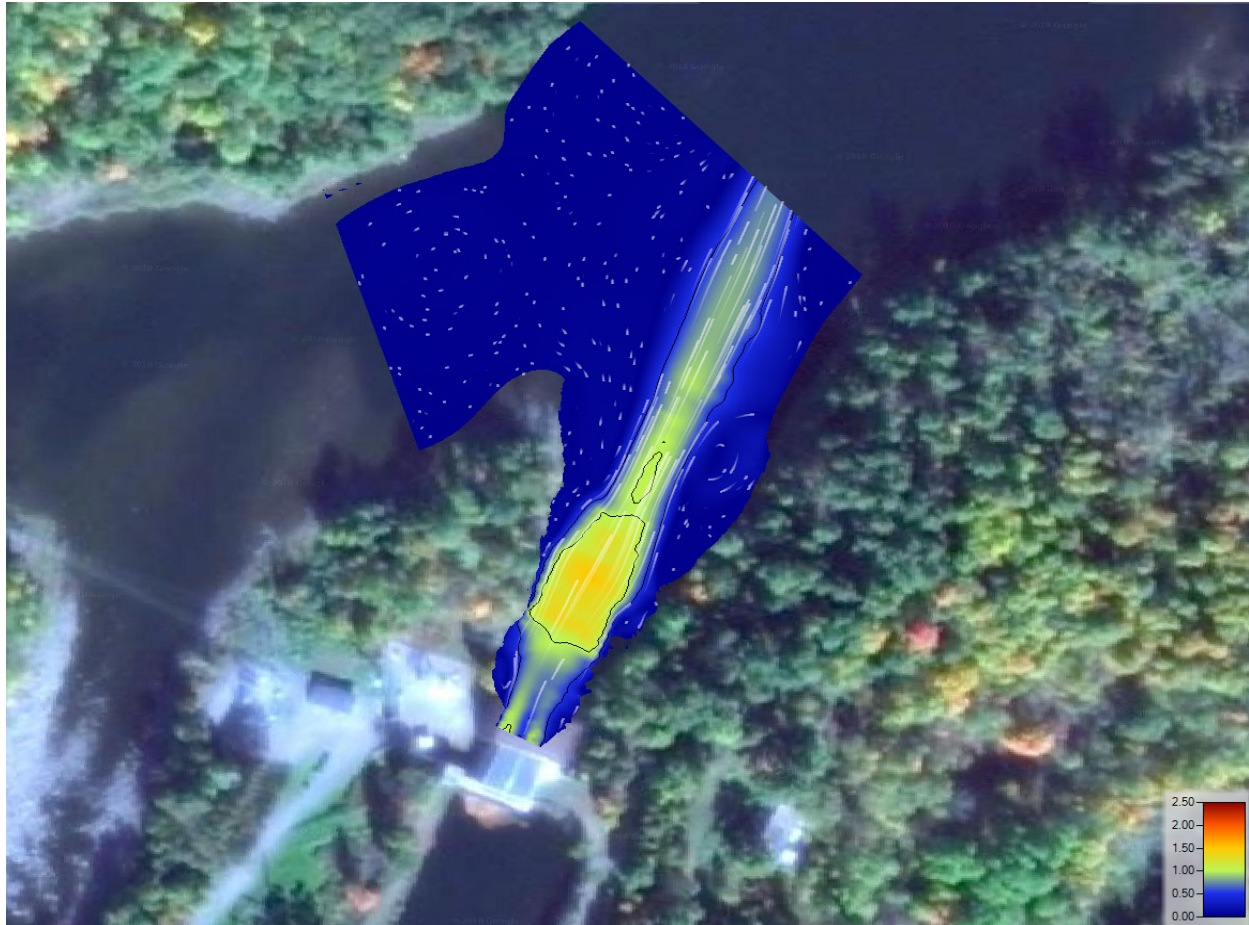


Figure 2-19. Future Calabogie GS Tailrace Hydraulic Conditions. 66 cms Flow (no spill)



Figures 2-20 and 2-21 depict the existing and proposed Calabogie GS Tailrace hydraulic conditions at flows of 160 cms, which is the capacity of the proposed powerhouse. Figure 2-20 representing the existing conditions shows moderate flows at both the tailrace and to a lesser extent through the South Branch Main Dam. Figure 2-21 shows higher velocities through the central portion of the tailrace.

Figure 2-20. Existing Calabogie GS Tailrace Hydraulic Conditions. 160 cms Total Flow: 66 cms Flow through Powerhouse and 94 cms through the South Branch Main Dam

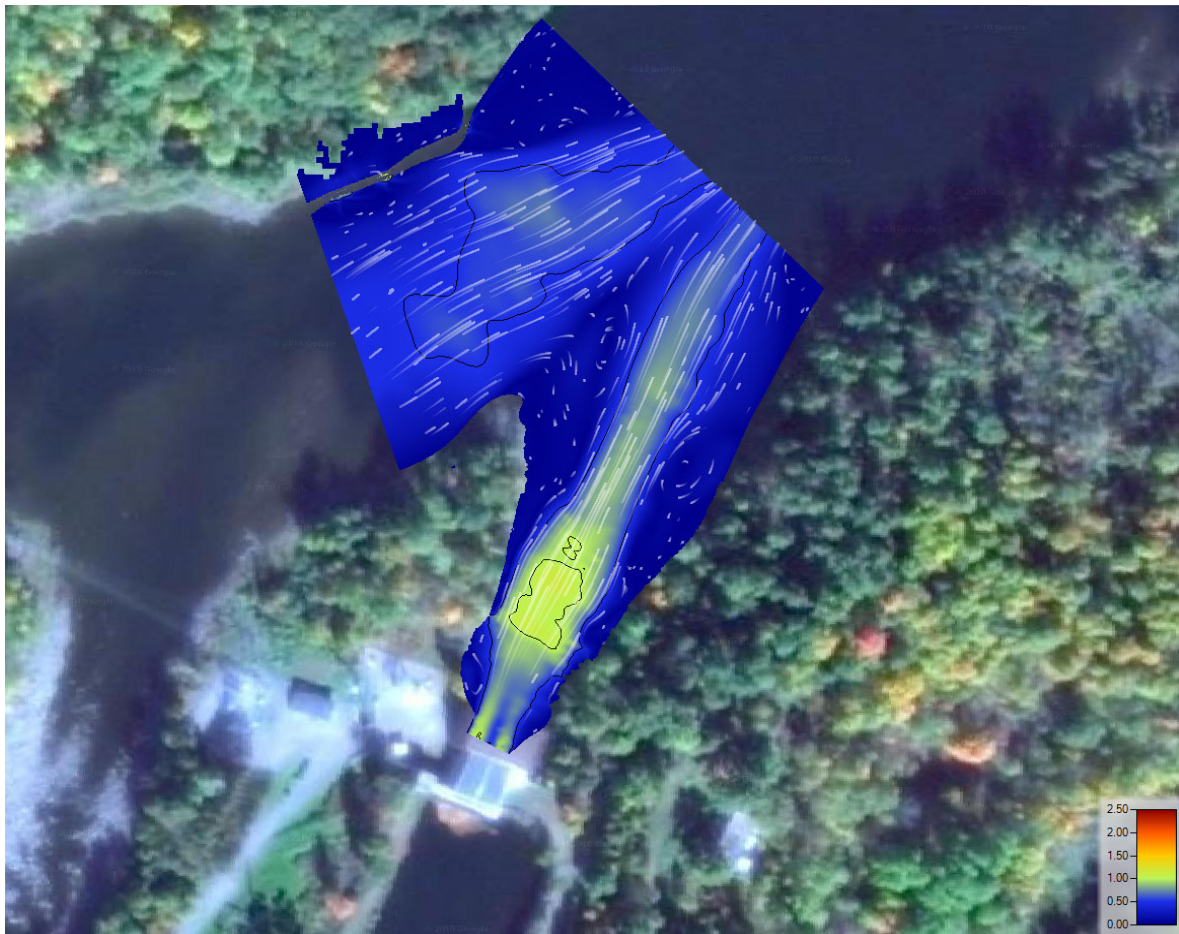
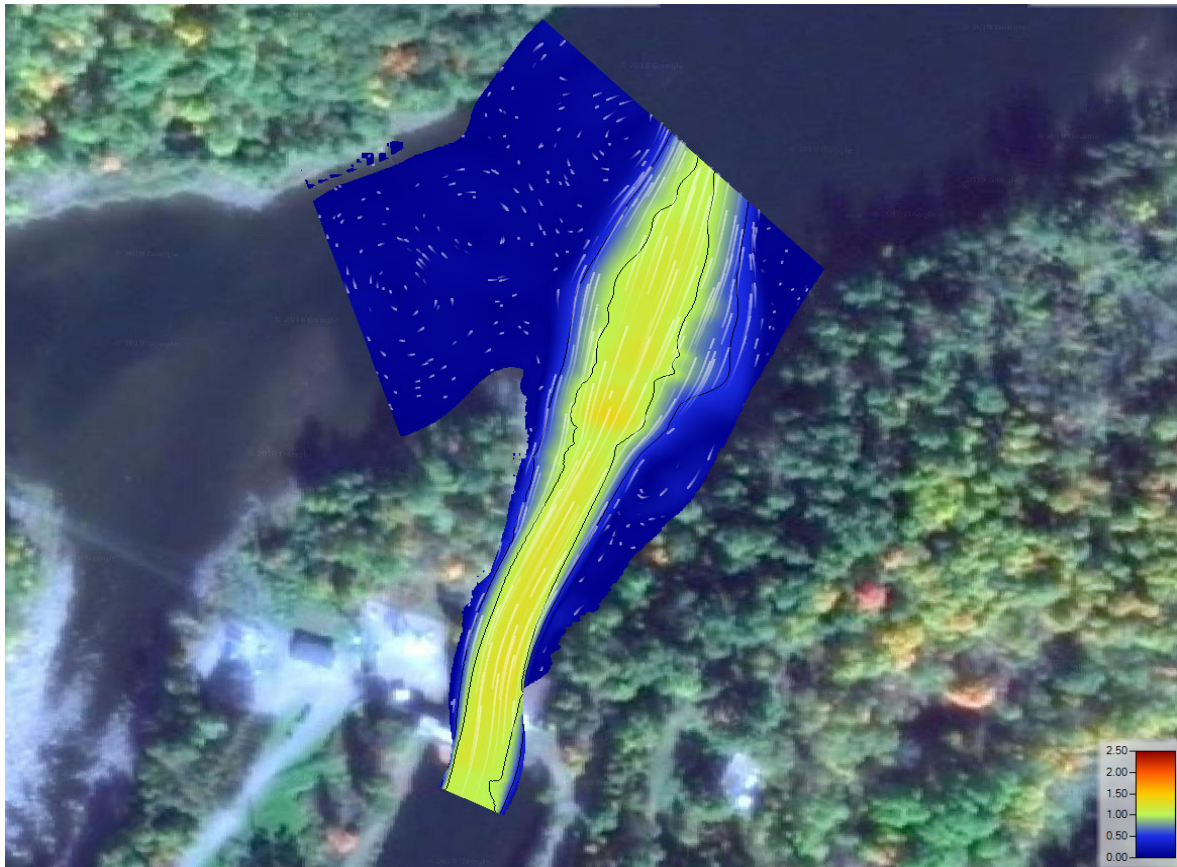


Figure 2-21. Future Calabogie GS Tailrace Hydraulic Conditions. 160 cms Total Flow, All Through the Powerhouse



The construction of much of the new tailrace will be undertaken in the “dry” by using a cofferdam. The tailrace area may require riprap to locally protect against erosion and sloughing of the overburden encountered, however, it is currently envisaged that the bulk of the tailrace excavation will be rock. Portions of the Madawaska River riverbank in the immediate vicinity of the tailrace area may also require erosion protection.

The shift of moving the powerhouse 50 meters upstream will increase the amount of tailrace habitat while reducing the amount of forebay habitat.

OPG will pursue more in-depth discussions with DFO as part of the request for review process and provide all information DFO requires to determine whether an Authorization is required and if so, what off-setting measures would be considered.

2.4.3.5 Structures for the American Eel

OPG is committed to supporting the recovery of American eel in consultation with Indigenous People and in accordance with provincial recovery strategies and policy direction. On the Madawaska River, there are no known occurrences of American Eel, including at or in the immediate area of Arnprior GS, Stewartville GS and Calabogie GS. As such, these facilities are currently compliant with the ESA.

Over time and as recovery strategies advance and succeed, the Madawaska River may become a focus of interest. This will signal that recovery strategies are working. OPG is using this redevelopment project to make the redeveloped Calabogie GS “eel ready”.

Eel ready means that the redevelopment will be planned, designed and executed in anticipation of adaptive management strategies that can be applied as circumstances change around the presence of American eel in the vicinity of the station.

Specific measures have been scoped into the design of the station to accommodate potential future needs for upstream and downstream passage, including:

- designing attractive flow at an eel trap/ladder at the plant tailrace;
- including a temporary trap and transport system at the plant tailrace to help monitor for early signs of eels showing up below the station;
- leaving room for permanent upstream and downstream passage infrastructure to be retrofitted on a long-term basis (OPG’s research suggests that upstream passage should likely occur in the plant tailrace and that is the proposed location for the temporary trap and transport system. Should eels return to the Madawaska River in this reach of the River, consideration could be given for another location);
- intake velocities and bar exclusion screen layouts designed to facilitate implementation of future effective safe passage of eels downstream through the GS;
- provision for future inclined screen and downstream flow bypass for downstream passage with bar spacing in the screen at a maximum of 19 mm during periods of downstream movement; and,
- early consideration of the pros and cons of operational variations that may support eel passage.

An adaptive management approach will be applied during operations to determine the best course of action to implement or install specific measures to support recovery as circumstances change.

2.4.3.6 Transmission Line

The existing GS is connected to Hydro One’s transmission network via a 44 kV transmission line that is connected to the Calabogie GS to the north. The existing transformer yard was extensively damaged during the 2018 tornado.

A new switchyard for the main step-up transformer will be constructed in close vicinity to the new powerhouse and will connect to the HONI transmission line at a pre-determined location.

2.4.3.7 Off-Site Communication

The new Calabogie GS will require a communication link with Stewartville TS for tele-protection signals and with Eastern Operation Control Center [EOCC] for remote SCADA.

To achieve this, a new microwave link between Calabogie GS and Stewartville GS will be constructed. The link will consist of two 150ft Microwave towers, one at each end. The location of the two towers will require the construction of new access roads. Wood poles to carry the power cables and Fiber Optic cables will be constructed to connect the MW towers to their respective Generating stations.

2.4.3.8 Water Control Features

The Ontario Ministry of Natural Resources and Forestry (MNRF) has in place Lakes and Rivers Improvement Act Technical Bulletins that detail the Ministry requirements for the safe operations of dams. The Technical Bulletins were initially issued in 2011. Based on the “Classification and Inflow Design Flood Criteria” Technical Bulletin, Ontario Power Generation (OPG) is evaluating whether additional spill capacity is required at Calabogie GS. While no decision has yet been made on whether any spill capacity alterations will be required for the site, OPG anticipates additional spill capacity will be required and achieved through a combination of channel improvements and constructing additional sluices.

OPG is only at the early stages of assessing the potential additional spill capacity requirements and options. As such, the review of environmental effects associated with the construction of additional spill capacity has not yet been initiated and are not discussed in this Report.

Environmental approval for the work could be considered per Section 8.8 of the OWA Class EA Process, “Addendum Provisions for Environmental Reports.” That assessment work could be carried out as modification to the project or Addendum provision. Alternatively, the approval could be undertaken through a separate process.

2.4.3.9 Other Features

Other features of the Calabogie GS that will remain unchanged from the current situation. Safety devices such as buoys, signage and booms will remain unchanged from the current situation. The existing office and washroom in the trailer are expected to remain but may be re-located closer to the new powerhouse.

2.5 Construction

Figure 2-7 shows the Calabogie site with a variety of construction stage features. These are each described below.

2.5.1 Site Access, Roads and Parking Areas

The primary access road to the site will remain as Generating Station Lane, a gravel road that is sufficiently wide to accommodate passing passenger vehicles. The Lane provides access to Lanark Road/County Road 511.

At this point no modifications are anticipated to the site entrance at County Road 511 (Lanark Road). However, should modifications be required these would be subject to review and approval by the County's Public Works Department. The Department has indicated that a traffic management plan will be required to describe the proposed traffic and how any impacts can be mitigated. The plan will likely need to ensure that signs are erected on the County Road to advise the other road users of turning traffic and a traffic control person may be needed during periods of high turning movements to/from the site.

A secondary access road currently exists from County Road 511 to Calabogie Island that is labelled as "Calabogie Island Road" on Figure 2-7. This is an existing single lane gravel road that provides access to the north side of OPG's South Branch Main Dam and to an OPG boat launch that is situated slightly further downstream. This road will be used for two purposes during construction. First, it is anticipated that some or most of the workers will park their vehicles on the island and access the main construction site by walking across the South Branch Main Dam. A parking lot is proposed in close proximity to the South Branch Main Dam to allow for this. This parking lot would be capable of accommodating approximately 50 vehicles. Second, excess rock and sediment are proposed to be placed on Calabogie Island so dump (or tipper) trucks will utilize the road. Imported engineered aggregates will be used to improve the roads should they be considered acceptable.

OPG, SNC-Sullivan and the Township of Greater Madawaska have entered into a Memorandum of Understanding to provide excavated rock from the project and deposit this on adjacent Township lands. This is described in more detail in 2.5.4 and 2.5.5. That arrangement will require SNC-Sullivan to construct a 200 to 300 meter length road on to the adjacent Township lands and also temporarily use the Township access to County Road 511 for the project (see Section 2.5.5).

2.5.2 Laydown and Storage Areas

During construction laydown and storage areas are required in order to facilitate demolition, excavation and construction. Most of Cross Island will be available at various times for temporary laydown and storage areas. Cross Island has historically had large cleared and flat areas that are suitable for such work. With the 2018 tornado the cleared area has expanded. Figure 2-7 shows one laydown area slightly west of the proposed powerhouse, however another large cleared area south of the powerhouse will be used to: allow equipment to work and turn around; park vehicles; store materials and equipment in an environmentally safe fashion; place trailers for worker use; etc.

2.5.3 Cofferdams and In-Water Works

The existing inlet structure/sluices will allow the forebay to be isolated and excavation work to begin in the forebay at the start of construction. Following the July 15th fish window, a cofferdam will be constructed upstream of the inlet structure to allow for removal of the existing inlet structure in the dry and rock excavation to continue. The upstream cofferdam will be constructed from blasted rock that has been excavated to accommodate the new powerhouse. Blast rock will be used to construct a 5.8 metres wide cofferdam, with a slope of 1.5H:1V up to elevation 155.17 masl. The upstream face of the cofferdam will be lined with a heavy-duty cofferdam membrane and sealed to the riverbed with a bentonite clay seal. Upon completion of the powerhouse, the liner, blasted rock and overburden will be removed, and the channel will be graded with rockfill.

A downstream cofferdam is required to isolate the downstream side of the construction and allow for the demolition of the existing powerhouse and construction of the new powerhouse and tailrace. The proposed cofferdam is a rockfill dam with an impervious geomembrane on the water side of the cofferdam. Seepage through the cofferdam will be collected and directed to a settling pond prior to discharge back into the river.

A small amount of tree and vegetation clearing is required on the east end of Cross Island to allow for access to construct this cofferdam. Similar to the upstream cofferdam, the downstream cofferdam will be constructed from blasted rock that has been excavated to accommodate the new powerhouse. Blast rock will be used to construct a 5.8 metres wide cofferdam across the width of the tailrace, with a slope of 1.5H:1V up to elevation 148.00 masl. The downstream face of the cofferdam will be lined with a heavy-duty cofferdam membrane and sealed to the riverbed with a bentonite clay seal. Upon completion of the powerhouse, the liner and blasted rock will be removed, and the area will be graded to align with the tailrace channel profile.

Should any in-water construction activities be required, they will be timed to avoid the spawning and egg incubation period of spring spawning fishes, such as Walleye. The exclusion period is from March 15 to July 15.

2.5.4 Excavation

The construction of the new powerhouse will require a significant amount of sediment and rock to be removed from the construction area. It is estimated that approximately 60,000 cubic meters of sediment/overburden and 66,800 cubic meters of rock would need to be removed. The sediment and rock have been tested. The rock can be re-used and the sediment/overburden will be disposed of on OPG property.

Blasting will be required to remove the rock for the new powerhouse, in the forebay and in the tailrace. A third-party firm will be hired to implement a vibration monitoring program, provide engineered blast designs, and consult in all blasting operations as required.

Prior to any blasting or rock excavation, the sediment in the forebay will be excavated down to either rock or the required hydraulic elevations and disposed of on OPG Property. Once the sediment has been removed and blasting is underway, excavation of the rock will begin. The rock will either be used as cofferdam material, stockpiled for later use as embankment treatment, or disposed of on Township Property (see section 2.5.5 Rock and Soil Deposition Areas where this is further discussed).

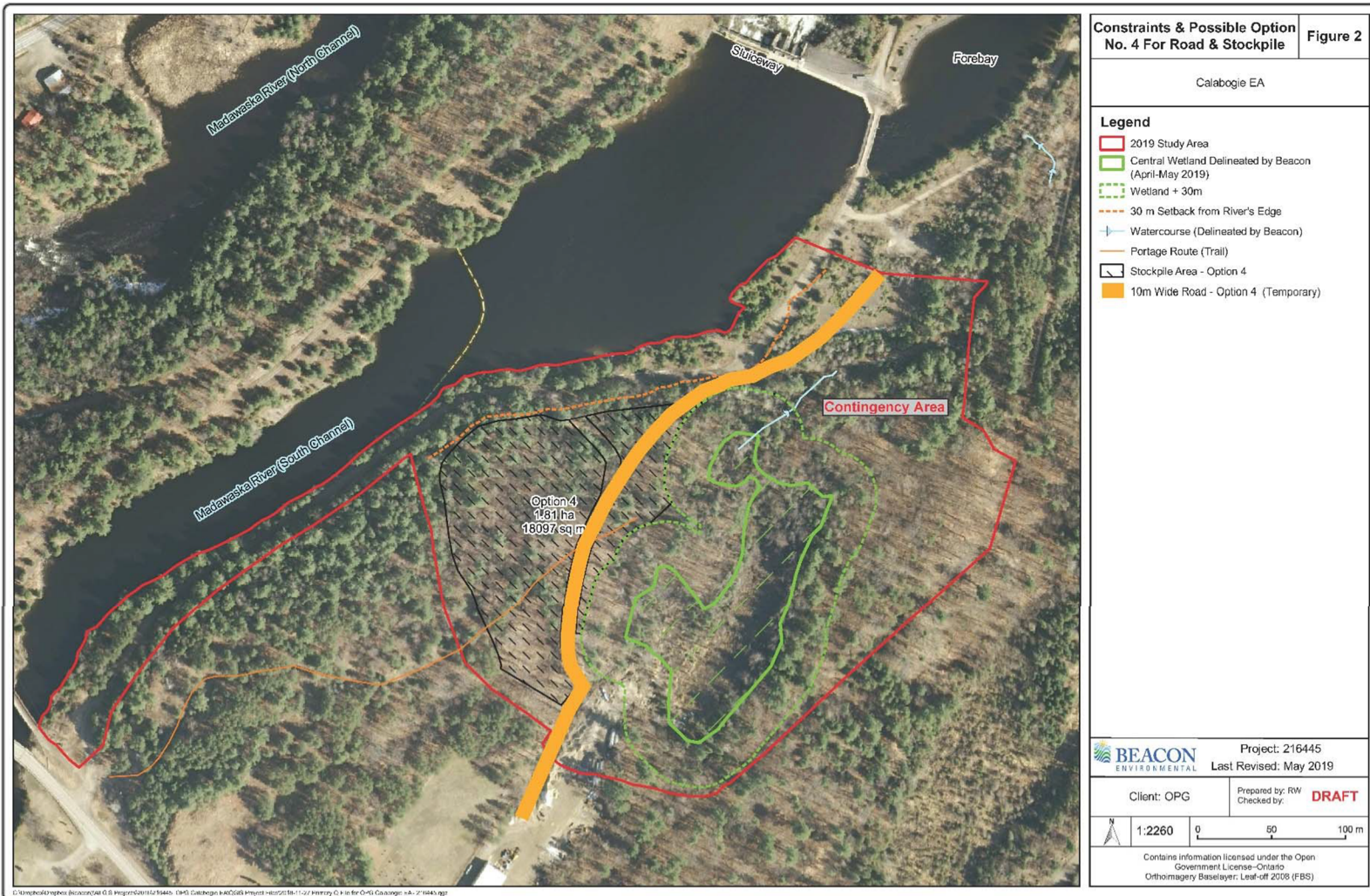
It is expected that groundwater infiltration or surface water runoff (including cofferdam leakage) could require pre-treatment prior to discharge. To collect water infiltration, sumps will be excavated at key locations of the excavation and pumps will be installed to dewater the area. If necessary, the water will be pumped into settling pond(s), silt treatment bags, and vegetated areas to mitigate any environmental issues that may arise from the dewatering. Should the water require secondary treatment for dissolved metals, proper measures will be taken including necessary permits and approvals.

2.5.5 Rock and Soil Deposition Areas

As previously indicated, an Agreement has been entered into among the Township of Greater Madawaska, OPG and SNC-Sullivan for the latter two to provide the Township with excavated rock for its future use. Excavated rock would be delivered to the rear of the Township's Works Yard which is situated approximately 200 metres away from the excavated area (see Figure 2-22 below). The Township has also indicated that it can take the demolished powerhouse (save for the exterior structure that has lead paint on it) as well. This Project will require Sullivan to construct an approximately 200-meter long temporary road spanning from OPG to Township property creating a direct access to a storage area at the back of the Township's lands. The Project would also involve decommissioning of this road following completion of the transfer of the rock. Figure 2-22 shows the likely area of rock placement based on archaeological, biological and engineering investigations and consultation with the Township. This area may be slightly further refined. This area is also shown as Area #3 on Figure 2-7.

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Public and Agency Consultation Technical Support Document

Figure 2-22. Proposed Road and Possible Rock Placement Areas



As previously indicated, the Township has agreed to take most of the rock associated with the structure along with the demolished powerhouse. However, the Township is only interested in the rock and is not interested in the soil, sediment or co-mingled rock and soil. As such, OPG will still have extra material it will need to deposit on site.

As such, two different areas have been proposed on site to place the remaining excavated rock and soil. The two proposed areas are shown in Figure 2-7. These areas were selected based on their location and physical and environmental conditions. In general, the emphasis has been made to place the material close to the original excavation and/or use and in sites that have been historically disturbed.

Area #1 is located on the northeastern tip of Cross Island. This Area would be used to place the material left over from the downstream cofferdam. This will eliminate most of the need for truck traffic for this material. It is possible that some of the cofferdam material might be used for fish habitat pending further discussions with the DFO. Area #2 is located on Calabogie Island immediately adjacent and northeast of the South Branch Main Dam. This area was previously disturbed by the original construction of the Calabogie GS and is a lower lying area. Given that this is a lower area, excavated material can be placed here with fewer potential concerns with respect to visual effects from residents located on the north side of the North Channel. A section of this area may also be potentially used for parking or other purposes during construction. Both of these areas are considered to be of lower ecological value. The placement of the rock and sediment will occur above the high-water mark to ensure there is no loss of riparian habitat.

OPG has been in recent discussions with the AOO and AOP about minor adjustments to the sediment and rock pile stockpile areas (Areas #2 and #3 in Figure 2-7) to address AOO and AOP questions and concerns. This may include placing the sediment pile beyond 30 meters from the high-water mark.

Following construction, the areas will be revegetated to suit the surrounding environment. This may involve seeding, planting or natural re-generation by placement of topsoil and with an appropriate seeding or planting. Discussions could be held with the AOO and AOP as to possible plantings.

2.5.6 Construction Schedule and Strategy

Construction will be initiated in early 2020 with the intention of the GS being operational in 2023. Vegetation clearing at the site is anticipated to occur in the early months of 2020 ahead of the spring breeding bird season. The placement of cofferdams will adhere to any fisheries windows.

2.6 Proposed Calabogie GS Operations

As outlined in the 2009 Madawaska River Water Management Plan, Calabogie GS operated (prior to the September 2018 tornado) to support the peaking operations of the four other OPG owned GSs on the Madawaska River. The generating units at the station had limited flow capacity (66 m³/s), but the operation of the units and sluice gates are integrated with the rest of the system on the Madawaska River. Calabogie was a generation bottleneck on the Madawaska River, and the small turbine capacity results in frequent spill past the station.

Proposed Calabogie Generating Station Redevelopment Project
Public and Agency Consultation Technical Support Document

The operation of the existing plant is based on a daily/weekly cycle, with the inflow passed through the plant over a daily or weekly period. The 2009 WMP notes that operation of the plant takes into consideration energy demands, recreational opportunities as well as walleye spawning activities.

OPG does not propose to alter the existing water management compliance requirements associated with this facility. The redevelopment of Calabogie GS will continue to be operated in full accordance with all of the flow and water level targets and compliance conditions identified in the WMP. Daily flows will remain unchanged, but additional portion of river flow will pass through the plant to generate electricity rather than just passing through the spillway gates.

In terms of mandatory and conditional water level targets, for Calabogie G.S. Table 9.15 of the 2009 WMP defines the following:

Table 2-1. Water Management Plan – Calabogie GS Mandatory and Condition Level Limits

Table 9.15: Calabogie GS Mandatory and Conditional Level Limits

| Parameter | Limit Type, Conditions and Notes |
|--|---|
| Absolute Maximum 154.17 m | Type: Mandatory Maximum level |
| Absolute Minimum 153.56 m | Type: Mandatory Minimum level |
| Summer Minimum 153.80 m | Type: Conditional Requirement The specified minimum level is the applicable limit provided the following condition outlined below is fulfilled. 1. The date is within the summer period. The summer period starts on Saturday 00:00 EST of the Victoria Day weekend and ends on the Monday at 24:00 EST of the Thanksgiving Weekend. The summer minimum can be suspended when the following conditions are fulfilled. 1. Declaration of an "Emergency Operating State" by the IESO. 2. IESO requests market participants to seek approval for environmental variances. 3. Implementation of a "3% Voltage Reduction" by the IESO. 4. Within 24 hours after the end of an Emergency Operating State, the level will be returned to the summer minimum level. 5. Walleye spawn/incubation flow limits at Calabogie are not active. 6. OPG will notify MNR once there is a reasonable probability that energy emergency flexibility will be used. |
| Walleye Spawn & Incubation Maximum 154.05 m | Type: Conditional Requirement The maximum level is applicable provided all the four conditions outlined below are fulfilled. The maximum level is to protect spawning grounds in Constant Creek. 1. The water temperature measured in the Barrett Chute tailrace or an agreed-upon location has reached 6 °C. 2. MNR has confirmed significant walleye activity at the Barrett Chute spawning shoal. 3. MNR has provided 24 hours notice of the start of the walleye spawning period. 4. The water temperature degree days since the start of the incubation period is less than 205 °C. |
| Walleye Spawn & Incubation Minimum 153.80 m | Type: Conditional Requirement The minimum level is applicable provided all the four conditions outlined below have been met. 1. The water temperature measured in the Barrett Chute tailrace or an agreed-upon location has reached 6 °C. 2. MNR has confirmed significant walleye activity at the Barrett Chute spawning shoal. 3. MNR has provided 24 hours notice of the start of the walleye spawning period. 4. The water temperature degree days since the start of the incubation period is less than 205 °C. |

In terms of mandatory and conditional water flow targets, for Calabogie G.S. Table 9.16 of the 2009 WMP defines the following:

Table 2-2. Water Management Plan – Calabogie GS Mandatory and Condition Flow Limits

Table 9.16: Calabogie GS Mandatory and Conditional Flow Limits

| Parameter | Limit Type, Conditions and Notes |
|---------------------------------------|--|
| Minimum Flow 0.8 m³/s | Type: Mandatory Minimum Level Note: This flow has not been measured since the replacement of the wooden stop logs with steel stop logs. The 0.8 m³/s is an estimated flow. |
| Walleye Spawn & Incubation 5 m³/s. | Type: Conditional Requirement The minimum walleye spawn flow is applicable provided all the three conditions outlined below are fulfilled. 1. The water temperature measured in the North Channel at Calabogie or an agreed-upon location has reached 6 °C. 2. MNR has provided 24 hours notice of the start of the walleye spawning period. 3. The water temperature degree days since the start of the incubation period is less than 205 °C. This flow limit is an instantaneous flow that must be maintained throughout the walleye spawning period. |

The annual variation of the mandatory and conditional limits are shown in Figure 9.08.

OPG will continue to operate the Calabogie GS and the other plants on the Madawaska River in full accordance with all flow and water level targets and compliance conditions in the Madawaska River Water Management Plan.

The Calabogie GS is a generating station on the Madawaska River, located between Barrett Chute GS and Stewartville GS. The existing turbine capacity of Calabogie is lower than the other stations on the Madawaska River, which becomes a constraint in the operation of the system. The present discharge capacity at Calabogie GS is 66 m³/s, but the upstream and downstream capacity at Barrett Chute GS and Stewartville GS is exceeding 450 m³/s. Under these conditions, Calabogie Lake is used as a daily reservoir to regulate the discharge and to maximize the energy production.

The average historical inflow for the period between 1965 and 2017 at Calabogie is approximately 90 m³/s with a median of 72 m³/s. The Barrett Chute and Stewartville GS are peaking plants whereas the existing Calabogie GS was used to support these operations with combinations of continuous turbine flow and gate operations. These operations modes can cause daily fluctuations of the water elevation at Calabogie Lake and Stewartville headpond. This form of operations for Calabogie GS has existed since peaking plants with larger discharge capacity than Calabogie were commissioned on the river.

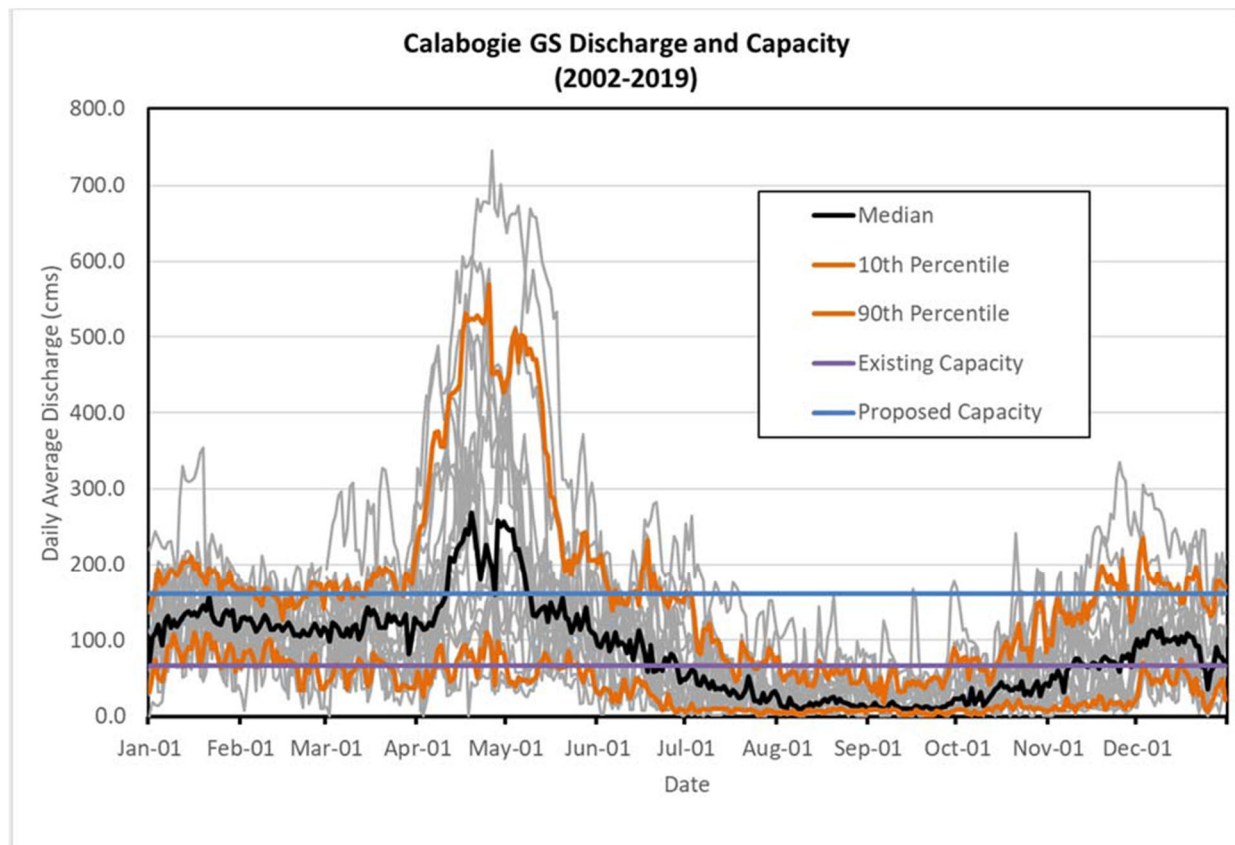
With the redevelopment of the Calabogie GS site and the increase of the generating and discharge capacity, there is the opportunity to more accurately shape the daily discharge from the facility. Regardless of the mode of operation, the turbine discharge capacity at Calabogie GS will remain lower than the discharge capacity at the other adjacent stations on the Madawaska River. Therefore, the priority in the operation of the hydro system will be for the Calabogie GS to continue to support the peaking operation of the downstream power plant at Stewartville with the possibility to minimize the fluctuations in the headpond to the extent practicable.

Figure 2-23 shows the historic total daily discharge (turbine flow & main control dam sluice flow) since the opening of the energy market, where each grey line is one year of data. The discharge past the Calabogie facility often exceeded the existing stations turbine capacity in the November to July period and was passed through sluiceways. The redevelopment will allow a greater amount of water to be passed through the turbines, which will allow OPG to produce more renewable energy from the existing water. The North Channel Control Dam sluiceway conditions will be maintained in accordance with the existing water management plan.

There will still be conditions and situations where a greater range at Stewartville GS is needed to meet Ontario grid requirements and maintain compliance with the other aspects of the Water Management Plan (WMP). However, there may be some conditions where the redeveloped Calabogie GS could match flow patterns at Barrett Chute GS and Stewartville GS to reduce water level fluctuations. If this occurs it will be done in compliance with the WMP. As a result, the redeveloped generating station will allow OPG to reduce the fluctuations in water level in Calabogie Lake and Stewartville more often than the current situation, but the impact will not be substantial.

Given the above, OPG does not plan to propose any formal changes to the compliance requirements in the WMP, however a Minor Amendment will be required to make administrative updates.

Figure 2-23. Calabogie GS Discharge and Capacity 2002 – 2019



There will be no permanent operating staff at the new station. Normal operation of the station and sluiceways will be carried out remotely by OPG. Normal maintenance activities at Calabogie GS will be carried out by OPG staff on an "as-required" basis. They will visit the station regularly.

Annual maintenance and overhauls for the redeveloped plant may require shut down of the units and will normally be scheduled when the flows are lowest and the loss of generation can be minimized. Minor overhauls require the units to be out of service for a minimum of 1 to 2 months and would likely only be required every 10 to 15 years. Major overhauls every 25 to 30 years could require a unit to be out of service for approximately 8 to 12 months. Unlike with the existing station, dewatering of the forebay will not be required to conduct maintenance on the new powerhouse.

2.7 Proposed Decommissioning

Decommissioning involves the permanent removal of the hydroelectric facilities, with the resultant loss of the site as a renewable source of electricity generation. Rather than decommissioning, redevelopment of a facility that is at the end of its designed service life could be a viable option. A number of OPG owned hydroelectric facilities that were built in the early 1900s have been redeveloped in the last 10 years, e.g., Wawaitin GS, Sandy Falls GS and Lower Sturgeon GS on the Upper Mattagami River, and Hound Chute GS on the Montreal River.

Once the Calabogie GS Redevelopment Project has reached the end of its service life in 90 years or more, additional redevelopment, rather than decommissioning, would be an option that should be considered again to further extend the life of this plant.

3 GENERAL CONSULTATION APPROACH

This chapter describes the general consultation approach undertaken as part of the proposed Calabogie Generating Station Redevelopment Project.

3.1 Public Consultation Plan

A public consultation plan was prepared for the project with the overall objective, as per the OWA Class EA (2018) (p. 34): “to provide those who may have an interest in the project, or those who may wish to participate with the opportunity to contribute to and inform decisions relating to a project.”

The plan was designed to, at a minimum, adhere to the requirements of the OWA Class EA process. The only mandatory public consultation requirements for Projects Associated with Existing Infrastructure are (OWA Class EA, 2018, Table 2, p.27):

- Notice of Commencement;
- Notice of Completion (to parties who have expressed an interest or participated); and,
- Statement of Completion.

The requirements for the above notices are identified within the OWA Class EA document, along with a description of a number of consultation principles, approaches and techniques. OPG’s consultation plan and past practices with respect to consultation on hydroelectric projects are consistent with these. Further, based on past experience of Arcadis and OPG, the consultation that was proposed in the plan and subsequently undertaken for the Project exceeds the minimum requirements.

3.2 Database

A database of public and agency stakeholders who were to be notified about the proposed Project, open houses and newsletters was developed. The initial database primarily focused on landowners adjacent to the Calabogie GS. The list of adjacent landowner addresses was generated using GeoWarehouse, an on-line service that provides access to land registry and mapping information. Twenty-four addresses were initially identified. The adjacent landowner list was updated and revised through the course of the consultation process.

A list of agency stakeholders was also developed for the Project. A copy of the agency contact list is provided in Appendix B. Further information on the development of the agency stakeholder list is provided in Section 5 below.

3.3 Project Website

A website was created for the proposed Project and can be found at www.calabogiegs.com. This website was active in November 2017 for the public and its operation has been on-going. Contact information is provided to facilitate inquiries.

The website pages include:

- Home Page;
- Notices/Decisions;
- Supporting Documents;
- Frequently Asked Questions;
- Open House Information; and
- Contact Page.

3.4 Notices

Public notices were prepared and circulated for the commencement and completion of the proposed Project, and prior to each open house. These included the following:

- Notice of Commencement;
- Notice of First Open House;
- Notice of Second Open House; and
- Notice and Statement of Completion.

3.4.1 Notice of Commencement

A Notice of Commencement for the proposed Project was prepared and provided the following information: project title; name of the proponent; a brief project description and project type; a map depicting the project location and anticipated zone of impact; a statement that the project is subject to a defined process under the Class EA for Waterpower projects; an invitation to participate in the process; a tentative schedule; a statement that the project is associated with existing infrastructure; the project website and project contact information, and informed of upcoming public information sessions.

The notice was published in the following newspapers:

- Renfrew Mercury (English) (Thursday November 30, 2017).
- Arnprior Chronicle-Guide (English) (Thursday November 30, 2017).

The notice was also available on the project website as of November 29, 2017.

Government agency representatives were called during the week of November 26, 2017 and advised that Notice of Commencement was placed in the above newspapers and circulated to the public. The government agencies contacted included: the Department of Fisheries and Oceans (DFO); Ministry of Environment Conservation and Parks (MECP); Ministry of Natural Resources and Forestry (MNRF); Township of Greater Madawaska; and, Renfrew County. A copy of the advertisement was emailed to MECP and MNRF on November 29, 2017.

A copy of the notice is provided in Appendix A.

3.4.2 Notice of First Open House

A Notice of First Open House was prepared and provided the following information: project title; name of the proponent; a brief project description and project type; a map depicting the project location and anticipated zone of impact; a statement that the project is subject to a defined process under the Class EA for Waterpower projects; an invitation to participate in the process; a tentative schedule; a statement that the project is associated with existing infrastructure; the project website and project contact information, and informed of upcoming public information sessions including detailed information on the format, time and location of the first open house.

The notice was published in the following newspapers:

- Renfrew Mercury (English) (February 15 and 22, 2018); and
- Arnprior Chronicle-Guide (English) (February 15 and 22, 2018).

The notice was circulated to the 24 adjacent landowner addresses identified for the initial database (noted above in section 3.2). Of the notices circulated to these addresses, 11 were returned as undeliverable as a result of an incomplete GeoWarehouse database.

Canada Post's Neighbourhood Mail Service was also utilized to distribute notices. This service provides complete delivery for user specified areas using the online Geographic Information System (GIS) service, Precision Targeter. Notices were circulated to 551 addresses in the vicinity of the Calabogie GS the week of February 19, 2018 and included houses, apartments, businesses and farms.

The notice was also available on the project website as of the week of February 12, 2018.

Government agency representatives were called the first week of February 2018 and advised that Notice for the First Open House was placed in the above newspapers and circulated to the public. The government agencies contact included the DFO, MECP, MNRF, Township of Greater Madawaska and Renfrew County. A copy of the advertisement was emailed to MECP and MNRF on February 7, 2018. The Township of Greater Madawaska and Standing Advisory Committee of the Madawaska River Water Management Plan also received person invitations to the session as separate meeting was held with them the week prior (February 26 and 27, 2018 respectively).

A copy of the notice is provided in Appendix A.

3.4.3 Notice of Second Open House

A Notice of Second and Last Open House was prepared and provided the following information: project title; name of the proponent; a brief project description and project type; a map depicting the project location and anticipated zone of impact; a statement that the project is subject to a defined process under the Class EA for Waterpower projects; an invitation to participate in the process; a tentative schedule; a statement that the project is associated with existing infrastructure; the project website and project contact information,

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and informed of upcoming public information session including detailed information on the format, time and location of the second and last open house.

The notice was published in the following newspapers:

- Renfrew Mercury (English) (April 11 and 18, 2019); and
- Arnprior Chronicle-Guide (English) (April 11 and 18, 2019).

The notice was circulated to an updated list of 26 adjacent landowner addresses on April 12, 2019. The notice was also circulated April 17, 2019 via email to stakeholders who attended the first open house or self-identified as requesting project updates.

Canada Post's Neighbourhood Mail Service was also utilized, similar to the Notice of First Open House, to distribute notices. Based on feedback from participants in the first open house, notices were circulated to an expanded area to capture more stakeholder addresses (a total of 784) in the vicinity of the Calabogie GS the week of April 15, 2019 and included houses, apartments, businesses and farms.

The notice was also available on the project website on April 15, 2019.

Government agency representatives were advised in late February 2019 that that 2nd Open House was planned for May 2, 2019. On April 26, 2019 they were called to advise that the open house was postponed due to flood conditions in the area this was rescheduled for June 17, 2019.

A copy of the notice is provided in Appendix A.

Open House Cancelled

Due to unforeseen circumstances associated with a natural flooding event along the Madawaska River and several other watercourses in southeastern Ontario, the Township of Greater Madawaska declared a State of Emergency. In the interest of public safety associated with flooding of roads and access to the Open House venue, OPG decided to postpone the scheduled Thursday May 2nd Calabogie Generating Station Redevelopment Open House to a future date. Correspondence regarding the postponement was circulated to stakeholders via email on April 30, 2019. There was not sufficient time to notify stakeholders via standard mail. OPG did let the public know by a newspaper notice, through the website and via access to the Township of Greater Madawaska website.

Open House Rescheduled

The second and last Open House was rescheduled to June 17, 2019. A revised second notice was distributed as per the process described above and circulated to stakeholders via mail on May 28, 2019 and via email on June 3, 2019. Seven (7) letters to landowners were returned as undeliverable.

The rescheduled notice was published in the following newspapers:

- Renfrew Mercury (English) (June 6 and 13, 2018); and
- Arnprior Chronicle-Guide (English) (June 6 and 13, 2018).

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Canada Post's Neighbourhood Mail Service was also utilized again to distribute notices. Notices were circulated to 784 addresses in the vicinity of the Calabogie GS the week of May 27, 2019.

The notice was also available on the project website as of May 29, 2019.

A copy of the notice is provided in Appendix A.

4 PUBLIC CONSULTATION OPEN HOUSES

Two public open houses were held for the proposed Project. The first was held in March of 2018 and the second was held in June of 2019.

4.1 Public Open House #1

The first public open house for the proposed Project was held on March 5, 2018 from 4:00 p.m. to 8:00 p.m. at the Calabogie Community Hall in Calabogie, Ontario.

The open house was designed for informal drop-in with project team representation from OPG and Arcadis. The purpose of the open house was to:

- Introduce the proposed Project and the project team;
- Provide information about the studies undertaken to support the Class EA process;
- Provide attendees the opportunity to ask questions and comment on the Project;
- Respond to questions and comments; and
- Create an opportunity for positive consultation.

Project information was presented through display panels. Copies of the Notice of First Open House were available. Printed information regarding the Calabogie GS and the Stewartville GS taken from the Madawaska River Water Management Plan (2009) was available for review.

A project sign-in sheet was available for participants to provide contact information in order to be included in future project correspondence. A comment sheet was also available for participants to submit questions and comments.

A total of 33 individuals attended the Open House. Thirty-two provided contact information on the sign-in sheet. The attendees represented a combination of adjacent landowners, the general public from the surrounding community, and two attendees from the County of Renfrew.

Copies of the display panels are provided in Appendix C. Photos from the Open House are provided below.

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A total of 18 Information Panels were available for the public to review, with project team members available to respond to questions. The panels provided an overview of OPG, the proposed Project and re-development options. They also indicated that an EA process under the OWA Class EA was commencing and identified general approval requirements. The material explained and identified the types of studies and field work that would be undertaken or that had already commenced and/or been completed. Information was provided on how hydroelectric development works and next steps on the proposed Project. In addition to Appendix C, these presentation panels can be found on the proposed Project website.

4.1.1 Input Received

A comment sheet was provided at the Open House giving the public two weeks to return comments. Five comment sheets were returned by the public, all of which were received at the venue.

In general, the most common questions and concerns raised were related to management and mitigation of the existing water level fluctuations and flow rates. There was general positive support for the proposed Project, recognizing benefits associated with management of the Madawaska River. Many of the questions were not related to the proposed Project.

The questions and comments received verbally and via comment sheets from the public are described below in Table 4-1. The comment sheet identified a check box to receive a follow up call from the project team regarding comments and questions. None of the participants that filled out a comment sheet requested this, although one individual noted a discrepancy in mapping regarding land ownership and requested that OPG resolve this.

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Table 4-1. Input Received from the Public at Open House #1

| Comment/Question from the Public | Response |
|---|--|
| Interest in the elimination of excessive water level fluctuations. Several noted fluctuations of 3 to 5 feet over short time frame and would like OPG to mitigate this. | The project is being planned so that the fluctuations in water level downstream in Calabogie will not be any greater with the proposed Project. Depending on where the property owner is located in the reach, they may be more influenced by Stewartville operations than Calabogie. OPG will conduct an analysis at some point examining the proposed design and its impacts on water levels and fluctuations of those water levels under various conditions. |
| Interest in flow rates, noting that while daily flow will not change, hourly flows may, noting that this seems reasonable. | Acknowledged. |
| How can wakeboarding on the Madawaska River be controlled? | This is not a responsibility of OPG. However, possible solutions may be to contact the Ontario Provincial Police regarding this concern or consult with the Ministry of Natural Resources and Forestry. |
| Protection of the existing conditions is very important. Improvement of habitat etc. is welcome. | Acknowledged. |
| If the project facilitates presence of barn swallow this will be beneficial in addressing mosquitoes. | Acknowledged. |
| Interest in protection of Walleye spawning. | The Madawaska River WMP compliance requirements, such as timing of flows for walleye spawning, will continue to be adhered to. |
| Will there be any pollution or downstream environmental damage? | <p>Construction is planned so as to prevent chemical or deleterious substances from entering the Madawaska River. This may be achieved by:</p> <ul style="list-style-type: none"> • Undertaking most of the work 'in the dry' and not in the River. • Preparing an environmental management plan requiring the constructor to adhere to a variety of best practices to prevent spills from entering the River. • In the event of a spill on land, mitigation will be implemented to immediately clean up the spill and workers with equipment will have spill kits, etc. on site. <p>It was noted that the downstream side of Calabogie is used for spawning and OPG will want to make sure spawning areas are still available for walleye and other fish such as River Redhorse.</p> |

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| Comment/Question from the Public | Response |
|---|--|
| OPG was identified as an important member of the community contributing to environmental, social and economic factors. The project is encouraged and there is benefit of preservation and use of the waterway locally and provincially. | Acknowledged. |
| Identification by two landowners of a discrepancy in OPG mapping and residential versus OPG land ownership. | Project team will review mapping. Property owners to be added to adjacent land owner list and follow up. |
| One resident didn't get the addressed notice for the meeting, just the Direct Mail notice. | Acknowledged that this was a limitation of the GeoWarehouse database used to generate a list of adjacent landowners. The contact has been added to the Project correspondence list. Property resides within the "Zone of Impact" although there are currently no proposed activities planned on that property. Project related traffic will occur along Lanark Road. |
| One resident offered the use of their land for parking or as a staging area and provided a photo of their property map. | Acknowledged. |
| The open house was informative and well executed. | Acknowledged. |
| What is the construction time frame? | A response was provided of 18 to 24 months. |
| Where will the construction area be located? | The area was shown on an aerial photo-based map. |
| Will there be impact or changes to the inlet sluice? | A response was provided that there is potential for this but it depends on the Project option selected. |

4.2 Public Open House #2

The second public open house for the proposed Project was held on June 17, 2019 from 4:00 p.m. to 8:00 p.m. at the Calabogie Community Hall in Calabogie, Ontario.

Similar to the previous one, the open house was designed for informal drop-in with project team representation from OPG and Arcadis. The purpose of the open house was to:

- Introduce the proposed Project and the project team;
- Describe the proposed project;
- Describe proposed environmental effects and recommended mitigation and monitoring measures;
- Provide further information about the studies undertaken to support the Class EA process;
- Provide attendees the opportunity to ask questions and comment on the Project;
- Respond to questions and comments; and
- Create an opportunity for positive consultation.

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Project information was presented through display panels. Copies of the Notice of First Open House were available. Printed information regarding the Calabogie GS and the Stewartville GS taken from the Madawaska River Water Management Plan (2009) was available for review.

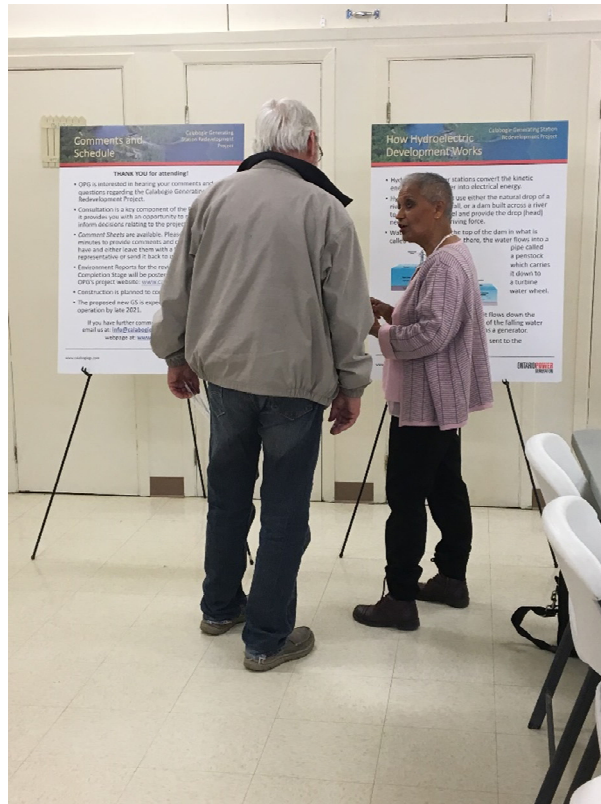
A project sign-in sheet was available for participants to provide contact information in order to be included in future project correspondence. A comment sheet was also available for participants to submit questions and comments.

A total of 25 individuals attended the second and final Open House. Twenty-four provided contact information on the sign-in sheet. The attendees represented a combination of adjacent landowners, the general public from the surrounding community, a local business operator and one attendee from the Canadian Wildlife Federation.

Copies of the display panels are provided in Appendix C. Photos from the Open House are provided below.



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A total of 30 Information Panels were available for the public to review, with project team members available to respond to questions. The panels provided an overview of OPG, the proposed Project and anticipated environmental effects and mitigation and overall benefits. They also indicated that an EA process under the OWA Class EA was commencing and identified general approval requirements. The material explained and identified the types of studies and field work that were completed. Additional information was also provided, including updated zone of impact, project plans, dam safety requirements, content on a tornado that had impacted the site, and updated environmental study information. In addition to Appendix C, these presentation panels can be found on the proposed Project website.

4.2.1 Input Received

A comment sheet was provided at the Open House giving the public two and a half weeks to return comments. Ten comment sheets were returned by the public, all of which were received at the venue. One additional email from an open house attendee was also received following the open house.

In general, the most common questions and concerns raised were related to management and mitigation of water level fluctuations and flow rates, shoreline erosion, aquatic species mitigation measures, potential impacts to electricity bills, recreational activities and health and safety. There was general positive support for the proposed project and project team representation of environmental material, as well as recognition of benefits associated with the proposed project.

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The questions and comments received verbally and via comment sheets from the public are described below in Table 4-2. The comment sheet identified a check box to receive a follow up call from the project team regarding comments and questions. Six (6) of the participants that filled out a comment sheet requested this. The email received following the open house from the attendee is also addressed in the table below.

Table 4-2. Input Received from the Public at Open House #2

| Comment/Question from the Public | Response |
|---|---|
| <p>Comment #1 - Concern over water level and speed of current. Notes inconsistencies in strength of current day to day and impact to safety (e.g. swimming and docking of pontoon). Seeks assurance regarding maintaining normal water level and safe water flow.</p> | <p>OPG will continue to operate the Calabogie GS and the other plants on the Madawaska River in full accordance with all flow and water level targets and compliance conditions in the Madawaska River Water Management Plan, including the summer conditions.</p> <p>Daily flow and water level conditions will remain unchanged from the existing situation. In certain conditions the hourly flow rate may be somewhat different from the existing situation.</p> <p>There may be some conditions where the new Calabogie GS could match flow patterns at Barrett Chute GS and Stewartville GS to reduce water level fluctuations in the Calabogie to Stewartville reach. For some residents of this reach, this has been an issue in the past and OPG's opinion is that this will slightly improve the historic situation.</p> <p>The individual making this comment provided specific contact information and OPG is following up specifically within this individual.</p> <p>Note that the individual who made this comment is located slightly downstream of the Springtown Bridge. In this reach of the River, the water level flows and levels are more influenced by Stewartville GS than Calabogie GS.</p> |
| <p>Comment #2 - Concern over loss of shoreline at residence. Noted a loss of 2-3 feet, including property surveyors landmarks. Notes interest in installation of rocks at his property that the Township will obtaining from the project site.</p> | <p>This concern is a historic concern. OPG will contact this individual whom provided their name and contact information to discuss shoreline concerns.</p> <p>Note that the individual who made this comment is located slightly downstream of the Springtown Bridge. In this reach of the River, the water level flows and levels are more influenced by Stewartville than Calabogie GS.</p> |

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| Comment/Question from the Public | Response |
|---|---|
| <p>Comment #3</p> <p>Interest in seasonal flow water level increase impacts to West shore of overflow channel and risk of permanent land loss, if any, from increased dam capacity.</p> <p>Interest in any increase in permanent flow water levels of secondary channel and how this may impact future property development.</p> <p>K-12 school information kits/visitors regarding early warning systems (i.e. sirens) and dam infrastructure along Calabogie-Arnprior dam runs.</p> | <p>The proposed project does not plan to increase flows down the North Channel. The North Channel is only used for spring spawning and for flooding situations in order to pass water downriver. This will be discussed with this individual.</p> <p>OPG followed up with this individual.</p> |
| <p>Comment #4 - Interested to know if new station will be unmanned, and if so how controls will be coordinated with other stations along Madawaska River.</p> | <p>Both the existing and proposed Calabogie GS are unmanned and are operated remotely from the Saunders Control Center. All the plants on the Madawaska River are operated in a co-ordinated fashion considering requirements and effects throughout the River.</p> <p>OPG followed up with this individual.</p> |
| <p>Comment #5 - Seeks information on whether the power/electricity generated services Calabogie and if the project will have an impact on monthly electricity bill (e.g. an increase or decrease).</p> <p>Noted the spawning pools by the K&P Trestle Bridge on North Channel and that concerns appear to be addressed.</p> | <p>When in service the Project will be added to the portfolio of all OPG investments. The Calabogie re-development project will not have a discernable or visible impact on rates. The changes in electricity rates are based on Ontario Energy Board (OEB) approval of changes in all cumulative costs across OPG, which can be higher or lower than the previous term. OPG is following up with this individual.</p> <p>Acknowledged. OPG maintains flows during the springtime down the North Channel to allow for walleye spawning.</p> |
| <p>Comment #6</p> <p>Seeks a firm statement of compliance to the 2011 Dam Safety Requirements.</p> <p>Notes proposed revisions to federal Fisheries Act and seeks acknowledgement in project planning to these.</p> <p>This individual also asked about questions regarding fish passage, new flows, habitat compensation, etc. as a result of these issues the project team followed up with this individual about his questions some more and he re-submitted a more formal comment about these issues.</p> | <p>The Calabogie Redevelopment Project will be designed and executed in accordance with the Ontario Ministry of Natural Resources and Forestry Lakes and Rivers Improvement Act (LRIA) Technical Bulletin with respect to dam safety and structural integrity; and the Constructor SNC-Sullivan will be obtaining LRIA Approval for this project during the construction phase</p> <p>The proposed project is being reviewed under the Fisheries Act.</p> |

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| Comment/Question from the Public | Response |
|---|---|
| <p>OPG advised that eel passage would be included in the new GS design but had no design details at this time and look forward to this when made available.</p> <p>I would also appreciate more information from OPG about the tailrace substrates and what will they be comprised of along with which species would be targeted for this enhancement with the removal of the existing GS. The new GS being situated a bit more upstream seems like more spawning habitat could be made available but wondering what mitigation measures may be considered to ensure they remain in place given the understanding that flows could increase from 60 to 160 cms?</p> | <p>American Eel</p> <p>Section 2.4.3.5 of both the Aquatic TSD and the Environment Report describe the American Eel passage proposed for the facility. As mentioned in that section. Specific measures have been scoped into the design of the station to accommodate potential future needs for upstream and downstream passage, including:</p> <ul style="list-style-type: none"> • designing attractive flow at an eel trap/ladder at the plant tailrace; • including a temporary trap and transport system at the plant tailrace to help monitor for early signs of eels showing up below the station; • leaving room for permanent upstream and downstream passage infrastructure to be retrofitted on a long-term basis; • intake velocities and bar exclusion screen layouts designed to facilitate implementation of future effective safe passage of eels downstream through the GS; • provision for future inclined screen and downstream flow bypass for downstream passage with bar spacing in the screen 20 mm during periods of downstream movement; and, • early consideration of the pros and cons of operational variations that may support eel passage. <p>The DB Contractor has been asked to design the American Eel passage into the facility even though the permanent features of it would not be constructed until eels appear in the system.</p> <p>Normally, OPG does not provide detailed engineering design drawings to members of the public and such drawings aren't included in an environmental assessment report.</p> <p>Tailrace Habitat</p> <p>The existing aquatic habitat conditions (i.e. substrate) are shown in Figure 3-9 of the Aquatic TSD and are described in a fair bit of detail in section 3.2.2.</p> <p>The issue as to whether additional spawning habitat will be created is at this point somewhat uncertain but will be discussed with DFO. At this point, DFO has not indicated if an Authorization under the Fisheries Act is required but it is possible. OPG is aware of this and</p> |

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| Comment/Question from the Public | Response |
|---|---|
| | <p>considers habitat compensation to be a fairly pragmatic solution.</p> <p>The commenter is correct in stating that having the powerhouse 50 meters upstream will result in an increase in aquatic habitat. Losing some of the forebay area is not as significant as this would be considered poorer habitat than increasing tailrace habitat area.</p> <p>The commenter may be correct in inferring that with increased flows from the powerhouse, the substrate could be mobilized (i.e. moved) by such water velocities. OPG is aware of this issue and describes the issue in section 2.4.3.4, which describes the existing and proposed tailrace conditions.</p> <p>OPG will be pursuing more in-depth discussions with DFO as part of the request for review process and provide all information DFO requires to determine whether an Authorization is required.</p> <p>At flows of 160 cms through the powerhouse any additional offsetting habitat in the tailrace would have to be designed along the margins of the tailrace and somewhat further downstream in order to prevent the mobilization of the spawning habitat substrate and to provide velocities conducive to spawning.</p> <p>The issue of the DFO authorization and any potential habitat enhancement will be considered in more detail in future discussions with DFO. If habitat enhancement was to be undertaken it would most likely be targeted towards walleye spawning habitat.</p> <p>OPG is willing to keep this individual informed of DFO discussions and decisions.</p> |
| <p>Comment #7- Concern about the snowmobile trail over township property.</p> | <p>OPG and the Township of Greater Madawaska will ensure that a snowmobile trail will be in place. Some re-routing may be required. OPG has discussed this with the President of the snowmobile association, and representatives from OPG, the constructor, and the township will meet in January 2020 to flag a section that re-routes the trail.</p> |
| <p>Comment #8 - New power station is a great addition for the extra electricity that will be developed.</p> | <p>Acknowledged</p> |
| <p>Comment #9 - Notes aquatic disturbance as something that OPG should be aware of.</p> | <p>Acknowledged</p> |
| <p>General Comments Several responses indicated positive remarks regarding Project Team representatives, materials</p> | <p>Acknowledged</p> |

| Comment/Question from the Public | Response |
|--|----------|
| presented and the project overall, noting materials and responses were very clear. One individual was also happy to see archeology being addressed in the environmental studies. | |

4.3 Summary of Public Open Houses

The two open houses demonstrated that there is no public opposition to the proposed project. There was not a single individual indicating opposition to the project. A number of individuals indicated verbally and in writing that the project appears well planned.

As has already been documented the main public concern has been the historic and existing range of water level fluctuations during certain times of the year in the Calabogie GS to Stewartville GS reach. While this is an existing situation, OPG is of the view that the proposed project should slightly reduce the frequency of such fluctuations on some occasions. OPG continues to communicate with any property owners that raise this concern.

4.4 Post - Public Open House #2 Consultation

In mid-July all of the draft reports were prepared as draft final documents and sent to government agencies for review. At the same time, OPG made the decision to make all of these reports available for public comment (except for the Indigenous Peoples TSD). These reports were uploaded to the www.calabogiegs.com website on July 10, 2019.

Since that time only one public comment was received. That letter was submitted on August 22, 2019 by the Ontario Rivers Alliance. A response letter was sent to this individual on October 21st, 2019. The letter raised questions with respect to: fish passage, water levels and flow velocity, turbines and climate change. All of these were responded to. The original letter and response appear as Appendix D to this Report.

5 GOVERNMENT AGENCY CONSULTATION

Consultation was undertaken with agencies, specifically the MECP, MNRF, MTCS and DFO, as well as both the Township of Greater Madawaska and Renfrew County. Significant consultation was initiated in 2017 with an agency kick-off meeting and continues to the current period. Initial discussions focused on the nature and scope of the proposed project and likely government information requirements.

A summary of agency consultation activities undertaken once the EA commenced in 2017 is provided below. OPG has consulted with various provincial and federal government agencies throughout the environmental assessment process. Some key dates and consultation are summarized below. Meetings notes from some of these meetings can be provided if the government agencies wish them:

- April 26, 2017 – Calabogie Site Visit and Meeting with MECP, MNRF, MTCS and DFO.
- February 26, 2018 – Meeting with the MNRF and Standing Advisory Committee of the Madawaska River Water Management Plan (note that the SAC are volunteer representatives).
- February 27, 2018 – Meeting with Township of Greater Madawaska.
- March 12, 2018 – Email correspondence with Renfrew County, Departments of Development and Property and Public Works & Engineering on transportation and traffic issues.
- December 10, 2018 – Site visit with a staff person from the DFO.
- December 11, 2018 – Government Agency Update Meeting with invited representatives from MoECP, MNRF, MTCS, DFO and Township of Madawaska Highlands. Limited representation from MNRF and MTCS was available only by phone.
- January 8, 2018 – Meeting with MTCS in Toronto to discuss Cultural Heritage Impact Assessment.
- January 22, 2019 – Meeting with the Township of Madawaska Highlands and Renfrew County to discuss municipal issues including use of roads, traffic, rock excavation, etc.
- February 21, 2019 – Meeting with the MNRF. This meeting was held as most MNRF representatives in the Pembroke District and Peterborough Region office were unable to attend the December 11, 2018 meeting.
- June 17, 2019 – OPG attendance at Township of Greater Madawaska Township Council Meeting and site visit to discuss project, road layout, rock and other related issues.

Since July 2019 there have been informal discussions and correspondence with government agencies with respect to their review of the documents. Formal comments and responses can be found in Appendix A to the Environment Report.

In addition to the meetings above there has been other less informal communications on-going with all the various federal, provincial and municipal entities.

6 SUMMARY AND CONCLUSIONS

The public and agency consultation process for the proposed Calabogie GS Redevelopment Project has been comprehensive and inclusive of all interested individuals and government representatives. In general, the public has been supportive of the proposed project. OPG is not aware of a single individual that has indicated opposition to the proposed project.

It is our opinion that all public comments raised have or are being addressed including ones unrelated to the undertaking. OPG will continue to address public and agency comments as they come forward.

7 REFERENCES

Ontario Waterpower Association. 2018. *Class Environmental Assessment for Waterpower Projects*. Eighth Edition.

8 ACRONYMS AND ABBREVIATIONS

| | |
|--|--------------|
| Algonquins of Ontario | AOO |
| Class Environmental Assessment | Class EA |
| cubic meters per second | cms |
| Fisheries and Oceans Canada | DFO |
| Environmental Assessment | EA |
| Environmental Assessment Act | EA Act |
| Environmental Report | ER |
| Geographic Information System | GIS |
| Calabogie Generating Station | GS |
| kilometre | km |
| Ministry of Environment, Conservation and Parks | MECP |
| Ministry of Natural Resources and Forestry | MNRF |
| Ministry of Environment and Climate Change | MOECC |
| Madawaska River Water Management Plan | MRWMP |
| Ministry of Tourism, Culture and Sport | MTCS |
| megawatt | MW |
| Ontario Power Generation | OPG |
| Ontario Waterpower Association | OWA |
| Ontario Waterpower Association Class Environmental Assessment for Waterpower Projects | OWA Class EA |

APPENDIX A

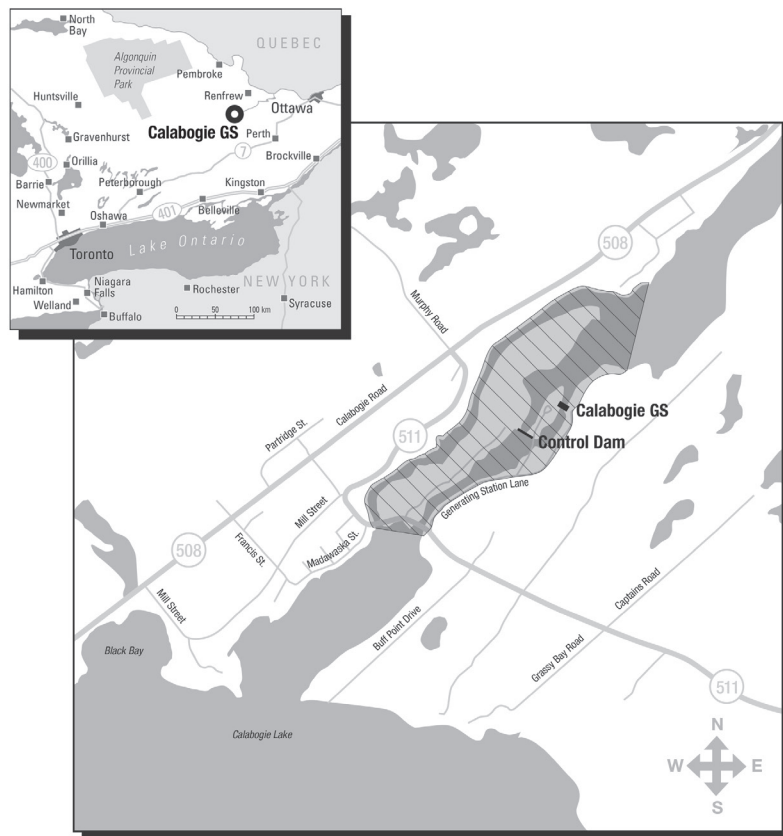
Project Notifications



NOTICE OF COMMENCEMENT FOR THE PROPOSED UNDERTAKING UNDER THE ONTARIO WATERPOWER ASSOCIATION CLASS EA FOR WATERPOWER PROJECTS: CALABOGIE GENERATING STATION REDEVELOPMENT PROJECT

Ontario Power Generation (OPG) is proposing to redevelop the existing Calabogie Generating Station (GS). This proposed undertaking will involve an Environmental Assessment (EA) under the Ontario Waterpower Association (OWA) Class EA for Waterpower Projects as a *Project Associated with Existing Infrastructure*. Constructed in 1917, the existing station has an installed capacity of 5 megawatts (MW) and is now at its end of life stage. OPG intends to redevelop the site and increase the station's capacity to approximately 10 to 15 MW.

The Proposed Undertaking is on the Madawaska River within the village of Calabogie, in the Township of Greater Madawaska, Ontario, as detailed on the map below. OPG does not plan to alter the approved water levels and flows as described in the Madawaska River Water Management Plan (WMP). As such, the anticipated zone of impact for the project is limited to the immediate area around the station (see shaded/hatched area on the map). An administrative amendment to the WMP may be required under the *Lakes and Rivers Improvement Act*. This notice and public consultation process for the project under the Class EA is intended to coordinate and meet the notification requirements relevant to the planning stage of the project under both the *Environmental Assessment Act* and *Lakes and Rivers Improvement Act* statutes.



The Class EA process requires OPG to undertake an evaluation of the project to evaluate its potential effects to the environment (positive and negative), and prepare a detailed Environmental Report. The evaluation and resulting environmental report will assess the potential effects of the proposed waterpower project on the environment during both construction and operation. OPG has identified certain environmental components that it expects to be the focus of the proposed project. Consultation with Indigenous communities and the public is an integral component of this process, to allow interested parties to provide comments on the project. You are invited to provide comments on the issues to be addressed. For information on the project proposal, to raise any issues or concerns, or to be placed on the project's mailing list, please contact one of the individuals identified below.

Over the next year, OPG will use the OWA Class EA process as a basis for coordinating all future consultation required for the planning stage of the Proposed Undertaking. If the Project proceeds as scheduled, construction could commence in 2020.

To encourage public participation, OPG is scheduling two rounds of Open Houses. The first Open House will likely take place in the first quarter of 2018 and OPG will provide further notification at that time.

OPG has retained Arcadis Canada Inc. to undertake the Class EA process. For more information, please contact:

Gillian MacLeod
Senior Environmental Advisor
Ontario Power Generation
700 University Avenue, H18
Toronto, ON M5G 1X6
416-592-3481
gillian.macleod@opg.com

Phil Shantz
Environmental Planning Leader
Arcadis Canada
121 Granton Drive
Richmond Hill, ON L4B 3N4
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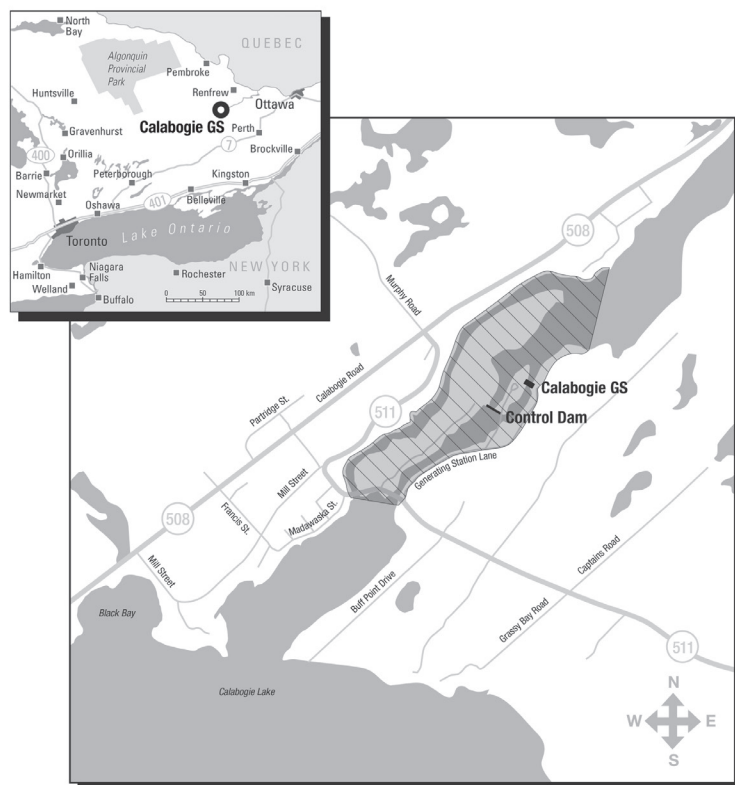
For more detail, please visit calabogiegs.com.

Under the *Freedom of Information and Protection of Privacy Act* and the *Environmental Assessment Act*, unless otherwise stated in the submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this matter and will be released, if requested, to any person.

NOTICE OF FIRST OPEN HOUSE FOR THE PROPOSED UNDERTAKING UNDER THE ONTARIO WATERPOWER ASSOCIATION CLASS EA FOR WATERPOWER PROJECTS: CALABOGIE GENERATING STATION REDEVELOPMENT PROJECT

Ontario Power Generation (OPG) is proposing to redevelop the existing Calabogie Generating Station (GS). This proposed undertaking will involve an Environmental Assessment (EA) under the Ontario Waterpower Association (OWA) Class EA for Waterpower Projects as a *Project Associated with Existing Infrastructure*. Constructed in 1917, the existing station has an installed capacity of 5 megawatts (MW) and is now at its end of life stage. OPG intends to redevelop the site and increase the station's capacity to approximately 10 to 15 MW.

The Proposed Undertaking is on the Madawaska River within the village of Calabogie, in the Township of Greater Madawaska, Ontario, as detailed on the map below. OPG does not plan to alter the approved water levels and flows as described in the *Madawaska River Water Management Plan* (WMP). As such, the anticipated zone of impact for the project is limited to the immediate area around the station (see shaded/hatched area on the map). An administrative amendment to the WMP may be required under the *Lakes and Rivers Improvement Act*. This notice and public consultation process for the project under the Class EA is intended to coordinate and meet the notification requirements relevant to the planning stage of the project under both the *Environmental Assessment Act* and *Lakes and Rivers Improvement Act* statutes.



The Class EA process requires OPG to undertake an evaluation of the project to evaluate its potential effects to the environment (positive and negative), and prepare a detailed environmental report. The evaluation and resulting environmental report will assess the potential effects of the proposed waterpower project on the environment during both construction and operation. OPG has identified certain environmental components that it expects to be the focus of the proposed project. Consultation with Indigenous communities and the public is an integral component of this process, and allows interested parties to provide comments on the project. You are invited to provide comments on the issues to be addressed. For information on the project proposal, to raise any issues or concerns, or to be placed on the project's mailing list, please contact one of the individuals identified below.

Over the next year, OPG will use the OWA Class EA process as a basis for coordinating all future consultation required for the planning stage of the Proposed Undertaking. If the project proceeds as scheduled, construction could commence in 2020.

To encourage public participation, OPG is scheduling two rounds of open houses. The first open house is scheduled as follows:

Monday, March 5, 2018, 4:00 p.m. to 8:00 p.m.
Calabogie Community Hall, 574 Mill Street, Calabogie, Ontario

The open house will provide the public with more information about the Proposed Undertaking. Anyone who attends will have the opportunity to speak directly with representatives from OPG and its environmental consulting team with regard to the OWA Class EA.

OPG has retained Arcadis Canada Inc. to undertake the Class EA process. For more information, please contact:

Gillian MacLeod
Senior Environmental Advisor
Ontario Power Generation
700 University Avenue, H18
Toronto, ON M5G 1X6
416-592-3481
gillian.macleod@opg.com

Phil Shantz
Environmental Planning Leader
Arcadis Canada
121 Granton Drive
Richmond Hill, ON L4B 3N4
905-764-9380, ext. 434
phil.shantz@arcadis.com

For more details, please visit calabogiegs.com.

Under the *Freedom of Information and Protection of Privacy Act* and the *Environmental Assessment Act*, unless otherwise stated in the submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this matter and will be released, if requested, to any person.

NOTICE OF SECOND AND LAST OPEN HOUSE FOR THE PROPOSED UNDERTAKING UNDER THE ONTARIO WATERPOWER ASSOCIATION CLASS EA FOR WATERPOWER PROJECTS: CALABOGIE GENERATING STATION REDEVELOPMENT PROJECT

Ontario Power Generation (OPG) is proposing to redevelop the existing Calabogie Generating Station (GS). This proposed undertaking will involve an Environmental Assessment (EA) under the Ontario Waterpower Association (OWA) Class EA for Waterpower Projects as a *Project Associated with Existing Infrastructure*. Constructed in 1917, the existing station has an installed capacity of 5 megawatts (MW) and is now at its end of life stage. OPG intends to redevelop the site and increase the station's capacity to approximately 10 to 15 MW.

The Proposed Undertaking is on the Madawaska River within the village of Calabogie, in the Township of Greater Madawaska, Ontario, as detailed on the map below. OPG does not plan to alter the approved water levels and flows as described in the *Madawaska River Water Management Plan* (WMP). As such, the anticipated zone of impact for the project is limited to the immediate area around the station (see shaded/hatched area on the map). A minor amendment to the WMP is anticipated under the *Lakes and Rivers Improvement Act*. This notice and public consultation process for the project under the Class EA is intended to coordinate and meet the notification requirements relevant to the planning stage of the project under both the *Environmental Assessment Act* and *Lakes and Rivers Improvement Act* statutes.



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The second open house is scheduled as follows:

Thursday, May 2, 2019, 4:00 p.m. to 8:00 p.m.
Calabogie Community Hall, 574 Mill Street, Calabogie, Ontario, K0J 1H0

The open house will provide the public with more information about the Proposed Undertaking. Anyone who attends will have the opportunity to speak directly with representatives from OPG and their environmental consulting team with regard to the OWA Class EA.

OPG has retained Arcadis Canada Inc. to undertake the Class EA process. For more information, please contact:

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Senior Environmental Advisor
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NOTICE OF RESCHEDULED SECOND AND LAST OPEN HOUSE FOR THE PROPOSED UNDERTAKING UNDER THE ONTARIO WATERPOWER ASSOCIATION CLASS EA FOR WATERPOWER PROJECTS: CALABOGIE GENERATING STATION REDEVELOPMENT PROJECT

Ontario Power Generation (OPG) is proposing to redevelop the existing Calabogie Generating Station (GS). This proposed undertaking will involve an Environmental Assessment (EA) under the Ontario Waterpower Association (OWA) Class EA for Waterpower Projects as a *Project Associated with Existing Infrastructure*. Constructed in 1917, the existing station has an installed capacity of 5 megawatts (MW) and is now at its end of life stage. OPG intends to redevelop the site and increase the station's capacity to approximately 10 to 15 MW.

The Proposed Undertaking is on the Madawaska River within the village of Calabogie, in the Township of Greater Madawaska, Ontario, as detailed on the map below. OPG does not plan to alter the approved water levels and flows as described in the *Madawaska River Water Management Plan* (WMP). As such, the anticipated zone of impact for the project is limited to the immediate area around the station (see shaded/hatched area on the map). A minor amendment to the WMP is anticipated under the *Lakes and Rivers Improvement Act*. This notice and public consultation process for the project under the Class EA is intended to coordinate and meet the notification requirements relevant to the planning stage of the project under both the *Environmental Assessment Act* and *Lakes and Rivers Improvement Act* statutes.

The Class EA process requires OPG to undertake an evaluation of the project to evaluate its potential effects to the environment (positive and negative) and prepare a detailed Environmental Report. The evaluation and resulting environmental report will assess the potential effects of the proposed waterpower project on the environment during both construction and operation. OPG has identified certain environmental components that it expects to be the focus of the proposed project and will present findings about the proposed project, environmental effects and proposed mitigation and monitoring measures. Consultation with Indigenous communities and the public is an integral component of this process and allows interested parties to provide comments on the project. You are invited to provide comments on the issues to be addressed. For information on the project proposal, to raise any issues or concerns, or to be placed on the project's mailing list, please contact one of the individuals identified below. If the project proceeds as scheduled, construction could commence in 2020.

The second open house has been rescheduled as follows:

Monday, June 17, 2019, 4:00 p.m. to 8:00 p.m.
Calabogie Community Hall, 574 Mill Street, Calabogie, Ontario, K0J 1H0

The open house will provide the public with more information about the Proposed Undertaking. Anyone who attends will have the opportunity to speak directly with representatives from OPG and their environmental consulting team with regard to the OWA Class EA.

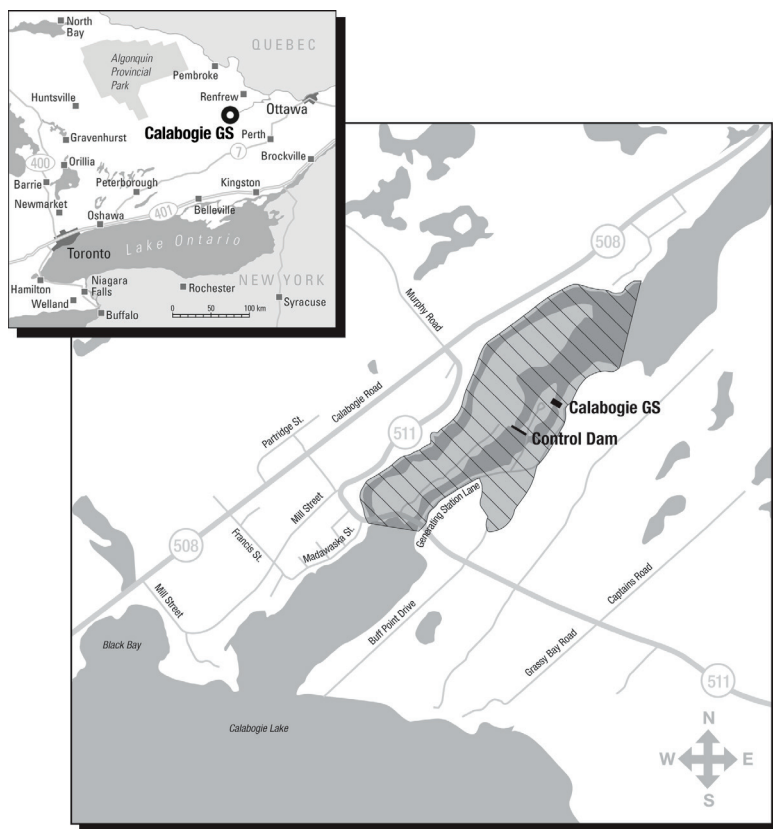
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APPENDIX B

Agency Contact List



APPENDIX B - GOVERNMENT AGENCY CONTACTS LIST

The following is a list of all the Agencies and Regulators that were consulted with for the Calabogie Redevelopment Project.

Department of Fisheries and Oceans

- Richard Janusz
- Todd Schwartz
- Adrienne McLean

Ministry of Environment Conservation and Parks

- Rosanna White
- Vicki Mitchell
- Jon Orpana (EA file Coordinator)
- Mallory Nadon, Species at Risk specialist
- Paul Heeney
- Carolyn Hann, (SPOC for Species at Risk)
- Brad Eckert, Sr. Env officer, Ottawa district office
- Lauren Forester, Surface Water Specialist

Ministry of Natural Resources and Forestry

- Mike Poskin, Renewable energy Coordinator
- Trevor Parker, Pembroke District Planner
- Korey Walker, Acting Regional Planner
- John Swick
- Erin Cotnam
- Kelly Belshaw, SPOC
- Pauline Capelle, Regional Planner (new SPOC)
- Kirby Punt, Pembroke District Management Biologist
- Mary Lyons, Lands and Water Technical Specialist
- Mary Beth Steward, Lands and Water Technical Specialist
- Darrell Reynolds, Acting Resource Liaison Specialist

Ministry of Tourism, Culture and Sport

- Brooke Herczeg, MTCS Heritage Planner
- Karla Barboza, Team Lead, Heritage
- Rosi Zirger

Township of the Greater Madawaska

- Allison Holtzhauer, CAO/Clerk-Treasurer
- Luke Desjardins, Township Planner
- Jamie Doering, Public Works

Renfrew County

- Craig Kelly, Director of Development and Property
- Steven Boland, Public Works (retired)
- Nathan Kuiack, Roads

Ministry of Energy

- Chloe Lazakis, Sr. Advisor Indigenous Energy Policy

Elected Candidate Offices

- Cheryl Gallant, MP
- John Yakabuski, MPP
- Mayor and Elected Council Members, Township of Greater Madawaska

APPENDIX C

Presentation Materials from Open House #1 and #2



Calabogie Generating Station Redevelopment Project

WELCOME!

Thank you for taking time to visit this Open House.
Please fill out a Comment Sheet and leave it with us
or take it home and return it later to the address
provided.

A project representative will be glad to answer your
questions.

Your input and comments are an important
contribution to helping us develop an
environmentally responsible project.



Please **SIGN-IN** to receive future project updates

Purpose of this Open House

Calabogie Generating Station
Redevelopment Project

To introduce you to Ontario Power Generation Inc.'s plans to redevelop the Calabogie Generating Station (GS).



To seek your feedback at this early stage on local environmental considerations, issues or concerns that should be addressed through the environmental assessment process.

Who is Ontario Power Generation?

Calabogie Generating Station
Redevelopment Project

- Ontario Power Generation (OPG) is an Ontario-based electricity generation company.
- OPG focuses on the efficient production of electricity from its generation assets, while operating in a safe, open and environmentally responsible manner.
- OPG is a commercial company, owned by the Province of Ontario – its sole shareholder.
- OPG has been given a mandate from the Province of Ontario to develop and expand its hydroelectric capacity.
- This project will provide more clean, reliable and renewable electricity for Ontario.



Existing Calabogie powerhouse on South Branch of Madawaska River

Madawaska River and Water Management Operations

Calabogie Generating Station
Redevelopment Project

Existing Operations

- Madawaska River flows 270 km from its headwaters in Algonquin Provincial Park to the Ottawa River at Arnprior. Its drainage area covers > 8,500 square km.
- Calabogie GS presently operates as a peaking plant in conjunction with the four other OPG owned generating stations on the Madawaska River.
- The generating units at the station have limited flow capacity ($66 \text{ m}^3/\text{s}$), but the operation of the units and sluice gates are integrated with the rest of the peaking system on the Madawaska River.
- Calabogie is a generation bottleneck on the Madawaska River, and the small turbine capacity results in frequent spill past the station.
- The operation of the existing plant is based on a daily/weekly cycle, with the inflow passed through the plant over a daily or weekly period. The operation of the plant takes into consideration energy demands and recreational opportunities as well as walleye spawning activities.

Proposed Project

- OPG does not propose to alter the existing water management compliance requirements associated with this facility.
- A redeveloped Calabogie GS will continue to be operated in full accordance with all of the flow and water level targets and compliance conditions identified in the Madawaska River Water Management Plan (MRWMP).
- Daily flows will remain unchanged, but an additional portion of river flow will pass through the plant to generate electricity, rather than just passing through the spillway gates.
- The increased flows through the units could have a slight effect on the hourly water levels for the reach as far as the downstream limit of the plant and until the upstream limit of the Stewartville forebay, but will remain consistent with the MRWMP.

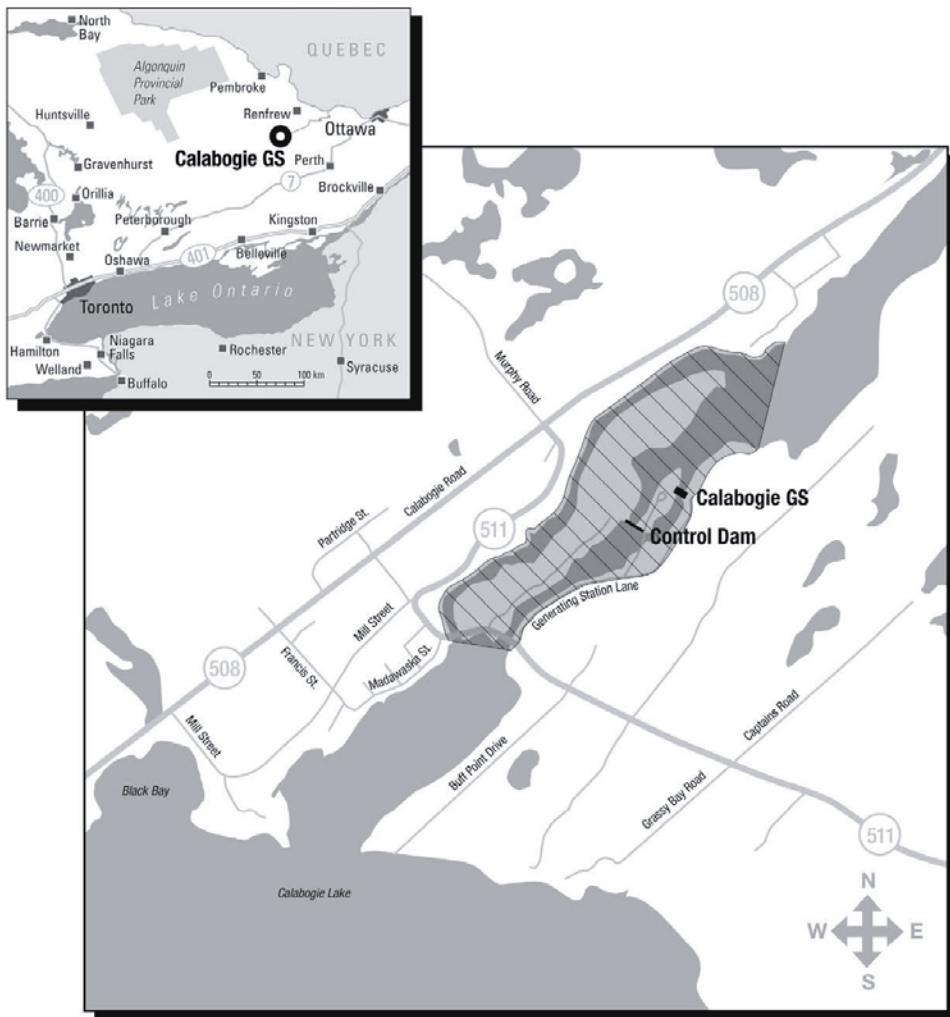


Existing Calabogie powerhouse on South Branch of Madawaska River

General Location and Zone of Impact

Calabogie Generating Station
Redevelopment Project

- The proposed zone of impact for the project is expected to be the immediate area around the GS (shown in the hatched area in the Figure below).



Project location and proposed zone of impact

Existing Calabogie Generating Station

Calabogie Generating Station
Redevelopment Project

- Calabogie GS was constructed in 1917 and is located within the Village of Calabogie. The current facility is considered to be near an 'end of life stage'.
- The GS has an installed capacity of 5 MW utilizing two quadruple-Francis horizontal turbines operating at a gross head of just under 9 m and a maximum total turbine outflow of 66 cms.
- Calabogie GS is significantly undersized in comparison to either typical mean flows or to both the upstream and downstream hydroelectric stations on the river, which have daily peaking flows up to 458 cms.



Madawaska River in the vicinity of the Calabogie GS

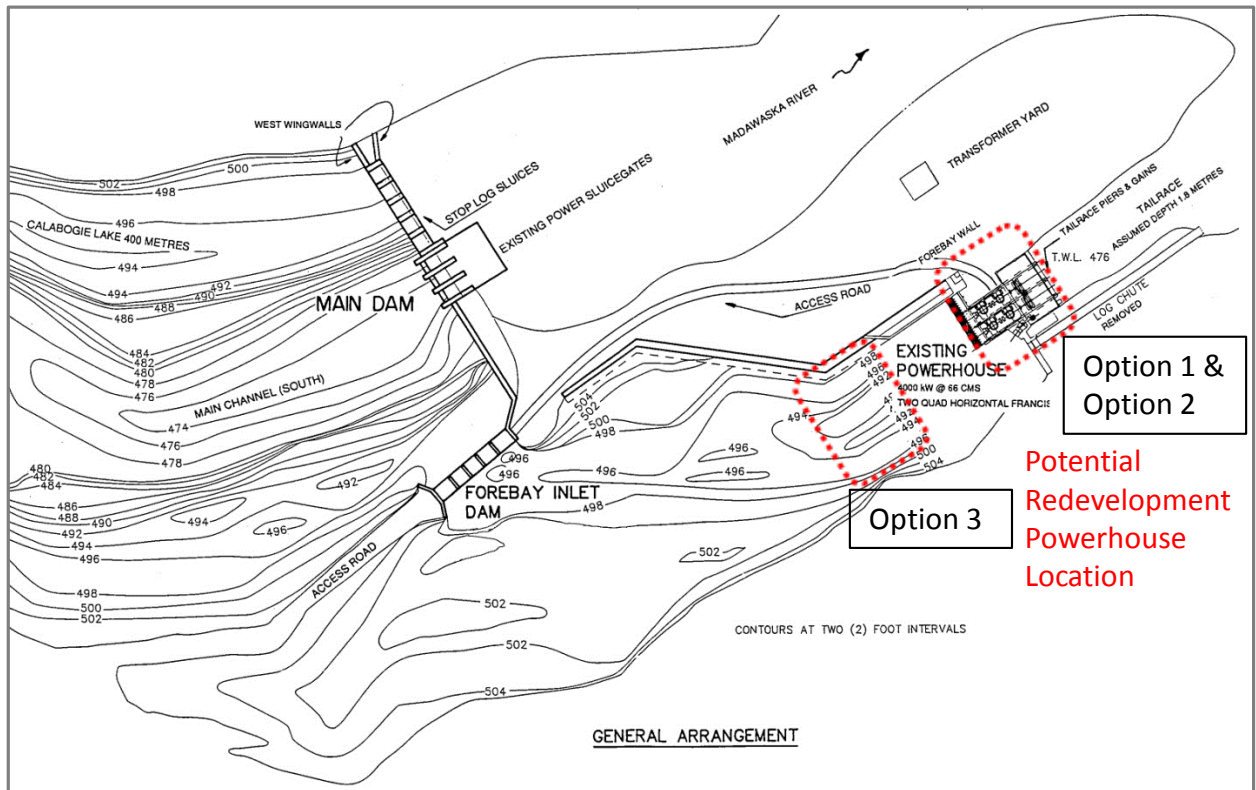
Water from Calabogie Lake travels downstream via the North Channel, South Channel Sluiceway, and the GS

- Over the last 50 years several studies have investigated redeveloping the site or increasing generation at the existing plant.

Proposed Plans

Calabogie Generating Station Redevelopment Project

- The proposed plan is to Re-Develop the station with capacity increased to approximately 10 to 15 megawatts.



Project Site Plan Options

- The existing powerhouse may be re-used or a new powerhouse might be constructed slightly upstream within the existing forebay.

Proposed Plans (continued)

Calabogie Generating Station
Redevelopment Project

- The proposed Calabogie GS redevelopment may consist of the following components/structures:
 - main dam and spillway
 - powerhouse structures
 - forebay wing wall
 - access road
 - forebay inlet structure and bridge
 - electrical substation



- The project will also require some ancillary facilities such as construction laydown areas and construction trailers.

Environmental Assessment Process

Calabogie Generating Station
Redevelopment Project

- In Ontario, proposed waterpower facilities are subject to the *Environmental Assessment Act* (EA Act).
- The Ontario Waterpower Association (OWA) developed the Class EA process which was approved by the Ontario Minister of the Environment and the Lieutenant Governor in Council in 2008. The EA Act formally recognizes the OWA Class Environmental Assessment for Waterpower Projects (OWA Class EA) and outlines the requirements for EA approval.
- Under the OWA Class EA the Calabogie GS Project will be classified as a “Project Associated with Existing Infrastructure”. Provided the requirements of the OWA Class EA planning process are met, and a Part II Order request is not made (or denied), a project is considered approved under the EA Act.
- Copies of the Class EA are available from www.owa.ca



Environmental Assessment Process (continued)

Calabogie Generating Station
Redevelopment Project

- EA approval is required prior to issuance of other project approvals and permits. An Administrative Amendment is likely required to the existing Madawaska River Water Management Plan (MRWMP).



View from eastern shoreline of the forebay looking towards the inlet sluices (bridge)

- Preliminary field work associated with assessing the environmental effects was initiated in 2016.
- More comprehensive field work was carried out in 2017.
- The effects of the project during construction and operation are now being assessed.
- Measures to avoid, prevent, eliminate, reduce, mitigate and compensate for negative effects will be identified.
- Measures to enhance positive effects will also be identified.



Site overview

Aquatic Assessment

- Aquatic field studies were completed in 2016 and 2017.
- The existing GS has in place existing seasonal regime constraints from April 1 to the May long weekend to facilitate Walleye and Northern Pike spawning. A minimum year-round flow, along with an enhanced minimum flow during Walleye spawning, is maintained in the North Channel.



North Channel of Madawaska River

- The Madawaska River between Calabogie GS and Stewartville GS is managed as a coolwater fishery with Northern Pike, Smallmouth Bass, Largemouth Bass, Walleye, Rock Bass, Pumpkinseed, Yellow Perch, White Sucker, and Redhorses present.



Aquatic Assessment (continued)

Calabogie Generating Station
Redevelopment Project

- Fall-spawning fish, Lake Sturgeon or American Eels are not known to be present in the stretch of the River between Calabogie GS and Stewartville GS.



River Redhorse (*Moxostoma carinatum*)

- River Redhorse (listed as a species of Special Concern) are likely spawning downstream of the Calabogie GS near the area known as Cherry Point.

- No major constraints are expected on the project but likely some kind of fisheries compensation (such as spawning habitat creation) will be required as part of a *Fisheries Act* Authorization to be obtained from Fisheries and Oceans Canada (DFO).



View from eastern shoreline of the forebay looking towards the inlet sluices (bridge)

Terrestrial Assessment

- Terrestrial field studies were completed in 2016 and 2017.
- Most of the forest cover on the site of the Calabogie GS is secondary forest having been cleared at the time of the original construction and later.
- Field studies/surveys on site have included:
 - Bat Survey
 - Whip-poor-will Surveys
 - Dawn Breeding Bird Surveys
 - Vegetation assessment (ecological land classification)



Remote acoustic bird monitor



- Barn swallows are present at the site and some mitigation measures will be required if they are potentially affected by the project.
- No major constraints are expected on the project.

Cultural Heritage Assessment

Calabogie Generating Station
Redevelopment Project

Archaeology

- A Stage 1 archaeological assessment was completed on the Calabogie GS in 2016.
- No areas of archaeological potential were identified and therefore no further archaeological resource assessment work is required.

Built Heritage

- A Cultural Heritage Evaluation was conducted on the Calabogie GS.
- No decision has been made at this point on the future of the Calabogie powerhouse.
- A Cultural Heritage Impact Assessment will be required based on the future design decisions for the proposed project development or site alteration.



Socio-Economic Assessment

Calabogie Generating Station
Redevelopment Project

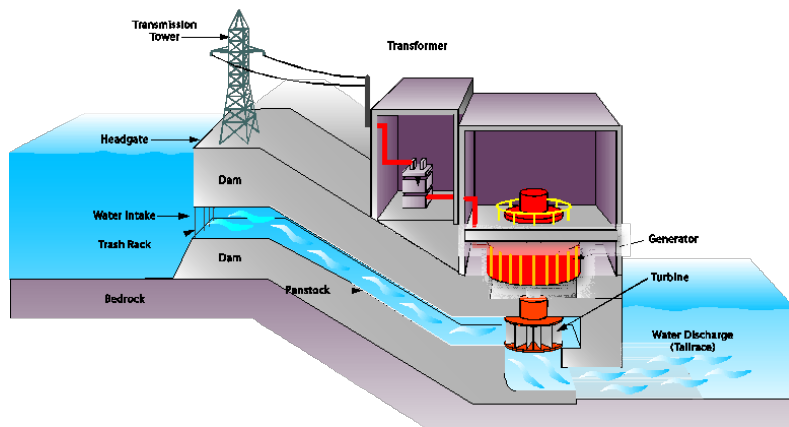
- No change in land use is proposed with the project.
- The project will generally have a minor positive effect during the construction phase through construction employment and contracting.
- Discussions will occur with the Township and County to determine any areas of concern and to mitigate any potential nuisance effects.
- There are no proposed alterations to water management plan levels on Calabogie Lake.



How Hydroelectric Development Works

Calabogie Generating Station
Redevelopment Project

- Hydroelectric power stations convert the kinetic energy of falling water into electrical energy.
- Hydroelectric stations use either the natural drop of a river, such as a waterfall, or a dam built across a river to raise the water level and provide the drop (head) needed to create a driving force.
- Water is collected at the top of the dam in what is called the forebay. From there, the water flows into a



pipe called a penstock which carries it down to a turbine water wheel.

- The water pressure increases as it flows down the penstock. The pressure and flow of the falling water drives a turbine which in turn spins a generator.
- This creates electricity that can be sent to the transmission grid.



We Value Your Opinion

Calabogie Generating Station
Redevelopment Project

THANK YOU for attending!

- Consultation is a key component of the EA process as it provides you with an opportunity to contribute and inform decisions relating to the project.
- OPG will be hosting a second Open House most likely in the first half of 2019 with key findings from the EA.
- Meetings and consultation activities have also been held with Algonquins of Ontario.
- We would like to know if there are any important environmental or social values, interests or concerns you might have about the project.
- There will be additional opportunities for you to participate in the EA process.

Please take the time to ask questions and complete the *Comment Sheets* before you leave.

If you have further comments or questions please email us at: info@calabogiegs.com or visit our project webpage at: www.calabogiegs.com

WELCOME!

Thank you for taking time to visit this Open House.
Please fill out a Comment Sheet and leave it with us or
take it home and return it later to the address
provided.

A project representative will be glad to answer your
questions.

Your input and comments are an important
contribution to helping us develop an environmentally
responsible project.



Please **SIGN-IN** to receive future project updates

Purpose of this Open House

Calabogie Generating Station Redevelopment Project

- To introduce you to Ontario Power Generation Inc.'s plans to redevelop the Calabogie Generating Station (GS).



- To seek your feedback at this stage on local environmental considerations, issues or concerns that should be addressed through the environmental assessment process.

Who is Ontario Power Generation?

Calabogie Generating Station
Redevelopment Project

- Ontario Power Generation (OPG) is an Ontario-based electricity generation company.
- OPG focuses on the efficient production of electricity from its generation assets, while operating in a safe, open and environmentally responsible manner.
- OPG is a commercial company, owned by the Province of Ontario – its sole shareholder.
- OPG has been given a mandate from the Province of Ontario to develop and expand its hydroelectric capacity.
- This project will provide more clean, reliable and renewable electricity for Ontario.

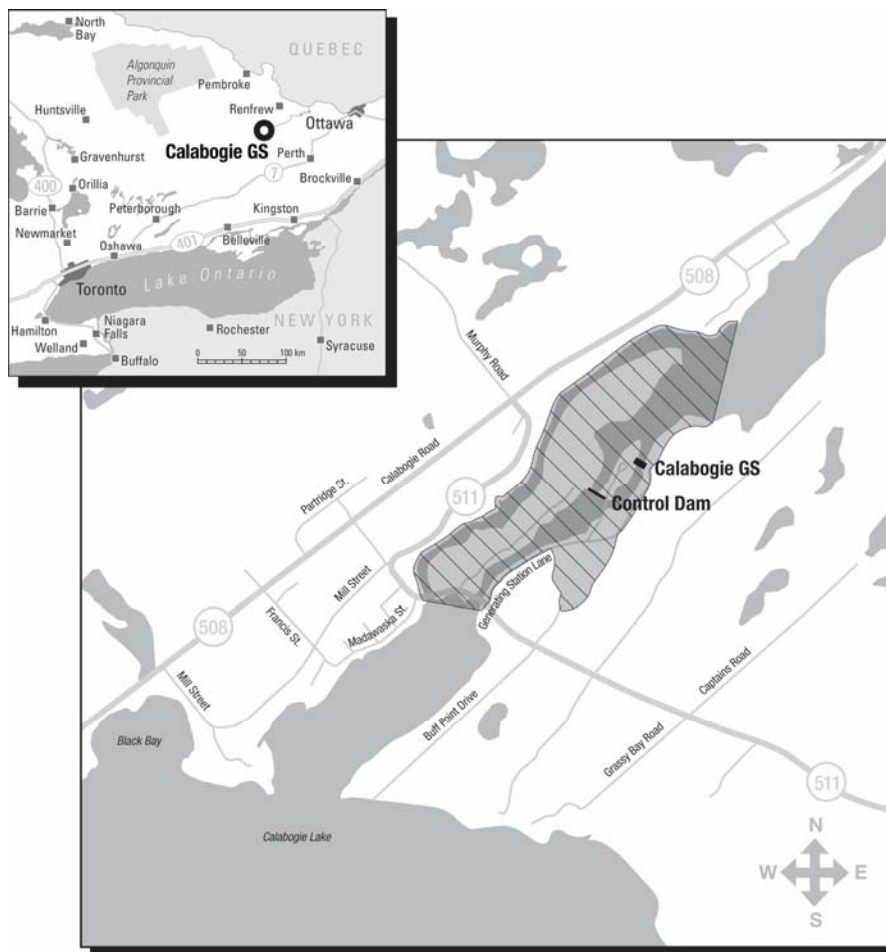


Existing Calabogie powerhouse on South Branch of Madawaska River

General Location and Zone of Impact

Calabogie Generating Station Redevelopment Project

- The proposed zone of impact for the project is expected to be the immediate area around the GS (shown in the hatched area in the Figure below).



Project location and proposed zone of impact

Proposed Site Plan

Calabogie Generating Station
Redevelopment Project

- See Page #1 and #2 of Landscape Panels

Proposed Plan (continued)

Calabogie Generating Station Redevelopment Project

- General layout of the Calabogie GS will remain unchanged.
- New powerhouse will be located approximately 50 meters upstream of the existing one.
- New GS will have an installed capacity of approximately 11 megawatts, an increase of more than 6 megawatts.
- New GS will be capable of handling a nominal flow of 160 cubic meters per second (cms), an increase of almost 100 cms.
- Laydown, parking and soil/rock deposition areas will be required for the construction stage of the project. Following construction, a topsoil cover will be placed and areas re-vegetated.
- Variety of environmental mitigation, training and monitoring measures will be put in place during construction to prevent negative environmental effects during construction.

Environmental Assessment Process

Calabogie Generating Station
Redevelopment Project

- In Ontario, proposed waterpower facilities are subject to the *Environmental Assessment Act* (EA Act).
- The Ontario Waterpower Association (OWA) developed the Class EA process which was approved by the Ontario Minister of the Environment and the Lieutenant Governor in Council in 2008. The EA Act formally recognizes the OWA Class Environmental Assessment for Waterpower Projects (OWA Class EA) and outlines the requirements for EA approval.
- Under the OWA Class EA the Calabogie GS Project will be classified as a “Project Associated with Existing Infrastructure”. Provided the requirements of the OWA Class EA planning process are met, and a Part II Order request is not made (or denied), a project is considered approved under the EA Act.
- Copies of the Class EA are available from www.owa.ca



Environmental Assessment Process (continued)

- Environmental assessment approval is required prior to issuance of other project approvals and permits.



View from eastern shoreline of the forebay
looking towards the inlet sluices (bridge)

- Preliminary field work associated with assessing the environmental effects was initiated in 2016.
- More comprehensive field work was carried out in 2017, 2018 and 2019.

- The effects of the project during construction and operation are now being assessed.
- Measures to avoid, prevent, eliminate, reduce, mitigate and compensate for negative effects are being identified.
- Measures to enhance positive effects will also be identified.



Site overview

Tornado

Calabogie Generating Station Redevelopment Project

- Tornado hit the site on Friday September 21st 2018 (day of Ottawa tornados):
 - Removed the roof from the existing powerhouse.
 - Damaged the transformer and lines, resulting in loss of power to the site.
 - Destroyed significant area of forest cover at site.
- OPG's primary focus was to make the site safe, by restoring temporary power to the site to get the sluiceway gates operating to enable water management.
- OPG is working toward placing the remaining powerhouse structure in a safe state until commencement of redevelopment project.



Madawaska River and Water Management Operations

Calabogie Generating Station
Redevelopment Project

Future Operations

- OPG will continue to operate the Calabogie GS and the other plants on the Madawaska River in full accordance with all flow and water level targets and compliance conditions in the Madawaska River Water Management Plan, including the summer conditions.
- Daily flow and water level conditions will remain unchanged from the existing situation.
- The new GS at Calabogie will have an increased flow capacity, which will allow OPG to produce more energy from the existing water.
- In the past, higher flows through Calabogie GS were split between the sluice gates and the station. Now more will pass through the station.

Madawaska River and Water Management Operations

Calabogie Generating Station
Redevelopment Project

Future Operations (continued)

- There will still be conditions and situations where a greater range at Stewartville GS is needed to meet Ontario grid requirements and maintain compliance with the other aspects of the Water Management Plan (WMP).
- There may be some conditions where the new Calabogie GS could match flow patterns at Barrett Chute GS and Stewartville GS to reduce water level fluctuations. If this occurs it will be done in compliance with the WMP.
- Given the above, OPG does not plan to propose any formal changes to the compliance requirements in the WMP, however a Minor Amendment will be required to the WMP to reflect the fact that a new GS has been constructed.

Aquatic Assessment

Calabogie Generating Station Redevelopment Project

- Aquatic field studies were completed in 2016 and 2017.
- The existing GS has in place seasonal regime constraints from April 1 to the May long weekend to facilitate Walleye and Northern



North Channel of Madawaska River

- Pike spawning. A minimum year-round flow, along with an enhanced minimum flow during Walleye spawning, is maintained in the North Channel.
- The Madawaska River between Calabogie GS and Stewartville GS is managed as a coolwater fishery with Northern Pike, Smallmouth Bass, Largemouth



Bass, Walleye, Rock Bass, Pumpkinseed, Yellow Perch, White Sucker, and Redhorses present.

Aquatic Assessment (continued)

Calabogie Generating Station
Redevelopment Project

- Fall-spawning fish, Lake Sturgeon or American Eels are not known to be present in the stretch of the River between Calabogie GS and Stewartville GS.



River Redhorse (*Moxostoma carinatum*)

- River Redhorse (listed as a species of Special Concern) spawn downstream of the Calabogie GS near the area known as Cherry Point. No impacts are predicted.

American Eels

- While American Eels are not currently thought to be present in the Madawaska River, OPG does plan to incorporate Eel passage into the design of the facility.
- An upstream ladder and tank will be incorporated into the facility.
- Provisions for downstream passage will be incorporated into the design so the facility can be easily retrofitted should American Eels become present in the Madawaska.

Aquatic Assessment (continued)

- Proposed new GS is not anticipated to have any negative effects on the fishery or aquatic environment.
- A large number of standard and specialized mitigation and monitoring measures are proposed to prevent negative effects from occurring. Mitigation measures would include: adherence to in-water work windows; and managing the construction site to prevent spills, erosion, sedimentation and alterations to the natural shoreline.
- Fisheries and Oceans Canada may require compensation due to the increased capacity of the new GS. If so, OPG is proposing that compensation measures (i.e. additional spawning habitat) are undertaken in the tailrace.



Terrestrial Assessment

Calabogie Generating Station
Redevelopment Project

- Terrestrial field studies were completed in 2016, 2017 and 2018, with additional work in 2019.
- Field studies/surveys on site included:
 - Bat Surveys (7 species observed);
 - Dawn Breeding Bird Surveys (42 species documented with 41 expected in or adjacent to study area);
 - Whip-poor-will Surveys (none observed);
 - Turtle Surveys (3 species observed but 4 expected);
 - Butternut Surveys (none observed); and
 - Vegetation assessment (ecological land classification).
- Most of the forest cover on the site of the Calabogie GS is secondary forest having been cleared at the time of the original construction and later.
- The proposed undertaking will require the clearing of less than ten hectares of vegetation.
- Most of this area that will be cleared can be re-planted or naturalized.



Remote acoustic bird monitor

Terrestrial Assessment – Effects and Mitigation

- 5 *Endangered Species Act* species have been identified and mitigation measures proposed:
 - Barn Swallow – Mitigation to include artificial nesting structure (already in place).
 - Blanding's Turtle – Mitigation to include staff training, signage and temporary exclusion fencing.
 - 3 Bat species – Mitigation to include situating project development activities away from roost trees; and tree clearing outside of active season.
- Variety of other mitigation measures to be utilized to protect the terrestrial environmental including:
 - Situating project development activities away from any rare or sensitive plants;
 - Environmental construction planning and monitoring;
 - Appropriate erosion and sediment controls;
 - Maintenance of equipment and management of site to avoid and remediate spills;
 - Timing of activities to avoid certain seasons;
 - Planning for emergencies; and
 - Worker education etc.
- Proposed mitigation measures expected to address all potential negative effects resulting in no negative residual effects.

Terrestrial Environment Surveys

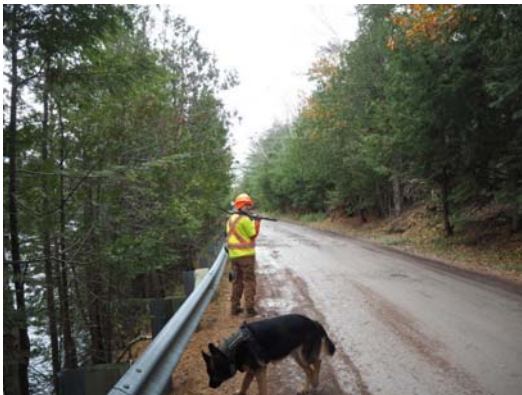
Calabogie Generating Station
Redevelopment Project

- See Page #3 of Landscape Panels

Archaeological Assessment

Calabogie Generating Station
Redevelopment Project

- Stage 1 archaeological assessments were completed on the Calabogie GS in 2016 and 2018. The 2018 fieldwork identified areas of archaeological potential. These areas of potential were tested as part of a Stage 2 archaeological assessment in the fall of 2018.
- No archaeological resources were located during the Stage 2 archaeological survey. As such, no further archaeological work is planned at Calabogie GS as part of the proposed redevelopment work.



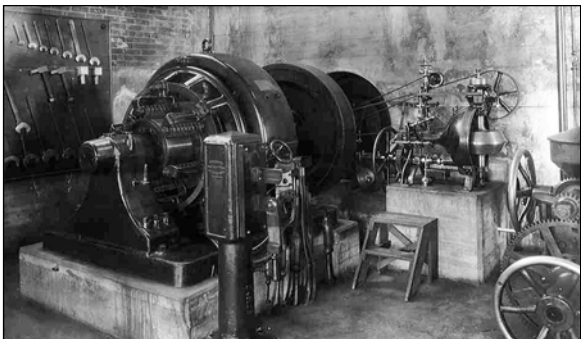
- Fieldwork in 2018 included participation with the Algonquins.



Cultural Heritage Assessment (Built)

Calabogie Generating Station Redevelopment Project

- The original Calabogie GS was constructed in 1917 to provide power during the First World War.
- The Calabogie GS has been evaluated under the Ministry of Tourism, Culture and Sport (MTCS) Standard and Guidelines for Conservation of Provincial Heritage Properties (Standards & Guidelines).
- A Cultural Heritage Evaluation Report (CHER) concluded the Calabogie GS fulfilled the evaluation criteria for determining cultural heritage value or interest set out in Ontario Regulation (O.Reg) 9/06 under the *Ontario Heritage Act* (OHA) for local significance and is considered for Listing as a Provincial Heritage Property; however, it was determined the property did not meet the criteria for provincial heritage significance in O.Reg 10/06.
- Re-using the 100 year old powerhouse was considered, but concluded not to be a feasible development option.



- The history of the GS has been documented and some equipment is proposed to be donated to the Township for display in a public park or other facility. OPG will also retain some equipment and consider a commemorative plan.

Socio-Economic Assessment

Calabogie Generating Station
Redevelopment Project

- The project will generally have a minor positive effect during the construction period to the local and regional areas through construction employment, contracting, and purchase of local goods and services.
- Discussions have occurred and will continue with the Township and County to determine any areas of concern and to mitigate any potential nuisance effects.
- As there are no proposed alterations to the current Madawaska River Water Management Plan compliance levels there is no anticipated effect on any human uses.



Working with the Township of Greater Madawaska

Calabogie Generating Station
Redevelopment Project

- The proposed project will result in the excavation of approximately 47,000 cubic meters of rock.
- The rock is of the quality that is suitable for road construction and maintenance.
- OPG and the Township have been working together to develop a plan to give the Township the rock.
- The Township Work Yard has lands adjacent to the existing Calabogie GS and the proposed plan is to deposit this rock on Township lands for its future use.
- This will involve the construction of a short 200 meter road and the creation of an area to deposit the rock.
- This plan has several benefits for all parties:
 - OPG does not need to find an alternative location on its site for the rock;
 - Township will receive rock at no charge for future road use; and
 - Reduction in the number of haul trucks on the local highway and roads.
- Environmental review of this area will occur this spring and some mitigation measures will be required.

Working with the Township of Greater Madawaska

Calabogie Generating Station
Redevelopment Project

- See Page #4 of Landscape Panels

Dam Safety Requirements

Calabogie Generating Station
Redevelopment Project

- The Ministry of Natural Resources and Forestry (MNRF) has in place Dam Safety Guidelines to protect the public and the natural and built assets of the Province. These were updated in 2011.
- Currently OPG is assessing the existing spill capacity at the Calabogie GS site and reviewing various options to increase spill capacity, as necessary, to meet the requirements of the 2011 MNRF Guidelines.
- Additional spill capacity may be achieved by a combination of channel improvements and installing additional sluices.
- Environmental approval for such work might be carried out as a Modification and/or Addendum to this Environmental Assessment or as a separate approval process.

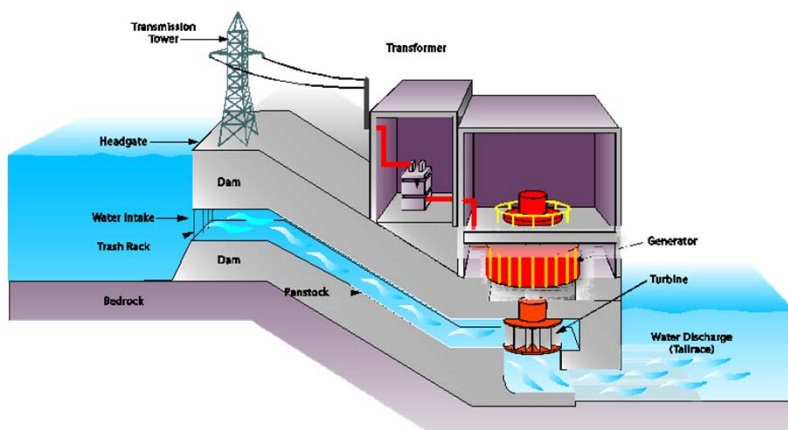
Project Benefits

- Will produce approximately 11 megawatts (MW) of clean renewable power for the Ontario electricity system for the next 90 years. This increase is more than 6 MW or enough electricity for about 6,000 homes.
- Results in a local and regional economic benefit during the construction stage.
- Allows OPG to better match flows in the Madawaska River to other Generating Stations and should in some conditions help to reduce the range and frequency of water level fluctuations between Calabogie and Stewartville.
- Will allow for future passage of American Eels.
- Results in an investment in the infrastructure at Calabogie GS which could assist with a future catastrophic event and to better address future climate conditions.
- Provides the Township of Greater Madawaska with rock that can help with future road construction and maintenance.
- All environmental impacts can be mitigated through appropriate planning, construction and monitoring.

How Hydroelectric Development Works

Calabogie Generating Station
Redevelopment Project

- Hydroelectric power stations convert the kinetic energy of falling water into electrical energy.
- Hydroelectric stations use either the natural drop of a river, such as a waterfall, or a dam built across a river to raise the water level and provide the drop (head) needed to create a driving force.
- Water is collected at the top of the dam in what is called the forebay. From there, the water flows into a



pipe called a penstock which carries it down to a turbine water wheel.

- The water pressure increases as it flows down the penstock. The pressure and flow of the falling water drives a turbine which in turn spins a generator.
- This creates electricity that can be sent to the transmission grid.

Comments and Schedule

Calabogie Generating Station
Redevelopment Project

THANK YOU for attending!

- OPG is interested in hearing your comments and questions regarding the Calabogie Generating Station Redevelopment Project.
- Consultation is a key component of the EA process as it provides you with an opportunity to contribute and inform decisions relating to the project.
- *Comment Sheets* are available. Please take a few minutes to provide comments and concerns you may have and either leave them with a Project Team representative or send it back to us by **July 3, 2019**.
- Environment Reports for the review and Notice of Completion Stage will be posted in summer 2019 on OPG's project website: www.calabogiegs.com
- Construction is planned to commence in early 2020.
- The proposed new GS is expected to go into operation by late 2021.

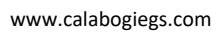
If you have further comments or questions please email us at: info@calabogiegs.com or visit our project webpage at: www.calabogiegs.com

Proposed Site Plan

Calabogie Generating Station
Redevelopment Project

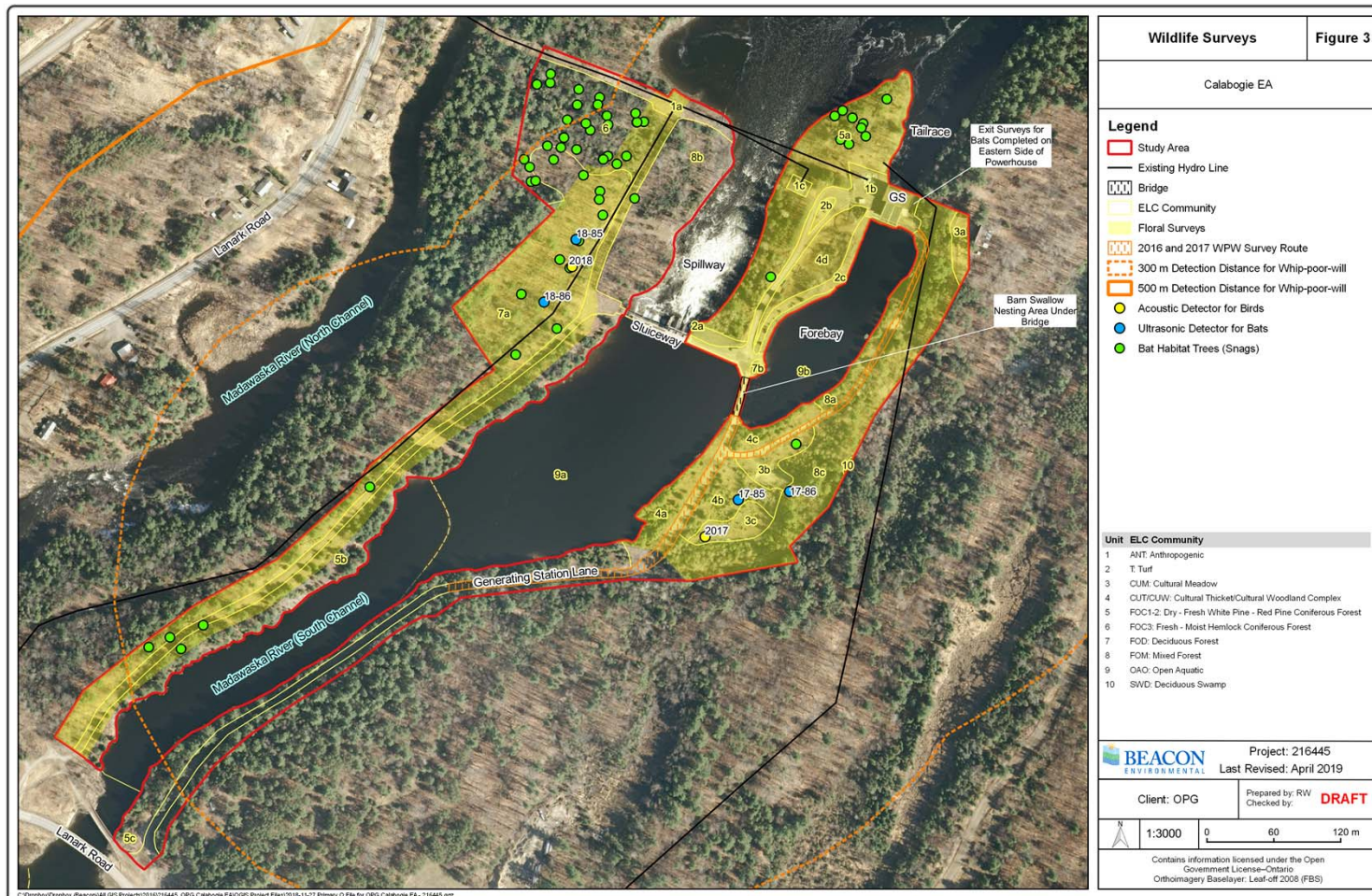


Calabogie Generating Station Redevelopment Project



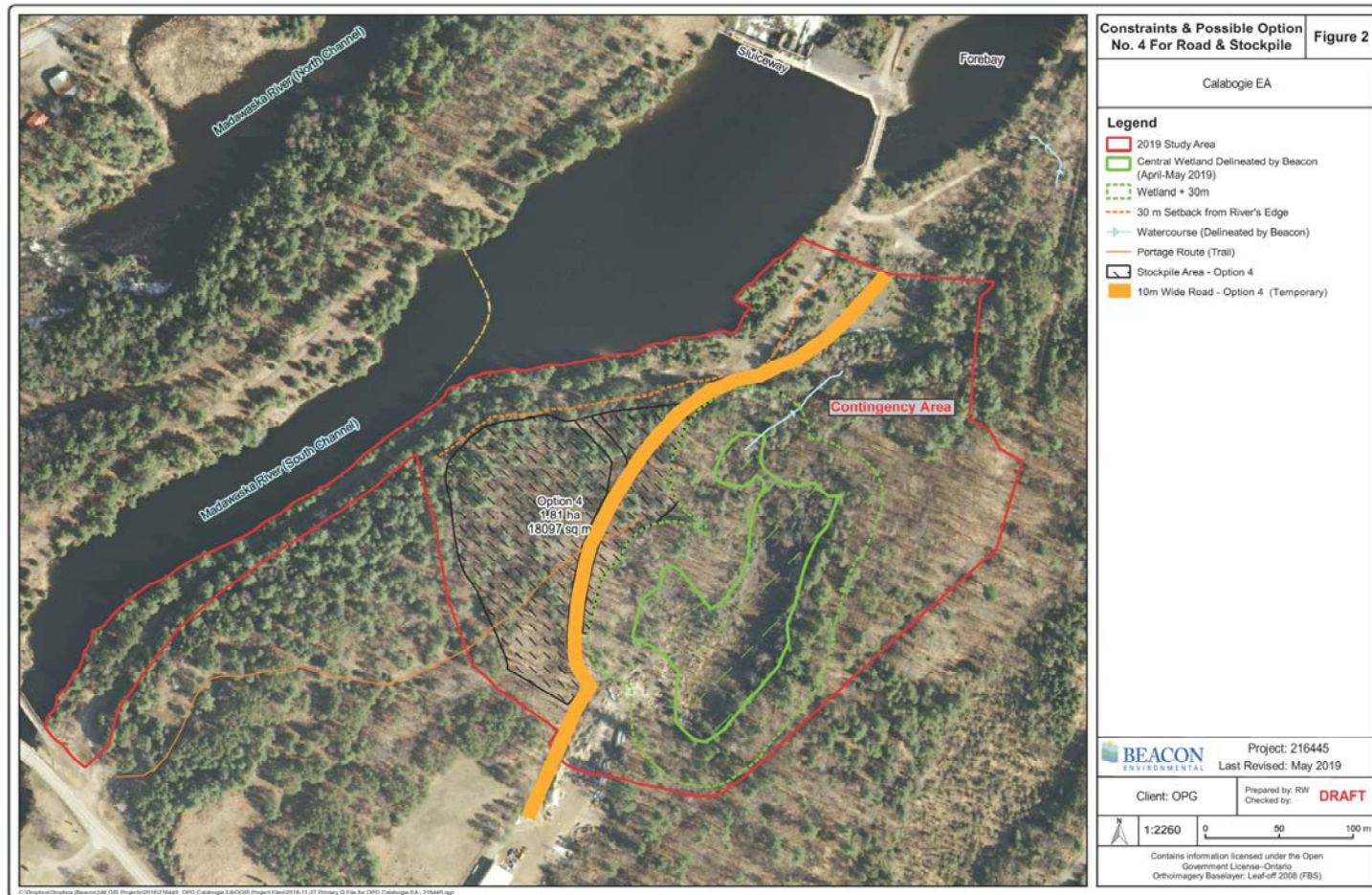
Terrestrial Environment Surveys

Calabogie Generating Station
Redevelopment Project



Working with the Township of Greater Madawaska

Calabogie Generating Station
Redevelopment Project



APPENDIX D

Correspondence – Ontario Rivers Alliance





**ONTARIO
RIVERS
ALLIANCE**

379 Ronka Road
Worthington, ON P0M3H0
LindaH@OntarioRiversAlliance.ca
OntarioRiversAlliance.ca

22 August 2019

Phil Shantz
Environmental Planning Leader (Canada)
Arcadis Canada Inc.
121 Granton Drive
Richmond Hill, ON
L4B 3N4

By Email: Phil.Shantz@arcadis.com

**Re: Calabogie Generation Station Redevelopment, Madawaska River
Review of Draft Environmental Report**

Dear Mr. Shantz:

The Ontario Rivers Alliance (ORA) is a Not-for-Profit grassroots organization acting as a voice for a coalition of members that have come together to protect, conserve and restore healthy riverine ecosystems.

I have had an opportunity to review your draft Environmental Report (ER) and have a few questions and comments.

Fish Passage:

Section 2.4.3.5 of the ER indicates that the redeveloped Calabogie GS will be “*eel ready*”, meaning it “*will be planned, designed and executed in anticipation of adaptive management strategies that can be applied as circumstances change around the presence of American Eel in the vicinity of the station*”.

Q1: I just want to verify that this means that eel passage will be fully completed and in place by the time the redeveloped GS is up and running?

Q2: Has OPG considered including fish passage for other species of fish, such as Walleye and River Redhorse? If not, why?

Water Levels and Flow Velocity:

Peaking operations, with the variable flow discharge and ramping patterns, the rate and frequency of water level changes, and the amount of time the station is at its maximum discharge level, can all have a significant impact on the degree of channel and bank erosion.

Q3: What mitigation measures will be implemented to reduce channel and bank erosion resulting from the increased flow velocity from 60 to 160 cms²?



In Table 6-2, Page 6-6 of the ER, you make comment that “*OPG will continue to operate the Calabogie GS and the other plants on the Madawaska River in full accordance with all flow and water level targets and compliance conditions in the Madawaska River Water Management Plan, including the summer conditions.*”

Q4: A common practice amongst hydroelectric proponents has been to use seasonal flows and water level targets to peak on a daily basis to service peak demand. Has this been your common practice to date?

You said, “*Daily flow and water level conditions will remain unchanged from the existing situation*”.

Q5: Will the number and frequency of daily water level fluctuations increase in the new operating strategy?

Q6: With total flow velocity increasing from 60 or 66 to 160 cms², what will the tailrace substrate consist of and how will it and habitat be protected against erosion and shifting?

Q7: What species will be targeted?

Turbines:

Q8: Will OPG consider installing fish/eel friendly turbines?

Climate Change:

The effect of damming on methane emissions conducted in a central European impounded river revealed that the reservoir reaches are a major source of methane emissions and that areal emission rates far exceed previous estimates for temperate reservoirs or rivers. It showed that sediment accumulation correlates with methane production and subsequent ebullitive release rates. Results suggested that sedimentation-driven methane emissions from dammed river hot spot sites can potentially increase global freshwater emissions by up to 7%.¹

Q9: Section 4.7.1, P-4-50 of the ER states, “*OPG has been an active corporation in better understanding the effects of climate change on its facilities and operations*”, but will OPG consider the effects that a redeveloped Calabogie Dam will have on climate change over the next 100 years?

Q10: Will the dam design have adequate spill capacity and resilience to withstand the extremes of climate change?

Thank you for this opportunity to review and comment on the draft ER – much appreciated.

Respectfully,

Linda Heron
Chair, Ontario Rivers Alliance
(705) 866-1677

¹ Maeck, A., DelSontro, T., McGinnis, D.F, Fischer, H., Flury, S., Schmidt, M., Fietzek, P. and Lorke, A., 2013. Sediment Trapping by Dams Creates Methane Emission Hot Spots, *Environmental Science and Technology*, 8130-8137, Online: <http://www.dx.doi.org/10.1021/es4003907>

Ms. Linda Heron
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Arcadis Canada Inc.
121 Granton Drive, Suite 12
Richmond Hill, ON L4B 3N4
Tel 905.764.9380
www.arcadis.com

Dear Ms. Heron:

Thank you for your letter dated August 22, 2019, in which you asked a number of questions with respect to the Draft Environmental Report for the Calabogie Generating Station Re-Development. In order to provide the most accurate responses to your comments and questions we have put them into a table format with your comments and questions in the left and centre columns and a response from Ontario Power Generation and Arcadis in the right column. Please see below.

Date:
October 21, 2019

Contact:
Phil Shantz

Phone:
905.764.9380

Email:
Phil.Shantz@arcadis.com

Our ref:
30000724-00008

| Comment | Question | Response |
|--|--|---|
| <p>1. Fish Passage</p> <p>Section 2.4.3.5 of the ER indicates that the redeveloped Calabogie GS will be “eel ready”, meaning it “<i>will be planned, designed and executed in anticipation of adaptive management strategies that can be applied as circumstances change around the presence of American Eel in the vicinity of the station</i>”.</p> | <p>Q1: I just want to verify that this means that eel passage will be fully completed and in place by the time the redeveloped GS is up and running?</p> | <p>For your background, in 2011 correspondence between OPG and the Ministry of Natural Resources concluded that there were no known occurrences of American Eel, or areas of protected habitat at or in the immediate area of Calabogie Generating Station, the Stewartville Generating Station (downstream) or Mountain Chute Generating Station (upstream). OPG is not aware of any new documented occurrences of American eel since 2011, and the two barriers to eel movement downstream of Calabogie have not been altered (Arnprior and Stewartville GSs). In recent years, efforts to recover American Eel in the Ottawa River have been in play, including construction of an eel passage structure on the Ottawa River at Chaudière GS. OPG also complies with the Endangered Species Act for American Eel through its Mitigation Plan activities at Chats and Chenaux GS on the Ottawa River. All of this is to say that as circumstances continue to change and American eel recover further up the system, OPG will be prepared to further support its recovery up the Madawaska River.</p> <p>The new Generating Station is being designed for American Eel passage. However, only certain components of it will be initially constructed.</p> <p>The new Generating Station will be constructed to facilitate upstream movement of eels. OPG will install a ladder in the tailrace of the proposed new station. The ladder will lead to a trap/tank where any eels can be counted and tagged prior to manually moving the fish upstream of the station.</p> <p>For future downstream passage, if eels are moved upstream of the station, or if there is a documented presence of large eels upstream of the proposed station, OPG will procure and install an inclined screen rack with spacing of no more than 19 mm. The inclined screen will lead to a bypass structure that will allow eels to move downstream and prevent entrainment. When installed the inclined screen would be deployed from July through September. The screen would be removed after September to minimize clogging from leaf debris in the fall and ice damage in the winter. By making provisions now for the future downstream passage of eels, the future retrofit (permanent ladder, inclined screen and bypass) will be relatively easy to add on later.</p> |

| Comment | Question | Response |
|---|---|--|
| | <p>Q2: Has OPG considered including fish passage for other species of fish, such as Walleye and River Redhorse? If not, why?</p> | <p>Providing passage for species such as Walleye and River Redhorse was not deemed necessary. Unlike the migratory American Eel, the other species are able to complete their life histories as resident populations within the reach between the Calabogie GS and the Stewartville GS.</p> <p>For downstream passage, the intake design proposed for the Calabogie GS offers a screened intake with specifically designed slow, fish friendly, approach velocities. These design characteristics prevent fish from becoming exposed to the risk of the turbines in the generating station and avoids the need for fish friendly turbines.</p> |
| <p>2. Water Levels and Flow Velocity</p> <p>Peaking operations, with the variable flow discharge and ramping patterns, the rate and frequency of water level changes, and the amount of time the station is at its maximum discharge level, can all have a significant impact on the degree of channel and bank erosion.</p> | <p>Q3: What mitigation measures will be implemented to reduce channel and bank erosion resulting from the increased flow velocity from 60 to 160 cms?</p> | <p>As indicated in the Reports, there is no increase in flow on the River but rather merely an increase in flow through the powerhouse with a proportionate decrease in flow through the existing South Channel sluiceway.</p> <p>The powerhouse peak flow of 160 cms is significantly lower than the flows that have been passed at the station as a whole during the spring time and during and after major flooding events. The station has passed flows of up to 745 cms in 2019. Therefore, the increase in flows through the powerhouse only represent a small proportion of the total flow in the river during peak times.</p> <p>As shown on various Figures (see Figure 2-5 or 2-3), the flows from the powerhouse and South Channel Sluiceway come together less than 200 meters from the powerhouse.</p> <p>Considering the above, the only risk of increased channel and bank erosion would come from the area immediately downstream of the powerhouse but before the confluence with the flow through the South Channel Sluiceway. OPG would be concerned with any channel or bank erosion in this area. As such, OPG is requiring the DB Contractor to ensure the banks and channel in this area are stable to prevent any significant erosion. It is very much in OPG's interest to ensure that this erosion would not occur.</p> <p>OPG would monitor to see if erosion is occurring. However, examination of older aerial photography of the River suggests that the River's banks in the discussed area are quite stable.</p> |

| Comment | Question | Response |
|---|---|---|
| <p>3. Water Levels and Flow Velocity</p> <p>In Table 6-2, Page 6-6 of the ER, you make comment that <i>“OPG will continue to operate the Calabogie GS and the other plants on the Madawaska River in full accordance with all flow and water level targets and compliance conditions in the Madawaska River Water Management Plan, including the summer conditions.”</i></p> | <p>Q4: A common practice amongst hydroelectric proponents has been to use seasonal flows and water level targets to peak on a daily basis to service peak demand. Has this been your common practice to date?</p> | <p>The operation of the existing plant is based on a daily/weekly cycle, with the inflow passed through the plant over a daily or weekly period. The 2009 Water Management Plan (WMP) notes that operation of the plant takes into consideration energy demands, recreational opportunities as well as walleye spawning activities.</p> <p>OPG does not propose to alter the existing water management compliance requirements associated with this facility. The redevelopment of the Calabogie GS will continue to be operated in full accordance with all of the flow and water level targets and compliance conditions identified in the Water Management Plan including all fisheries and other aquatic life requirement. Daily flows will remain unchanged but additional portion of river flow will pass through the plant to generate electricity rather than just passing through the spillway gates.</p> |
| <p>4. Water Levels and Flow Velocity</p> <p>You said, <i>“Daily flow and water level conditions will remain unchanged from the existing situation”</i>.</p> | <p>Q5: Will the number and frequency of daily water level fluctuations increase in the new operating strategy?</p> | <p>Please see response above.</p> |
| <p>5. Water Levels and Flow Velocity</p> | <p>Q6: With total flow velocity increasing from 60 or 66 to 160 cms², what will the tailrace substrate consist of and how will it and habitat be protected against erosion and shifting?</p> | <p>The tailrace will be protected from erosion and movement by matching the size of bed material with the anticipated water velocities.</p> <p>The bed material in the current tailrace channel is comprised of a mix of bedrock, cobble/boulder and cobble/boulder and gravel towards the end of Cross Island. The highest water velocities are experienced immediately downstream of the generating station and the size of the substrate are larger to ensure that the channel does not experience bed scour.</p> <p>To ensure habitat is protected, the upgraded project will match existing substrates and use a series of graded bed materials to cover the invert of the tailrace. Cobble and boulder substrate will be placed in the portion of the tailrace that experiences that highest flow conditions and smaller grades of cobble and gravel will be placed along the tailrace margins that do not experience scouring flows. Additional cobble and gravel material will be placed over near the end of Cross Island where the south channel and the tailrace become confluent.</p> |

| Comment | Question | Response |
|---|---|--|
| 6. Water Levels and Flow Velocity | Q7: What species will be targeted? | <p>We are somewhat uncertain as to what this question is asking but we are guessing that the questioner is asking about use of the tailrace substrate by fish species. Assuming that is the question we provide the following response.</p> <p>There are small areas of the tailrace and the downstream section of the South Channel Sluiceway that are likely being used for walleye spawning now. OPG anticipates that there will continue to be areas downstream of the powerhouse and South Channel Sluiceway that have appropriate conditions for walleye spawning. They would essentially be the “targeted species”.</p> |
| 7. Turbines | Q8: Will OPG consider installing fish/eel friendly turbines? | <p>OPG has incorporated some features into the design to prevent and reduce fish/eel impingement/entrainment. The intake design OPG has proposed for the Calabogie GS offers a screened intake with specifically designed slow approach velocities to avoid fish impingement and entrainment.</p> <p>With respect to future eel passage, the use of a screened intake with slow intake approach velocities minimizes turbine mortality, especially for long bodied eels that have an increased risk of entanglement in a spinning turbine. This downstream mitigation avoids fish and eel mortality by eliminating exposure to turbine blades or pressures but has negative consequences to generation capacity due to increased head losses. Future Eel passage downstream will be through a specifically designed bypass to avoid turbine mortality. The project has traded off head loss to minimize future eel mortality.</p> |
| 8. Climate Change <p>The effect of damming on methane emissions conducted in a central European impounded river revealed that the reservoir reaches are a major source of methane emissions and that areal emission rates far exceed previous estimates for temperate reservoirs or rivers. It showed that sediment accumulation correlates with methane production and subsequent ebullitive release rates. Results suggested that sedimentation-driven methane emissions from</p> | Q9: Section 4.7.1, P-4-50 of the ER states, “ <i>OPG has been an active corporation in better understanding the effects of climate change on its facilities and operations</i> ”, but will OPG consider the effects that a redeveloped Calabogie Dam will have on climate change over the next 100 years? | <p>The Question states: “but will OPG consider the effects that a redeveloped Calabogie Dam will have on climate change over the next 100 years?” The question and the reference to the European article seems to infer that the Calabogie Dam will have a negative effect on climate over the next 100 years related to the impoundment of the River.</p> <p>Please note that OPG is not redeveloping dams, it is redeveloping an existing generating station that has been in place for over 100 years. The existing dams are not being changed, and as indicated in a number of locations in the Reports, OPG intends to manage the Madawaska River in full accordance with all of the flow and water level targets and compliance conditions identified in the WMP.</p> <p>The proposed project does not propose any impoundment of the existing Madawaska River. For this reason there are no methane emissions related to the Calabogie redevelopment, This project is replacing an existing GS just upstream in the existing forebay of the exiting GS.</p> |

| Comment | Question | Response |
|--|----------|--|
| <p>dammed river hot spot sites can potentially increase global freshwater emissions by up to 7%.¹</p> | | <p>There is no inundation associated with the construction of this project, and no removal of any plant material.</p> <p>Having dams and the ability to control water are critical to managing water and flooding therefore beneficial to mitigating the impacts of climate change. The proposed project will also increase the renewable power generated at the facility.</p> <p>It is possible that the questioner is suggesting or inferring that the dam that controls Calabogie Lake water levels should be removed? OPG would note that there are hundreds of cottages and permanent homes situated around Calabogie Lake that have been constructed and lived in with expectations that Lake levels are managed according to the existing Water Management Plan. Furthermore, there are numerous property owners downstream of Calabogie GS that also rely on the facility's ability to control flood flows. As well, there is a significant amount of other public infrastructure such as roads that have been built around and near the Lake and use of which is dependent on relative certainty with respect to Lake levels.</p> <p>The water levels that are prescribed in the Madawaska River WMP can only be maintained by the existing control structures. It is OPG's view that removing the control facilities would be unacceptable to virtually all property owners upstream and downstream of the facility and moreover it would further weaken the ability to manage water levels during flood events. Therefore, removing the water control facilities would seem likely to be a very economically costly alternative for hundreds of households and government bodies. Furthermore, OPG does not have the authority to remove dams along the Madawaska River system as part of this Project.</p> <p>Within a Canadian context a number of recent projects in Quebec and Manitoba have demonstrated the net benefits of hydropower from the perspective of reducing greenhouse gas emissions. For example, there is readily available research from Hydro Quebec on reservoirs and greenhouse gas emissions: https://www.hydroquebec.com/sustainable-development/specialized-documentation/ghg-reservoir.html. All of this evidence suggests that hydropower is a much preferred option over any fossil fuel based electrical generation. The article referred to in the question seems to refer to the River Saar that is located in France and Germany. The watershed conditions with between the Saar and Madawaska with respect to sediment would appear to be extremely different. The</p> |

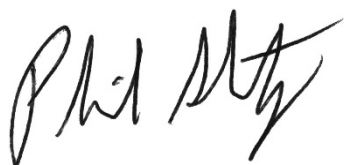
Ms. Linda Heron
October 21, 2019

| Comment | Question | Response |
|---------|---|---|
| | | Madawaska River watershed is generally forested with little urban or agricultural development and is located on the Canadian Shield and therefore, large amounts of sediment do not appear to be discharged along the way. Regardless, the proposed project does not result in any new impoundment which is the root of the concern expressed in the article. |
| | Q10: Will the dam design have adequate spill capacity and resilience to withstand the extremes of climate change? | OPG is currently assessing the facility with respect to MNRF Dam Safety Guidelines and has been in contact with the Ministry on this topic. Dam Safety requirements will be addressed in a separate project from the powerhouse redevelopment. Climate change is an element OPG is considering as part of the Dam Safety Assessment. |

We hope that the above responses adequately address all your questions. We will be including the comments, questions and responses as part of the public record. If you have any further questions, please do not hesitate to contact us.

Sincerely,

Arcadis Canada Inc.



Phil Shantz, M.E.S., M.C.I.P., R.P.P.
Vice-President

c.c. Svetlana Helc, Ontario Power Generation
Gillian MacLeod, Ontario Power Generation



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25 January 2020

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Re: Proposed Calabogie Generating Station Redevelopment Project
Notice of Completion

Dear Sirs:

The Ontario Rivers Alliance (ORA) is writing to comment on the Environmental Report (ER) issued by Ontario Power Generation (OPG) for the redevelopment of the existing Calabogie Generating Station (GS) on the Madawaska River, and to respond to OPG's 21 October 2019 response to our 22 August 2019 submission. Underlining is for emphasis only.

Fish Passage:

In your response to ORA's Comment 1 (Q1), you indicated that the new Calabogie GS is being designed for American Eel passage, but that "*only certain components of it will be initially constructed*". ORA submits that in the chance that Eels present themselves without notice, that the eel ladder and inclined screen rack should already be in place during those months that Eels are known to require passage.

In your response to ORA's Comment 1 (Q2), you indicated that "*providing passage for species such as Walleye and River Redhorse was not deemed necessary*". ORA submits that one of the most significant reasons for the decline in many iconic species of fish in Ontario is the almost total lack of fish passage at hydroelectric facilities, including the Calabogie GS and the other facilities on the Madawaska River. There are currently only three hydroelectric dams out of a total of 224 in Ontario that have installed fish passage. Without the provision of safe and suitable passage, fish are unable to move upstream to access critical habitat and spawning beds; and during downstream migrations many fish pass through the turbines and are killed or injured.



Impeding the passage of migratory fish species has been found to be the most significant ecosystem impact at over 60% of the projects in a world commission on dams survey. In 36% of these cases, the impact of the dam on migratory fish was not anticipated during project planning.¹

The ER states that, *“Historically, three species at-risk were present in the system: River Redhorse, American Eel, and Lake Sturgeon. Sturgeon has not been known from this portion of the Madawaska River for many years...”*². In the case of Lake Sturgeon, non-fragmented habitats are critical, as adults migrate considerable distances.³ Downstream passage through waterpower facilities and dams can cause injury or direct mortality to all life stages of Lake Sturgeon from exposure to extreme changes in water pressure, cavitation, shear, turbulence or mechanical injuries, entrainment and impingement^{4,5}. As a result, it has been concluded that, *the historical loss of habitat through impoundment and fragmentation and the failure to mitigate these losses is likely the greatest ongoing impediment slowing the recovery of sub-populations of Lake Sturgeon inhabiting highly developed systems such as the Ottawa River*⁶. *Lake Sturgeon in fragmented reaches of the Ottawa River exist in reduced numbers and have size distributions consisting predominately of larger individuals, indicating recruitment failure*^{7,8,9,10}.

The Environmental Commissioner for Ontario (ECO) stated in the 2014/2015 Annual Report Supplement,

*...ignoring the necessity for fish passage can create ecological costs for Ontario's fish species and river ecosystems. The ECO urges the MNRF to fix this long-standing and significant ecological problem for existing and future projects.*¹¹

The fact that Lake Sturgeon and American Eel no longer exists in this section of the Madawaska River, is all the more reason that OPG should make every effort to rehabilitate these populations and include effective fish passage for these and other fish species at this facility. OPG is a provincial entity and as such should set the example as a beacon for responsible and sustainable hydroelectric facilities and operations in Ontario.

ORA recommends that fish passage be installed at all new and redeveloped OPG facilities, and that protection and restoration of aquatic species at risk and other fish populations be made a priority.

Climate Change:

In your response you also addressed ORA's Comment 8 (Q9), in which you seem to have missed our point. ORA is not implying that you should remove the dam or drain the reservoir; we were simply pointing out that greenhouse gas emissions (GHG) resulting from the operation of this facility must be acknowledged and considered as an environmental impact.

OPG's response to ORA provided a link to *“readily available research from Hydro Quebec on reservoirs and greenhouse gas emissions”*; however, the lead scientist in all of their studies is Alain Tremblay, PhD., Environmental Sciences, Hydro Quebec. Studies are highly suspect when a corporation uses their own in-house scientists rather than relying on independent arms-length scientists.



ORA submits that Hydro Quebec's studies are biased in favour of its own profit-based self-interests. As you well know, the "emission free" label is used to great benefit as a sales pitch for waterpower producers. As a matter of fact, the link you provided in your response to ORA indicates that one of the payoffs is the "*potential CO₂ emission credits in the future Canadian carbon market*", and another is the sale of "*low GHG emissions*"¹² power to other jurisdictions.

Additionally, OPG's ER reports that "*the generation of hydroelectric power is a sustainable source of power that does not produce greenhouse gases and therefore is an important component of Ontario's climate change plan*"¹³. Even Hydro Quebec doesn't claim that hydroelectric does not produce greenhouse gases. Their bogus claim is that "*net GHG emissions from Québec hydropower are significantly lower than electricity generation from natural gas and coal, and on par with wind*"¹⁴.

Contrary to OPG's claims, there are a multitude of independent studies indicating that when sediment builds up behind a dam it releases net emissions of carbon dioxide and methane into the atmosphere for decades and possibly centuries following flooding.^{15,16}

In contrast to the widespread assumption (e.g., in Intergovernmental Panel on Climate Change scenarios) that GHGs emitted from reservoirs are negligible, measurements made in boreal and tropical regions indicate they can be substantial ^{17,18,19}

*"Methane is a potent greenhouse gas with a heat trapping capacity 34 times greater than that of carbon dioxide on a 100 year time scale."*²⁰ Methane is generated in reservoirs from bacteria living in oxygen-starved environments. "*These microbes eat organic carbon from plants for energy, just like people and other animals, but instead of breathing out carbon dioxide, they breathe out methane.*"²¹

The assessment of GHG emissions produced from new and older hydroelectric reservoirs is complex and variable, depending on the amount of upstream erosion, wastewater effluent, agriculture run-off, depth of the reservoir, amount of sediment build-up behind the dam, and the cumulative effects of all these combined influences.

River networks with high nutrient and sediment loading from erosion, agricultural or wastewater effluent, or hard shorelines in residential/industrial/commercial development areas, provides microbial communities with a large source of carbon that can deplete oxygen and fuel methane production. Algal blooms from excessive nutrient loading can further enrich reservoir sediments.²²

*"With the 'green' reputation of large hydroelectric dams already in question, scientists are reporting that millions of smaller dams on rivers around the world make an important contribution to the greenhouse gases linked to global climate change. Their study, showing that more methane than previously believed bubbles out of the water behind small dams..."*²³ For instance,

*With smaller dams storage becomes increasingly important. Reservoirs silting up or becoming overloaded with nutrients are common problems with major reservoirs and could be at least as serious where shallower bodies of water are created – the shallower a water body, the more easily eutrophic it can become. Likewise, methane generation occurs largely where water and sediment meet, and this means that a shallower water body is likely to release more methane [CH₄] per unit area than a deeper water body. Shallow reservoirs are not unlike paddy fields which are known to contribute substantially to methane emissions...*²⁴



Clearly dams and waterpower reservoirs (small and large) contribute to world GHG emissions and these emissions must be carefully assessed and reported in a transparent and authentic attempt to address climate change.

In any event it is clear that a full accounting of greenhouse gas emissions must be carried out before we can be assured that a decision to construct and/or operate waterpower facilities will be a positive or negative contribution to climate change.²⁵ This ER does not address this aspect of GHG emissions that could be produced by this facility, and is therefore misleading.

ORA recommends that OPG undertake a full assessment of the GHG emissions resulting from the operation of the Calabogie GS, taking into account the cumulative effects of all other upstream influences, and include those results as an important consideration in the ER.

Conclusion:

Ontario rivers are facing very challenging times, when the deregulation and streamlining of the regulatory process is taking place at break-neck speed! Most of the 224 hydroelectric facilities in Ontario were built in the late 1800s to early 1900s when very little attention was paid to the environmental costs. Since then the American Eel, Lake Sturgeon and Atlantic Salmon have been decimated – largely due to hydroelectric facilities fragmentating aquatic habitat and a gauntlet of turbines slicing and dicing these iconic fish. We are also experiencing Climate Change in real time, and it's placing increasing pressure on water quantity, water quality and species decline in Ontario rivers. Instead of increasing freshwater resilience and protection, OPG and the Ontario Waterpower Association are lobbying our legislators for additional gutting of the environmental regulatory process²⁶.

OPG has an opportunity to acknowledge these errors and to instead advocate for strengthened environmental protection and resiliency and to right the wrongs of the past.

Respectfully,

Linda Heron
Chair, Ontario Rivers Alliance
(705) 866-1677

Cc: Jessica Polak, VP of Operations, OPG – Jessica.Polak@OPG.com
Jeff Yurek, Minister of Environment, Conservation & Parks – Minister.MECP@ontario.ca

¹ World Commission on Dams. 2000.

² Proposed Calabogie Generating Station Redevelopment Project, Aquatic Environment Technical Support Document, 3.2.5.2, Fish Community Composition. P-75/173.

³ Golder Associates Ltd. 2011. *Recovery Strategy for Lake Sturgeon (Acipenser fulvescens) – Northwestern Ontario, Great Lakes-Upper St. Lawrence River and Southern Hudson Bay-James Bay populations in Ontario*. Ontario Recovery Strategy, Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vii + 77 pp.

⁴ Cada, G.F. 1998. Better science supports fish-friendly turbine designs. *Hydro Review*. November 1998: 52-61.



- ⁵ Golder Associates Ltd. 2011. *Recovery Strategy for Lake Sturgeon (Acipenser fulvescens) – Northwestern Ontario, Great Lakes-Upper St. Lawrence River and Southern Hudson Bay-James Bay populations in Ontario*. Ontario Recovery Strategy, Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vii + 77 pp.
- ⁶ Haxton, T.J., and Findlay, C.S. 2008. Variation in lake sturgeon (*Acipenser fulvescens*) abundance and growth among river reaches in a large regulated river. *Canadian Journal of Fisheries and Aquatic Sciences*. 65: 645-657.
- ⁷ Haxton, T.J. 2002. An assessment of lake sturgeon (*Acipenser fulvescens*) in various reaches of the Ottawa River. *Journal of Applied Ichthyology* 18: 449-454.
- ⁸ Haxton, T.J., and Findlay, C.S. 2008. Variation in lake sturgeon (*Acipenser fulvescens*) abundance and growth among river reaches in a large regulated river. *Canadian Journal of Fisheries and Aquatic Sciences*. 65: 645-657.
- ⁹ Haxton, T.J. and Findlay, C.S. 2009. Variation in large-bodied fish community structure and abundance in relation to water management regime in a large regulated river. *Journal of Fish Biology*. 74: 2216-2238.
- ¹⁰ Golder Associates Ltd. 2011. *Recovery Strategy for Lake Sturgeon (Acipenser fulvescens) – Northwestern Ontario, Great Lakes-Upper St. Lawrence River and Southern Hudson Bay-James Bay populations in Ontario*. Ontario Recovery Strategy, Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. vii + 77 pp.
- ¹¹ Ibid.
- ¹² *Hydro Quebec, Sustainable Development, Greenhouse gas emissions and reservoirs*.
- ¹³ Proposed Calabogie Generating Station Redevelopment Project, Environmental Report, 4.7.4 Climate Change Impacts (Mitigation Of) – Greenhouse Gas Reduction. P-4-70.
- ¹⁴ *Understanding Quebec Hydropower, Among the Lowest Greenhouse Gas Emissions of all Electricity Generation Options*.
- ¹⁵ Venkiteswaran, J.J., Schiff, S.L., St. Louis, V.L., Matthews, C.J.D., Boudreau, N.M., Joyce, E.M., Beaty, K.G., and Bodaly, R.A. (2013), Processes affecting greenhouse gas production in experimental boreal reservoirs, *Global Biogeochem. Cycles*, 27, doi:10.1002/gbc.20046
- ¹⁶ Maeck, A., DelSontro, T., McGinnis, D.F., Fischer, H., Flury, S., Schmidt, M., Fietzek, P. and Lorke, A., 2013. Sediment Trapping by Dams Creates Methane Emission Hot Spots, *Environmental Science and Technology*, 8130-8137, Online: <http://www.dx.doi.org/10.1021/es4003907>
- ¹⁷ St. Louis, V.L., Kelly, C.A., Duchemin, E., Rudd, J.W.M., Rosenberg, D.M. 2000. Reservoir Surfaces as sources of greenhouse gases to the atmosphere : a global estimate. *BioScience* 50(9) : 766-775.
- ¹⁸ World Commission on Dams. 2000. Introduction to Global Change, Working Paper of the World Commission on Dams, Secretariat of the World Commission on Dams, Cape Town, South Africa.
- ¹⁹ Environment Canada. 2004. *Threats to Water Availability in Canada. National Water Research Institute, Burlington, Ontario. NWRI Scientific Assessment Report Series No. 3 and ACSD Science Assessment Series No. 1. 128 p.*
- ²⁰ Myhre, G., Shindell, D., Breon, F.-M., Collins, W., Fuglestedt, J., Huang, J., Koch, D., Lamarque, J.F., Lee, D., Mendoza, B., Nakajima, T., Robock, A., Stephens, G., Takemura, T., Zhang, H., Anthropogenic and natural radiative forcing. In *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*; Stocker, T. F., Qin, D., Plattner, G.-K., Tignor, M., Allen, S. K., Boschung, J., Nauels, A., Bex, V., Midgely, P. M., Eds.; Cambridge University Press: Cambridge, U.K. and New York, U.S.A., 2013.
- ²¹ Beaulieu, J.J., Smolenski, R. L., Netch, C.T., Townsend-Small, A., and Elovitz, M.S., 2014. *High Methane Emissions from a Midlatitude Reservoir Draining an Agricultural Watershed. United States Environmental Protection Agency, Office of Research and Development, National Risk Management Research Laboratory, Cincinnati, Ohio 45268, United States*.
- ²² West, W.E., Coloso, J.J., Jones, S.E. Effects of algal and terrestrial carbon on methane production rates and methanogen community structure in a temperate lake sediment. *Freshw. Biol.* 2012, 57 (5), 949-955.
- ²³ Phys.org. Sediment trapped behind dams makes them 'hot spots' for greenhouse gas emissions. July 31, 2013. Online : <http://phys.org/news/2013-07-sediment-hot-greenhouse-gas-emissions.html>
- ²⁴ Abbasi, T. and Abbasi, S.A. 2011b. Small hydro could add up to big damage. *SciDev.Net* 20/06/11. Online: <http://www.scidev.net/global/water/opinion/small-hydro-could-add-up-to-big-damage-1.html>



²⁵ Gower, T., Rosenberger, A., Peatt, A., and Hill, A. 2012. *Tamed Rivers: A guide to river diversion hydropower in British Columbia*. Prepared for Watershed Watch Salmon Society. 64pp. Online: <http://www.watershed-watch.org/resources/tamed-rivers-a-guide-to-river-diversion-hydropower-in-british-columbia/>

²⁶ [Province to ease EA requirements for minor waterpower projects, January 23, 2020, Daily Commercial News.](#)

Monday February 24, 2020

Linda Heron
Chair, Ontario Rivers Alliance
379 Ronka Road
Worthington, ON P0M 3H0

BY EMAIL ONLY: Linda@OntarioRiversAlliance.ca

Dear Linda,

Thank you for your letter received by email on January 25th and for the opportunity to clarify our responses as follows:

ORA Question:

(Q1), you indicated that the new Calabogie GS is being designed for American Eel passage, but that “only certain components of it will be initially constructed”. ORA submits that in the chance that Eels present themselves without notice, that the eel ladder and inclined screen rack should already be in place during those months that Eels are known to require passage.

Clarification for ORA’s Question:

For your background, in 2011 correspondence between OPG and the Ministry of Natural Resources concluded that there were no known occurrences of American Eel, or areas of protected habitat at or in the immediate area of Calabogie Generating Station, the Stewartville Generating Station (downstream) or Mountain Chute Generating Station (upstream). OPG is not aware of any new documented occurrences of American eel since 2011, and the two barriers to eel movement downstream of Calabogie have not been altered (Arnprior and Stewartville GSs). In recent years, efforts to recover American Eel in the Ottawa River have been in play, including construction of an eel passage structure on the Ottawa River at Chaudière GS. OPG also complies with the Endangered Species Act for American Eel through its Mitigation Plan activities at Chats and Chenaux GS on the Ottawa River. All of this is to say that as circumstances continue to change and American eel recover further up the system, OPG will be prepared to further support its recovery up the Madawaska River.

The new Generating Station is designed for American Eel passage. At commissioning, the proposed GS will have an eel ladder/trap to facilitate upstream movement of eels. OPG will install a ladder in the tailrace of the proposed new station. The ladder will lead to a trap/tank where any eels can be counted and tagged prior to manually moving the fish upstream of the station. Since its unlikely eels would move up the North or South Channel at Calabogie due to the height and flows at the water control structures, any eels that come up the Madawaska River would be detected at the proposed ladder and trap.

Once eels are moved upstream of the station with the ladder/trap or if there is a documented presence of large eels upstream of the proposed station, OPG will install an inclined screen rack with spacing of no more than 19 mm. The inclined screen will lead to a bypass structure, which will be designed and built during the construction, that will allow eels to move downstream and prevent entrainment. When installed the inclined screen would be

deployed from July through September. The screen would be removed after September to minimize clogging from leaf debris in the fall and ice damage in the winter.

ORA Question:

(Q2), you indicated that “providing passage for species such as Walleye and River Redhorse was not deemed necessary”. ORA submits that one of the most significant reasons for the decline in many iconic species of fish in Ontario is the almost total lack of fish passage at hydroelectric facilities, including the Calabogie GS and the other facilities on the Madawaska River. There are currently only three hydroelectric dams out of a total of 224 in Ontario that have installed fish passage. Without the provision of safe and suitable passage, fish are unable to move upstream to access critical habitat and spawning beds; and during downstream migrations many fish pass through the turbines and are killed or injured.

Providing passage for species such as Walleye and River Redhorse was not deemed necessary. Unlike the migratory American Eel, the other species are able to complete their life histories as resident populations within the reach between the Calabogie GS and the Stewartville GS.

For downstream passage, the intake design proposed for the Calabogie GS offers a screened intake with specifically designed slow, fish friendly, approach velocities. These design characteristics prevent fish from becoming exposed to the risk of the turbines in the generating station and avoids the need for fish friendly turbines.

Clarification for ORA’s Question:

Fish passage for walleye and suckers in Ontario has had limited success, typically there is less than 30% passage at various fish ladders or passage structures in Ontario (Bunt et al. 1999; OMNR 2010). The Madawaska River management plan also reviewed fisheries issues on the river and no mention of fish passage at the Calabogie GS is found in the document (OMNR 2009).

To help manage fishes on the Madawaska R. upstream and downstream of the Calabogie GS, OPG has worked with anglers and the OMNRF to manage flows (especially during the spring for spawners such as walleye and river redhorse suckers). At the existing Calabogie GS, OPG maintains minimum flows (5 cms) on the North Channel Spillway based on studies by OPG and OMNR for spring spawners (OMNR 2009). Since fish passage for walleye and suckers has not proven effective to maximize the spawning ability for these spring spawners OPG envisions that impacts from the station will be managed through habitat improvements and flow improvements. The proposed generating station will maintain the spring spawning flows at the North Channel. It is also envisioned that spawning shoals will be constructed downstream of the proposed generating station to offset habitat changes on the River, suitable flows and depths will be maintained over the spawning shoals to ensure they are productive for spring spawning fishes (e.g., walleye, suckers, etc.) .

OMNR has also conducted stocking of walleye on Calabogie Lake to enhance walleye population and offset for overfishing (OMNR 2009)

For spring spawners upstream of the existing Calabogie GS and proposed station, OPG has constructed spawning shoals downstream of the Barrett Chute GS (OMNR 2009); minimum flows are maintained over the spawning

shoal to ensure they are functional for spring spawners. At the High Falls spillway (the spillway adjacent to Barrett Chute GS), when spill occurs in the spring, and spring spawners have accessed and likely spawned in the spillway, OPG maintains a minimum flow to protect spring spawners and the development of eggs and larvae. When sufficient time has passed after spawning, OPG in consultation with OMNR has developed a stepped decrease in flows to allow developing larvae to drift downstream. OPG also maintains a minimum year round flow to protect aquatic habitat in the High Falls spillway.

One of the reasons that there are so few fish ladders or fish passage around dams in Ontario is the ineffectiveness of fish passage for Percids (walleye) and Catostomids (suckers), since many of the dams and generating stations in Ontario are on river systems where these species are the dominant migratory fishes, passage is not a useful mitigation measure. However, these species respond favourably to habitat improvements and flow manipulation, based on the species present OPG proposes these offsets to mitigate impacts from the proposed station.

References

Bunt, C.M., C. Katapodis and R.S. McKinley. 1999. Attraction and passage efficiency of white suckers and smallmouth bass by two denil fishways. N. American Journal of Fisheries Management. 19: 793 – 803.

Kerr, S.J. 2010. Fishways in Ontario. Fisheries Policy Section. Biodiversity Branch. Ontario Ministry of Natural Resources. Peterborough. ON. 34 pages.

Ontario Ministry of Natural resources. 2009. Madawaska River Water Management Plan. 254 pages.

ORA Question:

Climate Change:

In your response you also addressed ORA's Comment 8 (Q9), in which you seem to have missed our point. ORA is not implying that you should remove the dam or drain the reservoir; we were simply pointing out that greenhouse gas emissions (GHG) resulting from the operation of this facility must be acknowledged and considered as an environmental impact.

OPG's response to ORA provided a link to "readily available research from Hydro Quebec on reservoirs and greenhouse gas emissions"; however, the lead scientist in all of their studies is Alain Tremblay, PhD., Environmental Sciences, Hydro Quebec. Studies are highly suspect when a corporation uses their own in-house scientists rather than relying on independent arms-length scientists.

ORA submits that Hydro Quebec's studies are biased in favour of its own profit-based self-interests. As you well know, the "emission free" label is used to great benefit as a sales pitch for waterpower producers. As a matter of fact, the link you provided in your response to ORA indicates that one of the payoffs is the "potential CO2 emission credits in the future Canadian carbon market", and another is the sale of "low GHG emissions" power to other jurisdictions.

Additionally, OPG's ER reports that "the generation of hydroelectric power is a sustainable source of power that does not produce greenhouse gases and therefore is an important component of Ontario's climate change plan"¹³. Even Hydro Quebec doesn't claim that hydroelectric does not produce greenhouse gases.

Their bogus claim is that “net GHG emissions from Québec hydropower are significantly lower than electricity generation from natural gas and coal, and on par with wind”¹⁴.

Contrary to OPG’s claims, there are a multitude of independent studies indicating that when sediment builds up behind a dam it releases net emissions of carbon dioxide and methane into the atmosphere for decades and possibly centuries following flooding.^{15, 16}

In contrast to the widespread assumption (e.g., in Intergovernmental Panel on Climate Change scenarios) that GHGs emitted from reservoirs are negligible, measurements made in boreal and tropical regions indicate they can be substantial ^{17, 18. 19}

Methane is a potent greenhouse gas with a heat trapping capacity 34 times greater than that of carbon dioxide on a 100 year time scale.²⁰ Methane is generated in reservoirs from bacteria living in oxygen-starved environments. "These microbes eat organic carbon from plants for energy, just like people and other animals, but instead of breathing out carbon dioxide, they breathe out methane."²¹

The assessment of GHG emissions produced from new and older hydroelectric reservoirs is complex and variable, depending on the amount of upstream erosion, wastewater effluent, agriculture run-off, depth of the reservoir, amount of sediment build-up behind the dam, and the cumulative effects of all these combined influences.

River networks with high nutrient and sediment loading from erosion, agricultural or wastewater effluent, or hard shorelines in residential/industrial/commercial development areas, provides microbial communities with a large source of carbon that can deplete oxygen and fuel methane production. Algal blooms from excessive nutrient loading can further enrich reservoir sediments.²²

“With the “green” reputation of large hydroelectric dams already in question, scientists are reporting that millions of smaller dams on rivers around the world make an important contribution to the greenhouse gases linked to global climate change. Their study, showing that more methane than previously believed bubbles out of the water behind small dams....”²³. For instance With smaller dams storage becomes increasingly important. Reservoirs silting up or becoming overloaded with nutrients are common problems with major reservoirs and could be at least as serious where shallower bodies of water are created – the shallower a water body, the more easily eutrophic it can become. Likewise, methane generation occurs largely where water and sediment meet, and this means that a shallower water body is likely to release more methane [CH₄] per unit area than a deeper water body. Shallow reservoirs are not unlike paddy fields which are known to contribute substantially to methane emissions...²⁴

Clearly dams and waterpower reservoirs (small and large) contribute to world GHG emissions and these emissions must be carefully assessed and reported in a transparent and authentic attempt to address climate change.

In any event it is clear that a full accounting of greenhouse gas emissions must be carried out before we can be assured that a decision to construct and/or operate waterpower facilities will be a positive or negative contribution to climate change.²⁵. This ER does not address this aspect of GHG emissions that could be produced by this facility, and is therefore misleading.

ORA recommends that OPG undertake a full assessment of the GHG emissions resulting from the operation of the Calabogie GS, taking into account the cumulative effects of all other upstream influences, and include those results as an important consideration in the ER.

Conclusion:

Ontario rivers are facing very challenging times, when the deregulation and streamlining of the regulatory process is taking place at break-neck speed! Most of the 224 hydroelectric facilities in Ontario were built in the late 1800s to early 1900s when very little attention was paid to the environmental costs. Since then the American Eel, Lake Sturgeon and Atlantic Salmon have been decimated – largely due to hydroelectric facilities fragmenting aquatic habitat and a gauntlet of turbines slicing and dicing these iconic fish. We are also experiencing Climate Change in real time, and it's placing increasing pressure on water quantity, water quality and species decline in Ontario rivers. Instead of increasing freshwater resilience and protection, OPG and the Ontario Waterpower Association are lobbying our legislators for additional gutting of the environmental regulatory process²⁶.

OPG has an opportunity to acknowledge these errors and to instead advocate for strengthened environmental protection and resiliency and to right the wrongs of the past.

Clarification for ORA's Question:

We acknowledge your concerns noted in your recent correspondence. We would like to distinguish between a redevelopment project and a greenfield project. With a redevelopment project such as Calabogie, the reservoir was built 100 years ago. As the Calabogie Project is not changing the existing reservoir area, there will be no change in greenhouse gas emissions at this site, and therefore there is no incremental impact with respect to the environmental assessment. However, you are correct that for new hydroelectric developments that involve the creation of new reservoirs, we would quantify new emissions as part of an environmental assessment process.

We trust that these clarifications help to address your questions. Please feel free to contact me should you wish to discuss further. My cell is the best if you wish to call, 416 528 967 or alternatively my email is also reliable – Gillian.macleod@opg.com

All the best,



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