LOWER STURGEON GENERATING STATION
MATTAGAMI RIVER
FISHERIES IMPACT ASSESSMENT
2006

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1.0 INTRODUCTION

C. Portt and Associates was retained, as part of the SENES Consultants Limited project team, by Ontario Power Generation Inc. (OPG) to conduct a fisheries impact assessment of the proposed Lower Sturgeon Generating Station (GS) redevelopment. The Lower Sturgeon GS is located approximately 40 kilometres (km) north of the Timmins city centre on the Mattagami River (Figure 1). This report presents the results of the fisheries impact assessment, that is based upon investigations of aquatic habitat and the fish community at the Lower Sturgeon GS in 2005 and 2006, as well as the proposed redevelopment works.

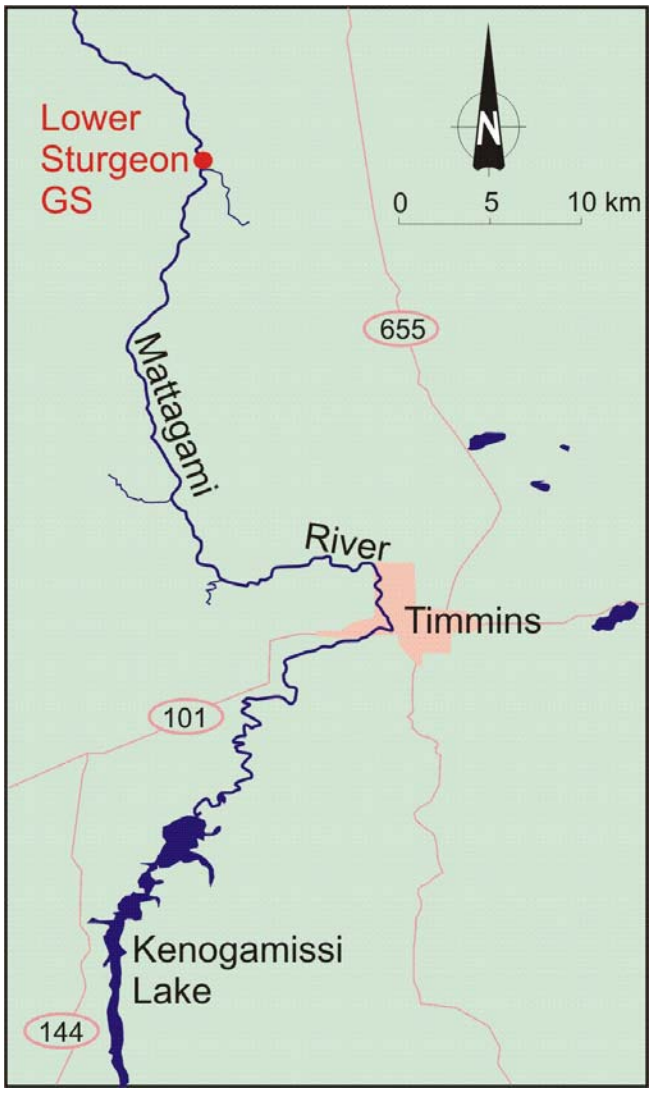

Figure 1: Location of the Lower Sturgeon GS on the Mattagami River near Timmins, Ontario.

2.0 METHODS

The results of investigations of the existing conditions at the Lower Sturgeon GS (C. Portt and Associates, 2006a; 2006b; 2006c) were used in conjunction with information provided by OPG regarding the proposed GS expansion project to assess the potential impact of the project on the fisheries resources that utilize the Lower Sturgeon GS site.

An additional fish collection was conducted by C. Portt and Associates staff (G. Coker, J. Reid) on June 21, 2006. Fish were collected by electrofishing in wadeable areas along the shore of the riffles that extend downstream of the tailrace using a Halltech Model HT 2000 backpack electrofisher. At this time the habitat was checked for any gross changes that might have occurred since the detailed habitat characterization in June 2005.

3.0 RESULTS OF JUNE 21, 2006 FIELD INVESTIGATION

Fish collected by electrofishing were 23 logperch (*Percina caprodes*), 5 johnny darters (*Etheostoma nigrum*), 2 juvenile burbot (*Lota lota*), 2 mottled sculpin (*Cottus bairdii*), 3 troutperch (*Percopsis omiscomaycus*), 1 mimic shiner (*Notropis volucellus*), 2 lake chub (*Couesius plumbeus*), 2 juvenile smallmouth bass (*Micropterus dolomieu*), and 3 yellow perch (*Perca flavescens*). Smallmouth bass, burbot, troutperch, and yellow perch were not captured during the previous year's electrofishing on June 8, 2005; the other species were.

Logperch and longnose dace are typical residents of riffle areas, and mottled sculpin are often found among coarse substrates, regardless of water velocity. Young burbot often occupy the interstitial spaces along cobble or rip rap shores (Scott and Crossman, 1973; G. Coker, personal observation). Lake chub prefer lakes or larger rivers (Scott and Crossman, 1973), and are known to spawn along the shallow rocky margins of larger rivers (Becker, 1983). The remaining fishes are likely found throughout the various habitats downstream of the Lower Sturgeon GS dam, but are probably more abundant in quieter water.

No significant changes in habitat from June, 2005, were apparent.

4.0 POTENTIAL IMPACTS TO FISH HABITAT

4.1 Generating station redevelopment

The existing two-unit Lower Sturgeon GS, with a maximum output of 5.3 megawatts, will be replaced by a new two-unit GS with a maximum output of approximately 14 megawatts. The existing GS will be completely demolished and the proposed GS will be built upon the footprint of the existing GS. The configuration of the GS will remain the same, with water from the headpond directly entering short penstocks contained within the powerhouse, passing through the turbines and draft tubes, and then discharging via the tailrace (Figure 2). The intake and the tailrace of the proposed facility will occupy the same locations and have the same orientation as the existing facility, however, they will be deepened to accommodate the larger plant flows (Francois Vitez, Ing., Gestion Conseil SCP, personal communication. November 13, 2006).

Mitigation

- In-water construction activities should be timed to avoid the spawning and incubation period of spring spawning fishes such as walleye (*Sander vitreus*), lake sturgeon (*Acipenser fulvescens*) and suckers (Catostomidae), which typically excludes in-water work from April 1 to July 1.
- Dredged material should be disposed on land above the high water level and suitably contained/stabilized to prevent the dredged material from re-entering the water.
- Sediment and erosion control measures should be implemented as required prior to work and maintained during the work phase, to prevent entry of sediment into the water. This should include sediment removal from water pumped from within cofferdam enclosures.

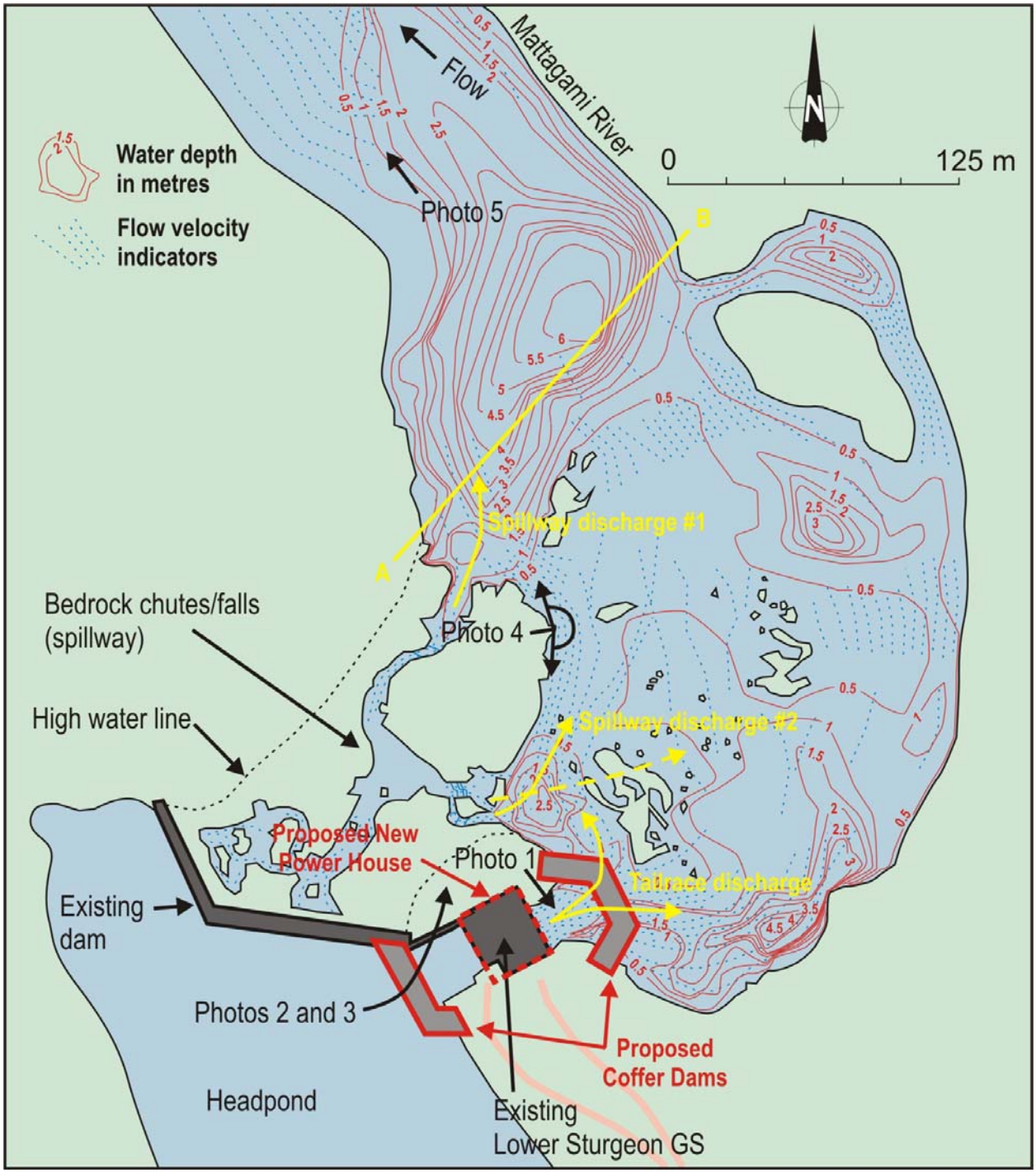

Figure 2: Detail of the study area in the vicinity of the Lower Sturgeon GS, showing the proposed redevelopment works, photograph locations, water depths, and the primary flow paths through the spillway and the tailrace. During high river flows the flow path from Spillway discharge #2 follows the dashed arrow. Note that the blue velocity indicators denote faster water when close together, and slower water when more widely spaced.

- All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance (e.g. petroleum products, debris etc.) from entering the water.
- The floor of the tailrace and any area of the exiting riverbed that is deepened and re-contoured to expose bedrock, should be covered by a layer of cobble-sized material to provide better habitat.

Assessed impact

Reconstruction of the Lower Sturgeon GS upon the same footprint and maintaining the same intake and tailrace locations, will result in permanent alterations to the floor of the short intake channel and the floor of the short tailrace, as both of these will need to be deepened close to the GS to accommodate the flows of the proposed larger GS. The areas being altered are not thought to be critical habitats, and likely have substrates of exposed bedrock or exposed bedrock overlain with a relatively thin layer of coarse granular material. These works will result in a minor alteration of habitat, but not a habitat loss or a reduction in habitat productivity. Provided that the recommended mitigation measures are implemented, the net impact to fisheries production will be negligible.

4.2 Temporary construction impacts

Temporary impacts to fish habitat will occur due to the placement of cofferdams and the dewatering of habitat within those cofferdams. A cofferdam is required at the intake structure to dewater approximately 520 metres^2 (m^2)(0.052 hectares) of the Mattagami River. A second cofferdam is required at the tailrace to dewater approximately 1080 m^2 (0.108 hectares) of river, most of which is presently existing tailrace (Photograph 1), to allow the deepening of the new tailrace and the decommissioning of the existing GS. It is anticipated that the cofferdams will be in place for 12 to 14 months.

During the period when no flow is being diverted through the GS, all flow in the Mattagami River will be passing through the spillway (Figure 2).

Mitigation

- In-water construction of cofferdams should be timed to avoid the spawning and incubation period of spring spawning fishes, such as walleye, lake sturgeon and suckers, which typically excludes in-water work from April 1 to July 1.
- If all water is being diverted through the spill channel at the time of the walleye, lake sturgeon and sucker spawning period, all water should continue to be diverted through the spill channel until the end of the hatch (July 1).
- Sediment and erosion control measures should be implemented as required prior to work and maintained during the work phase, to prevent entry of sediment into the water. This should include sediment removal from water pumped from within cofferdam enclosures.
- All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance (e.g. petroleum products, debris etc.) from entering the water.
- Blasting, if required, should adhere to the Fisheries and Oceans Guidelines for the Use of

Explosives In or Near Canadian Fisheries Waters (http://www.dfo-mpo.gc.ca/canwaters-eauxcan/infocentre/guidelines-conseils/guides/explosguide/chap3_e.asp#GUIDELINES).

Photograph 1: View of the Lower Sturgeon GS tailrace. May 1, 2006.

Assessed impact

The relatively small areas that will be temporarily dewatered have historically been impacted by the construction and operation of the existing Lower Sturgeon GS, and are likely exposed bedrock or exposed bedrock overlain with a relatively thin layer of coarse granular material. Because these areas were designed to convey water efficiently, the bottom has few protruding features that would provide structural habitat for fish. These areas are not thought to be critical for any life stages of any of the species present, and the fact that they are temporarily unavailable is not expected to have any significant impact on the overall fish production of the system.

Diverting all flow through the spillway will not result in increased erosion since the spill channel is the original channel of the Mattagami River, and has historically accommodated the total river flow. Walleye spawning observations in 2005 and 2006 did not identify the spillway as a spawning area for walleye or suckers, and no other critical or important habitats are thought to occur here that may be impacted by this temporary change in spill channel flow regime. Flows in walleye and sucker spawning habitat that may be, and probably are, present in the several kilometres of rapids downstream of the confluence of the tailrace and the spillway will not be altered during this construction period, as flow in the Mattagami River will continue to be managed as it was prior to the redevelopment. The temporary change in spill channel flow regime is not expected to have a negative effect upon the resident fish community.

4.3 Operation of the new Lower Sturgeon Generating Station

The redeveloped Lower Sturgeon GS will remain a run-of-the-river hydroelectric plant, and therefore will not change the flow regime of the Mattagami River or the management of water levels in the upstream reservoir. However, the proposed GS will have a greater flow capacity and therefore will alter the distribution of flow volume between the GS and the spillway (Figure 2). Presently, water is spilled through the spillway when flows exceed the 56 m^3/s capacity of the GS, which occurs approximately 65% of the time (Ontario Hydro, 1992). When the GS is capable of taking all river flow, approximately 2 - 3 m^3/s leaks through the dam stoplogs providing a small amount of flow to the spillway. The redeveloped Lower Sturgeon GS will have a rated flow of 123 m^3/s which will decrease the frequency of water spilled through the spillway from approximately 65% to approximately 26% of the time. It is thought that 2 - 3 m^3/s of flow through the control dam would continue to occur following redevelopment.

Downstream of where flows from the tailrace and the spillway mix, flow velocity and volume will not differ between pre and post redevelopment. However, the increased capacity of the GS will result in more water, on average, being passed through the GS and less through the spillway, resulting in some changes in flow velocity within discrete areas immediately downstream of the tailrace and spillway (Figure 2).

Mitigation

No mitigation is proposed.

Assessed impact

The existing flow regime within the spillway is approximately 2 - 3 m^3/s for approximately 35% of the time. With more water being diverted through the spillway, post-development flows of approximately 2 - 3 m^3/s within the spillway will occur approximately 74% of the time, with flows in excess of 2 - 3 m^3/s probably concentrated around the spring freshet. Habitat within the spillway is poor, being almost exclusively a series of bedrock chutes that are subjected to extremes in flow (Photographs 2 and 3). The extremes of flow and bedrock substrate limit the amount of habitat available and its productivity. A decrease in the amount of time that spillage exceeds the minimum flow of 2 - 3 m^3/s is not expected to further decrease the fish productivity of the spillway.

Since the orientation of the intake and the tailrace will not change post-development, habitat shifts in the vicinity of the intake and the tailrace that may occur due to changes in water flow over particular substrates are expected to be minimal. The primary change in habitat due to the operation of the expanded GS will be subtle changes in flow velocity and water depth within the broader area below the GS and the spillway (Figure 2). This area is generally shallow, with a few discrete deep locations, and the anticipated changes in the distribution of flow between the GS and the spillway will likely have some effect upon flow velocities over the riffles immediately below the GS and the spillway. It is anticipated that some portions of these riffles will be slightly faster, on average, under the post-development flow regime than what they would be under existing conditions and, conversely, some portions will be slower. Because of the complexity of the riffle habitats in this area (Photograph 4), these changes will result in subtle,

probably balanced, shifts in habitat utilization in close proximity to the tailrace and the spillway. These minor changes in flow velocity and depth will occur mainly near the tailrace and spillway outflows, and decrease in magnitude at greater distances downstream. No habitat will be lost. Downstream of line AB (Figure 2), a deep habitat area will buffer any residual flow changes caused by the post-development operating regime, so that flows in the balance of the 4 km of riffles that provide potential spawning habitat downstream in this section of the Mattagami River, will not change post-development (Photograph 5).

Photograph 2: Spillway with baseflow of approximately 2 - 3 m^3/s. June 8, 2005.

Photograph 3: Spillway during spring freshet. May 1, 2006.

Photograph 4: Panoramic view of complex riffle habitat downstream of the Lower Sturgeon GS and spillway. June 8, 2005. Labels that correspond to those in this photograph are provided in Figure 2 to facilitate comparison.

Photograph 5: Downstream view of riffles located downstream of line AB in Figure 2. June 7, 2005.

5.0 CONCLUSION

Provided that the recommended mitigation measures are implemented, it is our opinion that the redevelopment of the Lower Sturgeon site, and the subsequent operation of the new and enlarged GS, will not have a significant or measurable impact upon the composition or production of the Mattagami River fish community.

Please note the following key points of this assessment.

- Following the completion of construction the total amount of habitat will be unchanged.
- No critical fish habitats, such as walleye, sucker, or lake sturgeon spawning habitats, will be directly altered.
- Small changes in water depths and flow velocities are expected in the riffle areas that are in close proximity to the tailrace and spillway. However, because of the broad range of riffle habitats and the complex flow pattern in this area, the likely result of these flow changes will be a limited redistribution of subtle habitat conditions. These expected changes will occur in only a small portion of the total amount of riffle habitat found downstream of the Lower Sturgeon site.
- The areas that will be directly altered are mostly manmade habitats (the intake structure, the tailrace, and small areas in the immediate vicinity of both) and, although they do contain fish, the fact that they will be temporarily unavailable during construction is not expected to have a significant impact on the productive capacity of the system.

6.0 REFERENCES

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