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March 25, 2010

Ms. Loriena Melnick
Habitat Management Biologist
Fisheries and Oceans Canada – Eastern Arctic Area
PO Box 358
Iqaluit, Nunavut X0A 0H0

Dear Ms. Melnick:

Re: Fresh Water Intake From Nipissar Lake
Type 'A' Water License Application – 3 AM GRA
Rankin Inlet, Nunavut
DFO Habitat File No. N4-09-0037
File No. N-O 14850

1.0 Introduction

As per the letter from Fisheries and Oceans Canada (DFO) to the Nunavut Water Boards (NWB), dated December 16, 2009, and the discussions held during the Technical Meeting teleconference on March 3, 2010, we have obtained additional information to address concerns regarding potential impacts to fish habitat. As outlined herein, we were able to make an assessment of the potential for the intake to impact fish. At this time, we are not able to assess the potential impacts of lake drawdown, due to water taking exceeding the capacity of the Nipissar Lake watershed. As discussed, the GN has undertaken lake studies in 2009 and will continue through 2010, to determine the current and future impacts to lake levels resulting from Hamlet with drawls and the potential impacts on the aquatic environment.

2.0 Water Supply

The community draws its water from the Nipissar Lake, located 2 km northwest of the Hamlet. Nipissar Lake covers an area of 1,090,565 m^3. Using an average depth of 4 metres the estimated volume of the lake is 4,362260 m^3. The total drainage area of Nipissar Lake is 323 hectares. Using an annual precipitation rate of 297.2 mm and an annual evapotranspiration rate of 200 mm, the calculated total recharge to the lake is approximately 314 000 m^3 per year (Nuna Burnside 2009). This is lower than the numbers given in the Nipissar Lake Watershed Model, which calculates the useable storage of the lake to be about 1,400,000 m^3 and the estimated annual recharge as 600,000 m^3 per year (Stanley Assoc., 1996).

The Nipissar Lake pump house has vertical turbine submersible pumps installed inside twin intake lines. Each of the 10 up pumps has a 1020 L/min (17L/sec) capacity. Only one pump operates at a time. Operation of the pump is controlled by the water level in the water storage tank adjacent to the Williamson Lake pump house. An air compressor aerates water around the intake to prevent taste and odour problems.

According to the water use estimates, the Hamlet is using more water per year than the estimated annual recharge of the lake. The Government of Nunavut is conducting studies to identify an alternative water supply that they can pump into the reservoir during the summer months to maintain the water levels in the lake in the future.

3.0 General and Site Information

The name of the water source at the intake location is Nipissar Lake.

The location of Nipissar Lake is 2km northwest of the Hamlet and the pump station located on the east side of the lake 15V 545131.99 m E, 6966238.89 m N.

The type of waterbody is an in-land lake that has no direct connection to any watercourse or estuary associated with Hudson Bay.

The water intake has been elevated above the lake bed by approximately 2.0m. The intake has an air compressor aerates water around the intake to prevent taste and odour problems, this can also prevent fish from entering the intake due to air bubbles surrounding it similar to a bubble curtain used in construction projects to isolate the work area from fish bearing waters. The air bubbles could create a barrier around the intake therefore not allowing fish to enter the intake.

Initial construction of the intake was 30 years ago with modifications to the intake in 2009 based on a previous as built drawing. The intake construction consists of a barrel or cylindrical screen (Stainless Steel) that is aligned vertically and elevated approximately 2.0m from the lake bed.

4.0 Biophysical Information

Potential for fish presence in this waterbody would normally be limited due to the type of waterbody not having direct connection to watercourses or the estuary. Local knowledge states that fish have been released to the lake in the past although fishing is not permitted due to protection of the water supply and its water quality. Native species known to exist in the lake are Arctic grayling *(Thymallus arcticus)* and lake trout *(Salvelinus namaycush)* based on local knowledge (pers. comm. Joe Strickland). Based on the species noted above the potential for reproduction and possibility of smaller sizes and year class of fish may exist if the stock is naturally producing. The potential for forage species such as cyprinids may be possible unless the fish feed primarily on aquatic insects. The fish species known to exist would be classified as subcarangiform.

Physical description of the intake location is on the lake bed elevated 2.0m above the substrate in approximately 5.3m of water. The max depth of the lake is approximately 6.7m. Substrate at depth is reportedly sand and gravel, however there is no confirming documentation. The position of the intake is vertical based on the lake bed.

5.0 Water Use Information

The purpose of water withdrawal is for the consumption and supply for the Hamlet of Rankin Inlet. The inlet consists of 2 intakes with one being a continuous draw depending on consumption uses and reservoir levels. If the reservoir is full then one intake will run continuously but re-circulate the water within the intake system to reduce the potential for freezing during winter conditions. The average intake rate is 17L/sec or 1020L/min for one intake.

Effects on Nipissar Lake from the water taking would primarily be lowering of lake levels during dry periods in the summer. How this is related to the aquatic environment will need to be assessed based on the species known to exist (Arctic grayling and lake trout) and their usage of seasonal depth ranges depending on spawning and forage activities.

Structures associated with the intake include the insulated line, aeration line, pump house and transmission line, reservoir, and distribution system.

The water license application will be for an existing intake and possibly upgrades to the intake screen if required based on DFOs review. Future alternations to the intake are dependent on the findings of the current studies.

6.0 Fish Screen Information

The intake screen open and effective areas will need to be determined based on a rectangular screen opening of 3/16" (4.763mm) and 1" (25.4mm). The intake has been described as cylindrical screen (24"H x 18"Ø) with a sealed top and bottom made of stainless steel. It is unknown at this time what type of screen exists on the intake (i.e. wedge wire, woven wire), and this information must be acquired and verified to determine the "% open area" based on the DFO Fish Screen Guidelines and associated calculations.

Based on a review of the DFO guidelines, protection of fish with a minimum fork length of 25mm must be attained although the largest opening in the existing screen being 1" (25.4mm) therefore allowing for small fish to enter the intake depending on the intake velocity. As mentioned above, the aeration line aerates the water around the intake prior to being drawn into the system to reduce taste and odour issues related to stagnant water. No other cleaning, maintenance, or special requirements are known at this time.

7.0 Calculation Based on Assumptions

If we use a conservative estimate of 50% open area then we can determine what size the intake screen must be to satisfy the guideline requirements based on subcarangiform fish. The result based on a 12"Ø cylinder screen and a flow rate of 17L/sec and the assumed 50% open area the length of the intake screen would need to be 13.2" or longer to ensure that smaller fish can over come the velocity of the intake.

The dimensions of the intake are 24" long and therefore would equate to an open area of approximately 26% based on the DFO guideline calculations. Due to the required efficiency of intake screens it may be safe to assume that the % open area would be

greater than 26% and that the existing screen complies with the DFO Freshwater Intake End-of-Pipe Intake Guidelines (DFO, 1995) based on length of the screen.

8.0 Summary

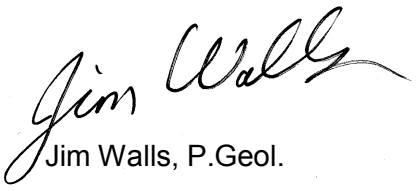
Based on the information currently available and conservative estimates, the current intake complies with DFO requirements, however the impact to aquatic habitat due to fluctuations to lake level due to seasonal drawdowns remains unknown.

We suggest the new license include the Condition to assess the impact of lake level fluctuations, due to Hamlet water taking, on fish habitat in Nipissar Lake by December 31, 2010. The findings should also include recommendations for action with a time line, should it be required.

If you have any questions or comments, or require further information, please contact our Aquatic Resource Specialist, Chris Pfohl, A.Sc.T., or the undersigned.

Yours truly,

Nuna Burnside Engineering and Environmental Ltd.



Jim Walls, P.Geol.

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