MALLARD LAKE FISH AND FISH HABITAT

Context

Golden Band Resources Inc. owns several gold deposits and the Jolu Mill gold processing facility and is proposing to develop selected deposits in the La Ronge Gold Belt located in north-central Saskatchewan. As part of the planning study conducted by Golden Band, Canada North Environmental Services (CanNorth) was retained to prepare an environmental evaluation of the aquatic resources in the Mallard Lake. Mallard Lake has been used in the past as a tailing management facility and is proposed for such use in the future. There is currently a proposal before Fisheries and Oceans Canada (DFO) to re-open the mine. In determining the application of the Metal Mining Effluent Regulations, one of the considerations is the lake's current status, from a legal basis, as fish-frequented. From a policy perspective a determination of the status of the fish habitat in the lake and the lake's ability to support fish may be considered.

Habitat Management requested Science advice on the status of Mallard Lake. In particular, they asked the following questions:

1) Does Mallard Lake, which has been used in the past as a tailings management facility (and is proposed for such use in the future), currently constitute a fish-frequented waterbody and fish habitat from a biological perspective?
2) Based on the information provided, does this water body have the potential to support fish and fish habitat on a long-term basis?
3) Do the data as collected provide for a conclusive determination? What additional information would be required to better characterize the status of the lake as fish habitat and/or fish frequented?
4) Does the quality of the water in the lake represent a danger (risk) to fish health such that fish should be prevented from entering the lake?

Habitat Management submitted their request for advice on April 22, 2008 and requested a response from Science by April 25, 2008. The response was to be based on the Aquatic Baseline Investigations of the Mallard Tailings Management Facility, Final Report prepared by Canada North Environmental Services Project No. 1138 January 2008.

Response

Aquatic Baseline Investigations of the Mallard Tailings Management Facility

1) Does Mallard Lake, which has been used in the past as a tailings management facility (and is proposed for such use in the future), currently constitute a fish-frequented waterbody and fish habitat from a biological perspective?

   Data from the report confirm that fish currently utilize Mallard Lake so it is currently a fish-frequented waterbody. Three species were captured by electrofishing survey (*Perca flavescens, Catostomus commersoni, and Coesius plumbeus*), and eggs of another

species were found by egg survey (*Esox lucius*). Species richness at Mallard Lake, based on 'snap-shot' survey, was similar to the reference lakes (Table 10). The length range for white sucker (6.6 to 22.5 cm) suggested that more than one age group was present, however ages were not provided. Egg collections of yellow perch indicated this species was reproducing in the lake, although egg fertilization and survival was not determined. Electrofishing was conducted on only one date (22 July 2007) and gill netting on three dates (14/15 Oct 2006; 19 May 2007; 23July 2007) (Tables 11 and 12). Surveys for eggs and juvenile and adult fish were too infrequent to determine lake residence time of fish, frequency of use, habitat use by life stage or population survival. The fact that Mallard Lake is currently being used by fishes, including for reproduction, is evidence that the lake provides fish habitat.

2) Based on the information provided, does this water body have the potential to support fish and fish habitat on a long-term basis?

The recent (2006-2007) survey data showing presence of fish and diverse habitats in Mallard Lake confirm that this water body has the potential to support fish and provide fish habitat. Reported dissolved oxygen levels in July were low (Table 2). The information provided was too limited, infrequent and incomplete to evaluate long-term viability of the current habitat for supporting fish populations. Completion of the spawning suitability analysis would be helpful (Table 15); suitability for other life stages should also be included. Historically, Mallard Lake supported fish populations, as evidenced by the need for a fish salvage program prior to mining (1987 EIS, pg. 1), and the reference to lake whitefish on page 25 of the report.

3) Do the data as collected provide for a conclusive determination? What additional information would be required to better characterize the status of the lake as fish habitat and/or fish frequented?

The data confirm that fish currently utilize the lake, but are not sufficient to determine long-term population viability. The reference lakes appear to be a considerable distance from Mallard Lake (Fig. 2). No data were provided from the connected downstream lake (Yew Lake). Habitat surveys need to be more thorough to quantify habitat supply and fish habitat suitability, including winter habitat. Fish surveys, benthos and limnological samples need to be conducted on a seasonal basis, to determine seasonal habitat use and suitability by life stage. Habitat suitability should be based on all life stages, not just spawning. Each of the cells should be surveyed with equal effort. The results of the phytoplankton and zooplankton samples were not reported. A time series of dissolved oxygen and temperatures should be analysed with respect to habitat suitability and availability.

4) Does the quality of the water in the lake represent a danger (risk) to fish health such that fish should be prevented from entering the lake?

The concerns regarding low oxygen (see 3 above) during July should be noted.

In addition to the aquatic baseline report, the Jolu Central Mill Gold Project Summary Document on the History of the Mallard Tailings Management Facility provided a table with Surface Limnology (Table 3) with data from March 27, 2008. The extremely low dissolved oxygen concentrations in cells A and B (1.08 and 1.9 mg/L respectively) would likely render Mallard Lake unsuitable for fish. These dissolved oxygen data are described in Table 3 as "Surface", but it is unclear at what depth the samples were

taken. This is relevant given that dissolved oxygen profiles of waterbodies vary significantly during the winter in general, and did so specifically for the nearby Island, Memorial and Weedy waterbodies shown in Table 5. If samples of Mallard Lake were indeed taken at the surface, and were representative of the whole waterbody, the low dissolved oxygen concentrations, would not make Mallard Lake suitable for fish and the waterbody could not be considered viable (long-term) fish habitat. Furthermore, the water and sediment chemistry profile of Mallard Lake are such that they would pose a risk to fish health. This is based primarily on sediment quality and on the content of copper specifically. The sediment concentrations of copper are nearly an order of magnitude greater than likely effects levels and most certainly capable of impairing reproduction and development of freshwater fishes. As a result fish access to Mallard Lake should probably be prevented.

Conclusions

Three species of fish were found in Mallard Lake, Yellow Perch (*Perca flavescens*), White Sucker (*Catostomus commersoni*), *and* Lake Chub (*Coesius plumbeus*) and there were eggs of a fourth species, Northern Pike (*Esox lucius*). Mallard Lake is currently a fish-frequented waterbody. The fact that Mallard Lake is currently being used by fishes, including for reproduction, is evidence that the lake provides fish habitat. However long-term viability of the waterbody is likely compromised due to the low winter dissolved oxygen levels and the water and sediment chemistry profile. Based on the data presented, access to Mallard Lake should probably be prevented as the water and sediment chemistry would likely pose a risk to fish health. Although there were some concerns with the completeness of the survey work reported in the baseline assessment, it provided the basis for these conclusions.

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