

## **Tailings disposal into an arctic meromictic lake, Garrow Lake, Cornwallis Island, NWT**

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<b>Project Location:</b>	Garrow Lake, Cornwallis Island, NWT
<b>Client(s):</b>	Department of Fisheries and Oceans, Western Region
<b>Date Completed:</b>	1980
<b>Project Budget:</b>	\$ 20,000

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Annual supply ship at Polaris Mine

### **Project Summary**

Polaris Mine is the northernmost lead-zinc mine in the world. Its tailings disposal area is below the halocline in Garrow Lake, which is a meromictic lake with elevated temperatures of 7 to 10 °C. The natural water surface elevation of the lake is 6 masl. Towards the south the lake is connected by a creek to the nearby (500 m) Garrow Bay of the Arctic Ocean.

When drilling in the area of the mine, a 'fluid loss table' had been encountered well above the 0 °C isotherm possibly as a result of karstic limestone features. The configuration of the 'fluid loss table' had not, however, been established between the Garrow Lake on the one hand, and Garrow and Cominco Bays on the other. The results of two thermistore boreholes were inconclusive. Due to the elevated temperatures below the halocline, the depth of the 'fluid loss table' under the ridges between Garrow Lake and the Arctic Ocean can be expected to be much shallower than that at the mine site.

As there has been a lack of groundwater studies in the high Arctic, groundwater studies in Antarctica were reviewed. There, saline groundwater has been flowing through permafrost down to about -30 °C. In view of the above, Dr. Weyer concluded that there is a very high likelihood of subsurface fluid flow from Garrow Lake to the Arctic Ocean.

### **Services Provided**

- Reconnaissance trip to Polaris Mine and Garrow Lake.
- Review of consultants reports on Polaris Mine and Garrow Lake (and other meromictic lakes) as well as Russian, Canadian and American literature of fluid flow through permafrost.
- Preparation of a review report on groundwater flow in Antarctica.
- Preparation and delivery of findings for Garrow Lake.

### **Deliverables or Results**

- Review report on groundwater flow in the high Arctic.
- Conclusion that subsurface fluid flow is likely occurring between Garrow Lake and the Arctic Ocean.
- Recommendations for further investigations.