



Department of Geography &
Environmental Studies
1125 Colonel By Drive
Ottawa, ON K1S 5B6
Canada

Phyllis Beaulieu, Manager of Licencing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU X0B 1J0
Tel: (867) 360-6338

May 2, 2016

Dear Ms Beaulieu;

I am writing to apply for Approval for the Use of Water or Deposit of Waste Without a Licence in accordance with your Regulations. I have attached a completed application that details our water use. Below, I provide a brief description of the undertaking in both English and Inuktitut.

If you have any comments or concerns, please don't hesitate to contact me.

Sincerely,

Derek Mueller
Associate Professor

Northern Ellesmere Ice Shelves, Ecosystems and Climate Impacts

Derek Mueller¹ and Luke Copland²

¹Department of Geography and Environmental Studies, Carleton University, Ottawa, Ontario

²Department of Geography, University of Ottawa, Ottawa, Ontario

Since 2002, there have been dramatic changes in the ice shelves along the northern coast of Ellesmere Island. Ice shelves that have been attached to the shore for thousands of years have been breaking-up, leading to the drainage of massive bodies of freshwater and the creation of new ice islands. The entire Ayles Ice Shelf broke away in summer 2005, and in summer 2008 the entire Markham Ice Shelf and large pieces from several other ice shelves were lost. Thousands of square kilometres of 50 to 70 year old landfast sea ice has also broken away from the coast, suggesting that the ice shelves which used to occupy this coastline will not regenerate in the foreseeable future. These physical changes are also causing major transformations in communities of micro-organisms that are associated with the ice.

The aim of this research program is to provide a comprehensive survey of the current characteristics and stability of the northern Ellesmere Island ice shelves and multiyear landfast sea ice. This will focus on measurements of ice thickness and internal structure using ice penetrating radar and shallow ice cores. Surface melt rates and patterns of surface motion will be determined from stakes drilled into the ice shelf surface and measurements with GPS systems. We will also take salinity profiles in the fiords and bays along the coast to measure how the water is changing. We plan to install a semi-permanent automated weather station that will provide temperature data in the vicinity of Milne Ice Shelf. This data will be uploaded daily via a satellite connection, and made publicly available on the internet. Samples will be taken for water quality and DNA analysis to examine the micro-organisms and their habitats and under the ice shelves.