AQUATIC ENVIRONMENT PROTECTION

ENVIRONMENTAL MONITORING OF OCEAN DISPOSAL SITES AROUND THE MAGDALEN ISLANDS

Fact sheet

PUBLISHED BY THE ENVIRONMENTAL PROTECTION BRANCH

Sediment sampling using a grab sampler (Photo: Donald St-Laurent, Environment Canada).

Background

The *Canadian Environmental Protection Act (1999)* calls for the environmental monitoring of ocean disposal sites containing dredge spoil or excavation material. Environment Canada provides for the annual monitoring of disposal sites. The monitoring of representative disposal sites allows permit holders to have continuous access to the appropriate sites, while guaranteeing that permit conditions are being respected. Monitoring also ensures that hypotheses advanced during the permit review and site selection processes are acceptable and sufficient to protect the marine environment and human health. In addition, the information accumulated over time allows authorities to determine whether ocean disposal regulations are adequate.

Previous monitoring studies

From 1996 to 2001, a number of environmental monitoring projects were carried out in the Magdalen Islands under the ocean disposal site monitoring program. Six different disposal sites were monitored. These activities are summarized in the table on page 2.

Environmental monitoring of dredging operations in the Grande Entrée shipping channel (2002)

Seleine Mines, the owner of a salt mine on the Magdalen Islands, obtained an ocean disposal permit to dredge roughly 300,000 m^3 of sediments in the Grande Entrée Channel during the summer of 2002.

The proponent used a trailing suction hopper dredge with a capacity of 2,750 m^3. Maintenance dredging was carried out to ensure a sufficient depth of water for ships to navigate safely. A portion of disposal site D, located 6 km off the port of Grande-Entrée, was used as a disposal site for the dredge spoil.

The fall 2001 sampling campaign showed that arsenic and copper concentrations in the channel sediments were within the range in which adverse impacts are occasionally observed. This means that arsenic and copper in sediments could cause adverse impacts on living organisms found at the loading and disposal sites.

Environment Canada Quebec Region
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Disposal site	Location	Objectives and results
CM-7 (1996)	Cap-aux-Meules	• Chemical and biological monitoring was performed at the disposal site to determine levels of certain metals and organic compounds in sediments, as well as the impact of waste on benthic organisms (i.e., organisms living on the ocean floor). All concentrations measured, including those for PAHs and PCBs, were within quality criteria. Disposal activities were found to have an effect on the structure of the benthic community, but not on its productivity or health.
Disposal Site D (1997)	Grande Entrée Channel	• Chemical and biological monitoring was performed at the disposal site to determine levels of metals and organic compounds in sediments, as well as the impact of waste on benthic organisms. No contaminant of concern was found in concentrations exceeding current standards and criteria. Similarly, biological tests on sediments did not find any toxicity. The new benthic community was found to have a different level of diversity and functionality than the pre-disposal community.
(1999 to 2001)		• Sediment transport studies to assess the stability of disposal site D. This work showed that the sediments deposited are fairly stable and are not having a significant negative effect on nearby lobster habitat (lobster is a very important fishing resource in the Magdalen Islands).
(2001)		• Sampling and analyses were carried out to determine how long the benthic community took to get re-established after disposal activities. Benthic organisms recolonized the disposal site 5–10 years after disposal of the dredge spoil.
CM-7 **GI-2** **IE-6** **M-5** **PB-8** (2001)	Cap-aux-Meules Grosse-Île L'Île-d'Entrée Millerand Pointe-Basse	• Echo sounding to locate, and determine the boundaries of, accumulations of dredge spoil at the disposal sites. Compliance with disposal permit conditions was also verified. These sites were selected because they will be the subject of chemical and biological monitoring studies on a short- or medium-term basis.

During dredging operations, sediments are likely to be resuspended and transported by the currents, resulting in increased turbidity and levels of suspended solids (SS). This increase could have a direct impact on marine organisms and habitats, particularly on the molluscs found in the lagoon.

Accordingly, the proponent took measures to mitigate the impacts linked to turbidity, SS and the metals present in fine sediments. A surveillance and monitoring program was implemented to assess the effectiveness of the mitigation measures and more accurately assess the impact on molluscs and human health risks. The program components are described below.

Bioaccumulation of arsenic, copper and cadmium

A program to monitor arsenic, copper and cadmium concentrations in the flesh of farmed molluscs was carried out by the project proponent, Seleine Mines. The monitoring program consisted of a series of measurements taken before, during and after dredging, the objective of which was to learn more about metal bioaccumulation in farmed mussels resulting from the dredging of fine sediments.

Health risk to consumers

Currently, there are no specific standards in Canada on allowable arsenic concentrations in the flesh of molluscs for human consumption. US government agencies use a standard of 86 mg/kg total arsenic (the standard was established based on the assumption that inorganic arsenic accounts for 10% of total arsenic). Based on US standards and historical bioaccumulation data, no adverse effects are expected on the health of consumers of mussels and scallops exposed to dredging work in 2002.

However, since the exact proportion of inorganic arsenic in the flesh of molluscs raised in aquaculture operations in the Grande Entrée lagoon is not known, Health Canada recommends a monitoring program to measure levels of chemical forms of arsenic in tissues before, during and after dredging operations to assess human health risks. The program was carried out in co-operation with the University of Quebec at Rimouski; the Quebec Department of Agriculture, Fisheries and Food (MAPAQ); the Institut des Sciences de la Mer [Ocean Sciences Institute]; Fisheries and Oceans Canada; Health Canada; the Canadian Food Inspection Agency; Seleine Mines and Environment Canada.

The objective of the program was to assess the impact of dredging activities on mariculture in the Magdalen Islands and the human health risks associated with mollusc consumption, while allowing mitigation measures to be optimized for future dredging of the channel.

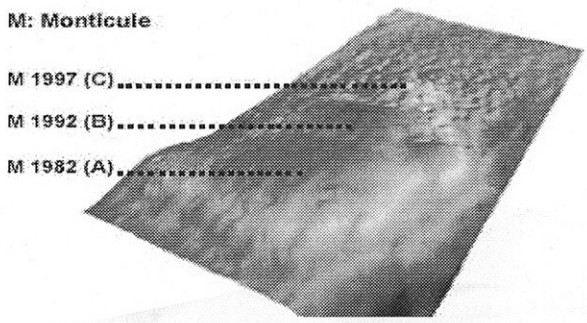
Impacts of suspended sediments

The impacts on molluscs of the suspended sediments produced by dredging and disposal operations were also assessed. The work focused on the physical effects of resuspended sediments on giant scallops. Effects were measured both in the lagoons and in surrounding areas, as well as at control sites, which should provide a comprehensive picture of impacts and their scope according to ambient conditions.

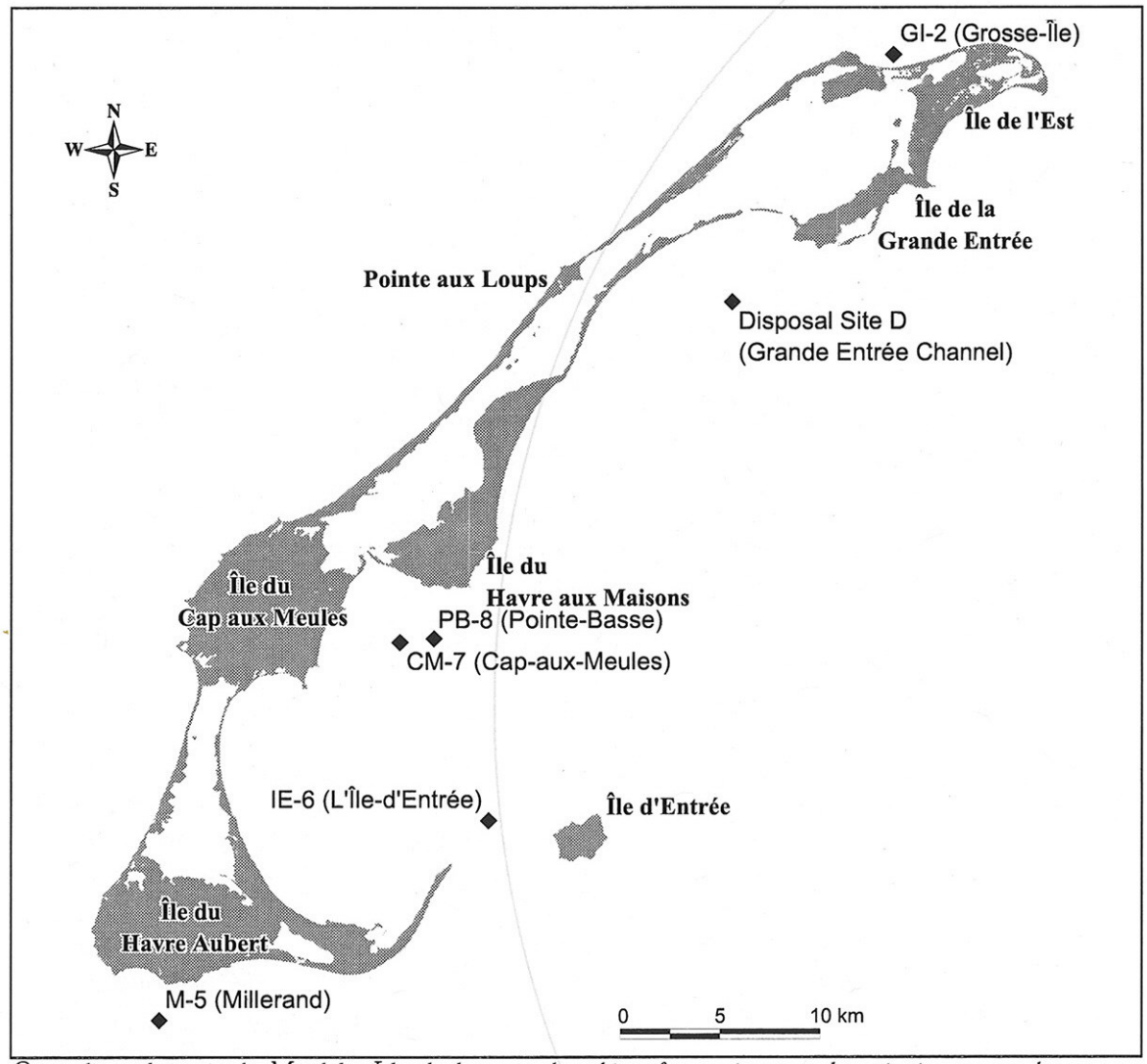
Analysis of the three above-mentioned studies is currently being completed and reports are expected to be submitted in the spring of 2003.

Echo sounding of disposal site D after dredging of channel in the summer of 2002

Environment Canada commissioned the Canadian Hydrographic Service to carry out echo sounding of disposal site D after the channel was dredged. One of the objectives of the survey was to locate, and provide a picture of, sediment deposits resulting from dredging to determine if disposed-of sediments comply with the conditions of the ocean disposal permit. The results, combined with historical data, could also be used to determine the stability of the newly created sediment mound.



Disposal site D off the Grande Entrée Harbour, according to an August 2000 bathymetric survey done by the Canadian Hydrographic Service for Environment Canada.



Ocean disposal sites in the Magdalen Islands that were the subject of an environmental monitoring program between 1996 and 2002.

For more information

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Published by Authority of the Minister of the Environment

ISSN 1488-8718

January 2003

Aussi disponible en français

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