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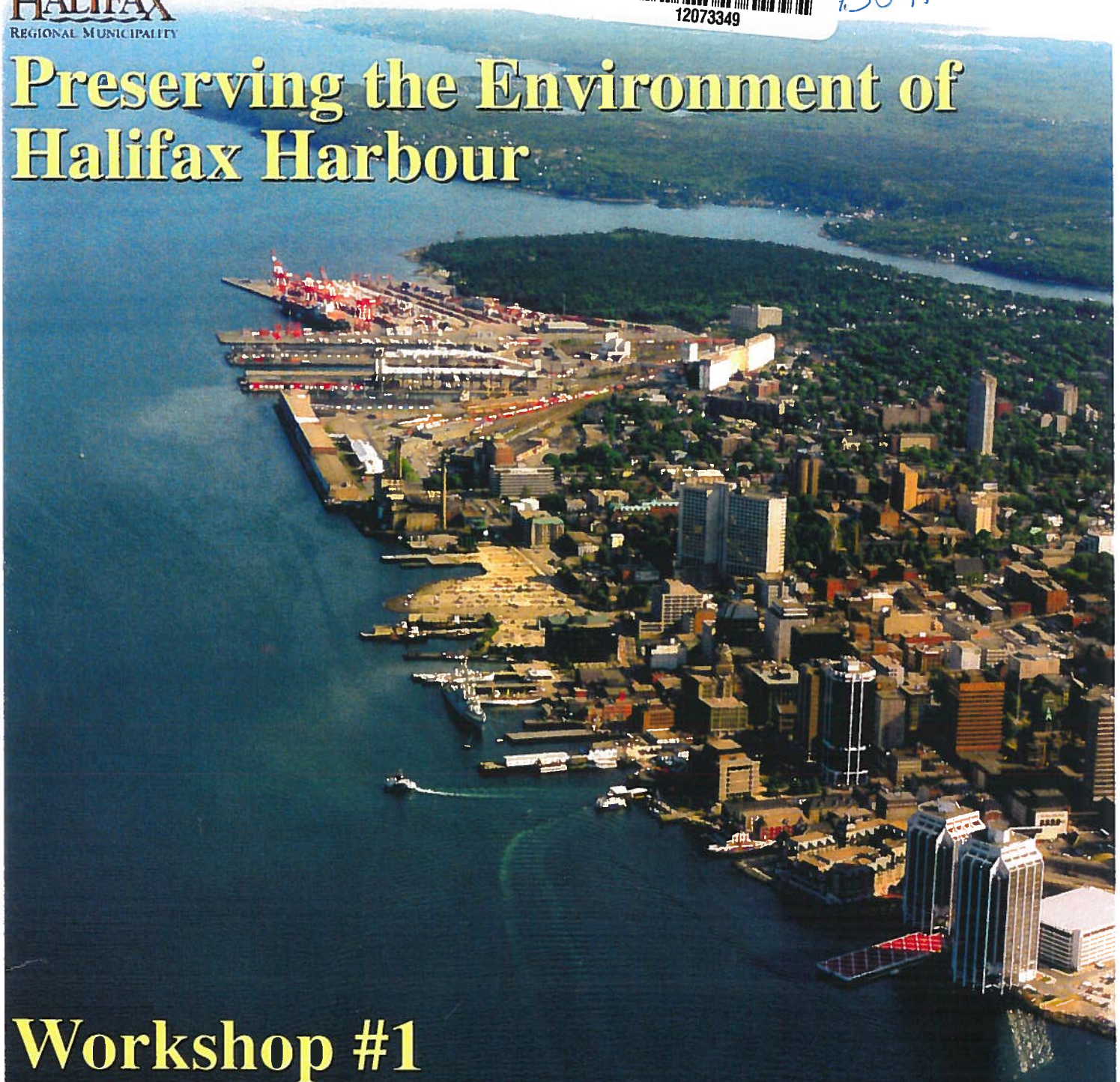
Preserving the Environment of Halifax Harbour



Workshop #1

Halifax Regional Municipality
Fisheries and Oceans Canada

Fisheries and Oceans Canada | Pêches et Océans Canada

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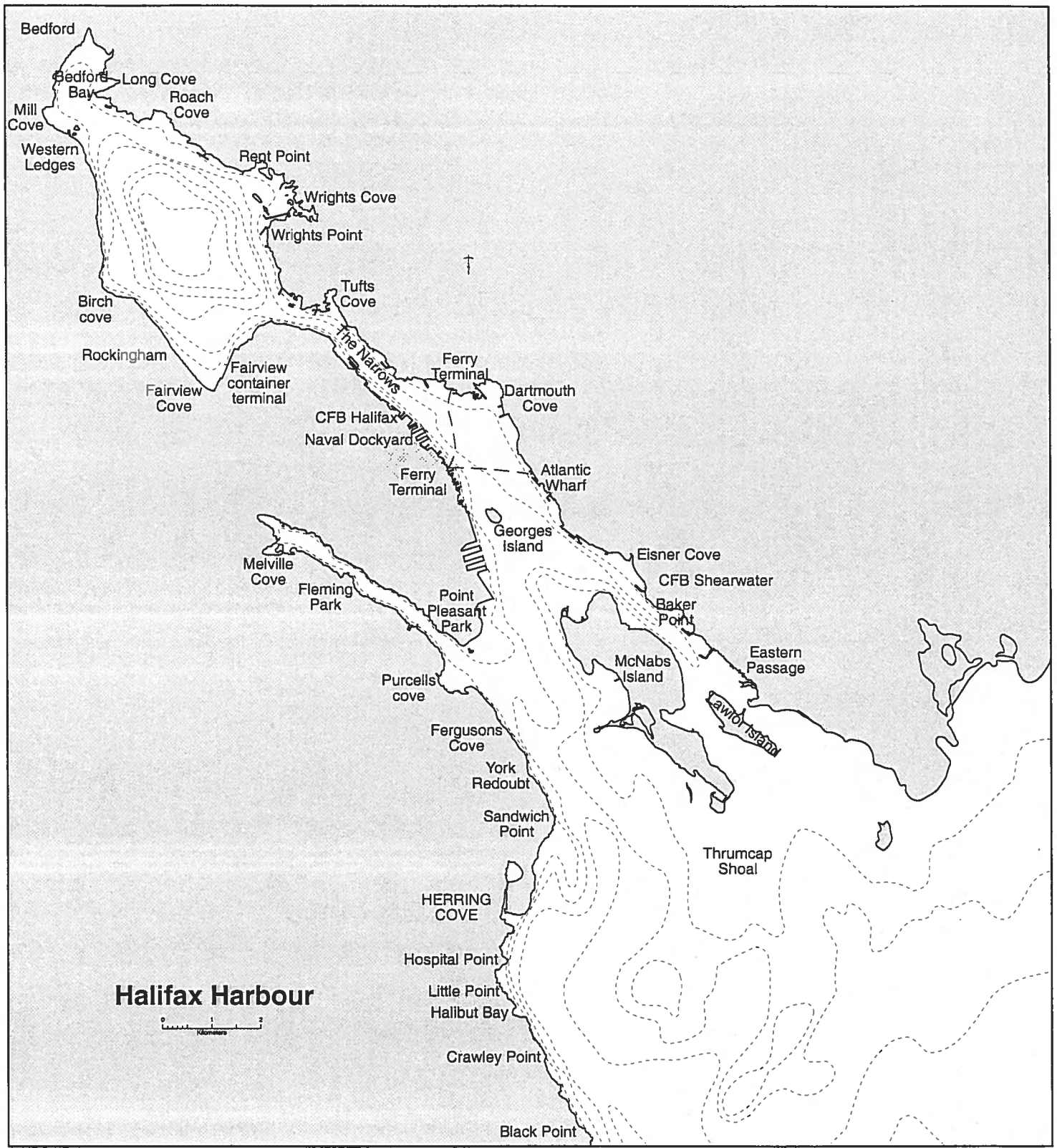

Workshop Sponsors

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Steering Committee

The Steering Committee was composed of Brian Thompson, Division Manager, Habitat Management Division, DFO; Jim Ross, Unit Head, Nova Scotia, Habitat Management; Andre Ducharme, Consultant and former employee of DFO; Brian Nicholls, Chair, Consultant and former employee of DFO and Maurice Lloyd, Director, Halifax Harbour Solutions Project, Halifax Regional Municipality.

Preserving the Environment of Halifax Harbour

Edited by

Andre Ducharme

Proceedings of the Workshop:
Preserving the Environment of Halifax Harbour: A discussion of the regulatory overlaps, the potential for integration of all marine and freshwater resource management, and the identification of opportunities for the conservation and restoration of fish and wildlife habitats and aesthetic values in Halifax Harbour.

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OPENING OF THE WORKSHOP

INTRODUCTORY NOTES

AND

WELCOMING ADDRESSES

Introduction and Purpose for the Workshop

Andre Ducharme

It is reasonable to assume that around 1749, when the first white settlers choose to establish a new town on the Halifax peninsula, the inlet was teaming with life of all sorts, as were the wild shores around. "....The harbour itself is full of fish of all kinds..." wrote Cornwallis in his first report to the authorities at London.

The new town prospered and grew during two and a half centuries of ever increasing commerce and industry. The Halifax Inlet became one of the great harbours of the world. It has witnessed the shipping activities of two world wars as well as long years of peacetime industrialization. Cities and towns established on its shores have multiplied and their population swollen beyond the wildest imagination of any 18th century visitor to these shores.

The Canadian constitution act of 1867 gave free navigation priority over all other uses within public harbours areas. The Act Confirmed that harbours are the property of the federal government in Canada and harbour jurisdiction extends to the seabed and foreshores that are used for shipping activities. In 1927 another Act of parliament created the Halifax Port Corporation to manage and administer this and other public harbours. In present days fifteen other jurisdictions also regulate the Halifax inlet, these are listed in appendix B. Many non regulatory stakeholders (waterfront development corporations, waste water treatment operators, shipping facilities and land developers) are actively modifying the Harbour watershed, its shore profile and the biological and physical characteristics of its fresh and saltwater regime.

Notwithstanding the greatness of its history, the Halifax Harbour in some respects is presently reduced to a shadow of its former beauty. At first glance the water still sparkles in the sun but many coves and shore areas reveal the presence of contamination and pollution. Large volumes of raw or only partially treated domestic sewage are presently released at various points in the harbour. The anaerobic sediments are contaminated with heavy metals (mercury, lead, zinc, copper and cadmium) and organic pollutants are present in high concentrations in some localities.

Much of the shoreline has been bared of its green mantle to make way for industry's facilities and for general urbanization purposes. Many of the animal species (particularly fish) that once were abundant in the inlet and its freshwater tributaries have dwindled to un-harvestable levels because their habitats have shrunk as a result of human activities. Some species still abound but can not be safely consumed by humans because they are contaminated (bivalves). Large areas of rich shoreline habitats have been buried (in-filling) to create more waterfront space for buildings, wharves, warehouses etc.

A surprisingly large fishing effort still occurs in all parts of the Halifax Inlet. Lobster is the principal species but many fin fish are also harvested on an occasional or part time basis. This fishery is a small fraction of the total provincial catch but the yield is sufficiently elevated to attract serious full time fishers. In the early 90's some 70 fishers worked the area on a part or full time basis which leads to the conclusion

that the Halifax Inlet is alive and remains a significant fishing ground.

The citizens of the Halifax Regional Municipality, the secondary stake- holders, have a great interest in their harbour as an industrial development tool. They are also interested in the preservation of the great boating, fishing, whale watching and other recreational potential offered by the protected waters of the Inlet and the Point Pleasant and MacNabs Island parks. The waterfront itself attracts countless visitors each year and this represents a significant source of income for the city in particular and the province in general.

Clearly both the natural beauty and the physical assets of the Harbour, including the extensive harbour development, constitute a subject of pride and attraction for residents and visitors to the area. However many problems are facing the resources managers and developers in their efforts to harmonize their environmental preservation activities. Some of these problems relate to the multiplicity of jurisdictions over the Harbour. Many of the applicable regulations are not known or are poorly understood. In order to reduce the risk of confusion there is a need to;

1-clarify jurisdictional boundaries ***(13 federal & 5 Provincial Acts)***

2-elaborate plans for future integration of management activities.

3-form Partnerships to undertake certain restoration activities deemed feasible.

4-protect and restore surviving wildlife habitat and restore the aesthetic values to the degree deemed possible.

This two day workshop is intended to bring together those who can most readily bring about or influence a new climate of collaboration concerning the restoration and preservation of the Halifax Inlet ecological integrity and its aesthetic value. The Halifax Regional Municipality is entering a time of burgeoning activities. This is an opportune moment to carry out such a workshop, as large development projects such as the Bedford Waterfront Construction are ongoing or proposed, and pollution abatement efforts by the Municipal government (HRM) are renewed (The Harbour Solutions Project).

The final product of this, and subsequent workshops, should be a ***Blue Print*** for:

1) The clarification of jurisdictional boundaries between regulatory bodies and an agreement to co-operate or integrate the regulatory functions within the Halifax harbour and its watershed:

2) The assessment and management of the environmental implications of future development activities in the Halifax Harbour. This should include a consultative process that takes into account the interests of all stakeholders, regulatory, and non regulatory governing bodies, the industry (including tourism) and the 325,000 plus residents of the Halifax Harbour.

3) An agreement, in principle on the preservation and restoration of fish and wildlife habitats and aesthetic values in the Halifax Harbour.

Welcoming Address

George DaPont

It is a pleasure to be here and to take part in this important workshop. It is great to see that you recognize the importance of this event. I understand there were very few cancellations and that you are all eager to participate in this crucial debate.

I am new to this area but I have already admired this magnificent harbour. I have seen how the population relates to their harbour and take much pride in the beauty of it. But I have also become aware that there are some serious problems and this workshop is an attempt by all of you to frankly debate some of these problems and to try and find solutions. I sincerely believe that this is a great, and very timely, endeavour.

I also believe that you are the perfect group to tackle this job – you have the expertise, you have the know-how but perhaps most important of all, you have a keen interest.

Partnering:
I am very pleased to see that in this activity DFO has found the perfect partner in the Halifax Harbour solutions project – in Halifax Regional Municipality. Having established a partnership is significant because it is an example of the government's "new" way of doing business. No longer do we work in isolation, we are forging relationships to take a united approach on a common problem.

On behalf of DFO I would like to welcome all of the participants from the HRM staff and the Harbour Solutions Project.

I have taken a look at your agenda over the next two days and it appears to me that you have your work cut out for yourselves. The agenda is tight and well structured. The goals you have set for yourself are not easy. With so many regulatory powers representing such diverse interests in the Halifax Harbour it appears to me critically important to attempt coming to terms with possible areas of overlap or conflict.

As well, you are assessing the possibility of integrating the work you do on all marine resource management in the future. This may be as simple as communicating with each other and keeping each other updated on the issues at hand as well as long-term projects. This is equally important and I dare say challenging!

Finally, I applaud the efforts to identify potential for preservation of existing natural resources and the restoration of lost wildlife habitats and aesthetic value.

In many ways you are setting new ground here. You are looking at better ways to work together and you are setting an example. What you can achieve with this harbour can be used as a sample of how to work together in the future.

I am glad to have had this opportunity to talk with you. I wish you all the best of luck in your endeavour. Thank you.

Welcome, Introduction, Purpose & Objectives

Brian Nicholls, Chair

Thank-you, George DaPont, for your words of welcome and encouragement.

By way of introduction, my name is Brian Nicholls, and I shall be chairing this workshop over the next two days. Many of you know me, and I see many familiar faces in the room. For those that don't, you will note from the program that I am listed as being "DFO-retired." I worked at BIO for many years, retiring in 1997 (and moving away from Halifax); my last position being Head of Environmental Assessment in the Marine Environmental Sciences Division. I was actively involved in Halifax Harbour environmental issues in the late-1980s and throughout the 90s, serving, for example, as a member of the Halifax Harbour Task Force.

In your registration packages there is a short paper providing an introduction to Halifax Harbour and to the workshop. I understand that the paper was also sent to participants in advance of the event. If you haven't read this paper, I urge you to do so. When I first read it, I was struck by a statement in the opening paragraph that is attributed to Edward Cornwallis who founded the settlement of Halifax in 1749. The statement was contained in his report to the authorities in England after first entering the harbour, and reads: "...The harbour itself is full of fish of all kinds..."

This statement has made me think about the quality of the environment of Halifax Harbour. Notwithstanding the plans of the Halifax Harbour Solutions Project, which I fully support, there may be the need to take additional action. Such action would likely be aimed at: improving the health of the environment of the harbour; increasing the productivity of the fish habitat of the harbour; and restoring the harbour to its former beauty; while ensuring that the harbour continues to support the many economic and recreational activities that are so important to this region. I offer these thoughts to you as we embark on this workshop, "Preserving the Environment of Halifax Harbour."

I want to spend a few moments in clarifying the title of the workshop.

- 1 The geographical extent of Halifax Harbour for the purpose of this exercise includes Bedford Basin, the Narrows, the Inner Harbour, the Middle Harbour, the Outer Harbour, and the Harbour Approaches (extending out to approximately the line between Devil's Island and Chebucto Head).

- 2. The environment of the harbour comprises primarily the marine environment, but in this exercise also includes associated freshwater environments, land around the harbour that provides important habitat for wildlife other than fish, e.g. birds, and also the atmospheric environment.

- 3. The term "preservation" is used here in a general sense, and is intended to include the protection, conservation, restoration and enhancement of the harbour.

I want to recognize the two sponsors of this workshop: the federal Department of Fisheries and Oceans (DFO) and the Halifax Regional Municipality (HRM). Both

considered that the time was now right to hold discussions with other interested parties on the launching of an initiative on the restoration and preservation of the environment of Halifax Harbour, such an initiative being complementary to the Halifax Harbour Solutions Project. I also want to recognize here the important role of Andre Ducharme in organizing this event. It was Andre who invited me to be the chairperson. He has had the difficult task of making this event happen; my role, as chairperson for a couple of days, is relatively easy!

At the outset it should be recognized that a project aimed at preserving the environment of Halifax Harbour could be a major cooperative undertaking, requiring the commitment of many agencies. George DaPont made this point in his opening welcome. Similar initiatives have been held elsewhere and have succeeded, e.g. Hamilton Harbour, which we are going to hear about tomorrow, and Boston Harbour. So what is being talked about here over the next two days is achievable!

It should be recognized that this workshop has a duration of only two days. Not long when you consider that the Halifax Harbour Task Force labored for over a year on a comparable issue ten years ago! In the time at our disposal the subject will be introduced and pertinent information provided, the associated issues will be discussed (in small groups), and through these discussion groups interest in the project will be gauged and suggestions invited for implementation. This workshop represents just a start in what could well turn out to be a very long project.

Participants should observe that there are three component thrusts to this workshop:

Dissemination of information on government regulations applicable to the harbour, and consideration of potential overlaps;

Assessment of the potential for the integration of marine resource management in the harbour so as to ameliorate impacts of such activities on marine ecosystems; and

Identification of the opportunities for the restoration and preservation of fisheries & wildlife habitats, and the improvement of the aesthetic values of the harbour.

The structure of the workshop program as per the schedule provided to participants is divided into seven parts as follows:

Day 1.

1. An ecological description of the harbour will be presented.

2. The anthropogenic stresses on the harbour will be outlined.

3 The regulations applicable to the harbour will be described by federal and provincial agencies; to be followed by a question-and-answer session

Day 2.

4. Non-regulatory stake-holders will outline their interests.

5. The Hamilton Harbour Case Study will be reviewed.

6. The three component topics of the workshop (referred to above) will be examined in small groups from the perspective of "Looking to the Future"; the results of these discussions will be presented to the full workshop.

7. The deliberations and conclusions of the workshop will be summarized.

Given the very full program it is important that all speakers remain on schedule. Note that anything important left out because of insufficient time can be provided to DFO (Andre Ducharme), either during the meeting or within a few days of the conclusion of the workshop, for consideration for inclusion in the proceedings of the workshop.

The poster papers (there are six) are an integral part of the workshop, and it is important that participants review these.

Proceedings of the workshop will be issued. Priority will be placed on producing these as soon as possible (the target date is mid-May), as opposed to striving for perfection in layout, etc.

Coffee-breaks and lunches will be provided throughout the two days.

Participants are encouraged to remain to the end of the event. There will be a draw for a framed photograph of Halifax Harbour at the conclusion of the workshop - - you have to be present at that time to be eligible to win it!

In closing, I wish everyone a successful workshop.

Part 1

Halifax Harbour – An Ecological Entity

The Living Estuary

Ken Mann

This presentation is intended to give an introduction to the working of Halifax Harbour as a living ecosystem. If we wish to preserve Halifax Harbour we need to have an understanding of its ecosystem structure and function. Some would emphasize keeping the water as clean as possible, others would emphasize keeping the shipping lanes free of undue sediment deposits. But the working of the estuarine ecosystem requires all of this and much more. There are many processes interacting and each must be allowed to play its part if the harbour is to be biologically productive and support populations of fish, shellfish, birds and mammals.

Halifax Harbour as an Estuary

A marine coastal inlet which receives an input of fresh water from one or more rivers is known as an estuary. Estuaries are very special places. They are on average much more productive of life than the waters outside on the shelf. To see why this should be so, consider Figure 1.

This figure represents a vertical section along the length of an estuary, with a river entering at the left and the open sea on the right. Because fresh water is lighter than salt water it forms a distinct layer at the surface, moving towards the open sea. As it flows along, this layer mixes with some salt water at its lower surface. This process, known as entrainment, causes the surface layer to become thicker and more salty as it progresses through the estuary. The net result is that the flow generated by the river carries some of the salt water out of the estuary.

To compensate for this loss, some salt water must enter the estuary from the open sea. It does so close to the bottom. This circulation, in at the bottom and out near the surface, is known as estuarine circulation. Not all estuaries have it, because if the estuary is very shallow and the tides are strong, the tidal currents may break down the pattern of circulation. Halifax Harbour, however, has the characteristic estuarine circulation.

Basic Biological Production

All forms of life in the harbour depend ultimately on the plant production, or primary production. In Halifax Harbour the most important primary producers are the microscopic floating forms known as phytoplankton. Like all plants, they have two essential needs, light and nutrients. The light comes from the surface, but the nutrients mostly come from the decay of plants and animals on the bottom. The two only come together when there is some mechanism for bringing the nutrients from the bottom up towards the surface. Estuarine circulation does this very well, so estuaries are more productive than open coastal waters.

Some of the phytoplankton production is consumed by microscopic animals floating in the water, the zooplankton, and the remainder sinks to the bottom and is used by animals or bacteria in the bottom deposits. These bottom-living animals are important food for fish, lobsters and crabs, and some, like clams, are valuable human food.

A healthy, functioning estuary acts as a natural trap for biological production. As the phytoplankton multiply in the surface

waters, they are carried slowly out toward the sea. The zooplankton travel with them, and are busy eating the phytoplankton. The droppings of the zooplankton, and dead phytoplankton, sink to the bottom where they begin to decompose, giving off nutrients. The nutrients are carried back towards the head of the estuary , drawn up to the surface layer, taken up by the phytoplankton, and the process is repeated.
The estuary also acts as a trap for material brought down the rivers. Organic and inorganic particles carried in a river in suspension, are dropped in the estuary as a result of physico-chemical changes that occur when fresh water meets salt water. Many of these substances are used in the biological cycles of the estuary.

The zooplankton are in turn, preyed upon by fish. The more productive the phytoplankton-zooplankton cycle, the more fish will enter the harbour to feed upon the zooplankton and animals on the bottom.

Most estuaries have, in addition to the phytoplankton, a fringe of large plants round the edge. In shallow estuaries these may be salt marsh grasses and seagrass. In a deeper estuary like Halifax Harbour, they are seaweeds. In its natural state, Halifax Harbour would have a dense fringe of rockweeds and kelps. These are important habitat for invertebrates like lobsters and mussels, and support a variety of small animals that are the food of fish.

Early settlers reported that Halifax Harbour was teeming with many kinds of fish and shellfish. This is to be expected, on account of the special mechanisms for creating a much higher biological productivity than is found outside on the shelf.

Halifax Harbour is Special
Halifax Harbour (Figures 2 and 3) has a special feature - Bedford Basin - carved out by a glacier. This type of basin is known as a fjord. Its presence has the effect of modifying the estuarine circulation. In the shallower part of the harbour, the inflowing bottom current is at a depth of less than 20m. This current soon fills the deeper part of the basin with cool, salty, dense water that remains relatively stagnant, while the estuarine circulation is confined to the upper part of the basin.

It was mentioned that when river water meets salt water, the suspended organic and inorganic material sinks to the bottom. Bedford Basin is thus a natural trap for material coming down the Sackville River. Much of that material is nutritious organic matter that supports a rich growth of bacteria on the bottom of the basin. Since the water is stagnant, the bacteria gradually use up the oxygen in the water. The deep water of the basin is characterized by low oxygen concentrations at certain times of year (Figures 4 and 5). If that water was never renewed it would eventually have no oxygen at all, and almost nothing could live there. Fortunately, every few months a storm passing up the coast is strong enough to cause a very strong circulation in the harbour and flush out the deep water of Bedford Basin. A sudden increase in the oxygen content of the bottom waters is indicative of such a flushing event.

Tidal Currents
Although the tidal currents are not strong enough to break down the basic pattern of estuarine circulation, they are strong enough to influence the bottom habitat for animals. As the tide begins to rise, water flows in to the outer harbour with velocities of 0.2 to 0.6 km per hour. As it passes through the narrows, it is accelerated to 0.6-1.4 km per hour, but when it gets into the Bedford Basin the velocity drops to about 0.1 km per

hour. As a result, the bottom deposits in the outer harbour and the narrows consist of relatively coarse sediments, or even bed rock, while the sediments in Bedford Basin, and in quiet backwaters of the outer harbour are of mud and silt containing a large proportion of organic matter.

The muddy sediments are inhabited predominantly by animals such as worms, that burrow in the sediment and feed on its organic matter, while coarser sediments tend to favour mussels and clams that filter the water as it moves above the sediment.

Human effects on the ecosystem

We have seen that Halifax Harbour is by nature a very productive ecosystem and it is also clear that as it is at present it is not fulfilling its potential. Let us look at problems resulting from the presence of man in a general way.

Inflowing rivers

Probably the most sensitive area is not within the harbour at all. It is the land area that drains into the harbour, and especially the Sackville River Basin. The average inflow from the Sackville River is on the order of 5 cubic metres per second. As we have seen, it is the driving force for the estuarine circulation and the carrier of organic and inorganic matter into the Bedford Basin.

In the 1970's, when rapid development was taking place in Sackville, and before there were stringent regulations controlling the runoff, it was not uncommon to see a stream of red, silt-laden fresh water passing over the surface of Bedford Basin. Deposition of this silt caused problems for the Bedford Basin Yacht club that were expensive to deal with, but the deposition of silt in the river bed also caused problems for breeding salmon that are still being addressed.

In addition to the silt load, rivers are likely to become the recipients of various kinds of contaminants as they pass through developed communities. Defence against pollutants begins in the watersheds of the inflowing rivers.

While I am not aware of any proposals to change the flow pattern of the Sackville River, it is important to note that the river is the main engine driving the estuarine circulation. There are many places around the world where the damming of rivers has caused major loss of estuarine function and fish productivity. One well-studied example is San Francisco Bay.

Sewage solids

Around 1970 there was a large amount of untreated sewage entering the Bedford Basin. Those of us at the Bedford Institute of Oceanography at the time pointed out that this organic matter would cause an additional requirement for oxygen on the floor of the basin, and that there was a real danger that if the process continued the lower water could become de-oxygenated. Not only would it kill a lot of benthic animals but when the strong mixing of the basin occurred, it could bring strong-smelling gases such as hydrogen sulphide to the surface. A consequence of this line of argument was that a collector pipe was built to intercept most of the raw sewage from the west side of the basin and transport it to the region of Richmond Terminals, where it is carried out to sea more freely.

At about the same time, the sewage treatment plant at Bedford was built, and designed to minimize the input of organic matter to the basin.

A separate and distinct problem exists with the contamination of sea water with bacteria and other organisms derived from sewage.

Most of these organisms die soon after being exposed to salt water, but water contaminated in this way is often considered unsafe for swimming and shellfish that filter contaminated water are unfit for human consumption.

Nutrients

In any estuary, the addition of large quantities of plant nutrients, such as nitrate, ammonia or phosphate, which inevitably leads to a great increase in the productivity of phytoplankton, is known as eutrophication. The most common sources of these nutrients are sewage and fertilizers. We do not have large areas of agricultural land draining into Halifax Harbour, but even the fertilizers used for lawns can be a significant contribution. In some situations, increasing the production of phytoplankton can lead to increasing production of fish and shellfish, which is no bad thing. However, when phytoplankton production becomes excessive, it exceeds the ability of the animals to feed on it. It then sinks to the bottom, decays and uses oxygen. Hence, even if we are able to control the input of sewage solids, there is still the possibility of depleting the oxygen in Bedford Basin by adding too much dissolved nutrient.

As a rough approximation, about half the nutrients in Halifax Harbour are derived from natural processes and about half from man-made sources.

In extreme cases of eutrophication, the concentration of phytoplankton is so great that it cuts off the supply of light to the seaweeds. Where this occurs, animals using the seaweed beds as habitat or for food become depleted and the whole ecosystem is impoverished.

Shorelines

The shorelines of an estuary are normally the most productive parts. Those parts of the shallow water down to the limit of light penetration are home to a variety of large plants. In shallow estuaries it is salt marsh grass and submerged seagrasses, but in a steep-sided basin like Halifax Harbour it is the seaweeds. These shallow waters are the home of numerous invertebrate animals such as mussels, clams, sea urchins and shrimps, that are either harvestable by man or support predatory populations of fish, lobsters, and sea birds.

When an area of shoreline is infilled for development, the highly productive shallow areas are smothered and only a limited productivity occurs, for example on the lower parts of a wharf or sea wall.

Contaminants

In addition to the problems with organic matter and nutrients from sewage solids, there are problems with contaminants such as heavy metals, oil and a range of other substances that enter the basin by way of sewers and surface water drains. There will be a discussion later of specific details, but from the point of view of the estuary as an ecosystem, there are several possible outcomes.

The most severe outcome is that organisms are killed by toxic substances, so that the function they perform in the community does not get performed. A less severe outcome is that organisms are not killed, but they do not function properly, for example, they may fail to breed.

Finally, the organisms may function perfectly well but their tissues are loaded with toxic substances so that they are unsuitable as human food. In Halifax Harbour there is not much evidence of organisms being killed, except in isolated incidents, but there is some concern about

the levels of contaminants in organisms fished from the harbour. Naturally, one wishes to manage the harbour so as to minimize such effects.

Summary

Viewed as a functioning ecosystem, Halifax Harbour has preserved most of its basic functions, but they have been modified by the presence of man, so that the harbour has lost much of its biological diversity and is much less productive of fish and shellfish than it was 250 years ago. In seeking a plan for integrated resource management, it is desirable to try to rehabilitate as many as possible of the aspects that have been lost.

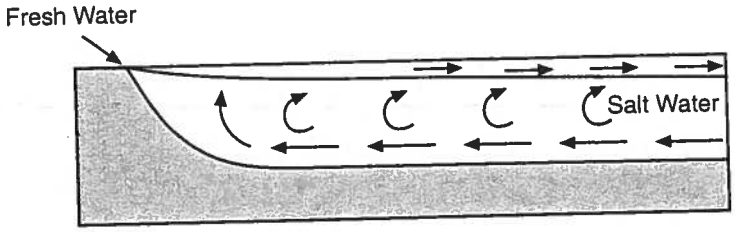

Figure 1. Vertical section through stratified estuary.

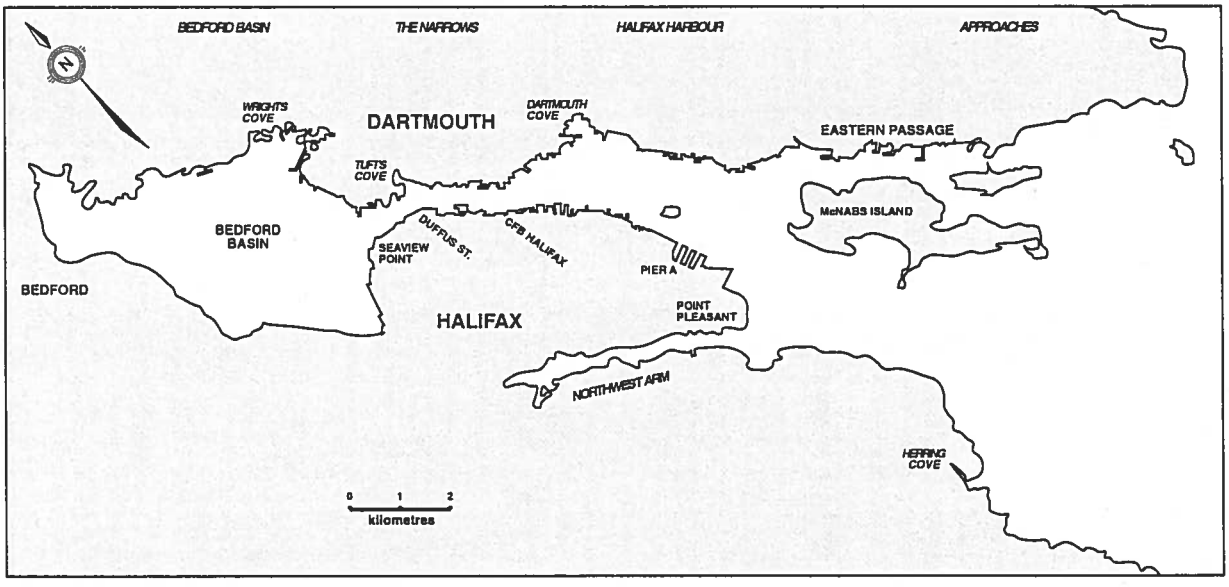

Fig 2. Map of Halifax Harbour

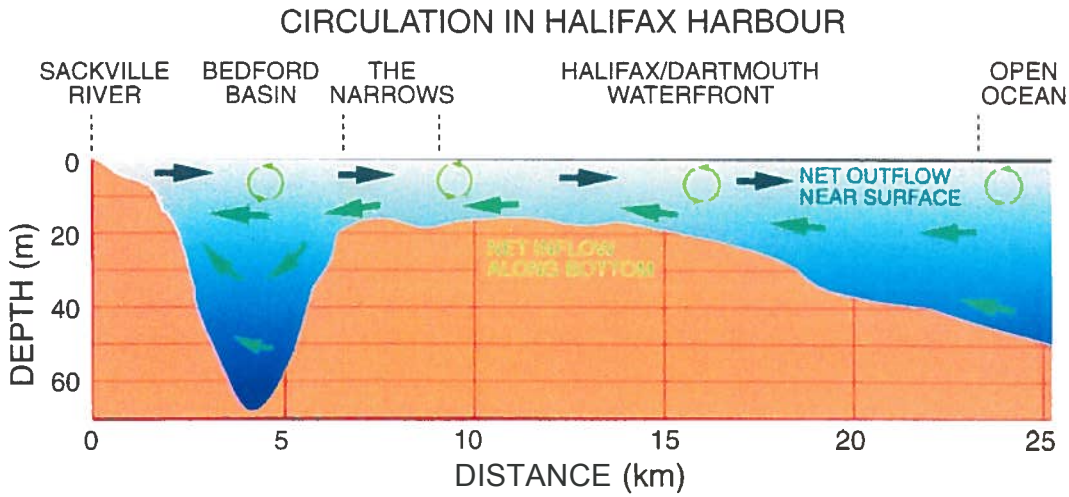

Figure 3. Circulation in Halifax Harbour

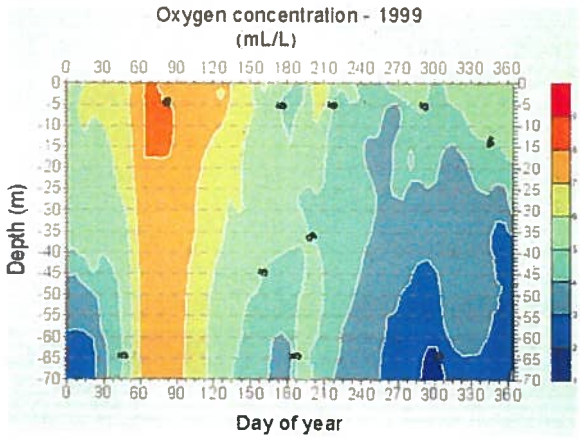

Figure 4. Oxygen concentrations at different depths in the Bedford Basin through 1999

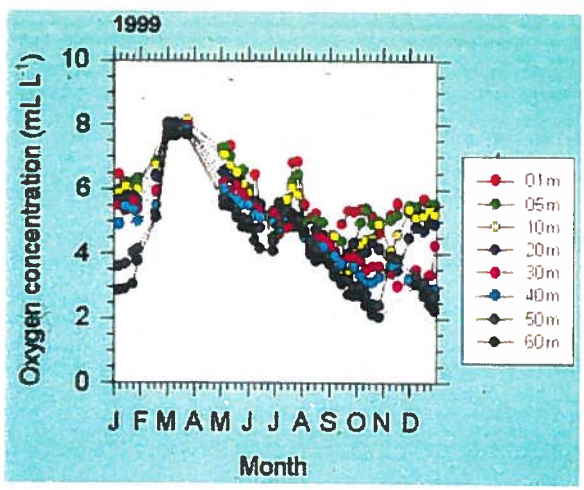

Figure 5. The numbers indicate concentrations in ml/l of oxygen.

Figures 4 and 5 reproduced from the files of Dr. Bill Li, DFO, with permission.

Preserving the Environment of the Halifax Harbour: What can Parks Canada Contribute?

Ron McDonald and Harry Beach

Introduction

What can Parks Canada contribute to the preservation of the environment of the Halifax harbour? To answer this question we are going to provide a brief overview of the properties that Parks Canada manages that have close ties to the Halifax harbour. We will examine the legislative base underlying Parks Canada activities around the harbour. We will give a brief overview of the Parks Canada's purpose and scope of operations. We will also explain two key concepts that Parks Canada uses to guide its conservation actions, commemorative integrity and ecological integrity. These concepts may help this group as it considers broad scale answers to the challenge of preserving the environment of the Halifax harbour.

Parks Canada's Purpose and Operational Scope

Parks Canada is an Agency of the Government of Canada that reports through a Chief Executive Officer to the federal Minister of Canadian Heritage. It was established under an Act of Parliament in December 1998. But Parks Canada traces its roots to the establishment of Banff National Park in 1885 and to the development of Canada's first national program for preserving sites of historical interest within the Dominion Parks Branch of the former Department of the Interior during the second decade of the 20th century.

Parks Canada's stated purpose from our 1994 Guiding Principles and Operational Policies publication is:

"*to fulfill national and international responsibilities in mandated areas of heritage recognition and conservation; and to commemorate, protect and present, both directly and indirectly, places which are significant examples of Canada's cultural and natural heritage in ways that encourage public understanding, appreciation and enjoyment of this heritage, while ensuring long-term ecological and commemorative integrity.*"

In the current language of business planning now in vogue in government Parks Canada's principal accountabilities are:

- ecological and commemorative integrity
- service to our clients
- wise and efficient use of public funds.

In meeting these ideals Parks Canada is held accountable by Canadians for the safekeeping of the "crown jewels" of Canada's natural and cultural heritage. Parks Canada has direct responsibility for the administration and protection of 39 national parks, 3 national marine conservation areas, 7 historic canals and 179 national historic sites. It is also responsible for the protection of heritage railway stations owned or controlled by federally regulated railway companies. It administers the Federal Heritage Buildings Policy which governs designation and subsequent interventions in the heritage character of significant structures owned by all federal government departments. Parks Canada provides support to the National Historic Sites and Monuments Board. It co-ordinates the

federal-provincial co-operative program for management of Canada's heritage rivers.

Parks Canada is the single largest federal land manager, with accountability for more than 240.000 square kilometres, or over 2.5% of the Canadian land mass: This will grow past 3% as the agency fulfils the federal government's current commitments to establish new national parks, marine conservation areas, and historic sites. The built assets managed by Parks Canada have an estimated replacement value well in excess of $6.4 billion. It employs some 6,000 individuals directly at the height of the summer tourist season.

Parks Canada's core responsibilities have been defined as protection, presentation and commemoration of significant heritage areas. In addition to these core obligations Parks Canada provides a number of direct services to Canadians such as recreation and leisure opportunities. It also plays a significant role in direct regional economic development and in drawing international tourism to Canada.

The commitment by Parks Canada to the commemorative and ecological integrity of its sites and parks ensures a continuing interest in matters relating to Halifax Harbour. Why you ask? What does this mean? To answer these questions first let us look at what Parks Canada does in and around the harbour, the legislative base for our activities, and consider in a little more detail the concepts of commemorative integrity and ecological integrity.

The Halifax Defence Complex

Parks Canada is responsible for the management and operation of five national historic sites in the Halifax area - Halifax Citadel, Prince of Wales Tower in Point Pleasant Park, York Redoubt, Georges Island and Fort McNab. These sites are collectively known as the Halifax Defence Complex. All of these sites in one way or another relate to Halifax Harbour. Indeed the "raison d'etre" for the establishment of the entire defence complex was the harbour. As a result Parks Canada is keenly interested in anything that relates to harbour development and the potential impact that such activity or development might have on the commemorative integrity of these national historic sites. To meet its responsibilities Parks Canada is guided by its Cultural Resource Management Policy under legislative authorities that have been established by the federal government.

Legislative Base for Parks Canada Properties on Halifax Harbour

Authority to own and manage sites flows from two pieces of legislation, the National Parks Act Part ll or the Historic Sites and Monuments Board Act. Historic Sites designated as historic parks under the National Parks Act Part ll have their boundaries established by Order in Council, and an Order in Council is required to modify those boundaries. Management of these historic park is governed by Historic Site Regulations. Three of the five historic sites in the harbour have been designated under Part ll of the National Parks Act. (Halifax Citadel National Historic Site, Prince of Wales Tower National Historic Site, and York Redoubt National Historic Site).

Georges Island National Historic Site and Fort McNab National Historic Site have not been designated as historic parks under the National Parks Act. Ownership and administration of these sites flows from the Historic Sites and Monuments Board Act. Boundaries are not established by order in council and can be adjusted without reference to an order in council. Administration of these sites is accomplished through application of various federal, provincial or municipal statutes or regulations.

Whether established as historic parks or not, National Historic Sites owned by Parks Canada are managed in keeping with Parks Canada's Cultural Resources Management policy described later in this paper.

For the purpose of this workshop, it is sufficient to note that Parks Canada owns and operates 5 National Historic Sites in or about the harbour, authority to own and manage flows from legislation, and that Parks Canada is an interested stakeholder in so far as harbour management issues may affect these historic sites. Relevant sections of the Acts referenced above are detailed in Appendix 1.

Before discussing the individual sites and their relationship to the larger harbour environment I would like to explain briefly what we at Parks Canada mean when we talk about commemorative integrity.

Commemorative Integrity and the Management of Historic Sites

A prime directive or mandate for Parks Canada is to ensure the commemorative integrity of national historic sites. The National Historic Sites program objectives make specific reference to the need to ensure the commemorative integrity of national historic sites administered by Parks Canada by protecting and presenting them for the benefit, education and enjoyment of this and future generations, in a manner that respects the significant and irreplaceable legacy represented by these places and their associated resources.

This commitment was reinforced in the Act which established Parks Canada as an agency (Parks Canada Agency Act, 1998). The preamble to the Act clearly states that it is in the national interest to ensure the commemorative integrity of national historic sites.

Canada's National Historic Sites policy defines commemorative integrity as the "health" or wholeness of a national historic site. It is our most important mandated responsibility providing concrete, practical direction for the planning, management, and operation of a National Historic Site. It also incorporates an accountability framework to monitor progress in achieving our mandated objective. Specifically, the policy states:

A national historic site possesses commemorative integrity:

- when the resources that symbolize or represent its importance are not impaired or under threat;
- when the reasons of significance are effectively communicated to the public; and
- when the heritage value of the place is respected by all whose decisions or actions affect the site.

Commemorative Integrity Statement

To measure the health or wholeness of a National Historic Site Parks Canada must produce a Commemorative Integrity Statement (CIS) for each site. This document describes, among other things, the historic values associated with each site and how best to protect them. While the focus in these documents is on the resources within the administered area they also addresses the larger issue of historical/geographical context or setting. These sites exist in an environment that can be easily compromised. CIS's have been prepared and approved for all the sites in the Halifax Defence Complex.

The Halifax Sites

The Halifax Citadel is the site most remote from the harbour yet many will remember that the view planes from Citadel Hill became an issue of great public debate in the 1970's. As a result view planes legislation

was introduced to protect these most important vistas. Parks Canada strongly supports such legislation as it significantly contributes to the commemorative integrity of the Halifax Citadel NHS. As a result it has led to the involvement of Parks Canada in a number of developments in the downtown core area over the last two decades. The relationship of the Citadel to the harbour has been protected. It is crucial for a true appreciation of the Citadel that visitors be able to understand how the Citadel related to the harbour and the other forts in the defence complex. The legislation facilitates this and thus contributes to commemorative integrity.

Parks Canada has a special interest in Point Pleasant Park for a number of reasons. In the first place Prince of Wales NHS is located in the park and is owned and operated by Parks Canada. Its commemorative integrity includes its geographical setting within the park and its relationship to the other forts and batteries in the area. Point Pleasant Park is federal crown land. A lease agreement was signed with the Point Pleasant Park Commission in 1872 for land which had become surplus to military needs. With the creation of the HRM the Commission was discontinued with the result that a new lease agreement is under discussion. Any development which impacts on Point Pleasant Park thus is of interest and concern to Parks Canada.

McNabs Island has been the subject of much study and analysis over the last several years. Parks Canada has been working closely with the Province of Nova Scotia concerning future land use and development on the Island. Provincial plans for a park on the Island enabled Parks Canada to rationalize its land holdings. Only lands essential to the management and operation of Fort McNab NHS were retained with the remainder being transferred to the Province. In the future Parks Canada plans to operate Fort McNab NHS within the context of the Provincial Park. To prepare for this eventuality a Statement of Commemorative Integrity was prepared which identified the importance of the geographical setting in which the site is situated. As part of the land exchange a complete environmental analysis of both McNabs and Lawlors Islands was undertaken. Parks Canada sees itself as a stakeholder and partner in the future development of McNabs Island.

York Redoubt on the western side of Halifax Harbour consists of a large land base - 72.5 hectares. The main part of the Site sits on a high bluff overlooking the harbour channel . Aside from specific resources within the site the Statement of Commemorative Integrity refers to the historic place. These values relate to setting and location. The setting includes the rocky bluff whose high elevation provided considerable strategic advantage over adjacent lands and water. The slope and formidable shoreline provided a deterrent to enemy landings. At the same time, certain places along the water's edge were adaptable to accommodate defence works. The location which flanks the harbour's entrance channel is another contributing factor to the definition of historic place. View planes, directly associated with the harbour's outer line of defence enhance our understanding of the role of York Redoubt within the Halifax Defence System and help define historic place.

Georges Island NHS sits in the middle of Halifax Harbour. In addition to the land base itself Parks Canada owns a water lot around the Island. The island is valued for its geographical setting in Halifax harbour, strategically situated to protect the naval base, and as part of the harbour landscape with important view planes associated with the harbour defence system. The physical attributes of the island such as its form, size, drumlin nature contribute to its historic

value by providing an environment capable of sustaining the evolution of the cultural landscape that witnessed significant changes in defence technology. In discussing historic place one must understand the "whole" of Georges Island and its relationship to the Halifax Defence Complex. The site is in fact an island, located in the middle of one of the finest harbours in the world. It has both a military and navigational reality. The island sits in a very specific geographic and strategic context. Its view planes enabled it to dominate the harbour channel and its location was integral to the overall defence system. Georges Island must always be placed within this larger reality to better protect and present its heritage values. Commemorative integrity ensures this perspective.

This description of commemorative integrity and the various national historic sites within the Halifax area should give participants an idea of why Parks Canada would be interested in a workshop entitled "Preserving the Environment of Halifax Harbour" and why we consider ourselves a stakeholder and partner when it comes to harbour development. While it is the imperative of commemorative integrity that most directly draws us in as concerned stakeholders it is necessary to also understand the concept of ecological integrity and how that may or may not be relevant to our discussion to fully understand the Parks Canada interest in the environment of Halifax Harbour.

Definition of Ecological Integrity and National Parks

The concept of ecological integrity was first imbedded in the National Parks Act in 1988 in relation to park management planning but without a definition ecological integrity. A bill, now in Parliament to further amend the National Parks Act would make clear that for national parks the; "*maintenance of ecological integrity through the protection of natural resources shall be the first priority of the Minister in the consideration of park zoning and visitor use*". But what does it mean? What is ecological integrity? Honest ecosystems. The most up-to-date definition that I have, and this has been the subject of much scientific and bureaucratic debate, is:

"*An ecosystem has integrity when it is deemed characteristic for its natural region, including the composition and abundance of native species and biological communities, rates of change and supporting processes*"

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The authors of this definition stress that for national parks ecological integrity includes a number of key characteristics;

- Ecological integrity must be assessed with an understanding of the regional evolutionary and historic context that has shaped the system
- The best ecological integrity conservation strategy is to maintain or restore the native system diversity (gene, species and community levels)
- Because ecosystems are dynamic, conservation strategies should maintain or restore key ecological processes within their natural range of variability
- Ecosystems are multi-scaled and conservation should be considered at many scales. National Parks are parts of larger ecosystems and they must be managed in that context.
- Functional connections between parks and equivalent protected areas within the regional ecosystem should be maintained or restored to allow wildlife movement.
- Populations of species should be managed to levels that have a high likelihood of persistence.
- Ecosystems have characteristic rates of change rates and direction are critical to understanding the system.

- Parks have a finite capacity to withstand human use and facilities should be compatible in type and amount.
- Ecological integrity must be assessed and understood at a landscape scale. While ecological integrity cannot be assessed at the scale of a forest stand, campground, or parking lot, it can be compromised at any scale. Even small scale impacts can have cumulative effects and should be considered in this light.
- The goal of conserving ecological integrity is best addressed by maintaining or restoring the diversity of genes, species and communities native to the region. It is simply consistent with the vision of integrity which is "wholeness" -if parts are missing, the ecosystem is not whole.

Simply put national park ecosystems have integrity when they have their native components (plants, animals, and other organisms) and their biological and physical processes (disturbance, growth), intact.

Parks Canada scientists and partners in the academic community have been working over the past ten years to establish a rational means of assessing ecological integrity so that we can track and report on the state of the National Parks in Canada. This includes the development of a monitoring framework and the specific ecological integrity monitoring programs at each of the national parks.

From an operational perspective the introduction of the concept of ecological integrity into the day-to-day working of Parks Canada has pushed our managers out of the parks themselves, across park boundaries into the world of stewardship and ecosystem-based management. It is not now uncommon to hear of a Parks Canada Superintendent acting as an intervener in regional land use planning exercise or environmental assessment process for a project outside of park boundaries when activities threaten ecological integrity. We will be doing more of this in the future as ecological integrity becomes a central value in the culture of our organization.

For anyone interested in exploring Parks Canada's journey into the world of ecological integrity I recommend the reports on the State of the Parks produced every two years and tabled in Parliament since 1990. Also an independent panel on the Ecological Integrity of Canada's National Parks has just finished its work will release its report to the public latter this month.

Ecological Integrity and the Management of National Historic Sites

As noted Parks Canada's purpose statement, the concepts of both long-term ecological integrity and commemorative integrity are core values for our organization. Clearly commemorative integrity has much more relevance to national historic sites than does ecological integrity. That is not to say that ecological values are not important or are not considered in our historic sites. Environmental protection measures, environmental assessment, integrated pest management and other environmental protection tools are used to a high standard in national historic sites. In larger historic sites with significant land bases such as Louisbourg National Historic Site here in Nova Scotia or L'Anse aux Meadows in Newfoundland Parks Canada makes significant efforts to track and maintain ecological integrity. But in general measures to maintain ecological integrity are subservient to cultural integrity requirements in national historic sites. And in special situations such as Kejimkujik where a park is both a National Historic Site and a National Park there are important

management challenges in accommodating both ideals within a single property.

Is the Concept of Ecological Integrity as Developed for the National Parks Relevant to the Halifax Harbour?

National Parks are at the conservation end of a ecosystem-use spectrum. Their role is to conserve ecosystems with the highest degree of ecological integrity. Halifax Harbour is clearly at another point on that spectrum. Measuring and setting goals related to ecosystem integrity would clearly be a worthwhile exercise to raise awareness and protect the environment of the harbour in the long term.

Summary

We think that the concepts of commemorative and ecological integrity will be useful in any broader scale ecosystem approach to management exercise such as the one at the core of this workshop.

Even though these ideas were developed specifically to deal with the management issues facing protected heritage areas such as national historic sites and national parks we invite you to consider how they might be incorporated in the discussions here this week.

Identifying, measuring, reporting and taking active measures to preserve and protect the primary cultural and ecological values of the Halifax Harbour must be at the heart of any successful effort to protect the environment of the Halifax Harbour in the long term. Parks Canada continues to see itself as a partner in the future of the Halifax Harbour.

Table 1 Parks Canada's Chosen Indicator Set for the Assessing Ecological Integrity of Canada's National Parks

Biodiversity	Ecosystem Functions	Stressors
Species richness • Change in species richness • Numbers & extent of exotics **Population Dynamics** • Mortality/natality rates of indicator species • Immigration/ emigration of indicator species • Population viability of indicator species **Trophic Structure** • Size class distribution of all taxa • Predation levels	**Succession/retrogression** • disturbance frequencies & size (fire, insects, flooding) • vegetation age class distributions **Productivity** • landscape or by site **Decomposition** • by site **Nutrient retention** • Ca, N by site	**Human land-use patterns** • Road density • Population density • Land uses **Habitat Fragmentation** • Patch size inter-patch distance for interior **Pollutants** • Sewage, petrochemicals • Long-range import of toxic chemicals **Climate** • Weather data • Frequency of extreme events **Other** • Park specific issues

Preserving the Environment of Halifax Harbour: What can Parks Canada contribute?

Appendix 1

National Parks Act Part II

Historic Parks. (1) The Governor in Council may set apart any land the title to which is vested in Her Majesty, as a National Historic Park to

(a) commemorate a historic event of national importance; or

(b) preserve any historic landmark or any object of historic, prehistoric or scientific interest of national importance.

(2) The Governor in Council may make any changes in the areas set apart under subsection (1) that the Governor in Council may consider expedient.

10. The Governor in Council may, by order, apply to the areas set apart under subsection 9(1) such provisions of sections 5, 7 and 8 as he may consider advisable.

Historic Sites and Monuments Act Chapter H-4

An Act to establish the Historic Sites and Monuments Board of Canada

Short Title

1. This Act may be cited as the Historic Sites and Monuments Act.

R.S., c. H-6, s. 1.

Interpretation

Definitions

2. In this Act,

"Board" means the Historic Sites and Monuments Board of Canada established by section 4;

"historic place" means a site, building or other place of national historic interest or significance, and includes buildings or structures that are of national interest by reason of age or architectural design;

"Minister" « ministre »

"Minister" means the Minister of Canadian Heritage.

R.S., 1985, c. H-4, s. 2; 1995, c. 11, s. 23.

Commemoration of Historic Sites

Powers of Minister

3. The Minister may

(a) by means of plaques or other signs or in any other suitable manner mark or otherwise commemorate historic places;

(b) make agreements with any persons for marking or commemorating historic places pursuant to this Act and for the care and preservation of any places so marked or commemorated;

(c) with the approval of the Governor in Council, establish historic museums;

(d) with the approval of the Treasury Board, acquire on behalf of Her Majesty in right of Canada any historic places, or lands for historic museums, or any interest therein, by purchase, lease or otherwise; and

(e) provide for the administration, preservation and maintenance of any historic places acquired or historic museums established pursuant to this Act.

R.S., c. H-6, s. 3.

Halifax Harbour and Marine Mammals : Life in the Shipping Lanes

Paul F. Brodie

Introduction

Marine mammals (seals and whales) exist in large numbers in the northwest Atlantic. The marine inlet, which forms Halifax Harbour and approaches, provides a window for us to observe the diversity, remarkable size, and activities of several species that are representative of the bigger picture in the Atlantic. Marine mammals are present year round, as much a tribute to their adaptability as it is to our relatively recent interest in marine habitat.

In spite of a 250 years of shipping commerce, shipbuilding, and wartime activity Halifax harbour still provides a basis for year-round ecotours, sportfishing, seabird and whalewatching. Chebucto Head has been the site of commercial herring seining, side by side with fin whales, exploiting the same resource. This activity is adjacent to, and often within, the shipping lanes of very large vessels.

There is no hunting of seals in the immediate area, and there are guidelines and regulations to reduce harassment of whales. This may be a most important signal. Marine mammals are still not that well understood, in terms of their hearing tolerances, and we are left to differentiate between what may be considered their "conditioning," and the priority which they place on prey resources or other qualities of a particular site. We can be encouraged that the harbour continues to be attractive to marine mammals while supporting viable commerce, however we should not be complacent, since marine mammals are an important asset as well.

To understand marine mammals we require greater appreciation of how these animals work, from their mechanics to their physiology. This allows us to develop more realistic models of individuals and to extrapolate to populations, their energy costs, thus their food requirements and the ocean dynamics, which generate the necessary prey concentrations. In the process, marine mammals become valuable research tools. In turn, we may learn to minimize our impact upon them.

In terms of the northwest Atlantic, and how it is reflected in Halifax Harbour, it is worth examining some of the events which may have resulted in major demographic changes with respect to marine mammals on the Scotian Shelf, the Gulf of St. Lawrence and the Bay of Fundy/Gulf of Maine. Some changes may be triggered by natural events, while others may be a consequence of changes in fishing practices and fishing technology. It is important to remember that marine mammals are also renewable resources and are harvested by other Canadians.

Feeding Mechanics and Possible Sound Generation in Whales

Baleen whales are the largest animals to have ever existed; consequently the scale of their mechanical actions (biomechanics) is unparalleled in evolutionary history. The exceptional body mass and unique tissue design of these mammals could only have evolved in the relative weightlessness of a marine environment, which also serves as a heat sink for the purpose of thermoregulation (Brodie,1993 a).

Some of the feeding actions of Rorquals (Fin and Blue whales) are of spectacular proportion, engulfing as much as 70 mt of seawater in several seconds, retaining this volume within an elastic throat pouch, while retaining the prey as water is forced out through baleen filter plates (Orton and Brodie,1987)

Based on field experiments, primarily on fin whales, it was proposed (Brodie,1993b) that the forces involved in the inertial feeding action of baleen whales such as fin, blue and sei whales, was of such a scale that these forces were also used to generate powerful, low frequency, noise. The noise was not considered to be simply incidental to the action, rather the final event in an evolved engulfing strategy. These noises were produced by a pseudocavitation (joint crack), generated by re-articulation of the mandibles at the jaw tip, and may be an important component of some feeding actions.

The forces involved can be quite spectacular: a whale of 50-150 mt, moving at 1-3 m/sec, lowering a massive jaw which could experience flow rates of 10-30 mt of seawater per second, through the jaw frame and into the elastic throat pouch. The force driving the jaw downward would range from 1,000 to 3,000kg, equivalent to 10, 000 to 30,000 Newtons (Brodie, field measurements). In response to this force, the mandible dislocates or re-articulates. The cavitation produced within the rapidly separated synovial tissue at the tip is transmitted along the 4.5-7m oil-filled mandible as a reverberation or stridulation of very low frequency (est . below 20 Hz). It is also possible that the enormous, near hemispheric buccal pouch, when under full distension, might act as an additional resonating surface.

These observations also suggest that, at least these baleen species have evolved protective mechanisms within these lower frequencies and amplitudes, which buffer their own noise generation as well as that of others. It was proposed that the massive complex of elastic tissue joining the mandible to the cranium might also act as a mechanical noise filter.

This action is of such a scale, both in size and the forces involved, that the resulting noise might reasonably be considered too powerful to be of biological origin, and may therefore have been attributed to man-made mechanical noise. This explanation has caused some researchers to re-examine their field data.

Group feeding, by fin whales for example, is commonly observed (P. Brodie, pers.obs.) and the noise may be of selective advantage, providing acoustical cues to associated whales, that prey have been encountered. Depending upon the number of whales in a feeding area as well as the feeding strategy, the number of low frequency pulses might vary from several, to hundreds per day.

Marine Mammal Observations in the Harbour and Bedford Basin

Bedford Basin is not often regarded as a body of water frequented by marine mammals. It has been assumed by most to be unattractive to wildlife in general and this attitude is reflected in the low level of sighting and reporting effort.

While there is industrial shipping, military vessels, and pleasure boat activity in part of the basin, much of the shoreline on the eastern side is not readily accessible to the public, furthermore the nearshore is relatively undisturbed. The continued presence of other predators of fish: loons, ospreys, cormorants, mergansers, herons,

bald eagles as well as recreational fishermen, does provide some evidence of prey diversity and distribution. It is assumed that marine mammals prey on the same species. Cod and haddock have been seen to be landed by fishermen fishing in the Narrows, and herring and mackerel shoals have been observed. Shoals of mackerel have been observed feeding on copepods at the dockside of BIO. The gyre caused by the tidal currents and the quay at BIO, especially on the north side, has been an attractive feeding site for all bird species mentioned, as well as marine mammals.

The tidal flow through the Narrows probably does provide some navigation cues for marine mammals at the south end of the basin. There is no basis for the popular assumption that any marine mammals present in the basin, are there because they are unable to find an exit.

Seals

Both grey and harbour seal have been observed in Bedford Basin, however harbour seals are by far the most common sighting. Harbour seals can be observed basking on the rocks along the shoreline over much of the year, and individual seals will haul out on the ice in February and March. Harbour seals have been observed off BIO, surfacing with fresh-caught flounder. One harbour seal was observed on a rock off Prince's Lodge, carrying a flipper tag, which indicated that it had originated from Sable Island. Numbers of harbour seals frequenting the basin at one time, might be as high as 20-30. Added to those seaward of Point Pleasant Park, there may be in excess of 100 seals in the harbour for part of the year. These numbers drop off in May- July when most move to breeding sites along the coast or possibly to Sable Island.

The much larger grey seal is not as conspicuous by its evasive behaviour. Frequency of sightings is lower and it is doubtful that more than 2-3 animals frequent the basin at one time, with several times that number in the outer harbour. The large breeding colony of grey seals on Sable Island, producing circa 30,000 pups (D. Bowen, pers com.) during the January-February breeding season, does result in a movement of young (2-3 month old) to the mainland. Invariably, during late February and March, there are reports of whitecoat and moulted pups along the shoreline, including the basin. Animals in good condition will eventually move out of the basin after several days.

The Sable population of grey seals has demonstrated a greater than 100-fold increase in pup production since 1963 (300 in 1963 to over 30,000 in 1999). It was proposed that this continued rate of increase might be in response to changes in technology within the swordfishery (Brodie and Beck, 1983). In this case, extensive removal of the dominant bycatch on the pelagic longlines (predatory sharks) may have resulted in higher survival rates of grey seals. Sportfishing and other directed shark fisheries may also have contributed to the decline in some of the larger predatory sharks.

Whales

Most of the sightings have been of small odontocetes, however there have been reports of larger whales.

Harbour porpoise do frequent Bedford Basin, usually single animals and occasionally in pairs. The earliest sighting, April 12, 1999 off BIO (obs. P. Brodie), was of a pair swimming along the east shoreline through the tidal gyre.

Atlantic white-sided dolphins have been sighted in the basin on several occasions

over the past 25 years. They enter the basin, mid-summer to fall, usually in groups numbering 20-35 animals. Because of their more visible surface activity they are better monitored. They range over a large part of the basin, from the container pier across to BIO and northwest toward Bedford. They have been observed swimming within close proximity of the DND(DREA) acoustic research facility moored on the west side of the basin. As well, they have been observed swimming within 100m of a submarine leaving through the Narrows. On many occasions their surface behaviour indicated that they were group feeding, several times in an area where fishermen reported catching haddock. During the mid-1980's one group of circa 35 animals remained in the basin for 10 weeks. In the mid 1950's a beluga was seen over several days, swimming near the shipyard and the Narrows. A carcass, believed to be that of a beluga, was later reported to have grounded on the shore near the west side of the Narrows.

Large Whales

In July 01 and 03, 1991, there were separate reports of a large whale approaching, or close to, pleasure boats on the west side of Bedford Basin. The description provided, of the size, speed and behaviour suggested that it was a northern right whale.

There had been previous reports with similar descriptions, from the Northwest Arm and off Point Pleasant Park. In February of 1987, two right whales were reported (P. Grey, pers. com) in the vicinity of feeding fin whales off Chebucto Head.

There have been several whale carcasses examined over the years: fin, sei and humpback. In all cases, it appears that they had been struck offshore by large container vessels, which by their bulbous bow design, retain the carcass until the ships reverse during docking.

References:

Brodie P.F. 1993A A Note on Some Aspects of the Physiological and Bio-mechanical Research Conducted on Rorquals from Iceland. Rep. Intl.Whal.Commn. 43. SC/91/Fl2. 501-503.

Brodie P.F. 1993B Noise Generated by the Jaw Actions of Feeding Fin Whales. Can.J. Zool. 71: 2546-2550.

Brodie P. F. and B. Beck 1983 Predation by sharks on the grey seal (Halichoerus grypus) in eastern Canada. Can. J. Fish. Aquat. Sci. 40(3), 267-271.

Orton, L.S. and Brodie P. F. 1987 Engulfing Mechanics of Fin Whales. Can. J. Zool. 65: 2898-2907.

Halifax Harbour: Marine Geology, Anthropogenic Characteristics and Management

Gordon B. J. Fader

Introduction

The most recent marine geological and geophysical surveys of Halifax Harbour, extending from Bedford Bay to the inner Scotian Shelf, were part of a comprehensive study of the Harbour conducted between 1988 and 1995 (Figure 1). These studies were driven by: 1) the initiation of new nearshore programs of the Geological Survey of Canada; 2) offshore mineral assessment programs of the Canada–Nova Scotia Mineral Development Agreement commonly known as MDAs; and 3) requirements for a geoscience synthesis of the Harbour related to plans for siting, design and construction of wastewater treatment facilities.

Acoustic survey data were collected with sidescan sonar, high-resolution seismic reflection profiling and multibeam bathymetric mapping systems. Sediment samples were obtained with grab samplers, corers and borehole drilling equipment. Direct seabed observations were conducted using submersibles, remotely operated vehicles and camera systems. Maps of sample and acoustic control, sediment distribution, bedforms, gas-charged sediments, sediment thicknesses, seabed anthropogenic and natural features, multibeam bathymetry and seabed slope have been prepared (Fader et al., 1991 and 1994) as Geological Survey of Canada Open File reports. A geological history of the Harbour has been interpreted from these data sets and a regional synthesis of the marine geology is in final preparation to be published as a Bulletin of the Geological Survey of Canada (Fader and Miller, in prep.). The information in this report provides a regional geological framework (Figure 2) of the Harbour which can be applied to a wide variety of development activities such as the design and assessment of engineering projects and as the basis for additional benthic and oceanographic studies. Summary assessments on environmental conditions (Fader and Buckley, 1995) and engineering development (Lewis et al., 1996) have also been published.

Geological History

A geological history dominated by glacial processes of deposition and erosion during ice advance and retreat; glaciomarine and lacustrine deposition overprinted by marine transgression; and recent modern sedimentation has produced a complex stratigraphy and contrasting sediment distributions between the inner and outer areas of the Harbour. The morphology and location of the Harbour itself is attributed to glacial overdeepening of pre-existing fluvial drainage systems that were constrained by the presence of a large Devonian-aged granite batholith to the west of the Harbour. Varying bedrock lithologies and structure also caused differential erosion so that overdeepening by glaciers was confined to anticlines of the Goldenville Formation within the Harbour: Bedford Basin being a typical example (Figure 3). Glaciers repeatedly advanced throughout the Harbour during the Pleistocene, but the bulk of the present sediment was deposited during the last glaciation (Wisconsinan). Drumlins and

moraines composed of till were formed by ice which advanced well beyond Halifax Harbour to the edge of the Scotian Shelf, over 100 km to the southeast. A series of post-glacial lakes formed throughout the Harbour in bedrock depressions and were progressively flooded by the sea during the marine transgression beginning approximately 11,600 yBP from a low stand of -65 to –70 m at the mouth of the Harbour (Stea et al., 1994). The transgression eroded and reworked glacial materials, forming sand and gravel deposits of the Sable Island Sand and Gravel formation. By 6000 yBP, deposition of LaHave Clay began in the inner Harbour, sourced from eroding glacial, lacustrine and estuarine materials. Bedford Basin, formerly a lake, was finally flooded by the rising sea at 5700 yBP, resulting in a transition from lacustrine to marine environments. Conspicuous boulder berms, formed as ice push ridges, ring Bedford Basin at a present depth of 23 m and attest to the existence of a lake prior to the marine incursion.

Sediment Deposition

The present inner Harbour north of McNabs Island is a depositional zone for muddy sediments, with local areas of high currents that result in both areas of non-deposition and periodic deposition and erosion (Fader et al., 1996). Fine-grained sediments are generally trapped in the Harbour. In striking contrast, the outer Harbour is a highly energetic environment of sand and gravel with a variety of bedforms, and exposed bedrock. Little sediment deposition is presently taking place in the outer Harbour with the exception of sand and gravel eroded from till and drumlins along the shoreline of the south eastern area. A sediment transitional zone occurs between the inner and outer areas of the Harbour west of McNabs Island north of Sandwich Point. Sedimentary furrows, sediment moats and obstacle induced scours attest to periodic deposition and erosion of the silty sandy clay. Both the inner and outer Harbours exhibit large areas of seabed that are relict, having resulted from glacial deposition and erosion followed by the marine transgression, with no modern alteration or deposition.

Large zones of LaHave Clay in the inner Harbour, and buried estuarine/lacustrine mud in the outer Harbour, are charged with biogenic methane gas. Dredging, propeller scouring and anchoring contribute to the release of the gas through the sediments and water column in the inner Harbour. The thickest deposits of LaHave Clay, ranging to over 6 m, occur in depositional zones in the inner Harbour north of McNabs Island, north of Georges Island, in the Northwest Arm, Eastern Passage and in Bedford Basin. The mud is very thin or absent in The Narrows and in most nearshore zones of less than 5 m water depth, as well as to the east and west of Georges Island, on Ives Knoll, and in the deepest part of the inner Harbour between northwestern McNabs Island and south Halifax Peninsula. Areas of the deep floor of Bedford Basin show several 2 m deep broad depressions with horseshoe-shaped northwest flanks. The origin of these features is not clearly understood as they could represent depressions formed by methane gas venting, sediment dewatering, differential compaction or slumping.

Anthropogenic Features

Anthropogenic features are widespread on the Harbour floor north of McNabs Island. These include a dense network of anchor marks, dredge spoils, borrow pits, collapsed bridge remains, shipwrecks, propeller scours, dredged areas, cables, pipelines, outfalls and intakes, sewage banks, seabed moorings, automobiles and unidentified debris. Anchor marks, depressions up to 2 m

in depth and 5 m in width, are widespread in Bedford Basin and inner Halifax Harbour. They are formed by the deployment, dragging and recovery of ships' anchors and are classified as anchor pit marks, anchor chain marks and anchor drag marks. The term "anchorturbation" is proposed to describe the process of anchor disturbance and resuspension of sediments. Their widespread presence attests to a strong influence on the disturbance and resuspension of sediments by shipping related activities. Over 30 shipwrecks or large pieces of shipwrecks have been found on the Harbour seabed.

Sediment Transport

Sediment bedforms and transport indicators occur both on cohesive and non-cohesive sediments. Periodic strong oceanographic currents that result from large storms redistribute sand and gravel in the outer Harbour. These events also resuspend fine-grained sediments in the inner Harbour developing sedimentary furrows, sediment moats and scour depressions. Other depressions are localized moats surrounding raised features on the seabed which result from a lack of deposition controlled by slight increases in currents. The orientation and other characteristics of the bedforms, together with geochemical anomalies indicate net transport of material up Harbour to the north.

Harbour Management

As a result of the detailed mapping of the seabed of Halifax Harbour and an understanding of past and present processess that have and are shaping the Harbour floor, marine geologists are frequently called upon to provide advice and guidance to a wide variety of industrial, university, government and private groups interested in conducting activities and development in the Harbour. Examples include the siting and routing of communication and electrical transmission cables, the siting of water intakes for cooling and lobster storage, shipwreck location, beach construction, filling in of shoreline areas, aggregate availability, wharf construction, archaeological assessment, location of unexploded ordinance, etc. By default, the Geological Survey of Canada, therefore, contributes to integrated coastal management by providing a knowledge base on seabed conditions as well as advice and guidance on conflict resolution, despite the fact that the GSC does not have a regulatory mandate.

During deliberations of the former Halifax Harbour Cleanup Corporation on the design of a single regional sewage treatment facility, it was often remarked by company officials that harbour wide plans were very difficult to develop because of the many agencies, organizations and communities with an interest and role in Halifax Harbour management. To some degree this has been partially alleviated by the establishment of the HRM with a strong regional political voice instead of many.

Despite the problems in Harbour management associated with a wide variety of regulators and interest groups, we can be confident in knowing that the Harbour is one of the best studied in the world. From a geoscience perspective the Harbour is well-understood and the development of new mapping technology within the Harbour (Courtney and Fader, 1994) has provided an unprecedented understanding of conditions, attributes and processess. Less understood characteristics of the Harbour include detailed oceanographic measurements on currents and waves and a regional understanding of the distribution of benthic organisms and sediment organic contaminants. Despite these shortcomings, the extensive knowledge base does allow for

detailed planning and assessment of activities presently taking place and/or planned for the Harbour. Perhaps what is needed is a central clearing agency to guarantee that future plans and proposals are adequately vetted amongst the many organizations with regulatory responsibilities and to ensure that other knowledgeable organizations can be readily accessed.

References

1991, Fader, G. B. J., Miller R. O., and Pecore, S. S., The Marine Geology of Halifax Harbour and Adjacent Areas (Volume 1 and 2, 23 pp. and 25 maps). Geological Survey of Canada Open File Report No. 2384.

1994, Courtney, R. C. and Fader, G.B.J. A new understanding of the ocean floor through multibeam mapping: Science Review 1992 and 1993 of the Bedford Institute of Oceanography. Dept. of Fisheries and Oceans, p. 9-14.

1994, Fader, G.B.J., Miller, R.O. and Pecore, S.S. Sample control, anchor marks, anthropogenic features and lacustrine sediments of Halifax Harbour. GSC Open File Report # 2958.

1994, Courtney, R. C. and Fader, G.B.J. A new understanding of the ocean floor through multibeam mapping: Science Review 1992 and 1993 of the Bedford Institute of Oceanography. Dept. of Fisheries and Oceans, p. 9-14.

1995, Fader, G.B.J. and Buckley, D.E., Marine geolgy and geochemistry in the environmental management of Halifax Harbour. In Environmental geology of urban regions. Special publication of the Geological Association of Canada. Also in Geoscience Canada.

1996. Fader, G.B.J., Miller, R.O. and Courtney, R.C. A geological interpretation of multibeam bathymetry: inner Halifax Harbour. GSC Open File Report # 3154

1996, Lewis, C.F.M., Taylor, B.B., Stea, R.R., Fader, G.B.J., Horne, R.J., MacNeil, S.G. and Moore, J.G. Earth science and engineering urban development in the metropolitan Halifax region. GAC Special paper in Urban Geology of Canadian Cities. Edited by P.F. Karrow and O.L. White.

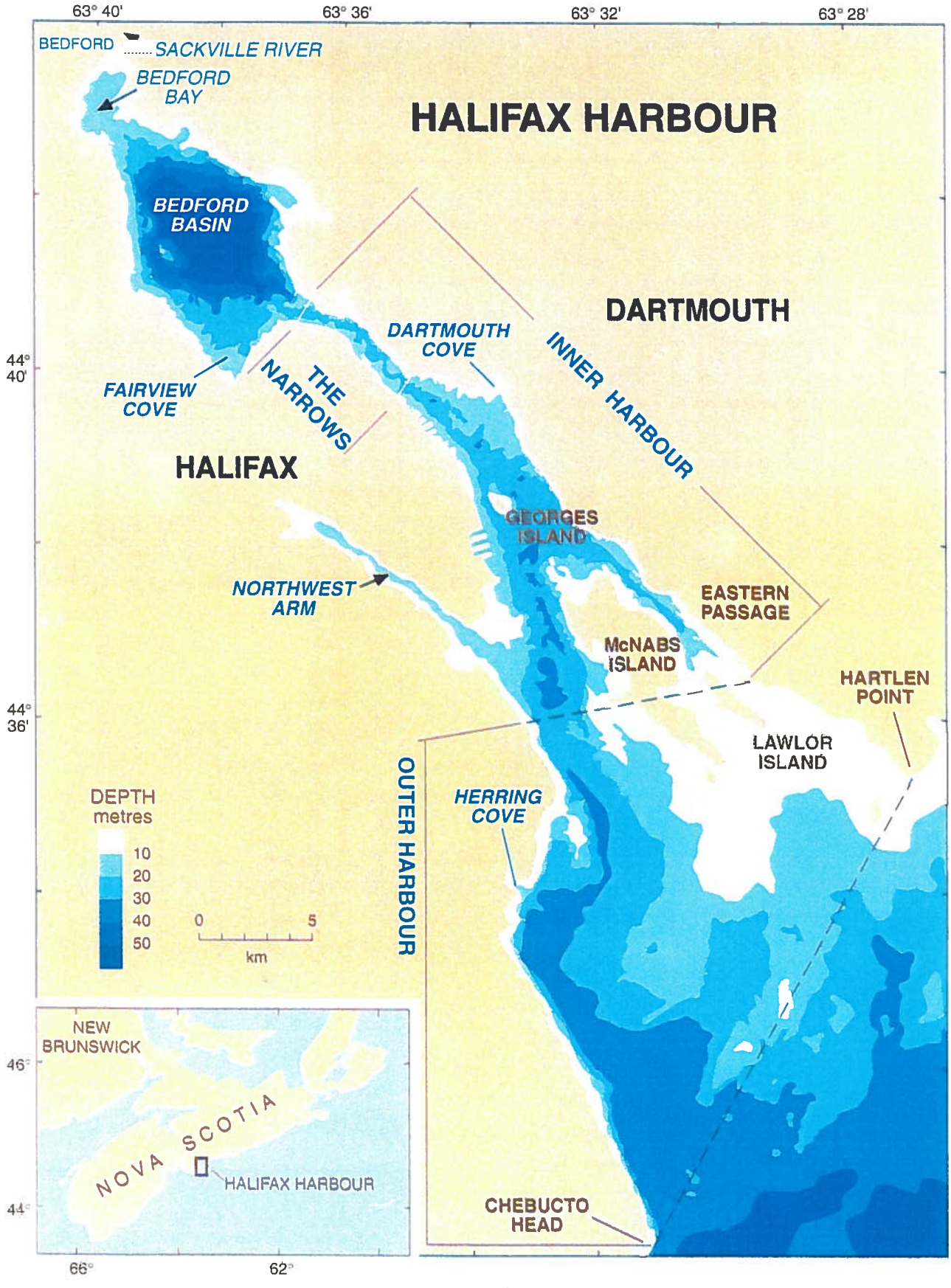


Figure 1. Bathymetry and geographic divisions of Halifax Harbour.

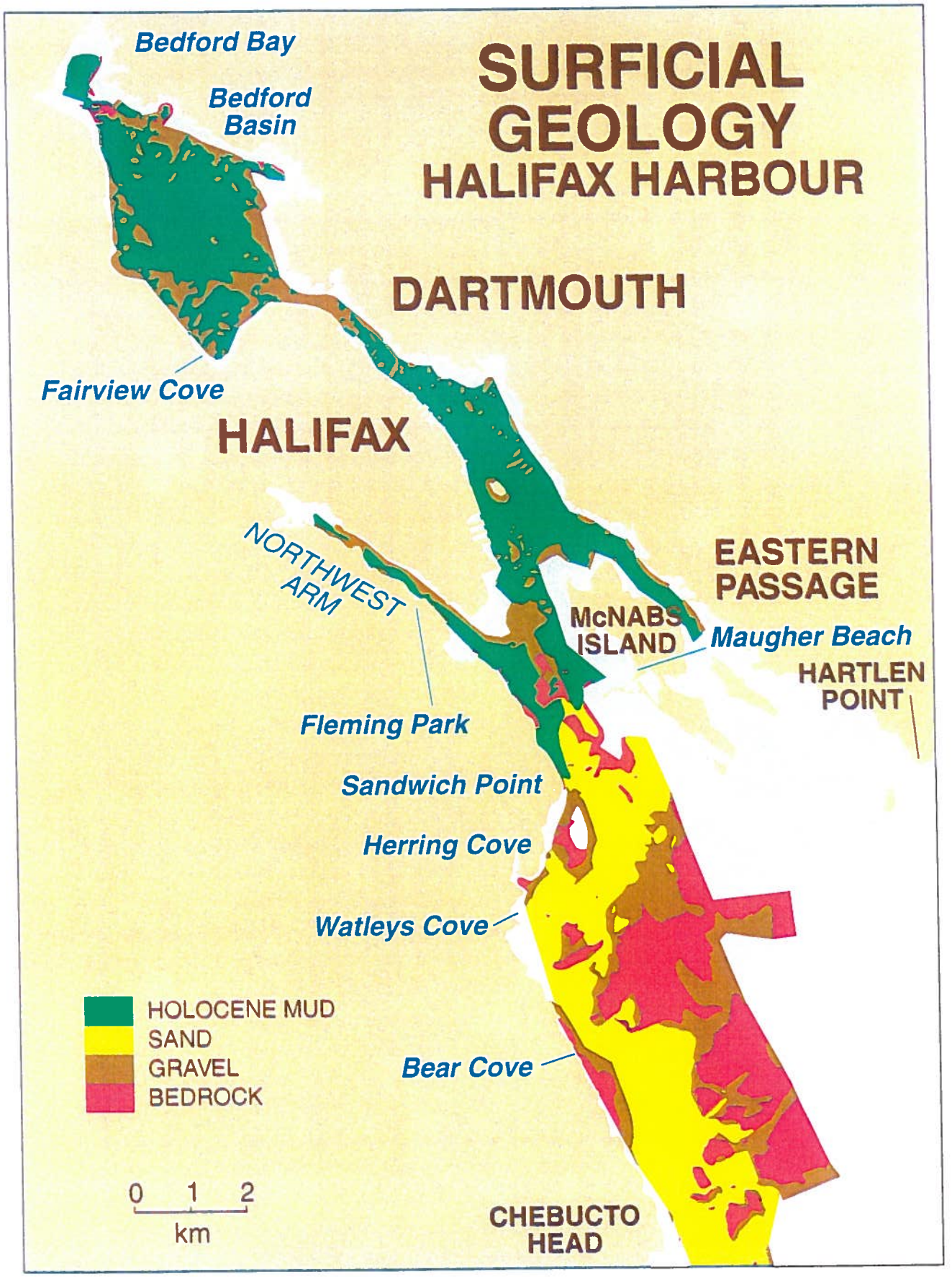


Figure 2. Distribution of surficial sediments on the seabed of Halifax Harbour.

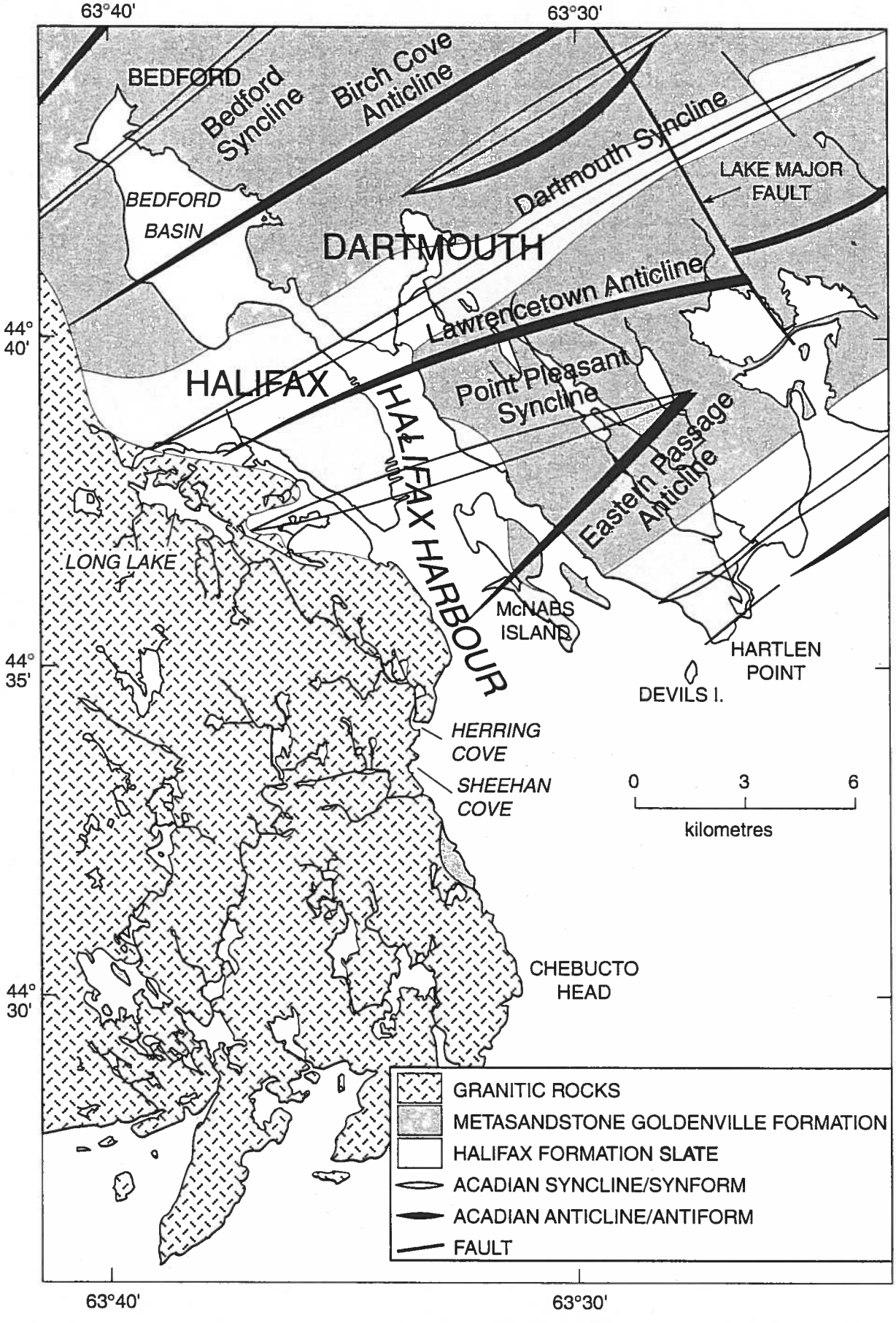


Figure 3. Bedrock geology of the area surrounding Halifax Harbour and the location of harbour-crossing bedrock structural elements.

Question and Answers
Part 1

Questions asked by Gordon Fader, NR Can. Scientist in his presentation *

1. Will present and future sewage treatment plant designs be subjected to environmental assessment? What are the triggers?
2. Are planned infilled areas always subject to rigorous environmental assessment?
3. Has the presence and threat of unexploded ordinance been properly addressed?
4. What effect does harbour shape change have on sediment and contaminant redistribution?
5. Are the finfish and lobster still safe for consumption?
6. Who controls the laying of cables, pipelines and water intakes on the seabed?
7. How has the HRM followed the recommendations of the Solutions Advisory Committee?
8. Are there sufficient resources applied to the archaeological potential?
9. What is the benthic distribution of organisms and their associated habitats?
10. Where should and should not development take place? Is there a long range plan?

** Dr. Fader posed a series of questions - of critical importance to the entire workshop participants - that remain to be answered.*

Part 2

Anthropogenic Stresses

The Sewer Side of Halifax Harbour

John Clarke

Halifax Harbour has received human wastes for untold years. Prior to the arrival of Europeans, this waste was small in volume and easily assimilated by the harbour waters. This changed in 1749 when Halifax was founded and 2500 settlers arrived. Shortly after this, the Royal Navy established the dockyard to service the expanding military presence in the colony. As the cities of Halifax and Dartmouth grew, so did the volume of human wastes and industrial wastes going into the harbour from the fishing and shipping industries, and from the military bases. The industrial wastes were mainly solid wastes such as old barrels or lost metal articles such as tools or chain, although there were some organic wastes from fish processing or leather tanning works discharging to the harbour. These wastes likely had a significant impact on the immediate discharge area but this was not considered a problem by the population. The boundless ocean waters were always being renewed.

At this time, there were no sewers aside from the streets and all wastes flowed to the harbour. The smell and the footing grew so bad that a bylaw was introduced in the early 1800's to prohibit the direct discharge of "slops" to city streets. This was largely an aesthetics issue. The population of the Halifax area in 1871 had grown to 29,600. It was not until the late 1880's to early 1900's that anything resembling a modern sewer collection system was built. Combined sewers, combining both domestic sewage and storm runoff, were constructed to service some areas. This was the origin of the current problem with combined sewer systems in the older parts of Halifax.

By 1911, the population had grown to 46,600. Through the First World War, increasing industrialization associated with shipping and the war effort led to increased industrial discharges to the harbour. The military population peaked at 9,000 during the war but had declined to 400 by 1922. The Shearwater air base was established in 1918 as a US naval air station. The civilian population also continued to grow, to the point that scientific studies in 1924 identified pollution in the waterfront area from the Narrows to the Ocean Terminals on the Halifax side of the harbour and from Eastern Passage to the Narrows on the Dartmouth side. Thirteen sewers were discharging raw sewage to the harbour. This was the first documented sign that sewage discharges were perceived as unacceptable, and that harbour water quality was being impaired.

During World War II, the military population in the Halifax area grew from 1,700 to about 50,000 and then declined. The navy grew from 11 ships to 300, with many more using the port as a staging point for convoys crossing the Atlantic. DREA (Defence Research Establishment Atlantic) was founded on the Dartmouth shore, and the CFAD (Canadian Forces Ammunition Depot) was located on the Dartmouth side of Bedford Basin. This military presence added further wastes to the harbour.

Halifax Harbour was receiving the untreated wastes from 138,400 people and associated industries in 1951. As the importance of the environment to Nova Scotians grew, politicians responded in the 1950's and 60's by requiring sewage treatment for

discharges to Bedford Basin to protect the Basin water quality. This resulted in the construction of the Mill Cove secondary treatment plant in 1971 and an interceptor sewer from Mill Cove to Duffus Street shortly after.

On the Dartmouth side, the Burnside industrial park started to develop in 1967. This area has experienced considerable growth since that time to over 1200 businesses. The sewer from this park was routed to Tuft's Cove, just south of the Narrows. Thus, by about 1975, there were only treated municipal discharges to the Basin and all untreated discharges occurred south of the Narrows. There were and still are other private, institutional and industrial discharges to the Basin but the major flows of sewage were excluded.

Although the Basin water quality would appear to be protected by this approach, the Basin already contained contaminated sediments from previous discharges. The circulation of harbour waters also transports some contamination from discharges south of the Narrows into the Basin. As noted above, there are still non-municipal flows that enter the basin.

Another source of contaminants to the harbour was reduced, but not eliminated, in the 70's. The Halifax city dump located on the shore of the Basin just east of the Mackay Bridge was closed and no new material was added, but the lack of an engineered containment means that contaminants continue to leach, at an unknown rate, into the harbour waters.

The City of Dartmouth and Halifax County built a secondary treatment plant at Eastern Passage in 1974 to address water quality problems in that area.

Other plans for sewage treatment were under consideration during this period and after it, but no additional facilities were constructed.

The Metropolitan Area Planning Committee considered a regional Plan with a treatment facility at "Hen and Chickens", a shoal off Point Pleasant Park. They also identified a facilities need for additional harbour studies to establish the degree of treatment required and to evaluate the impacts of sewage discharges on water quality. In the late 70's, there were further studies on regional treatment options, sludge management and "special waste" discharges to the harbour.

In 1988, the Canada-Nova Scotia Subsidiary Agreement on Halifax-Dartmouth Metropolitan Area Development was signed for the construction of a regional sewage treatment facility. Despite considerable effort and expenditures, this project never moved past the planning stage.

A sludge lagoon was constructed at the Aerotech Industrial Park in 1989 as a disposal site for the sludges from the existing sewage treatment plants in Halifax County. This removed a source of solids, BOD, metals and other organic contaminants that had previously been discharged to the harbour.

In 1998, the Halifax metropolitan area had a population of 348,800. Aside from the 2 treatment plants noted above, untreated sewage totaling 186.5 million litres per day was discharged from 26 municipal outfalls, all south of the Narrows. Of these, 24 are combined sewer outfalls. The 7 major municipal outfalls and their contribution are as shown in Table 1.

Table 1. Sewage discharge from Major Municipal Outfalls

	Outfall	Million L/D	
Halifax	Duffus Street	48.6	50% of Halifax flow
	Pier A	19. 3	21% of Halifax Flow
	Chain Rock Drive	12.2	13% of Halifax flow
Dartmouth	Dartmouth Cove	35.0	60% of Dartmouth flow
	Melva Street	5.9	10% of Dartmouth flow
	Burnside	5.7	10% of Dartmouth flow
Herring Cove	Herring Cove	35.4	100% of Herring Cove flow
	TOTAL FLOW	**186.5**	

It is estimated that 86% of the total municipal flow into the harbour remains untreated. In addition to these municipal outfalls, there are federal, institutional and private ones which bring the total to about 47.

These effluent discharges pose a number of problems for the health of Halifax Harbour. Very briefly, the discharges contain varying amounts of metals that may dissolve in the water or stick to the particulates in the discharge and fall to the seafloor as sediments. These sediments can smother the benthic community. The organic component of the discharge will decompose and use up oxygen to the point that marine organisms will die unless it is replaced. Some of the persistent organic chemicals and the metals are toxic to both benthic organisms and to fish in the water column. The storm runoff contains a broad range of chemicals, including petroleum products from cars and trucks on the streets. None of these materials are healthy for marine biota.

The human sewage and animal feces in storm water contain coliform bacteria that contribute to the growth of algae and shellfish but can lead to eutrophication if they are present in excess, or cause human illness if the shellfish are consumed. Most of the harbour is closed to shellfish harvesting as a result. Halifax Harbour, specifically Bedford Basin, has had only a few instances to date of fish kills from these types of inputs. They are a sign that the environment is stressed beyond the point of acceptability.

In general, the water quality of Halifax Harbour is good but it is deteriorating, and there are localized areas of significant contamination around the major outfalls.

A SUMMARY OF SPILLS INTO HALIFAX HARBOUR

Roger Percy

Introduction

Environment Canada has maintained a spills database since 1974. The database, now computer-searchable, is employed primarily to assess spill trends and is therefore useful in the design of prevention initiatives.

This paper briefly describes the spill reporting and response system in place in Atlantic Canada and attempts to provide a snapshot of information on the number and source of Halifax Harbour incidents over the past 6 years.

Spill Reporting and Alerting System

In Atlantic Canada, a dedicated pollution reporting number (Maritimes - 1-800-565-1633; Nfld. - 1-800-563-2444) has been established to receive spill reports both from marine and land-based sources. By prior agreement, the Coast Guard Operations Centre, manned on a 24-hour/day basis, alerts Environment Canada, appropriate CCG Emergency staff and the relevant provincial environment department. In this manner, appropriate regulatory and response bodies are promptly notified with a single telephone call. This arrangement also enables a cross-check among agencies to ensure that an effective and timely on-scene response, if necessary, has been mounted.

Response to Spills

Contingency plans, communication linkages and lead/resource agency designations for various spill scenarios are well established and tested on the east coast of Canada.

The onus for response, cleanup and environmental mitigation resides with the responsible party. The polluter may also depend on outside support and advice from commercial cleanup contractors and industry associations. In Canada, provincial and federal response to an emergency is scaled according to the seriousness of the event, the applicable legislative authority, the significance of the environmental impacts risked and the capabilities and responsibilities of the polluter. A team approach is normally taken to ensure that relevant jurisdictions are participating in the preparation of any advice or decision-making.

Environment Canada chairs the Regional Environmental Emergencies Team (REET) as a mechanism for marshaling and delivering comprehensive environmental advice and information. REET provides advice on spill impacts, resource sensitivities, environmental forecasting, cleanup techniques and priorities while planning and responding to emergency events. REET includes representatives from all federal and provincial agencies that have expertise, information or authority relating to environmental protection in the event of an emergency. Because private industry and industry associations have significant responsibilities for emergency planning and response, many are also members of REET. The Atlantic REET has operated continuously for more than 28 years.

Spill Trends Database

Each year, in excess of 2,500 spills are reported in the Atlantic Region. Since 1974, Environment Canada has kept a detailed manual record of all these spill reports. This data is now entered into a searchable computer database. Information is recorded

for some 40 categories including, among others, the date/time of the spill, cause and reason, type of product, amount of spill where known, province and location of the event, as well as the environment into which the material was released.

Caution should be used when interpreting any statistics developed from the spills trends database since clearly not all spills are reported to environmental authorities. Furthermore some agencies and industries have adopted strict policies that require every spill, no matter the size or location, to be reported while others only report when legally required to do so. As you will see from the information, that I will be presenting there are a significant number of incidents for which no one claims responsibility.

Spills into Halifax Harbour

While the Atlantic Region is not heavily industrialized, compared to other areas, there is nevertheless a substantial volume and variety of oil and chemical products imported into, transported through, processed and manufactured within the Halifax Harbour watershed. Many of these materials pose potential environmental and human health hazards when accidentally or deliberately released to the environment.

For the period 1994 to 1999 inclusive, we have recorded a total of 636 spills into Halifax Harbour (Figure 1); 79 of these pollution incidents took place during 1999. Roughly 18% of the reports since 1994 are for products other than oil. While there is considerable variability from year to year there is roughly a 50% reduction in the number of reports by the end of the 6 year period.

Not surprisingly, many of the spills that find their way into the harbour are of unknown origin (Figure 2); fully 38% of the total falls into this category. The main sources include ships (204; average 34/year), oil handling facilities (115; average 19/year) and other sources (47; average 8/year) which includes identified land-based releases entering the harbour via sewer outfalls and storm drains.

Figure 3 is a bar graph which categorizes the main reasons for spills into the harbour. Of the known reasons, human actions (33%), equipment failure (14%) and pipeline leaks (7%) are most often cited.

The large unknown category shown in Figure 4 is comprised of mystery sheens from unidentified ships and from run-off via outfalls. Of the known sectors reporting spills, the petroleum sector (36%) and the three levels of government(35%) held the largest share. Other contributing sectors were transportation (17%) and commercial facilities (8%).

Figure 5 attempts to sub-divide sector spills into sub-sectors. The largest number of government spills over the 1994 - 1999 period is attributable to the Department of National Defense, however, it should be borne in mind that DND is one of the groups mentioned earlier that adheres to a very strict reporting policy and responds to all incidents in the vicinity of their facilities.

The largest number of transportation sector spills is associated with the marine industry (63) while within the commercial facilities sector the service industry (33) has the majority of spills.

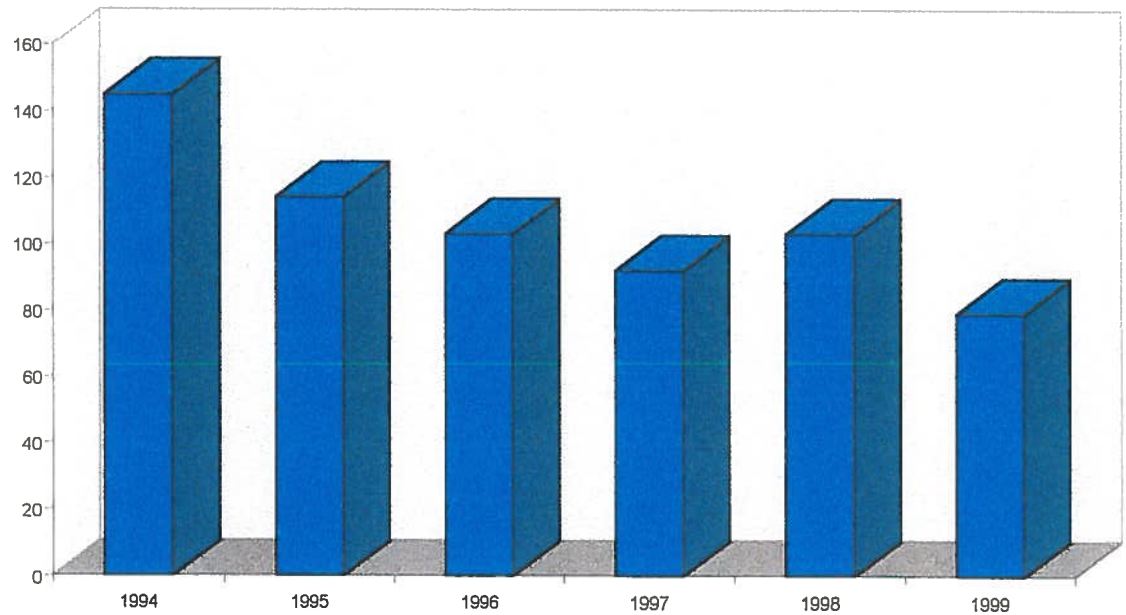


Figure 1-Number of Spills into Halifax Harbour

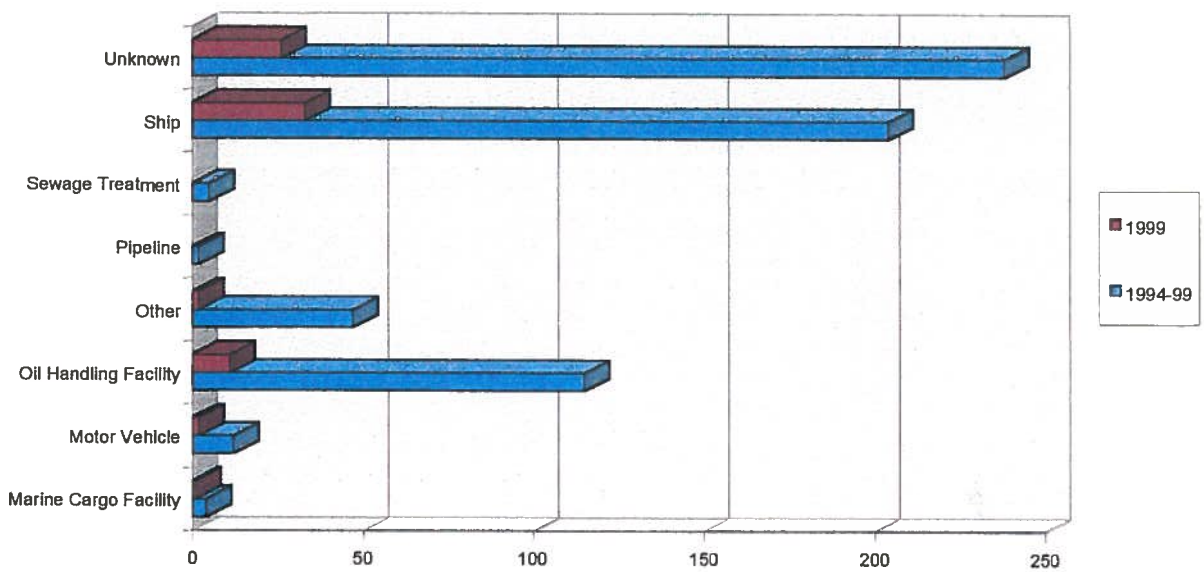


Figure 2-Spills into Halifax Harbour by Source

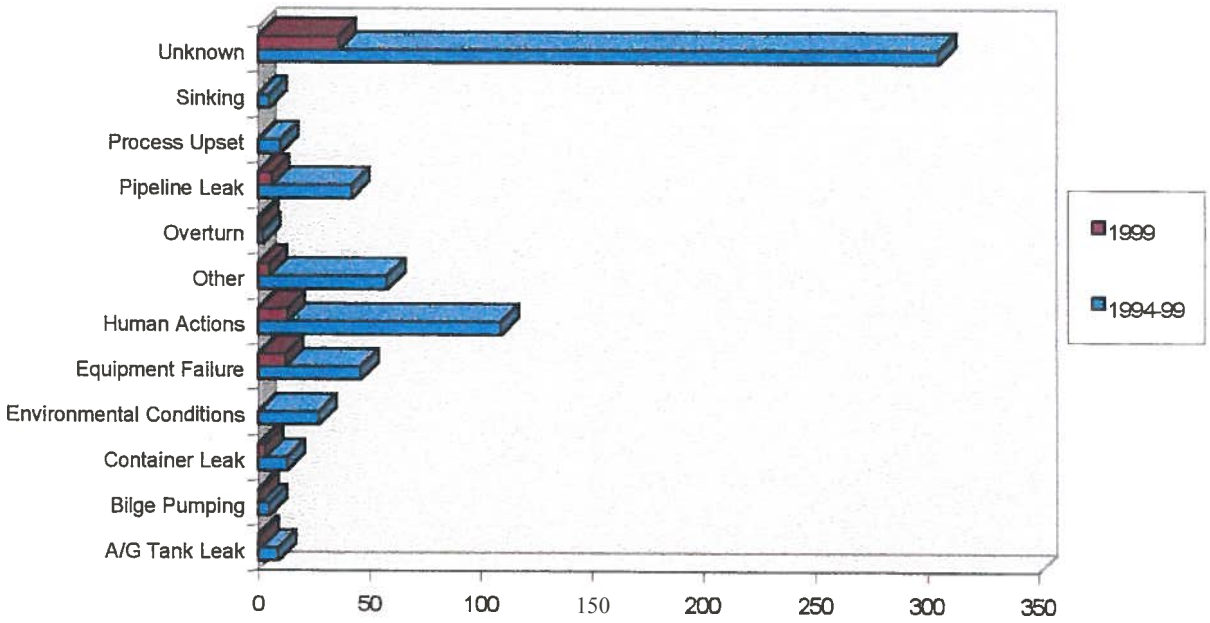


Figure 3-Spills into Halifax Harbour by Reason

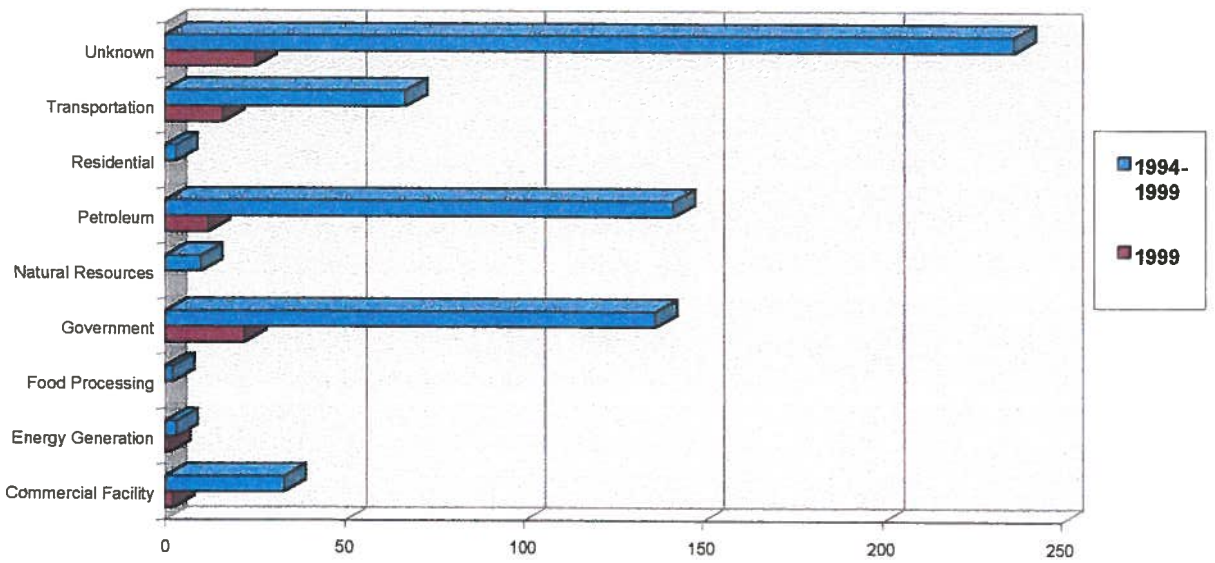


Figure 4-Spills into Halifax Harbour by Sector

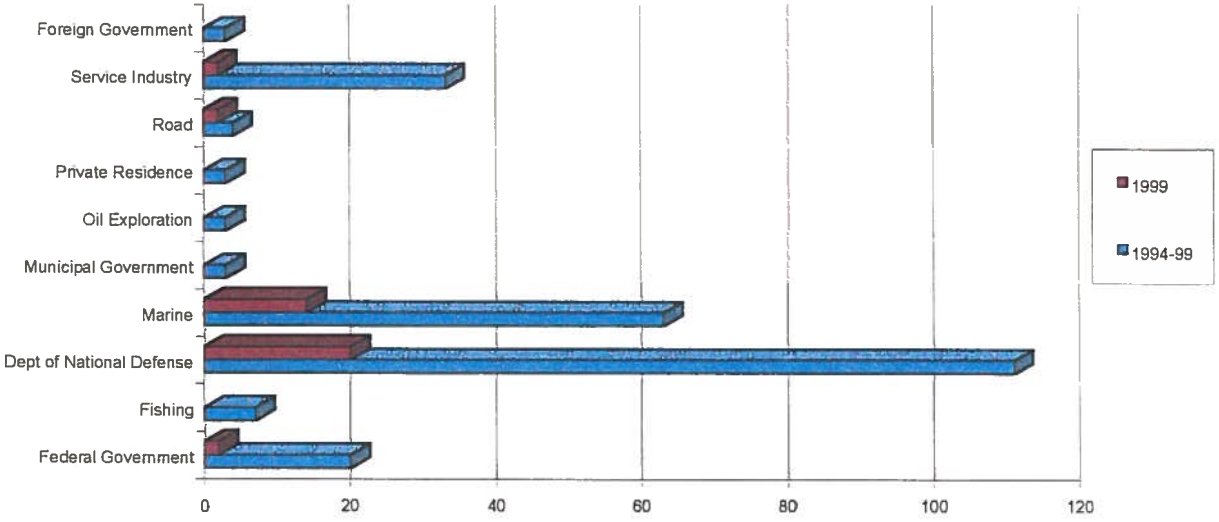


Figure 5-Spills into Halifax Harbour by Sub-sector

Ocean Disposal Activities In Halifax Harbour

K.L. Tay Ph.D.

Introduction

Halifax Harbour has been subject to environmental pressure from a variety of pollution sources. In addition to the daily discharges of untreated sewage, household and industrial wastes, marine activities such as construction, infilling, ship repair and fabrication, dredging and ocean disposals of dredged materials and other wastes have all resulted in some form of environmental impacts to the harbour.

This paper describes how waste disposal activities in the harbour are regulated by the *Ocean Disposal Regulations* of the *Canadian Environmental Protection Act* (CEPA), waste disposal options in the harbour, and the need for programs to reduce the many waste streams going into the harbour.

Regulation of Ocean Disposal Activities

Disposal of wastes at sea is regulated by Part VI of CEPA. The act implements domestically the provisions of the *London Convention*, also known as the *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters*.

CEPA Part VI is administrated by Environment Canada through a permitting system, inspection of activities, and a disposal site monitoring program. Under CEPA Part VI, "*dumping*" is defined as "*....the deliberate disposal at sea from ships, aircraft, platforms or other anthropogenic structure including disposal by incineration or other thermal degradation, of any substance,....*". "*Dumping*" does not include "*.... any disposal that is incidental to or derived from the normal operations of a ship, aircraft, platform or other anthropogenic structure....*". Thus, the discharge of ballast water, bilge water, or sewage from ships is not considered ocean disposal. Neither the use of infilling materials for infilling/construction nor the end-of-pipe releases from shore-based facilities are considered ocean disposal activities.

CEPA Part VI adopts a "reverse listing" approach whereby only those wastes listed may be considered for disposal at sea. The list is:

- Dredged materials;
- Fish waste and other organic matter resulting from industrial fish processing operation;
- Ships, aircraft, platforms or other structures from which all material that can create floating debris or other marine pollution has been removed to the maximum extent possible if, in the case of disposal, those substances would not pose a serious obstacle to fishing or navigation after being disposed of;
- Inert, inorganic geological matter;
- uncontaminated organic matter of natural origin;
- Bulky substances that are primarily composed of iron, steel, concrete or other similar matter that does not have a significant adverse effect, other than a physical effect, on the sea or the seabed.

Prior to issuing an ocean disposal permit, Environment Canada must ensure that the

proposed activities have been reviewed in accordance with the requirements of the *Canadian Environmental Assessment Act* (CEAA). CEAA requirements are similar to those of CEPA but there are additional obligations including the need to address:

- cumulative environmental effects,
- health and socio-economic conditions,
- physical and cultural heritage concerns,
- the current use of lands and resources for traditional purposes by aboriginal persons,
- the environmental effects of malfunctions or accidents that may occur and;
- the technical and economic feasibility of mitigation measures.

III. Regulated Ocean Disposal Activities in Halifax Harbour

Since 1975, 31 ocean disposal permits have been issued for the disposal of wastes in Halifax Harbour. All were for the disposal of dredged materials except for three permits which were in relation to scientific experiments involving oil spill recovery and dispersants. The 28 dredged material permits represent only 1.5% of all dredged material permits issued for Atlantic Canada.

They were all issued for dredging activities associated with marine construction and deepening of berthing areas and shipping channels in the harbour. The majority of the Halifax Harbour dredged material disposal permits was issued between 1976 and 1989. Since 1990, the number of permits issued has dropped significantly. This reduction is likely the result of the following events:

- In 1989, polynuclear aromatic hydrocarbons (PAHs) were added to the list of ocean disposal screening chemicals because of their potential toxicity and carcinogenic properties. This has discouraged dredging proponents to apply for ocean disposal permit due to the high levels of PAHs in many dredged sites in the harbour;
- Most of the dredged material ocean disposal permits issued in the 1980s were for dredging activities associated with marine construction, such as the building of several container piers and the reconstruction of the DND Dockyard. Such projects have occurred less frequently in the 1990s;
- In 1995, the ocean disposal permit application fees was increased from a maximum $1,000 to a flat $2,500 per permit application. Beginning in 1999, ocean disposal permit holders have been required to pay $470 of disposal site monitoring fees for every 1,000 cubic metres of dredged materials that is authorized for disposal at sea. This increase in fees has resulted in proponents, particularly of small projects, turning to land-based disposal alternatives.

Disposal Options for Contaminated Sediments in Halifax Harbour

Ocean disposal data retained by Environment Canada indicated that Halifax Harbour sediments contain the same heavy metals and organic contaminants that are commonly found in other North American major harbours such as Vancouver and Boston harbours. However, distribution of these contaminants in the harbour is highly heterogeneous. For example, sediment concentration of total PAHs and PCBs concentrations could range from non-detectable to as high as 62 mg/kg and 954 mg/kg respectively in some areas of the harbour.

When concentrations of these contaminants in the dredged materials exceed the ocean disposal chemical screening criteria (0.1 mg/kg for PCBs and 2.5 mg/kg for PAHs),

ocean disposal permit applications are rejected, unless it is demonstrated in a series of sediment bioassays that the dredged materials are non-toxic to sensitive marine organisms. Once ocean disposal is rejected as a waste management option, land disposal and shoreline containment may be the only alternatives.

Pollution Prevention

The continuing discharges and accidental spills of contaminants to Halifax Harbour have created a problem for proponents of dredging projects. Contaminant levels in sediments more often than not preclude the option of disposing of dredged materials at sea. Other disposal options are costly and may cause unwanted environmental effects both in the harbour and on land.

To ensure the marine environment in the harbour is better protected, Environment Canada is actively promoting the pollution prevention and control programs that re-use, recycle and reduce wastes. A good example is the development of a pollution prevention program initiated by Environment Canada with industry and other government departments to minimize releases of harmful materials from ship building and repair facilities within the harbour.

In 1996, the Halifax Regional Municipality initiated a strategy to control the disposal of toxic materials at source which will result in reduced levels of metals and organic contaminants discharge to the harbour through the municipal wastewater system. The municipality's Halifax Harbour Solution Project will further reduce the impact that sewage has on the harbour.

Summary

Ocean disposal projects regulated by CEPA Part VI in Halifax Harbour have occurred infrequently. These projects were mostly related to dredging activities associated with construction and deepening of berth areas and shipping channels. Disposal at sea, which is the preferred disposal option for dredged materials, is often unavailable due to elevated contaminant levels in harbour sediments.

Positive steps are underway that will reduce contaminants found in the many waste streams going into the harbour. Although our record on releasing contaminants to the harbour has and continues to improve the legacy of contaminated sediments in Halifax Harbour and the lack of disposal options for the dredging of these materials will be with us for many years into the future.

Keys To Environmental Quality Management In Marine Areas Of Halifax Harbour

Dale E. Buckley

Introduction

It is essential to identify issues and concerns in the management of any system or enterprise. An urban marine harbour system, such as Halifax Harbour, provides challenges to the public and its government to properly assess these concerns and issues.

There are three types of environmental issues that will concern people and their government, and should provide a basis for environmental management. **Aesthetics** of the environment are determined by the senses of sight, smell, and taste. The desire to have a coastal marine water free of floating debris, discoloration and turbidity is often expressed as a priority by area residents and visitors. Undesirable odours emanating from waste products discharged into marine harbours is particularly abhorrent to the public. Consumption of marine food products that exhibit a tainted or odious flavour is certain to be unacceptable. **Habitat** for biological communities is often expressed as a concern by the urban community. It is almost inevitable that some alteration or destruction of initial biological communities will result when the infrastructure for an urban harbour is developed, however, residents of this urban community often express their concern that habitats be preserved or maintained as much as possible. **Human health risks** often dominate concerns expressed by the public and highlighted by the news media. These concerns are usually focused on toxins in food products or human exposure to microorganisms in the water.

It is very important to understand factors that determine environmental quality in an urban harbour. These factors include identifying the sources of contamination, how contaminants are moved through the harbour, and what are the main reservoirs or repositories of these contaminants. Sources of contamination can be chronic, such as from continuously flowing sewage outfalls, or episodic, such as is the case in oil spills or bulk waste dumping. It is also important to assess the quantity and quality of contaminant sources over time to determine if the inputs have increased or decreased. The stability of contaminant reservoirs (sinks) over time and with changing physical and chemical conditions will also be a factor in determining future environmental quality.

It is important to make a distinction between terms that describe environmental conditions. Often there is confusion between the terms "contamination" and "pollution". These terms have previously been defined (Buckley, 1994) as: **contamination** occurs when a physical or chemical condition caused by human activity is significantly at variance with natural background conditions, and this abnormal condition may pose a threat to living resources or human health. **Pollution** has occurred when physical or chemical conditions have been altered (contaminated) to such an extent that significant damage to living resources or human health has been demonstrated. Understanding these conditions will help to establish priorities in environmental management. It is inevitable that some contamination will take place in

an urban harbour, and this may be acceptable to the public. However, it is desirable to avoid pollution, and the public will usually support measures to reduce the risk of pollution.

The Halifax Harbour Estuarine System

The particular characteristics of Halifax Harbour are determined by the estuarine nature of the harbour. The harbour is a 25 km long inlet with a narrow drowned river valley through the central part of the harbour (25 to 40 m deep) and a deep inner basin (70 m deep), figure 1, Buckley and Winters (1992), Fader and Buckley (1995). The estuary has a relatively small fresh water inflow (mean annual 17 ± m3 s^{-1}). The tidal volume is 373 times greater than the freshwater inflow making the estuary a tidally dominated system. This characteristic is important because it determines how contaminants that enter the harbour from the freshwater sources will be transported or mixed in the estuary. Generally the harbour can be considered a poorly flushed system, as will be demonstrated later in this paper.

Chemical analyses of water, suspended particulate matter (spm), and bottom sediments were carried out in intensive studies of Halifax Harbour between 1989 and 1992, Buckley et al. (1989), Buckley et al. (1991), Buckley and Winters (1992), Buckley et al., (1995), Dalziel et al., (1991), Fitzgerald et al. (1991), Gearing et al. (1991), LeBlanc et al., (1991), Winters et al., (1991). Although these studies involved examination of many samples they can not be considered to be comprehensive in terms of all types of potential contaminants because there are few data on organic contaminants such as PAH's, dioxins, furans, pesticides, herbicides and similar potential toxic compounds. There are, however, abundant data for a number of potentially toxic metals such as Hg, Zn, Cu, and Pb. Examination of the distribution of these metals in the water, spm, and bottom sediments can serve as indicators of sources and sinks of contamination in the harbour.

The chemical characteristics of bottom sediments as well as some data from marine waters and **spm.** have been presented by Buckley and Winters (1992). This research report provides several important conclusions about the significance of contamination in all areas of the harbour.

1. Most of the contamination is primary (41%) in bottom sediments and is derived from the discharge of waste from the untreated municipal and industrial sewers.
2. Secondary contamination is derived from leaching of solid waste deposits and drainage of land surrounding parts of the harbour.
3. Annual accumulations of metal in bottom sediments of the harbour are very high at: Cu = 10,700 kg.year-1; Zn = 36,000 kg.year-1; Pb = 34,600 kg.year-1; Hg = 185 kg.year-1.
4. More than 88% of Cu, Pb, Zn, and Hg reaches the bottom sediments as particulate-bound metal. Very little of the dissolved input of Pb, and Hg is flushed out of the harbour.
5. More than 50% of the Cu, Pb, and Zn in the bottom sediments is potentially reactive under oxidizing and reducing conditions.
6. Sediments in Halifax Harbour are among the most highly contaminated as compared with other marine areas in the industrialized world.

The distribution of organic carbon and contaminant metals is illustrated by maps of concentration of these contaminants in the surface sediments of the harbour, figure 2 and 3. Organic carbon concentrations (carbon derived from organic matter) is very

high (greater than 6%) in parts of Bedford Basin, in the Northwest Arm and adjacent to the main sewer outfalls at Tufts Cove, CFB Halifax, Dartmouth Cove, and Pier A. From these major outfalls organic waste is dispersed into the central harbour and Bedford Basin. Very little organic carbon is dispersed to the southern approaches of the harbour beyond McNabs Island. This distribution pattern confirms the weak flushing characteristics of the harbour and illustrates that contaminants associated with the organic carbon will be concentrated in the deep areas of Bedford Basin and the Northwest Arm. Concentrations of zinc metal also illustrates the sources of this contaminant, with the sewer outfalls at Tufts Cove, CFB Halifax, Dartmouth Cove, and Pier A clearly identified. In addition to these sources for Zn there is indication that Zn is also derived from the old landfill site at Seaview Point. High concentrations of Zn up to 500 ppm are found adjacent to the point sources and in Bedford Basin sediments. Again there are indications that very little Zn is dispersed outside the inner harbour. Although Zn metal can be used as an indicator of contaminant distribution in the sediments, the dispersion pattern is not identical with other metals, and probably not identical with all other types of contaminants, Buckley and Winters (1992).

Research reported by Buckley et al. (1995) and by Gearing et al. (1991) demonstrates that high concentrations of contaminants are buried beneath the surface sediments of the harbour. From analyses of sediment core samples it was found that high levels of contaminants could be found to depths of 50 cm or more in some areas. Determination of the age of the sediment layers by ^{210}Pb and ^{137}Cs techniques, Buckley et al. (1995) demonstrated that significant contamination of the harbour sediments began about 1890 and increased throughout the 20th century in most areas, figure 4. Analyses of hydrocarbons in buried sediments of the Northwest Arm, Gearing et al. (1991), show that organic contaminants have increased about 100-fold since 1900. Contaminants that are characteristic of sewage and urban runoff have had an exponential growth over time, while hydrocarbon combustion products including some PAH compounds have decreased slightly from a maximum dated around 1950, figure 5. This latter decrease is probably due to the change in domestic and industrial combustion fuels from coal to hydrocarbons.

The reservoir of contaminants in the surface and subsurface sediments pose a serious threat to the future environmental quality of the harbour. Data in table 1 illustrates the quantity of potentially reactive metals contained in the uppermost 2 cm of bottom sediments in the harbour.

Table 1. Potentially reactive metals in surface sediments of Halifax Harbour, with relativecontributions from various sources *(Quantities in tonnes, summarized from Buckley and Winters, 1992).*

Metal	From Primary Contamination	From Surface Drainage	From Secondary Contamination	Annual Accumulation
Zn	35.9	72.3	99.9	36.0
Cu	12.96	18.8	32.9	10.75
Pb	26.4	71.0	103.0	34.6
Cd	0.1	0.02	0.06	0.03
Hg	0.18	0.35	0.49	0.18

Annual total metal accumulation was calculated from average deposition rates for each area dominated by the source type.

Because the data in table 1 refers mainly to the potentially reactive quantity of metal from each type of source that is accumulated in the surface sediments, and not to the total amount of metal in the sediments (except for annual accumulation) it should be clear that primary contamination (ie. from the sewers) accounts for only about 20 % of the accumulated reactive Zn in the surface sediments. Similarly, the primary source of reactive Cu accounts for 25 % of the total reactive Cu; primary reactive Pb accounts for 15 % of the total reactive Pb; primary total Cd accounts for about 100 % of the total Cd, and primary Hg accounts for 21 % of the total Hg. Because the average deposition rates for sediments in the harbour are generally less than 2 cm per year, the annual accumulations of total metal generally is less than the quantities of potentially reactive metal in the uppermost 2 cm of surface sediments.

The key knowledge to be gained from the "source and sink" data for contaminant metals is that the sewers are not the most important source for most of these contaminants. Indeed, the secondary sources from surface drainage of land areas, and from remobilization of accumulated metals in the bottom sediments are likely far more significant in the overall environmental quality of the harbour. Furthermore, most of the highly contaminated areas of the harbour contain high levels of contaminants to depths in the sediments of 20 to 50 cm, Buckley et al. (1995), Gearing et al. (1991). This means that a huge reservoir of contaminants lurks below the surface layers and could be remobilized in the future due to chemical reactions in the sediments or by disturbance of the sediment layers during dredging operations, or due to shipping operations.

Management and Regulation Implications

It is clear that Halifax Harbour sediments are highly contaminated with high concentrations of organic carbon, metals and at least some types of organic compounds. It is also clear that most of these contaminants are contained in sediments within the geographic boundaries of Bedford Basin and the central harbour. This means that at the present time contamination in the southern approaches to the harbour or in areas seaward of McNabs Island is minimal. This condition means that the impact of contamination within Halifax Harbour on the open Atlantic Ocean is probably not significant. In order to meet the international commitments of the Montreal Accord on Marine Pollution these conditions should not be changed to increase the discharge of contaminants to the open marine areas. The implications of this commitment is that sewer discharge or waste disposal should not be designed to place contaminants in the marine area outside of the inner harbour.

From the information summarized in this paper it should be evident that contaminant sources in Halifax Harbour are not due solely to the discharge of the untreated sewage. Although this is the most important source of some total metals, it is not the most important source of potentially reactive metals. The potentially reactive metals are more significantly derived from land drainage and secondary contamination within the harbour sediments. This means that even if the sewers could be treated very successfully to remove particulate matter and organic matter (as might be achieved with primary or enhanced primary treatment) there would be minimum improvement in the immediate discharge of dissolved metal contaminants from the treated effluents. Even if there was some reduction in the discharge of metal

contaminants in the treated effluents, this condition would not result in significant reduction of contamination from surface drainage and secondary contamination in the bottom sediments. For example, the contamination from the old landfill site at Seaview Point would continue. Contaminants in the bottom sediments will continue to be a threat in the future as these contaminants will be remobilized through chemical reactions within the sediments, such as natural diagenesis. Also, contaminants now buried in subsurface layers will periodically be exposed to the overlying water column as a result of sediment disturbances caused by ship propellers and anchoring, dredging, and other engineering works.

There continues to be supposition that treatment of the main sewer outfalls of the Halifax Regional Municipality constitutes a cleanup of the Harbour. This suggestion is not only misleading it is incorrect. Sewage treatment will not immediately reduce any contamination already residing in the sediments. If no effort is made to reduce runoff through the landfill site at Seaview Point, or surface drainage in other areas surrounding the harbour then these sources will continue unabated. Suggesting to the public that sewage treatment is a Halifax Harbour cleanup, rather than an attempt to reduce levels of source contamination, will ultimately lead to public dissatisfaction and distrust when it is realized that contamination continues to exist and that some goals of environmental quality restoration can not be achieved.

References

Buckley, D. E. (1994) 25 years of environmental assessment of coastal estuarine systems: lessons for environmental quality management. In P. G. Wells and P. J. Ricketts (Eds.) 1994. Coastal Zone Canada '94, "Cooperation in the Coastal Zone": Conference Proceedings. V. 3, Coastal Zone Canada Association, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada, pp. 1304-1340.

Buckley, D. E. and Winters, G. V. (1992) Geochemical characteristics of contaminated surficial sediments in Halifax Harbour: impact of waste discharge. Canadian Journal of Earth Sciences, v.29, no. 12 pp. 2617-2639.

Buckley, D. E., Fitzgerald, R. A., Winters, G. V., LeBlanc, K. W. G., and Cranston, R. E. (1991) Geochemical data from analyses of sediments and pore waters obtained from cores collected in Halifax inlet, M. V. FREDERICK CREED cruise 90 and HUDSON cruise 89-039('90). Geological Survey of Canada, Open File Report 2410, 116 p.

Buckley, D. E., Hargrave, B. T., and Mudroch, P. (1989) Geochemical data from analyses of surface sediments obtained from Halifax inlet. Geological Survey of Canada, Open File Report 2042, 24p.

Buckley, D. E., Smith, J. N. and Winters, G. V. (1995) Accumulation of contaminant metals in marine sediments of Halifax Harbour, Nova Scotia: environmental factors and historical trends. Applied Geochemistry, V. 10, No. 2, pp. 175-195.

Dalziel, J. A., Amirault, B. P. and Rantala, R. T. T. (1991) The distribution of nutrients, suspended solids, dissolved and particulate metals in Halifax Harbour. Canadian Technical Report, Fisheries and Aquatic Science, No. 1826.

Fader, G. B. J. and Buckley, D. E. (1995) Environmental Geology of Halifax Harbour, Nova Scotia. In Eyles, N. (Ed.)

Environmental Geology of Canada, St. John's NF, pp. 249-267.

Fitzgerald, R. A., Winters, G. V., LeBlanc, K. W. G., Buckley, D. E., and Cranston, R. E. (1991) Geochemical data from analyses of sediments and pore waters obtained from cores collected in Halifax inlet, C. S. S. NAVICULA cruise 90-010. Geological Survey of Canada, Open File Report 2449, 106 p.

Gearing, J. N., Buckley, D. E. and Smith, J. N. (1991) Hydrocarbon and metal contents in a sediment core from Halifax Harbour: a chronology of contamination. Canadian Journal of Fisheries and Aquatic Sciences, V. 48, No. 12, pp. 2344-2354.

LeBlanc, K. W. G., Fitzgerald, R. A., Winters, G. V., Buckley, D. E. and Cranston, R. E. (1991) Geochemical data from analyses of sediments and pore waters obtained from cores collected in Halifax inlet. Geological Survey of Canada, Open File Report 2345, 116 p.

Winters, G. V., Buckley D. E., Fitzgerald, R. A. and LeBlanc K. W. G. (1991) Inorganic geochemical data for surface sediments from Halifax inlet. Geological Survey of Canada, Open File Report 2389, 64 p.

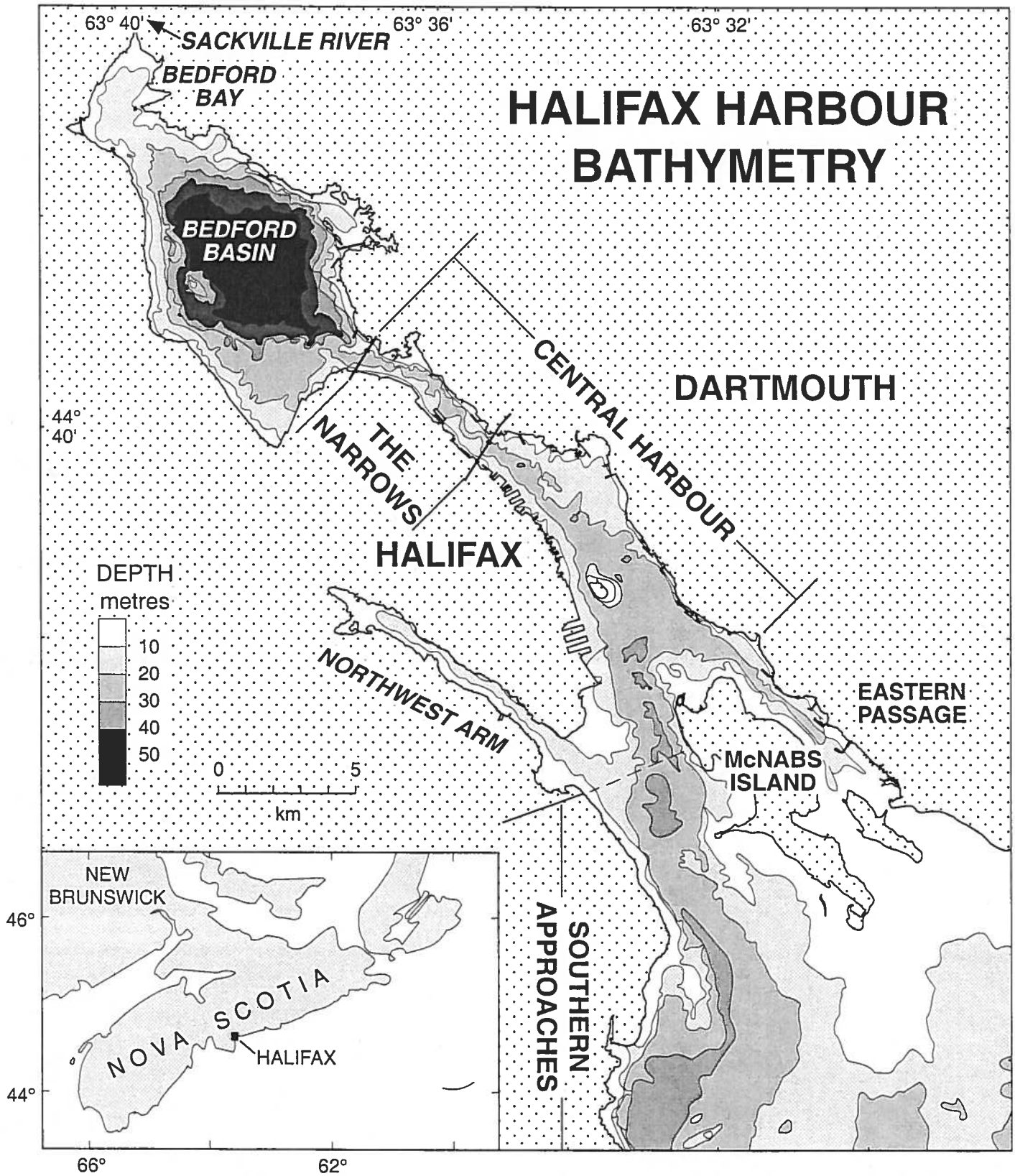


Fig 1. Bathymetry map of Halifax inlet from southern approaches to Halifax Harbour to Bedford Bay on the north

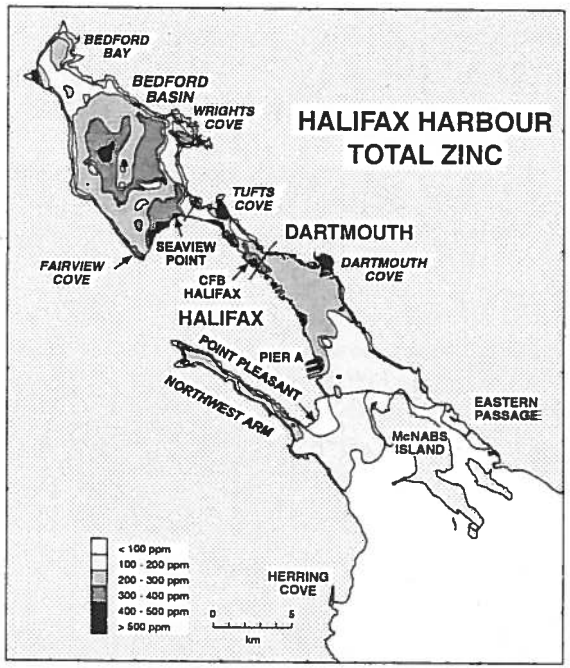


Fig 2. Concentrations of organic carbon in surficial sediments of Halifax inlet.

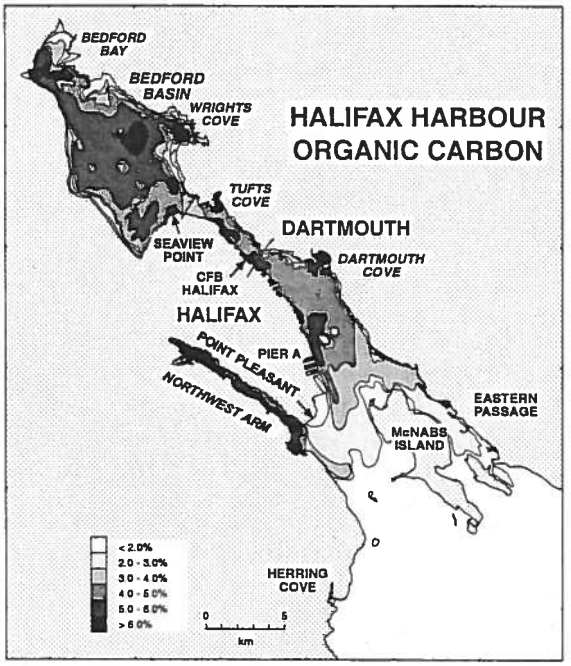


Fig 3. Concentrations of total zinc in surficial sediments of Halifax inlet.

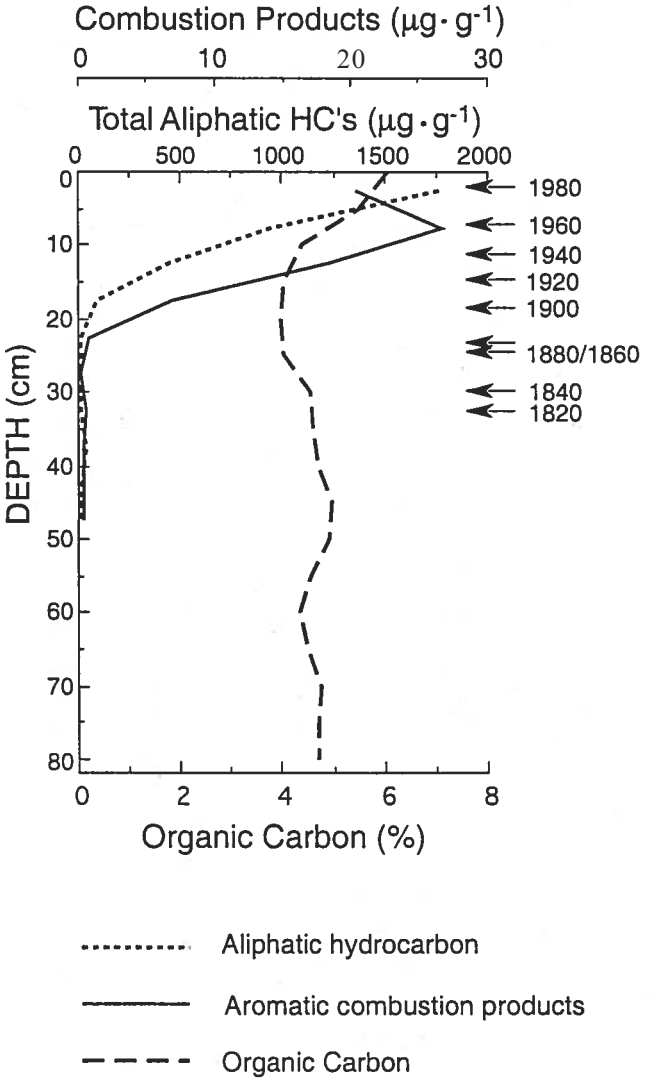


Fig 4. Profiles of total aliphatic hydrocarbons, combustion products, and total organic carbon in sediment core.

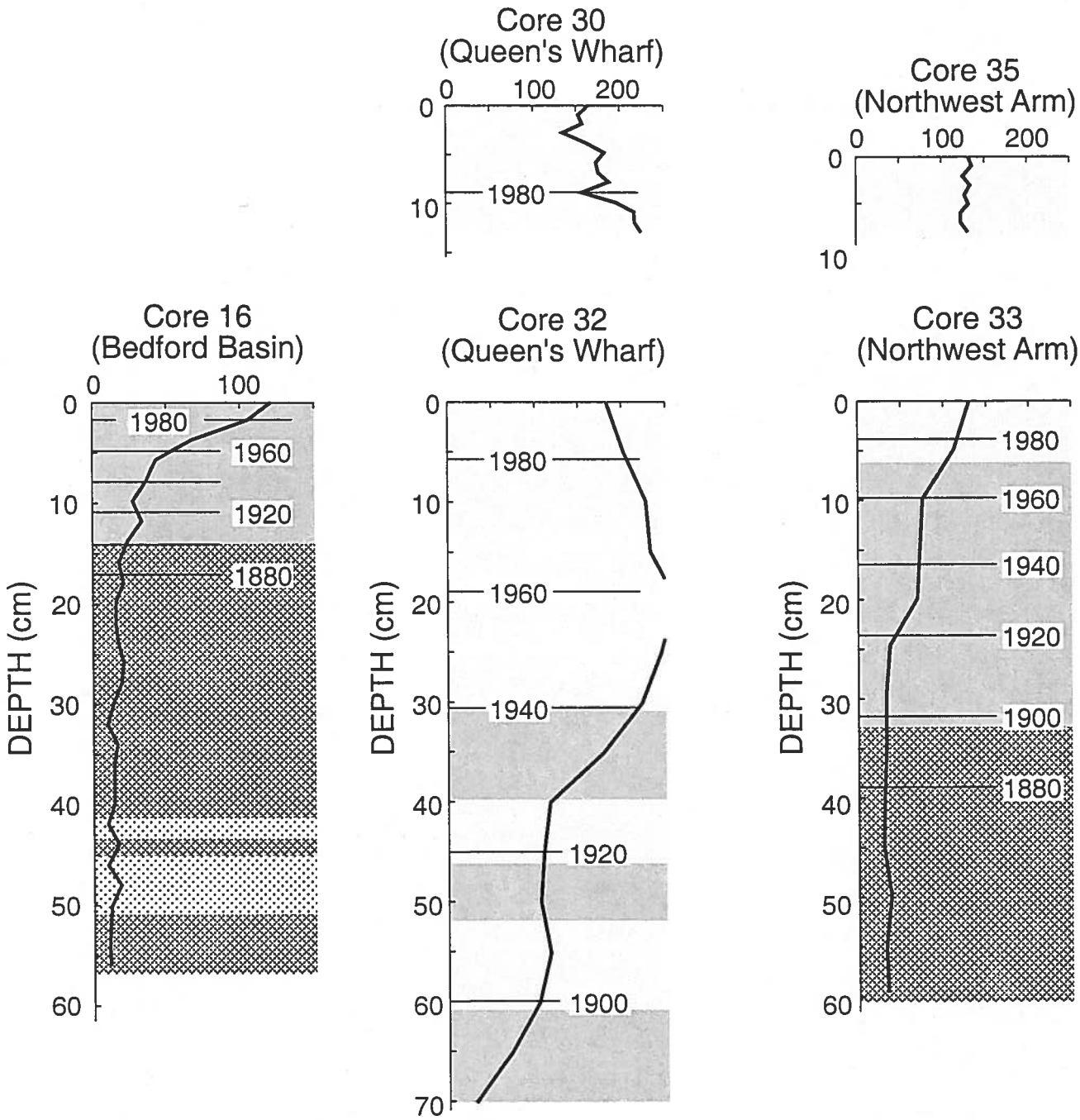


Figure 5. Profiles of sediment cores from Halifax Harbour illustrating the concentration of total Cu with depth of dated cores. Dominant geochemical factors representing dominant contamination processes are identified for depth zones in each core: factor 1 primary contamination: factor 2 secondary contamination: factor 3 diagenesis: factor 4 surface drainage.

Traffic Quantification

Capt. Randy Sherman

Halifax Harbour is the busiest harbour on the east coast, home to a great variety of craft, ranging in size from kayaks and canoes to the largest ships afloat. The Universe Ireland, a VLCC, for instance, which called here a few years ago, is 356,000 dwt, and approximately 330 metres in length.

According to the vessel traffic centre where these vessel movements are recorded, approximately 50,000 movements occur annually within the limits of Halifax Harbour.

This number includes all ferries, naval vessels, Coast Guard vessels, commercial ships, tour boats, and any other craft over 20 metres. This does not capture the movement of pleasure craft, workboats, small naval craft, and others under the minimum size requirements for reporting.

As an indication of the magnitude of unreported craft, consider there are five yacht clubs and two marinas within the harbour limits, as well as nine public boat launching facilities in the area. It is estimated there are 2500-3000 yachts belonging to club members **alone,** with an ever-increasing number of visiting yachts each summer to swell these numbers.

All the clubs actively participate in yacht racing and regattas throughout the summer months. Ask any harbour pilot what his radar screen looks like when he's approaching Maugher's Beach during a regular Wednesday night yacht race...The North West Arm is teeming with activity in the warmer months with young and not-so-young learning to sail, kayaking, canoeing, sailboarding, rowing , and operating jet skis. Small craft are evident in many areas of the harbour -- fishing during the mackerel runs, not to mention the commercial fishing vessels harvesting lobster within the harbour waters. That's an overview of the small craft traffic in the port.

On the commercial side, there were 2436 cargo ships which called at the port in 1999. They can be broken down into several broad categories based upon design and type of cargo carried.

The following is a general guide to identifying these ships and their related activities:

The category with the highest number of ship calls was container vessels with 504. These call primarily at the two container terminals, Halterm in the south end and Fairview Cove in Bedford Basin. Tankers accounted for 251 calls. This includes both large tankers bringing crude oil to the Esso refinery and the smaller coastal tankers loading refined product for distribution throughout the Atlantic provinces and the St. Lawrence River. Bulk carriers were next at 218 ships. The majority were gypsum carriers calling at National Gypsum in the basin, with the remainder carrying grain and coal. There were 197 general cargo vessels last year, serviced mainly at Ocean Terminals, Richmond Terminals and the Woodside Industrial Wharf A wide variety of cargo was handled, such as rubber, steel coils, structural steel, heavy machinery,

project cargo, pulp and paper products , and many others.

Fishing boats made 180 calls. This included both foreign and local vessels. The majority of foreign vessels were Japanese longliners with the bulk of local vessels being in the herring fishery. A certain number were also engaged in tuna fishing during that season.

Combination container/*roro* ships accounted for 161 calls, primarily at Haltern and Ocean Terminals, with roll on/roll off and vehicle carriers calling 90 and 68 times respectively. The latter berth at Autoport in Eastern Passage.

Vessels operating in the offshore business contributed the following last year;

Offshore supply-67
seismic research-99
technical support/pipe layer-20 oil rigs-2

The cruise trade has shown a significant increase in past years, with 78 calls to the port in 1999. These were concentrated on the seawall(piers 20,21 22) and Ocean Terminals on *multiple call* days.

The remainder of the commercial traffic breaks down into the following;

Barges - 43
Cable layer - 5
Factory fishing vessel - 9
Ferry - 3
Heavy lift vessel - 6
Reefer vessel - 2
Tug - 433

I do not have any figures for military and DFO traffic as our system does not track them. Suffice it to say it is a considerable number when you take into account all the various vessels in these fleets.

This includes all military ships, both Canadian and visiting foreign vessels, Coast Guard icebreakers and buoy tenders, pollution response vessels, fisheries patrol craft, hydrographic survey ships, and research vessels.

In addition to all this, much activity occurs at the anchorages, including bunkering, minor repairs, and occasionally cargo transfers. These ships will have been captured in the figures above but I am mentioning them to give a better appreciation of the type of activities which occur in the harbour.

Questions and Answers
Part 2

Question:
What products are of concern with regard to runoff from adjacent lands into the harbour?

Dale Buckley:
Taking Seaview Point dump as an example, all types of products, hydrocarbon residues, PCB, etc. It depends where surface drainage comes from.

Question:
What is the impact of discarded batteries?

Dale Buckley;
In certain areas there is an increase of lead and cadmium. CFB Halifax is the main point of cadmium release.

Question:
What do we know and what work has been done on the re-suspension problem?

Dale Buckley:
We know that if the oxygen level changes the metals may be re-mobilised. If the oxygen levels improved metals may be released, as was the case in the New York Harbour. (Within 2 years the Harbour was bioturbated). Presently the New York Harbour clean up is not seen as a success. A similar situation occurred in New Bedford , Massachusetts, during the dredging of sediments.

Question:
Can you explain the discrepancy between the number of disposal sites you have shown and those listed with Environment Canada?

Dr. Kok-leng Tay
Some of these sites existed before there was regulated Ocean Dumping. (OD) (1975-76). Some of these sites are illegal and no longer used.

Question:
Do you capture most cases of Ocean Dumping now?

Dr. Kok-Leng Tay:
Yes I believe we do. Our information process is such that we would know if dumping occurred illegally.

Question:
Is there a virtual stop on Ocean Dumping within the Harbour?

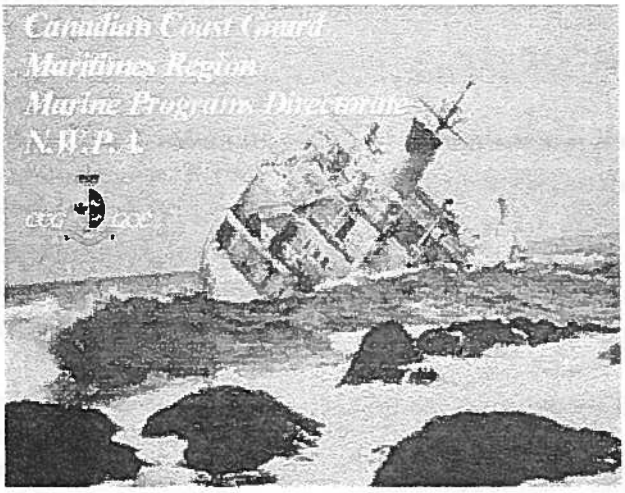
Dr. Kok-Leng Tay:
Not really, numbers are down, possibly because of the increasing expense.

Part 3

The Regulatory Environment

Navigable Waters Protection Act

Larry Wilson



Navigable Waters Protection
NWPA History and Purpose

- N.W.P.A. - Navigable Waters Protection Act
- Old Legislation dating back to 1882
- Federal Law Designed to Protect the Public Right of Navigation
- Relates to ' Works ' built " in, upon, over, under, through or across " any Navigable Waterway
- Coast Guard, of DFO administers the NWP Act, as well as parts of the National Energy Board (NEB) Act

The NWPA allows the Minister to :

-Regulate any Works that may Interfere with Navigation
-Any Project (work) such as Aquaculture, Bridges (Confederation Bridge) Wharves, Dredging, etc., that is built on, over, under or across any navigable waterway requires approval below the high water mark)

Not just Oceans / Coastal - includes Rivers, Lakes, Canals, etc.
-Authorize interferences to Navigation
-Balancing a shared use of the waterway
-Enforcing and Regulating Provisions of the Act
-Removal of Obstructions
-Responding to Complaints
-Advise CHS of Works for charting purposes
-Receiver of Wrecks

Approvals - Exemptions
-Approvals are granted under section 5(1) or 6(4)
5(1) formal process which triggers CEAA
6(4) formal process for existing sites and also triggers CEAA

Exemption 5(2) used when work does not interfere (can not attach conditions)
Canadian Environmental Assessment Act (CEAA) Triggers
Formal Approval triggers the "Law List" in CEAA - EA required prior to Authorization
Federal Grant of Land
Federal Grant of Money
Federal Act (for example the NWPA)

Areas Where we will Seek Amendments

The NWPA requires modernization to meet today's conflicting demands of waterway users. The "Act" is outdated. The last major amendments were in 1969.We are trying to do two things in the NWPA Amendment Process:

1. Address Problems and Inconsistencies in the Present Act
2. Add New Powers that will allow the NWPA Process to Address Modern Issues and Operate more Effectively

Proposed Areas Seeking Most Significant NWPA Amendments

Include:
Streamline the Approval Process
Focus Government involvement on Major Navigation Issues, and Get Out of Regulating Minor Navigation Waterways
Changes will include:
The exclusion certain waters and certain works or classes of works from the approval process i.e. a footbridge over a small creek does not generally represent a substantial interference to navigation but currently always requires mandatory formal approval)
These changes would assist in reducing the number of NWPA applications and workload

Recently, the core NWPA Amendment team has made significant progress on the amendments, but a great deal remains to be done. The aquaculture issue has not yet been addressed head on within the amendment process, however, it will be during this month.

Also:
Co-operation with other jurisdiction
Enhance the provision of enforcement
Allow for removal of abandoned vessels and
Include cost recovery mechanisms

Proposed Approach and Schedule for amending the NWPA

NWPA Amendments - Management and Advisory Structure has been proposed (i.e. Steering Committee/CCG MB; Advisory Committee; Project Leader NPP and working committee/groups)

There will be extensive public consultation to ensure the amendments take into account stakeholders' interests, as well as specific client groups, e.g. the aquaculture industry and recreational boaters. In addition, the provinces, territories, aboriginal groups, environmentalist and municipalities will be consulted.

Amendments to NWPA - Draft Schedule

Winter / Spring 2000:
Complete examination / amendments of present Act
Produce discussion paper
Consultation within DFO and informal consultations with other key departments
Briefing to the Minister to inform Cabinet to proceed re External Consultations

Spring / Summer 2000

Mail-out / publication on the internet of the discussion paper to obtain feedback from the public (not only applicants)
Prepare and conduct Public consultation on the paper

The 10 province consultations should be completed by school break and consultations

in Territories must, for example, be done outside hunting season

Summer / Fall 2000
Targeted consultations (e.g. Aboriginal groups, Provinces and Aquaculture Industry

Fall 2000
Formal Interdepartmental consultations

January / March 2001
Draft Memorandum to Cabinet Approval

Spring / Summer 2001
Drafting New Legislation

Summer / Fall 2001
Targeted consultations on Draft Bill

Aquaculture

Recent legal interpretation has changed how we apply the NWPA:

Should there be a need to attach a condition to the approval, such as Navigational Aids, the formal approval process (5(1), 6(4)) must be followed.

Requirement to Advertise in two (2) Local Papers and Canada Gazette to Solicit Public Comment in regards to Navigation

5(1) Proposed and 6(4) Existing Projects are on The Law List of CEAA and requires that an EA be conducted prior to issuing authorization under the NWPA

NWP/Aquaculture - Synopsis Maritimes Region
1000 (+ -) Aquaculture Sites in Region / 230 in Nfld (next closest in terms of Aquaculture Applications)
Presently on Average takes 8 months or more (2-3 yrs) to Process

Unique Region:
3 Provinces - 3 Types of Provincial / other Administration
Numerous Aquaculture Associations, to deal with.

Presently Outstanding:
PEI - 400 applications and strategy in place
NB - 40 (+ -) applications with 60 expected applications
NS - 140 (+ -) applications with 70 expected applications

Challenges / Issues
Recent Legal Interpretation - Changes in How We Do Business
Pressure from Provincial Gov't and within our own Department in regards to Aquaculture Development
Amendments to Act (consultations / eventual tabling)
Change to Regulations - Forth Coming
Presently 5 yr. approval
Change in Line with Leases / Term of NWPA Approval for Aquaculture - Need to ensure the present 5 year approval timeframe under the current Regulations (i.e. aquaculture) is changed to accommodate the industry (10-20 years; has not been decided

National Consistency in regards to:
Markings
Processing
Assessment
Enforcement
National Meeting Held 1st week of Jan to work on issues.
Will have National Aquaculture Guide and Marking Guidelines within next month.
Communications
Enforcement
Final Inspections
On-going Inspections
Legal Liabilities
Timeframes / # of Applications

Streamlining Process with Provinces
Meeting held / on-going
Consult / Educate Industry
Information Management
Time
G.I.S.
Workload (i.e. Sable Gas, Sempra Distribution)

Other significant workload associated projects such as Sempra Gas - for 3 counties in NS we have presently received 102 Water Crossing Applications
Expect 700 more- all require navigability assessments (for NS only)
NB to come and Offshore

Canada Marine Act

Capt. Randy Sherman

On the 1st of March, 1999, the Canada Marine Act came into force with respect to the Halifax Port Authority. Prior to this date, the port was operating under the Canada Ports Corporation Act and was a crown corporation answering to the Canada Ports Corporation in Ottawa.

Under the new Act, the port is now an agent of the crown, reporting directly to the Minister of Transport. As an agent, this means the Authority neither has access to federal funding nor will the federal government guarantee any loans or outstanding debt the port may incur conducting its business. The port must be self sufficient and operate from its revenues or if major capital outlay is required for a project beyond the ports resources, funding must be obtained through private lending institutions, partnerships, or other available means. The authority derives its revenues from fees levied on ships using the port and the goods loaded or discharged from the ships, any services provided such as electricity and water, and from leasing facilities and land.

The terms and conditions under which the port may operate are set out in the letters patent. These include such things as the waters within port limits, the federal real property under the management of the port, the number of directors on the board, the maximum term of any leases or licenses, the limits on borrowing power, etc.

The board consists of seven members, chosen as follows:
- one nominated by the Minister
- one appointed by the municipality
- one appointed by the province
- the remaining four nominated by the minister in consultation with the users of the port, with user defined as a person that makes commercial use of, or provides services at the port.

The port authority derives its power from section 28 of the Act which states
"The power of a port authority to operate a port is limited to the power to engage in

(a) port activities related to shipping, navigation, transportation of passengers and goods, handling of goods and storage of goods, to the extent that those activities are specified in the letters patent; and

(b) other activities that are deemed in the letters patent to be necessary to support port operations."

Under section 56 of the Act, the port traffic control parameters are established, for the promoting of safe and efficient navigation or environmental protection in the waters of the port with respect to ships. This basically states that the port has the right to monitor vessel movements, establish practices and procedures to be followed by ships, specify radio frequencies to be used and establish traffic control zones.

To manage traffic control, the port may designate a person or class of persons to exercise the following functions: -give traffic clearance to a ship - request specific information in respect to a ship -direct a ship on berthing assignments and restrict its movements as required by various circumstances.

The intent of the above is clearly to allow the port to establish a vessel traffic control centre if it is required. At present, most of the above mentioned functions in Halifax are carried out by the Coast Guard MCTS centre in conjunction with the designated person at the port responsible for traffic control, namely the harbourmaster. If in the future the Coast Guard wishes to relinquish this function, the door is open for the port to establish its own.

Section 62 outlines the areas in which the port may make regulations. Briefly, these are navigation within the port including mooring, berthing, loading, unloading, of ships

-removal, destruction or disposal of any ship, structure, work, or other thing that interferes with navigation
-maintenance of order and safety of persons or property within the port
-regulation of persons, vehicles and aircraft
-regulation of excavation, removal or deposit of any material which is likely to affect navigation or lands adjacent to the port
-regulation of the transportation, handling or storage in the port of explosives or other dangerous substances
-the stewardship obligation of the port authority in respect of real property under the management of the authority.

These regulations were just recently promulgated and came into force March 1, 2000. The practices and procedures are nearly completed and should be issued by May 1.

In respect to the land management role of the authority, this applies to the submerged Crown owned land or waterlots within the harbour limits as well as its onshore holdings. However in Halifax Harbour there are still many valid privately owned waterlots, ie, those whose ownership can be established before Confederation. The port does not have any authority over these properties, other than normal navigational practices. Any structures erected on a private waterlot would be subject to approval by other government departments, such as the Coast Guard as administrators of the Navigable Waters Protection Act, Fisheries and Oceans, Environment Canada, and possibly others. The NWPA regulations does not apply if a work is built, placed, rebuilt, repaired, or altered by the port authority.

Part 4 of the Act outlines the regulations and enforcement powers of the port authority. It sets out the terms under which an enforcement officer is appointed and describes their powers to enforce the provisions of the Act in respect to inspection of vessels or premises, requirements of the owners of the aforementioned to provide any records requested, search and seizure procedures, detention of ships or goods, and the fines for non-compliance. In the case of an individual, the maximum fine, unless designated otherwise in the Act , is $5000 and for a corporation,$50,000.

Canada Port Authority Environmental Assessment Regulations

The CPA Environmental Assessment Regulations were published in Gazette II July 28, 1999. These Regulations are based upon the Canadian Environmental Assessment Act, which entered into force in 1995. Concurrent with the new Act, a new agency was created, the Canadian Environmental Assessment Agency, as a replacement for FEARO.

The CPA EA Regulations were the result of an initiative by the Canadian Environmental Assessment Agency in 1997 to address

'implementation gaps' in the conduct of environmental assessments by extending the application of the Act to crown corporations and all other federal entities. The pending introduction of the Canada Marine Act, with the creation of new 'Canada Port Authority' entities, served as the catalyst for the Agency to target Canadian ports as the principal target in the drive to eliminate these implementation gaps.

The CPA EA Regulations make the conduct of environmental assessments mandatory for CPA'S. The CPA's must follow the basic three tier format outlined in the Act. Establishment of public registries for EA documentation is also a significant new requirement contained in the Regulations to enhance transparency and public accountability. However, the CPA's were also given some latitude in the specific application of the CPA EA Regulations which is meant to reflect the unique commercial circumstances which the CPA's now operate within. For example, CPA's have the ability to determine the extent of public consultation in the Screening and Comprehensive Study tiers.

Canadian Environmental Protection Act

The new CEPA has not yet been proclaimed, however it is anticipated that this will occur in the near future. There are some areas of port involvement in relation to the implementation of CEPA. For example, the powers of Enforcement Officers under CEPA include operational control over the movement of commercial vessels, and the potential to direct vessel operators to discharge cargo. Obviously these powers have significant ramifications for the conduct of port operations. Therefore, through the Operations Committee of the Association of Canadian Port Authorities, the Harbour Masters in CPA ports will attempt to impart their concerns to Environment Canada in the hope that conflicting regulatory actions between federal entities can be avoided through open communication.

As you have heard, the port authority has a very broad base of responsibility within the harbour limits and as a result there are several areas of overlapping regulation with other government agencies. This requires that the port works closely with all other agencies with an interest or responsibility in the port, including but not necessarily limited to the Coast Guard, Transport Canada, Department of National Defense, Fisheries and Oceans, Environment Canada and Public Works. In my opinion, if this forum can help streamline the processes for port customers, users, and the general public when dealing with government agencies and regulations, while still achieving the objective of preserving the harbour's environment, it will have achieved some success.

Canada Shipping Act

Mike Balaban

Historical Dates

1843 - The Steam Boat Act, Province of NB
1906 - The Canada Shipping Act (CSA)
1927 - The Canada Shipping Act revised
1934 - The Canada Shipping Act re-enacted highly technical instrument of safety legislation which consolidated Canadian and British laws

Marine Services under CSA

1936 - The Ship safety function placed under newly created Department of Transport
Regionalization and consolidation of marine services under Ship Safety Directorate
1972 - Protection of the marine environment under Ship Safety Directorate (AWPPA)

Marine Services in the,'90s

1995 - Ship Safety Directorate divided into Marine Regulatory Directorate and Ship Inspection Directorate
1997 - Both Directorates re-integrated along with Marine pilotage into today's Marine Safety Directorate - CCG transferred to DFO

Marine Safety's Mission

Marine Safety is dedicated to the safety of shipping and protection of life, property and the marine environment

Technical Services, CSA Part V

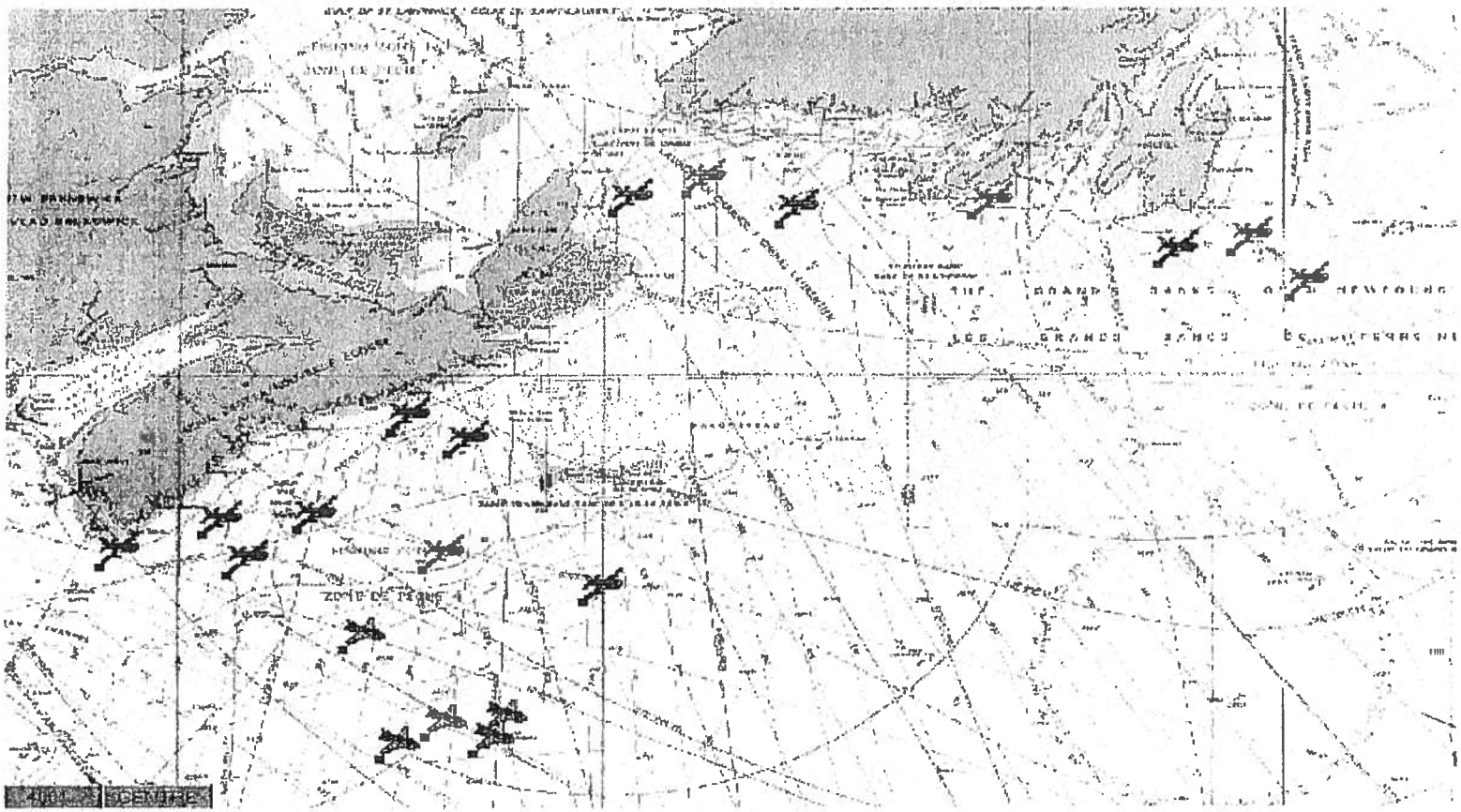
Ships Inspection, CSA Part V and IX
Compliance and Enforcement
Ships Registry, CSA Part I
Port Warden, CSA Part Vll
Pollution Prevention Officers, CSA PartXV
Safe Container Inspectors, Safe Containers Convention Act

Pollution Prosecutions: Atlantic 1994 - 2000 (March):

Maritimes				Newfoundland			Combined Maritimes & NF		
Year	Inv.	Pros	Fines	Inv.	Pros	Fines	Inv.	Pros	Fines
1994	65	14	$131,800	28	7	$85,000	93	21	$216,000
1995	55	10	$73,910	20	3	$16,000	75	13	$89,910
1996	60	5	$35,000	28	4	$12,000	88	9	$47,000
1997	83	7	$44,000	28	5	$38,500	111	12	$82,500
1998	60	7	$63,500	50	4	$55,000	110	11	$118,500
1999	64	14	$88,900	55	4	$63,500	119	18	$152,400
2000	15	12	$70,000	4	3	$23,500	19	15	$93,500
Total	**387**	**57**	**$507,110**	**209**	**27**	**$293,500**	**596**	**84**	**$800,610**

** Highest fine levied in Canada (Saint John, N.B.) on August 4th, 1994, was $75,000.00 against the **Tito Tapias** (17 to 35 MT of fuel)*

Aerial Sightings
Atlantic Region 1999 - 2000



Topics

- CSA Reform Overview
- Track I - Bill C-15
- Track 11 - New Statute
- Regulatory Reform
- Marine Safety Contacts

Objectives

- Simplify the statutory framework
- Make the Act consistent with federal regulatory policies
- Contribute to the economic performance of the shipping industry

Strategy

- Track I -Bill C-15
- New General Part (Part 0.1)
- Registration & Licensing (Part 1)
- Miscellaneous urgent items Track 11
- New Statute
- Overhaul balance of the Act (Parts 2 - 17)
- Include Track I amendments

Results

- More compact
- Streamlined
- Modernized
- Clarified TC/DFO responsibilities

Track

- Received Royal Assent June 11, 1998
- Coming into force dates:
- June 11, 1998 (Royal Assent)
- October 31, 1 999
- February 25, 2000

Track II -New Statute

- TC
- Cabinet Authority - Secrecy Laws
- Received Cabinet Approval in July
- Limited Distribution
- Consultation
- Introduction in early winter

Pollution Provisions

- TC/DFO responsibilities divided
- Authorities carried over
- Delegation of authority
- "Civil Liability and Compensation for Pollution" part moved to *Marine Liability Act*

Objective

- Modernize, Reorganize and Improve
- Regulations
- Strategy
- Input from the Marine Community
- Review Conducted Internally
- Regulatory Priorities

Regulatory Priorities

- Life Saving Small Vessel Regulations
- Tackle Regulations
- Equipment Regulations
- Fire Detection & Extinguishing
- Equipment
- Regulations

Regulations to support new statute

- Canadian Maritime Documents
- Enforcement Measures
- AFADA ACT

Public Works Act Federal Real Property Act

Hari Samant

Three Aspects of PWGSC, Interest

- Impact of our operators in the Halifax Harbour
- Good corporate Citizen/Broader Government Objectives
- Expertise / Assisting Federal Government Departments / Agencies

Our Commitment

Environmental Policy:

"PWGSC shall carry out all operations and activities in an environmentally responsible manner that meet or exceed all applicable environmental codes, regulations and the principles of sustainable development".

"As a provider of common services to federal departments and agencies and a centre of expertise in related environmental matters, PWGSC will make available to its clients such advice and assistance as they may require to facilitate progress towards their own environmental objectives".

PWGSC's operations and activities shall respect the code of Environmental Stewardship for the Government of Canada

Environmental Services We Offer:

- Sustainable Development
- Strategies (SDS)
- Environmental Management System
- Environmental Impact Assessments

Our Expertise

Site Assessment / Contaminated Site Remediation
Environmental Audits
Env. Bldgs. and Systems, Management
Waste Management
Environmental Training

Our Association with and commitment to Halifax Harbour Cleanup Initiatives

RDG was an active member of the management Committee of Halifax Harbour Cleanup Inc.
ACOA Consultant/Advisor for EIA/Panel Review (Fournier task Force)
Our Association with and commitment to Halifax Harbour Cleanup Initiatives
Halifax Harbour Cleanup Federal Action Plan (1995)
Contributed to the Halifax Harbour Solutions Symposium 1996
Member of the Halifax Harbour Advisory Committee 1997-98

An Overview of the Federal Real Property Act

Raymond Lewis

The Federal Real Property Act

Addresses how the federal government acquires, administers, leases, and disposes of real property, both within and outside of Canada. The following article is a brief overview of the act and its accompanying regulations, as may be of interest to the participants of the Preserving the Environment of Halifax Harbour Workshop.

Public Works and Government Services Canada (PWGSC) is one of the oldest departments in Canada, dating from 1840 when it was know as the Board of Works of the government of the United Canadas. From this founding, the administrative structure of the department became increasingly complex as Canada developed and became a country, and as the real property management requirements of the federal government became more demanding. Real estate transactions and real property law also grew in complexity, and it was eventually recognized that the federal government could enjoy a great benefit if its generic real property legislation was modernized and simplified, and if the authority and responsibility for the management of real property assets was clarified.

Jurisdiction

In 1992, Parliament created the Federal Real Property Act (FRPA) to address how the federal government acquires, administers, leases, and disposes of real property, both within and outside of Canada. At the same time, over 18 other federal acts were amended to transfer their real property powers to the FRPA (including the Public Works Act, which remains as enabling legislation for the department). The FRPA addresses all federal real property with the exception of those lands governed by special legislation, such as the National Parks Act ("park lands"), and those assets controlled by certain non-agent crown corporations.

Powers of TBS

The overall responsibility for the management of federal real property assets rests with the Real Property Management Division of the Treasury Board Secretariat (TBS). The FRPA provides the TBS with two channels to influence the administration of federal real property: (1)TBS can make financial and managerial limitations on a Minister's control of real property, and (2) the Governor-in-Council may only adopt TBS recommendations for real property initiatives.

Concept of Administrative Control

Ministers are given administrative (custodial) control over specific properties that are required to support the delivery of their programs. This administrative control is a key concept of the FRPA, in that federal assets are "owned" by the Crown and not by individual departments. Ministerial custody is therefore temporary, and when an asset is no longer required to support a specific program, it must be released for the use of other federal departments (or if no other federal department has a use, it is declared surplus to the federal inventory and disposed of at market value). Ministerial custody also mandates that the property be managed and maintained in a proper manner, and that the property custodian respect the value,

integrity, and potential enjoyment of future custodians. One aspect of this is respect for the environment.

Concept of Priority Circulation

The Federal Real Property Regulations outline the procedures for which a real property interest may be transferred between federal departments, or disposed of from the federal inventory. A custodial Minister first declares a property surplus to program requirements, at which time it is offered to all other federal departments (and through them to federal crown corporations and agencies). If an interest is expressed, only the custodial "administration" of the property is transferred to the new Minister, while the Crown continues to retain all the previous interests enjoyed. If no other department expresses an interest, the property is then offered to the provincial Crown. The concept of the Indivisibility of the Crown is applied in that only "administration and control" of a property can be transferred to the provincial Crown. If the province does not want the property, then the property advances through the priority circulation process for sale to the appropriate county or municipal jurisdiction, and then as the final level to the general public. All property transfers or sales are conducted at market value.

PWGSC and the FRPA

The Real Property Services branch of PWGSC provides a range of services in support of federal accommodation and real estate requirements. The FRPA is utilized as a working tool that provides the authority and guidance for a wide range of projects, including the potential use of federal real property assets for any projects that may support the environmental preservation of Halifax Harbour. As both a custodian in its own right, and as a client service provider to other departments, PWGSC is a major beneficiary of the simplicity and clarity provided by the FRPA.

For Further Information:

Guide to the Federal Real Property Act and Federal Real Property Regulations;
Bureau of Real Property and Materiel, Treasury Board Secretariat, Ottawa, October 1996.
PWGSC internet web-site:
http://www.pwgsc.gc.ca
Treasury Board Secretariat internet web-site:
http://www.tbs-sct.gc.ca

The Oceans Act

Faith Scattolon

Over the past twenty years, there has been growing focus internationally and domestically on how we manage our oceans and coastal areas. The past 25 years have seen a dramatic increase in our use of oceans space and resources. During this period there has also been a growing body of both codified and "soft" international law. Among these are the 1982 United Nations Convention on the Law of the Sea, the Rio Declaration on Environment and Development (1992), and the Convention on Biological Diversity (1992).

The Oceans Act, passed into effect in January 1997, recognizes that conservation and long-term sustainable use are key to management of oceans space and resources. The Act builds on the initiatives that Canada has supported internationally and recognizes the complexity of oceans and coastal management within Canada where greater than twenty federal agencies, provincial and territorial governments, and land claim bodies all have legislative responsibilities related to oceans and coastal management. The Oceans Act provides the framework within which Canada shall exercise its rights and responsibilities for those areas under its jurisdictional power.

The Preamble to the Oceans Act outlines the objectives of the Act:

- To promote the understanding of the oceans, oceans processes, marine resources, and marine ecosystems;
- To affirm that conservation based on an ecosystem approach which is fundamental to maintenance of biodiversity and productivity
- To promote the wide application of the precautionary approach in the conservation, management and exploitation of marine resources in order to protect these resources and preserve the marine environment and;
- To recognize that the oceans and their resources offer significant opportunities for economic diversification and generation of wealth for the benefit of all Canadians.

The Oceans Act further recognizes our shared responsibility for oceans management and conservation and the need for collaboration among all jurisdictions and interests; the need for integration of planning and management of all oceans-related activities within DFO, among OGDs, with provinces/territories and stakeholders; and that planning and management decisions must be based on the impacts on ecosystems as a whole, not just on a single resource.

The Oceans Act is divided into three parts:

- Part I defines Canada maritime zones and associated rights and responsibilities;
- Part II lays out the requirement for DFO to lead, with other jurisdictions and interests, in the development of an Oceans Management Strategy based on the principles of sustainable development, integrated management, and the precautionary approach. Part II also establishes programs that DFO is responsible for developing under the Act (integrated management plans; marine environmental quality guidelines/criteria and marine protected areas.)
- Part III describes the Minister of Fisheries and Oceans roles in providing Coast Guard and Hydrographic Services and in conducting scientific research and

includes consequential amendments to other federal legislation.

The focus of this document is Part II of the Oceans Act.

Under the Oceans Act, Canada's National Oceans Management Strategy is to be grounded in collaboration - with federal departments/agencies, provincial governments, affected aboriginal organizations, coastal communities, other groups/bodies. The Oceans Act recognizes that no one entity/agency can do this alone and it recognizes the authorities of other agencies, levels of government. The Oceans Act programs are also strongly based on collaboration. Section 31 of the Act states that the Minister, in collaboration with other ministers, boards and agencies of the Government of Canada, with provincial and territorial governments and with affected aboriginal organizations, coastal communities and other persons and bodies, including those bodies established under land claims agreements shall lead and facilitate the development and implementation of plans for the integrated management of all activities or measures in or affecting estuaries, coastal waters and marine waters that form part of Canada or in which Canada has sovereign rights under international law.

The Oceans Act provides instruction to the Minister of Fisheries and Oceans on how integrated management plans shall be developed and also provides certain tools for implementing these plans. For the purpose of the implementation of integrated management plans, the Minister shall develop and implement policies and programs, shall coordinate with other ministers, boards and agencies of the government of Canada in the implementation of policies and programs with respect to coastal and marine waters. The Minister may establish advisory or management bodies, recognize established bodies, and may establish marine environmental quality guidelines, objectives, or criteria. The Act also makes provision to make regulations prescribing marine environmental quality requirements and standards.

Within integrated management and planning, the Oceans Act provides for the establishment of marine protected areas (MPAs). A marine protected area is an area of the sea that forms part of the internal waters of Canada, the territorial sea of Canada or the exclusive economic zone of Canada and has been designated under this section for special protection for one of the following reasons:

- Conservation and protection of *commercial and non-commercial fishery resources, including marine mammals and their habitats*
- Conservation and protection of *endangered or threatened marine species and their habitats*
- Conservation and protection of *unique habitats*
- Conservation and protection of marine areas of *high biodiversity or biological productivity*
- Conservation and protection of *any other marine resource or habitat as is necessary to fulfill the mandate of the Minister*

The Oceans Act places responsibility on the Minister of Fisheries and Oceans to lead and coordinate the development and implementation of a national system of marine protected areas on behalf of the government of Canada; and in particular with those other federal agencies with mandates to establish protected areas in oceans and coastal areas: Environment Canada and Parks Canada.

So how might the programs flowing from the Oceans Act work? The development of Oceans and Coastal Management (OCM) plans will involve the participation of government, First Nations, industry, community, and academic representatives to facilitate issue-based dialogue. These stakeholders will need to work together to establish the goals, objectives and actions for the plan. Collaborative mechanisms can be established to incorporate new ocean activities or increased levels of activity.

Oceans management should build on existing management mechanisms where possible. However, after the identification of management gaps and weaknesses at the federal level, it may be necessary to establish new advisory or management boards to fill in gaps and develop operational networks and links through memoranda of understanding (MOUs) and related arrangements for working relationships among stakeholders. When weaknesses appear on an issue-by-issue basis, it will be necessary to facilitate a long-term solution in the OCM plan.

MPAs

Marine Protected Areas (MPAs) are distinct components of an Oceans or Coastal Management Plan. Special ecological areas need to be identified and protected through the MPA Program. The MPA Program will build upon and form linkages with established and developing oceans and coastal management initiatives. Sensitive or special areas requiring protection may be identified through the planning process for the development of the Oceans Management Plan.

MEQ Regulations

Specific indicators are needed to define and monitor the health of an ecosystem. Marine Environmental Quality standards and monitoring protocols are measures that provide objectives to be attained and maintained relative to the condition or state of specific components of the ecosystem. Indicators that are measurable or quantitative are most useful. Monitoring the indicator over time can provide longer-term information on trends. Indicators can be used to track progress toward attainment of the associated ecosystem health objectives and goals and as an indication of whether ecosystem management decisions are being effective. Damaged ecosystem components and various strategies to restore them will need to be identified.

Ocean-use Planning and Area-based Management

The ocean-use-planning concept of area-based management and area zonation is one mechanism that could be used to deal with multiple-use issues through oceans management. Decisions about the use of ocean space could be based on layers of geo-referenced information regarding ecological attributes, habitat sensitivity and ocean use activities.

The implementation of the OCM plans will be a long-term, adaptive management process, requiring on-going planning and implementation and periodic review and revision. Performance review and measurement are needed to revise and improve the plan periodically based on surveillance, monitoring, research, increased understanding of the area and the impact of use and changes in public attitudes and perceptions. Hence, the planning process would be a rolling agenda that results in actions being taken that require ongoing feedback to determine if the planning philosophy and objectives are being achieved.

Halifax Harbour – Fisheries Act Implications

B. D. Thompson

Introduction

Since Halifax was founded in 1749, considerable fish habitat losses have occurred in the Halifax Harbour, the Bedford Basin and the Northwest Arm. These losses generally have anthropogenic causes, such as dredging, infilling, the discharge of wastewater and contaminated surface runoff. Similarly freshwater brooks, streams and lakes have been lost or significantly degraded as a result of land disturbance and other development activities (Bruin, 2000). In spite of this, the Halifax Harbour continues to support a viable commercial fishery as well as some recreational fishing activities. Commercial fishing efforts within the Harbour involve a total area of about 24 km^2. The most sought after species include lobster, cod, haddock, and herring (Rozee, 2000).

Recreational fishers in the Halifax area target pollock, smelt, Atlantic salmon, gaspereau, sea trout, shark and mackerel. During the 1950s and 1960s, recreational fishing was quite popular at various points along the shores of the North West Arm, the Halifax Harbour and the Bedford Basin. Since then, efforts appear to have declined somewhat. This is probably due to lost habitats, limited access, pollution and reduced fish abundance. Some groups such as the Sackville Rivers Association have undertaken habitat restoration activities in order to improve recruitment and productive capacity.

The Halifax Harbour also serves as a nucleus for a number of important land and marine based activities. Container ships and bulk carriers frequent the City's offloading, handling, processing and storage facilities on a year-round basis. Cruise ships and tour boats are common sights during the summer months and Canada's East Coast naval fleet is also based in Halifax. All of this involves multiple jurisdictions and many opportunities for overlap, duplication and confusion.

This paper describes specific aspects of the Fisheries Act which are applicable to both development and operational practices within the Harbour and its watersheds. It should complement similar papers prepared by other jurisdictions and should help to stimulate further discussion. This is consistent with the objective of the workshop which is to identify opportunities for future collaboration and to help establish a more integrated approach to managing our Harbour and its resources.

Fisheries – A Federal Responsibility

In Canada, the Constitution Act established the Federal Government as having the sole responsibility for managing marine and freshwater fisheries. This was further confirmed through the passing of the Fisheries Act by Parliament in 1868. In the intervening years, this legislation has undergone a number of significant revisions. Today, the Fisheries Act serves as a powerful regulatory tool with a number of provisions, which deal with fish habitat and pollution related issues, as listed in Table 1.

Table 1: Habitat Protection and Pollution Prevention Provisions of Fisheries Act (Source: Annual Report to Parliament, 1998)	
Section	**Intent**
20	The Minister may require the construction of fishways at obstructions.
21	The Minister may authorize payment, order construction or removal or require fish stops or diverters for fishways.
22	The Minister may require sufficient flow of water for the safety of fish and for the flooding of spawning grounds as well as free passage of fish during construction.
266	Prohibits obstruction of fish passage through channels, rivers and streams. Also, the Minister may authorize devices to prevent the escape of fish.
27	Prohibits the damage or obstruction of fishways, the impediment of fish to fishways and fishing in the proximity of fishways.
28	Prohibits the use of explosives to hunt or kill fish.
30	The Minister may require fish guards or screens to prevent the entrainment of fish at any diversion or water intake.
32	Prohibits the destruction of fish by any means other than fishing.
34	Contains definitions used throughout Sections 35 and 36.
35	Prohibits the harmful alteration, disruption or destruction of fish habitat unless authorized by the Minister.
36	Prohibits the deposit of deleterious substances in waters frequented by fish, unless authorized by regulations.
37	The Minister may request plans and specifications for works or undertakings that might affect fish or fish habitat. The Minister may, by regulations or with Governor in Council approval, make orders to restrict or close works or undertakings that may harmfully alter fish habitat or lead to the deposit of deleterious substances.
38	Gives the Minister the authority to appoint inspectors and analysts and describes inspector's powers, including entry, search and the power to direct preventative, corrective or cleanup measures. Provides for regulations that require reporting of abnormal deposits of a deleterious or substances that occur in contravention of the general prohibition, regulations or site–specific authorizations.
40	Sets out penalties in case of a contravention of: Sections 35 or 36; failing to provide information or to undertake a project in compliance with Section 37; or failing to make a report or to otherwise comply with Section 38
42	Those causing the deposit of deleterious substances in waters frequented by fish are liable for costs incurred by Her Majesty. Also, the Minister shall prepare an annual report on administration and enforcement of the fish habitat protection and pollution prevention provisions of the Fisheries Act as well as a statistical summary of convictions under Section 40.

Fisheries Act - Habitat Related Provisions

Sections 20, 21, 22 and 26 of the Fisheries Act are usually applied to fish migration and fish passage situations involving diadromous species in freshwater environments. An example in the Halifax area might include proposals for dams within the Sackville River system. Some of these same sections can also be applied to estuaries where causeways or dams are constructed. Examples in the Maritimes Region where fish passage provisions would apply to estuarine environments include the Petitcodiac River causeway near Moncton, New Brunswick and the Annapolis Tidal Power Station in Nova Scotia.

Section 28 of the Act prohibits the hunting or killing of fish and marine mammals using rockets, explosive materials, explosive projectiles or shells (some exceptions apply). Although this section is intended to control fishing methods, it also prevents the damage to fish habitat that might occur if such fishing methods were used. Although not believed to be a common occurrence in Atlantic Canada, such practices are used in developing countries and are responsible for the large-scale destruction of fish habitats including fragile coral reefs.

The Fisheries Act also contains a provision (**Section 30**) which requires the prevention of fish passage from Canadian fisheries waters into water intakes, ditches, channels and canals. This is normally accomplished through the installation and maintenance of appropriately sized screens. These may be necessary where water is diverted or extracted for uses such as irrigation, manufacturing or power generation. In the Halifax Harbour, this section would apply to the cooling water intakes from power plants or similar facilities.

The destruction of fish by means other than fishing is prohibited by **Section 32** of the Act. Similar to **Section 28**, this provision also protects fish habitat from activities such as underwater blasting.

Sections 35 and 36 prohibit harmful habitat alteration and pollution while **Section 34** provides relevant definitions. The DFO, Habitat Management Division dedicates a significant level of effort towards the administration of **Section 35** while Environment Canada (EC) administers and enforces **Section 36** through a formal Memorandum of Understanding. **Section 36** prohibits the deposition of deleterious substances in waters frequented by fish. DFO plays a scientific and advisory role in the administration of this section.

Section 37 of the Fisheries Act provides DFO and EC with an alternative to enforcement and allows the Minister to request plans and specification for works, which might adversely effect fish habitat through physical alteration or pollution. Failure to provide the requested information is considered to be in violation of the Act. This Section also provides for the issuance of stop work orders with Governor in Council approval.

Sections 38, 40 and 42 of the Act deal with enforcement matters such as the appointment and power of inspectors, penalties under **Sections 35** and **Section 36** as well as some cost recovery opportunities.

Important Definitions

The Fisheries Act's definitions of fish and fish habitat are very broad. For example, fish is considered to include:

a) *"parts of fish*
b) *shellfish, crustaceans, marine animals, and any parts of shellfish, crustaceans or marine animals and*
c) *the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals."*

Similarly fish habitat is defined as *spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.*

On this basis, disturbing areas populated by aquatic insects could potentially be a violation under the Fisheries Act since these can be considered as a food supply for fish. In the marine environment, fish habitats can range from coastal mud flats and rocky inter-tidal areas to offshore fishing banks and unique features such as canyons. Fresh water habitats can include lakes, rivers and even intermittent streams.

Fisheries Act - Section 35

Section 35 of the Fisheries Act is considered to be strong regulatory tool which is best suited for enforcement matters and for dealing with violations.

Section 35(1) " *No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat.*"

Section 35(2) *"No person contravenes subsection (1) by causing the alteration, disruption or destruction of fish habitat by any means or under any conditions authorized by the Minister under regulations made by the Governor in Council under this Act"*

Enforcement

Each year, the Habitat Management Division initiates approximately 20-25 enforcement actions and about 5 prosecutions. Several investigations related to potential Fisheries Act violations are currently underway in the Halifax Harbour area. Penalties for violating the Fisheries Act are consistent with other federal environmental legislation. Table 2 shows maximum fines and penalties for a number of legislative acts related to the marine environment. In practice, the courts determine the severity of the punishment on a case specific basis.

Because of the significant demands it places on both fiscal and human resources, enforcement is not always considered to be the most efficient or effective approach for conserving or protecting fish habitat. Once a decision is made to take an enforcement action, it becomes necessary to involve a number of staff including Fishery Officers, habitat specialists and legal counsel. They must then carry out inspections and investigations, collect and preserve evidence, prepare court briefs, make court appearances and determine and recommend appropriate sentencing options.

The outcome of individual court cases is not always predictable. Even in successful prosecutions, the actual penalties assigned by the courts might not be consistent with the importance placed on the habitat which is lost or damaged.

Table 2: Fines and Penalties – Federal Legislation (Source: Thompson, 1999)	
Legislation	**Penalties**
Fisheries Act	Summary conviction: $300,000 fine & 6 month sentence. Indictable offence: $1,000,000 fine and 3 year sentence.
Navigable Waters Protection Act	$5,000 fine and 6 month sentence.
Canadian Environmental Protection Act	Summary conviction: $300,000 fine & 6 month sentence. Indictable offence: $1,000,000 fine and 3 year sentence (5 years for fraud)
Migratory Birds Convention Act	Fine $1,000,000 individual & $250,000 corporations. Other: provisions for forfeiture.
Canada-Nova Scotia Offshore Petroleum Accord Act	Summary conviction: $100,000 fine & 12 month sentence. Indictable offence: $1,000,000 fine and 5 year sentence.
Transportation of Dangerous Goods Act	Summary conviction: $50,000 fine. Indictable offence: 2 year sentence. Compensation $1,000.000

As part of sentencing, the Department often requests that fines be directed towards restitution. In these instances, the work is usually carried out through community groups.

Project Authorizations

Under the Fisheries Act, project proponents are not obligated to submit projects for a review by DFO. Authorizations are only issued when a loss of fish habitat is anticipated and in situations where this loss is acceptable to DFO. In such instances, it is the loss of habitat, that is authorized, and not the project itself.

In spite of this, proponents and their consultants often consult with DFO regarding proposed undertakings. The Department usually responds by providing them with guidelines or letters of advice. By following DFO's recommendations, harmful alteration of fish habitat can often be avoided and a formal authorization is not required.

In the Maritimes Region, approximately 2500+ projects are received by DFO each year, through referral processes usually involving other government departments. These project referrals can range from simple culvert installations to major environmental assessments for offshore hydrocarbon development projects.

When Section 35 authorizations are issued by DFO, the project proponent is usually required to provide some form of habitat compensation. Because there are many uncertainties regarding the efficiency/inefficiency of created habitats, a factor of safety is normally applied. This is typically based on a 2:1 ratio of replacement to lost habitat.

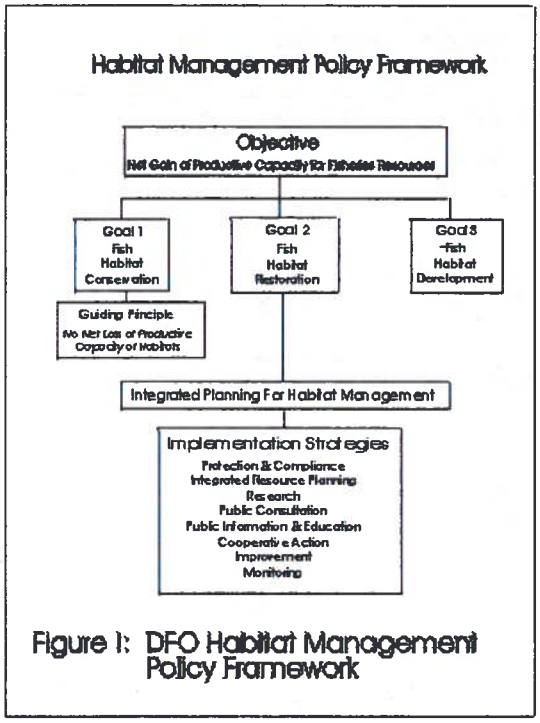


Figure 1: DFO Habitat Management Policy Framework

Fisheries Act Section 35 authorizations also serve as a trigger for the Canadian. Environmental Assessment Act (CEAA). In such cases, the DFO Habitat Management Division becomes a
Responsible Authority under CEAA and must ensure that an environmental assessment is completed and reviewed. The Division is also responsible for environmental assessments triggered by the Navigable Waters Protection Act.

The Habitat Management Policy DFO is fortunate in having a formal policy to deal with fish habitat issues. The policy's objective is a net gain of productive capacity for fisheries resources. Figure 1 illustrates the policy framework, the goals and implementation strategies.

Historically as much as 77% of the Habitat Management Division's resources (on a national basis) have been directed towards the managing of referrals under the first goal. However the Division is presently developing a new blueprint for the future which will focus on more proactive initiatives. These will include improved guidelines and communications programs, increased efforts directed towards education and public awareness, greater participation in integrated resource planning and new information sharing arrangements.

The Habitat Policy has a very clear hierarchy of preferences for dealing with project proposals as illustrated in Figure 2. Avoiding disturbance is always the preferred option which can often be achieved through project relocation or design changes. In other cases, mitigation through appropriate construction techniques is also possible. The least favoured approach is compensation.

Summary

The Halifax Harbour represents one of the most important assets on Canada's east coast and provides the Province of Nova Scotia with many opportunities for diverse economy. In spite of its apparent resilience, large population increases and intense use over the past 2.5 centuries have resulted in

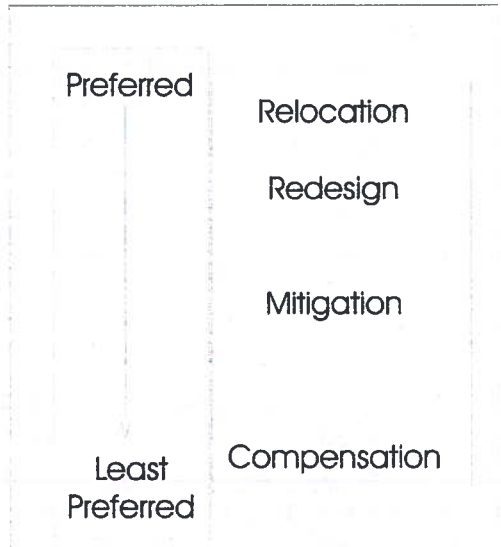


Figure 2: Hierarchy of Preferences

significant degradation of the Harbour. Because of the multiple jurisdictions involved in development initiatives and regulatory decisions affecting the harbour, there is a need to implement an integrated approach for planning and management. Terrestrial and marine-based activities must both be considered. A high level of communication, co-operation and commitment by all levels of government will be necessary to operate in an effective and efficient manner and to ensure a sustainable future.

The question which we must all now address, as individual agencies and as a group, is simply *"Is it really worth it?"*. I submit that indeed it is. I also believe that based on the level of interest expressed during the **Preserving the Environment of Halifax Harbour Workshop** that my view is not a singular one! We must only decide where to go from here!

References:

Bruin, Jennifer. 2000. Lost streams in the Halifax Harbour watershed between 1865 and 1992. Poster Presentation, Preserving the Environment of the Halifax Harbour Workshop. Halifax, Nova Scotia.

Fisheries Act. R.S., c. F-14, s. 1.

DFO. (1998). The administration and enforcement of the fish habitat protection and pollution provisions of the Fisheries Act, Habitat Management. Annual Report to Parliament 1997-98.

DFO 1986, Policy for the Protection of Fish Habitat. Department of Fisheries & Oceans Communications Directorate, Ottawa, Ontario.

Thompson, B.D., 1998. Environmental regulation of offshore hydrocarbon development. Unpublished paper prepared for 5001.01. Graduate studies, Marine Affairs Program. Dalhousie University, Halifax. N. S.

Rozee, P. 2000. Infilling and alterations of Halifax Harbour. Poster Preseentation, Preserving the Environment of the Halifax Harbour Workshop. Halifax, Nova Scotia.

The Environment Of Halifax Harbour
The Navy Influence

Lt. (N) Ken P. Squire

Since the mid 1700s, there has been a shore based as well as fleet based naval presence in Halifax. First the British then the Canadian Navy up to this day used Halifax as its primary ship support center for the Western North Atlantic. In its role as support center, Halifax was and still is a center for shipbuilding, ship repair, ship re-supply and ship disposal. Historically, these activities have not been kind to the environment of Halifax Harbour.

Recent interest (in terms of naval presence in Halifax) in the environment, the subsequent federal, provincial and municipal environmental legislation has prompted DND to become a good environmental corporate citizen.

The Canadian Environmental Protection Act and the Fisheries Act are show-stoppers for the Canadian Navy. The Canadian Navy will not knowingly contravene these laws unless there is an immediate danger to a ship or human life. The Canadian Shipping Act and the International Maritime Organization's MARPOL 73/78, in most cases, carry exemptions for naval ships, however, the Canadain Navy subscribes fully to these acts/regulations. These international and federal laws and regulations are reflected in the Maritime Command Order G- 1 8 and the Queen's Harbour Master Harbour (QIM) Control Instructions. Further, it is reflected in the Maritime Command Order 4-12, the environmental policy of the Chief of Maritime Staff (CMS), that Maritime Command is committed to meeting or where possible meeting or exceeding provincial and municipal laws and regulations. The methods that the navy has chosen to maintain and improve its environmental performance are:

(A) Environmental Awareness Training Maritime Forces Atlantic (MARLANT) Personnel in the following sub categories.

- Unit Environmental Awareness Training for all personnel;
- Work Place Hazardous Material Information System Training (WIMS); and Unit Environment Officer Training.

(B) Maritime Environmental Protection Program is a program that is aimed at improving the engineering controls aspect of marine pollutions by:

- Replacing old equipment such as oily water separators and Air Conditioning Plants with new systems that meet the legislative requirements;
- Installing new equipment for new requirements such as solid waste handling and Black and Grey Water systems aboard ships and specially designed HAZMAT Storage facility ashore to control the purchase and disposal of HAZMAT;
- Incorporating support facilities ashore to handle oily waste water and metal laden effluents;

- Having all jetties fitted with oily waste water connections for the ships as well as sewage connections;

(C) Protection.
This is part of the on going support to ships from short based facilities to:

- provide the necessary training to the ship's staff in responding to oil and HAZMAT spills

- to support the ships with the necessary equipment and materials to respond immediately to a spill;

- provide professional spill response services to the Fleet through QHM;

- provide professional spill response services for land based spills through Formation Construction Engineering; and

- reduce solid non-hazardous waste generation by recycling and re-using of materials, and composting of food stuffs.

(D) Infrastructure Improvement and Effluent Monitoring Program In support of our naval vessels, integral units and lodger units, significant improvements have been made to supporting infastructure to enhance the pollution prevention. ANT infastructure improvements are as follows:

- improved facilities at the Damage Control School at Purcell's Cove where propane is used to simulate shipboard fires instead of fuel oil. The site also houses an effluent treatment facility and effluent monitoring;

- oil water separators fitted at the Transportation, Electrical and Mechanical Engineering workshop at Willow Park and at the Auto Hobby Club at Windsor Park to prevent oil from entering the storm drain systems; Effluent monitoring in a multitude of sites throughout MARLANT in Willow Park, Windsor Park and the Damage Control School as the areas with the highest potential to affect Halifax Harbour.

(E) Environmental Management Systems
Included in the CMS policy is the requirement for the Maritime Forces Atlantic and all its major units to have an Environmental Management System (EMS) equivalent to the ISO 14001 standard in place by 31 March 2000.

(F) Sustainable Development Strategy
This is a program that has identified environmental objectives and targets for all of DND with a mandate to show improvements with respect to environmental performance annually.

As with any home, those who reside therein share the responsibility to keep it clean and in good repair. Good policy, education and training, equipment and materials and operating procedures are the Canadian Navy's tools to maintain and improve its environmental performance. After all, Halifax is the home of the Canadian east coast fleet.

The Regulatory Environment

Dave Aggett

Abstract Governments have at their disposal a number of tools to assist, promote and compel industry to undertake operations in a manner which protects diversity and environmental resources. These tools include educational materials, funding, technical assistance, research, and finally, legislation. Environment Canada controls the introduction of pollutants into water by applying Section 36, *Fisheries Act* and Part 7, Division 3 of the *Canadian Environmental Protection Act* (1999).

The environmental protection sections of the Fisheries Act of Canada are co-managed by the Department of Fisheries and Oceans and Environment Canada. Under an MOU, the Department of Fisheries And Oceans administers Section 35 of the Act, commonly known as the "habitat protection provisions", and Environment Canada administers Section 36(3), commonly known as the "pollution prevention provisions".

These two sections most commonly referred to by number: Section 35(1) and Section 36(3) of the *Fisheries Act*, provide Canada's strongest tool for discharging the federal constitutional responsibility for protection and management of fishery resources.

The Disposal at Sea provisions of the *Canadian Environmental Protection Act* (1999) prohibit the disposal at sea of any substance without the benefit of a permit. The terms under which permits are issued are strict and are based on Canada's obligations under the *London Convention.*

Fisheries Act S. 36(3)

Section 36(3) of the Fisheries Act states:

> Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water."

So, what does this mean? If we define each term, we may get a clearer picture of our responsibilities.

> "person" - a person is a human being, a body corporate (company) or a government department (Her Majesty the Queen in Right of Canada)
>
> "Deposit" - means any discharging, spraying, releasing, spilling, leaking, seeping, pouring, emitting, emptying, throwing dumping or placing. (S. 34(1)) Further, where a corporation commits an offence under this act, any officer, director or agent of the corporation who directed, authorised, assented to, acquiesced in or participated in the commission of the offence is a party to and guilty of the offence. (S. 78.2)
>
> "Deleterious substance" - means any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water. (S. 34(1)) In the landmark case R. vs MacMillan Bloedel Alberni) Limited, the Supreme Court of Canada ruled that "What is being defined is the substance that is added to the water, rather than the water after the addition of the substance.... Once it is

determined that (the substance) is a deleterious substance and that it has been deposited, the offence is complete without ascertaining whether the water itself was thereby rendered deleterious."

"water frequented by fish" - means water which, at some time, has fish in it. Again in R. vs MacMillan Bloedel, the Supreme Court ruled that "This section (of the Fisheries Act) does not speak of "water in which there are fish" but of "water frequented by fish". To restrict the word "water" to the few cubic feet into which the (substance) was poured would be to disregard the fact that both fish and water move." Additionally it means "Canadian fisheries waters" which is all waters in the fishing zones of Canada, all waters in the territorial sea of Canada and all internal waters of Canada. (S. 2)

"fish" - includes, but is not limited to, parts of fish, shellfish, crustaceans, marine animals and any of their gametes, larvae, or juvenile stages.

In administering the *Fisheries Act*, Environment Canada's enforcement officers, designated by the Minister to be "Inspectors", have certain authorities which allow them to enter, at any reasonable time, any place where they have reasonable grounds to believe that any work or undertaking resulting or likely to result in the deposit of a deleterious substance into water frequented by fish, is occurring.

While an inspector is conducting an inspection, the owner or person in charge of any place, and any person found there is obliged by the *Fisheries Act* to give the Inspector all reasonable assistance, and must furnish the inspector with information the Inspector requires. (S. 39(10))

It is an offence under the Fisheries Act to obstruct or hinder or to make a false or misleading statement to a Fisheries Officer or Inspector, who is carrying out duties under the Act.

It is not necessary, for the purposes of this paper to discuss penalties for non-compliance, but it may be useful to mention that recent court cases involving accidental releases of deleterious substances into water frequented by fish have resulted in fines in the order of $25,000 to $50,000. Courts are significantly harder on offenders who deliberately deposit or knowingly neglect to prevent deposits. Corner Brook Pulp and Paper paid $750,000 for a chronic release. For reference, it may be useful to see S. 78, 78.1, 78.2, and 78.3 of the *Fisheries Act*.

Canadian Environmental Protection Act (1999) Section 125(1)

Section 125(1) of the *Canadian Environmental Protection Act* (1999) states:

"No person shall dispose of a substance in an area of the sea referred to in any of paragraphs 122(2)(a) to (e) unless

(a) the substance is waste or other matter and
(b) the disposal is done in accordance with a Canadian permit"

For further clarification the terms are defined below.

"person" - a person is a human being, a body corporate (company) or a government department (Her Majesty the Queen in Right of Canada)

"disposal" - the deliberate disposal of a substance, including dredged material, at sea, the storage of a substance on the seabed or subsoil of the seabed and the disposal of a ship or aircraft.

"sea" - the territorial sea of Canada, the internal waters of Canada (excluding rivers and freshwater and some noted exclusions in the Gulf of St. Lawrence), any exclusive economic zone created by Canada, any area of the sea under the jurisdiction of a foreign state other than its internal waters, and any area of the sea not included in the foregoing.

"waste or other matter" - means waste or other matter listed in Schedule 5 of the Act. (ie. dredged material, inert and inorganic geological matter, fish waste, ships etc., uncontaminated organic matter, bulky material under certain conditions)

"permit" - a permit issued by the Minister for the loading and ocean disposal of substances. Permits are only issued after rigorous screening against a host of criteria. Applications are often rejected for dredging operations in industrial harbours due to the gross contamination of sediments. Factors considered in granting permits are found in Schedule 6 of the Act.

The authorities of CEPA Enforcement Officers are similar, and in several cases broader than those of Fisheries Officers and Inspectors. Authorities of, and obligations to, CEPA Enforcement Officers may be found in Sections 218, 219, 220, 226, 227 and 228. Ofences and punishments are found in Sections 272, 273 and 274.

Avoiding Prosecution

What can one do to prevent being prosecuted for environmental offences? The short answer is, to exercise "all due diligence". Section 78.6 of the *Fisheries Act* and section 283 of CEPA, protect a person from being convicted under the Acts if the person establishes that they exercised all due diligence to prevent the commission of the offence. Paraphrasing from Black's Law Dictionary, due diligence is a measure of prudence or care which you would ordinarily expect from a reasonable person under the circumstances. In other words, if it is reasonable to anticipate an event, and you have the power or authority to prevent the event, you must act, or you will not have exercised all due diligence. If you prevent the offence you can't be prosecuted, and if despite all your efforts, the offence still occurred, you may be able to defend against a prosecution. If you have been warned by an inspector that you are in danger of violating the law, or that you are violating the law, and you do not do everything in your power to stop or prevent the offence, you will be unlikely to be able to apply a due diligence defence.

What sorts of evidence will be accepted by the courts as being valid examples of due diligence? In the case of R. v. Bata Industries Ltd. (1992, Unreported), Judge Ormston of the Ontario Provincial Court sets out a useful checklist:

> "I ask myself the following questions in assessing the defence of due diligence"
>
> (a) Did the Board of Directors establish pollution prevention "system"? Was there supervision or inspection? Was there improvement in business methods? Did he exort those he controlled or influenced?
>
> (b) Did each Director ensure that the Corporate officers have been instructed to set up with a system sufficient within the terms and practices of its industry of ensuring compliance

with environmental laws, to ensure that the officers report back periodically to the
Board of the operations of the system, and to ensure that the officers are instructed to report any substantial non-compliance to the Board in a timely manner?

(c) The Directors are responsible for reviewing the environmental compliance reports provided by the officers of the corporation but are justified in placing reasonable reliance on reports provided to them by corporate officers, consultants, counsel or other informed parties.

(d) The Directors should substantiate that the officers are promptly addressing environmental concerns brought to their attention by government agencies or other concerned parties including shareholders.

(e) The Directors should be aware of the standards of their industry and other industries which deal with similar environmental pollutants or risks.

(f) The Directors should immediately and personally react when they have notice the system has failed.

The Regulatory Environment-Provincial Department of the Environment

Christine Mosher

The following are extracts from a document entitled "A Guide to the Act" from a publication accessible at the describe environmental control mechanisms which may apply with regard to an activity occurring in the Halifax Harbour.

PART IV: Environmental Assessment
An environmental assessment examines and evaluates the environmental effects of an undertaking. An undertaking includes an activity, project, structure, work or proposal and may include a policy, plan or program. A modification, extension, or abandonment of an undertaking may be considered an undertaking (ss.3(s)(az)). An environmental effect means any positive or negative change that the undertaking may cause in the environment including any effect on socio-economic conditions, environmental health, physical and cultural heritage or on any structure, site or thing including those of historical, archeological, paleonthological or architectural significance and any change to the undertaking that may be caused by the environment (s.3(v).

The Environmental Assessment Regulations provide further details. Policies, plans or programs which do not lead to adverse effects or significant environmental effects will not be subject to an environmental assessment (Reg. s.4). Modifications, as defined, are not intended to include routine maintenance or repairs.

Undertakings requiring Assessment
The types of undertakings that require environmental assessment are listed in Schedule "A" of the *Environmental Assessment Regulations*. They are divided into Class I and Class II undertakings. Class II undertakings are generally more complex and require a public hearing or review. (See Chapter 2 of the Guide for more information.)

Stages of the Environmental Review
The stages of the process may include registration/examination, focus report, environmental assessment report, public hearing or review and recommendations, and a decision by the Minister. These stages are highlighted in the table on page 5 which illustrates that it is not necessary to go through every stage of the process. All Class II undertakings must have a public hearing or review.

First, the proponent (the applicant)must register the undertaking (s.33). Registration information includes a description of the undertaking, the environment that will be affected and any obvious environmental effects.

After registration, the Minister examines the registration information and makes one of the following decisions:

1. the undertaking is rejected;
2. the undertaking may proceed;
3. more information is needed;
4. a focus report is needed;
5. all or part of the matter should be referred to ADR;
6. an environmental assessment report needed.

If after an examination of the registration information the Minister decides that it is likely that the undertaking will cause adverse effects or negative environmental effects which cannot be mitigated, the Minister may reject the undertaking (s34(1)(f)). This will save the proponent the time and money necessary to engage in a long process which would eventually reach the same decision. Conversely if it is clear that the undertaking will not cause adverse effects or negative environmental effects, then any Class 1 undertaking may be approved at this early stage (ie. "screened out"). If there is not enough information the Minister may request additional information.

Where there are only a small number of unresolved issues or concerns, the Minister may decide that a **focus report** is needed. Instead of requiring a full environmental assessment report, the proponent would be advised to focus on providing information on these key issues. If the focus report clarifies these matters, the Minister may decide to approve or reject the undertaking without the proponent spending additional time and money preparing an environmental assessment report.

The Minister may recommend the matter be referred to ADR before a decision is made. This may be the case if a decision to approve or reject an undertaking seems to hinge on resolving difficult scientific or technical matters or if it seems that narrowing the critical issues would be helpful.

Finally, the Minister may decide that it is most appropriate to require an **environmental assessment report**. This is a detailed report that assesses all of the environmental effects of an undertaking. At each of the subsequent stages in the process, the Minister's decision involves a similar range of choices (ss.34, 35, 38, 39).

PART V: Approvals and Certificates

"Approval" is a term that replaces what used to be referred to as permits, licenses and letters of authority. Approvals include renewals of approvals (s.3(f)). Approvals are written permissions granted by the Department to engage in certain activities that potentially could damage the environment. Approvals contain specific terms and conditions designed to mitigate the potential adverse effects associated with a particular activity.

Approvals are issued to ensure that these activities are regulated and monitored so that the environment is protected. That does not mean that having an approval is all that you need to do to operate legally. An approval holder must still comply with all provisions of the *Act*. For example, you must still report and remediate spills. Permits or approvals required under other legislation must also be obtained.

Activities may include modifications or extensions. Any person proposing to engage in an activity or to modify or expand an existing activity that has possible environmental consequences should contact the Department about the need for an approval.

Activities Requiring Approval

Over 100 designated activities require approval from the Department. They are

listed under 6 divisions in the *Activities Designation Regulations*. (See Chapter 2 of the Guide for more information about which specific activities require approvals.) Also, individual regulations can require that an approval be obtained (eg. *Sulphide Bearing Material Regulations).*

Activities on federal lands which will have an impact off-site on provincial lands are required to have an approval (Reg. s.4(2)).

Part V of the *Act* is not complete without reference to the *Approvals Procedure Regulations* and the *Activities Designation Regulations*. Therefore, reference to these regulations will be mentioned in this discussion of Part V of the *Act*.

Procedure after Non Approval

Two types of offences may be created if you do not obtain an approval for a designated activity (s.50). The first type is where you know you need an approval but intentionally choose to begin or continue a designated activity without first obtaining an approval. This is referred to as a ***mens rea* offence**. It has the most severe penalty - $1000 to $1 million or up to 2 years imprisonment, or both. The other type of offence for failing to obtain an approval requires no specific intent. This is referred to as an **absolute liability offence** or a **strict liability offence**. Although this creates a lesser offence, the penalties are still severe. There is no minimum fine or jail term but there is a $1 million maximum fine.

1.**Filing an Application**

An approval application must be filed with the Department (s.53). Generally, the information required to accompany an application includes a detailed description of process and site specifications, any substances that will be released, and any public consultation that will be undertaken. The *Approvals Procedure Regulations* (s.5(1)) sets out more fully the types of information that should accompany the application. Any required municipal approval, permits or other authorizations may need to be submitted at the time the application is made (s.53(4)).

If your application contains trade secrets or confidential business information, clearly mark this on the relevant portions of the documents. This information will not be released if the Department determines that it meets the criteria outlined in the *Freedom of Information and Protection of Privacy Act.*

The Administrator will inform the applicant if the activity is one that does not require an approval. If an approval is required, it will not be processed until all the required information is submitted (s.53(3)). If an application is not considered "completed", the applicant must be notified within 14 days of filing the application what further information is needed to make it complete. If the request to supply additional information is not supplied within 3 months, the application may be rejected. (See the *Approvals Procedure Regulations* s. 6(3) and s.6(4) which provide for requesting an extension of time.) It is crucial that all the necessary information be supplied. If you are in doubt about what information should be included, the Department staff will provide assistance to you.

2.**Review of the Application**

Once a decision is made that the application is completed, a letter is sent to the applicant

within 10 days advising how long it will be before the Minister will make a decision to approve or reject the approval application. Unless the letter provides that it will be longer, a decision must be made within 60 days of receipt of the completed application (s.54).

During the detailed review of the application, the Administrator will consider many factors such as the suitability of the site and the effectiveness of monitoring and rehabilitation programs. If during the detailed review crucial information is found to be missing, incomplete, or wrong, the Department policy is that the application can be rejected or the applicant can waive the 60 day time frame for processing, provide the additional information and the approval process will continue. (See "Policy on Procedure to Process Approvals under Part V of the *Environment Act*", dated July 14, 1995, and "Procedure to Process Approvals under Section 54 of the *Environment Act*", dated August 21, 1995).

3.**Decision to Approve/Reject the Application**

The Minister may issue an approval or refuse to do so. Generally, when an approval is issued it is subject to terms and conditions (s.56). The ministerial power to decide whether or not to issue an approval can be delegated to the staff level (eg. Regional Managers) as a means of streamlining the procedure (s.17) or it can be transferred to another government department (s.19).

The Minister has a **public interest override power** to refuse to issue an approval (s.52(1)). Certain limits have been imposed on the Minister's exercise of this discretion (s.52(2)). The Minister may only use the override powers to refuse to issue an approval based on a proposed activity that contravenes a policy of Government (eg. no nuclear power plants) or the Department (eg. bans on the importation of hazardous waste), if the location is unacceptable, or if the adverse effects are unacceptable.

Lifetime and Ownership of Approval

Approvals do not last more than **10 years** unless the regulations provide a longer term (See the *Approvals Procedure Regulations* s.11(1)). Approvals **may be renewed** upon the payment of renewal fees (See the *Approvals Procedure Regulations* s.11(3)).

Once an approval is issued, the applicant **cannot change the activity** in any way that would result in an adverse effect (s.55(1)). For example, the applicant must not discharge new contaminants not covered by the approval, or increase the amount of a contaminant being discharged. The applicant is allowed to do maintenance, adjustments and repairs in the normal course of business (s.55(3)). An approval can be changed if an application is made to do so. An approval holder can request to have the approval **amended** (s.58(1)).

The approval holder can also apply to **abandon** the approval. The terms and conditions respecting monitoring and security will apply for 2 years or longer after the date of abandonment, and rehabilitation plans will be required (*See the Approvals Procedure Regulations* ss.21 & 22).

The Minister may also unilaterally **amend a term or condition** of an approval (s.58(2)) if:

1. new information comes to light about an adverse effect that was not reasonably foreseeable when the approval was issued;

2. the term or condition is about monitoring or reporting; or
3. a temporary suspension of the activity is involved.

Further, the Minister may **cancel or suspend** an approval (s.58(2)(b)) if:

1. there is a breach of the approval; or

2. new information about an adverse effect becomes available.

An approval holder **can not sell or transfer** an approval without the written consent of the Minister. There is a 60 day time period for the consent unless the Minister gives notification that more time is needed (s 59(2)). With the consent of the new approval holder, a term of the existing approval could be altered (s.59(3)). A "Guideline on Transfer of Approvals under Section 59 of the *Environment Act*", dated September 19, 1995, is available from the environmental registry. A **name change** of an approval holder is not a transfer and does not require a formal assignment. The Minister must be notified. (See the *Approvals Procedure Regulations* s.9(2)). The *Approvals Procedure Regulations* (s.12) outline specifically when consents to transfer are needed:

1. the sale of a controlling interest in a business;

2.a transfer from a parent company to a subsidiary or an affiliate;

3. sales by receivers, trustees, or fiduciaries.

Application of the Provincial *Crown Lands* Act and *Beaches Act* within the Halifax Inlet

Harry Ashcroft

The Nova Scotia Department of Natural Resources administers over 30 provincial statutes. As custodian of most of the Province's 3.5 million acres of upland, it is not surprising that the majority of these statutes deal such matters as forest management, mineral resources, wildlife protection and outdoor recreation activities.

The two provincial statutes which the Department of Natural Resources commonly uses to administer, and regulate activities on, submerged land are the *Crown Lands Act* and the *Beaches Act.* I have been asked to speak on these two Acts and their application within Halifax Harbour and its environs.

The two Acts can have very different applications. Each can be applied independently of the other, but they are often applied in combination to submerged lands.

The Crown Lands Act

Under the *Crown Lands Act,* the province exercises its proprietary interest, or ownership, of the majority of lands under provincial jurisdiction. However, it does not apply to lands which are under the administration and control of other provincial departments. Public highways, for example, do not fall under the *Crown Lands Act.*

Submerged coastal lands, excluding federally owned submerged lands and privately owned water lots are generally understood to be owned by the Province under the administration and control of the Department of Natural Resources and therefore, by definition "Crown Lands".

The *Crown Lands Act* includes the following provisions:

Section 5 of the Act gives the Minister of Natural Resources supervision, direction and control of
(a) the acquisition, registration, survey and sale or disposition of Crown lands; and
(b) the administration, utilization, protection and management of Crown lands

Section 16 allows the Minister of Natural Resources (with the approval of the provincial Cabinet) to convey Crown land, or any interest in Crown land and to transfer the administration and control of Crown lands to the Government of Canada or an agency thereof.

Section 24 allows the Minister to set aside special areas on Crown lands for such purposes as forest research or management; water protection and regulation; and wildlife protection.

Section 38 prohibits the unauthorized dumping or depositing of material on or over Crown lands.

Section 39 provides for the removal of unauthorized structures from Crown lands.

Section 40 prohibits the unauthorized

removal of resources from Crown lands .

The Act provides details on how surveys of Crown lands are to be made; registration of documents; keeping records related to Crown lands; acquiring and disposing of interests in Crown land; wildlife and forest management; how offenses are to be dealt with. The *Crown Lands Act* therefore gives the Department of Natural Resources the explicit authority to deal with the types of issues that a land owner commonly has to deal with.

In order to assess the extent of this Act's application in the vicinity of Halifax Harbour, one simply needs to determine what, if any land in the Halifax Inlet is provincially owned and under the administration and control of the Minister of Natural Resources.

Title to Halifax Harbour was transferred from the Nova Scotia to Canada under the British North America Act. Twelve other harbours in Nova Scotia are considered to be federal by agreement or working arrangement between the two levels of government.

To define the limits of Halifax Harbour, the Provincial Crown Lands Record Centre refers to the description found in the Halifax Harbour Commissioners Act of 1927:

> For the purposes of this Act, the harbour shall include all the waters lying Northwest of a line running North 56 East and distant 3,500 feet Southeasterly from Pleasant Point, and including the waters of Bedford Basin and the Northwest Arm, together with all lands and land under water, the title of which at the time of the passing of this Act is vested in His Majesty in the right of his Dominion of Canada, and which is not under the jurisdiction of any department of Government.

There are a few anomalies:
Apparently, when Halifax Harbour was transferred to Canada in 1867, the railway causeway at Mill Cove in the Bedford Basin had already been constructed - a portion of the Basin was therefore separated from the harbour, except for some sluiceways in the causeway to allow for the waters to pass. There has been some discussion as to whether or not Mill Cove should be considered part of the federally owned harbour since it appears that it was not suitable for navigation at Confederation. Virtually all of Mill Cove has been conveyed to private interests by the province, the most recent conveyance being to Food City Limited, in 1972. It is noted that there was some doubt as to the authority of the Province to issue the grant, and the following proviso was added:

> "It is an express provision of this grant that the Province makes no warranty or authority to issue the same and that should any lack of warranty of authority or jurisdiction in the Province be established, the Province is absolved from any liability other than the refund in whole or in part of any price paid by the Grantee for this Grant"

The Province has also acquired a small number of water lots within the Harbour one in front of the Nova Scotia Hospital, another is in Bedford Basin. The latter is Crown land and was leased in 1991 to the Bedford Waterfront Development Corporation, by the Department of Natural Resources. With the exception of a few isolated water lots, there is no provincial Crown land within the

Halifax Inlet, north of the federal/provincial boundary.
Conversely, south of the Harbour boundary, almost all of the submerged land in the Halifax inlet is under provincial ownership and under the administration and control of the Department of Natural Resources. Again, there would be some exceptions where lands have been conveyed to private interests or transferred to Canada.

The Beaches Act
The *Beaches Act* provides that "the beaches of Nova Scotia are dedicated in perpetuity for the benefit, education and enjoyment of present and future generations of Nova Scotians.

The purpose of the *Beaches Act* is to:

> (a) provide for the protection of beaches and associated dune systems as significant and sensitive environmental and recreational resources;
> (b) provide for the regulation and enforcement of the full range of land-use activities on beaches, including aggregate removal, so as to leave them unimpaired for the benefit and enjoyment of future generations;
> (c) control recreational and other uses of beaches that may cause undesirable impacts on beach and associated dune systems.

For the purpose of the *Beaches Act*, "beach" means "that area of land on the coastline lying to the seaward of the mean high water-mark and that area of land to the landward immediately adjacent thereto to the distance determined by the Governor in Council, and includes any lakeshore area declared by the Governor in Council to be a beach."

The administration, management and control of beaches is under the direction of the Minister of Natural Resources.

Section 6 prohibits the removal of sand, gravel, stone or other material from a beach without permission from the Minister.

Section 8 states that no person shall, while on a beach,

> (a) be impaired by alcohol or drugs;
> (b) act in a noisy or disorderly manner;
> (c) create a disturbance
> (d) pursue a course of conduct that is detrimental to the safety of other beach users or their enjoyment of the beach and its facilities;
> (e) willfully destroy property and other natural resources found on or adjacent to a beach;
> (f) dump or garbage or other material on a beach other than in a receptacle so provided;
> (g) engage in any other activity prohibited by regulation.

Regulations made pursuant to the *Beaches Act* state that "no person shall develop a beach without the prior written authorization and approval of the Minister (of Natural Resources).

The regulations define "develop" as the "construction of a path, trail or road on a beach or the erection or placement on a beach of a building, structure or other manmade feature not indigenous to the site.

Other regulations deal with the removal of beach aggregate; injuring natural objects or plants; removing rocks, fossils or other objects of natural curiosity; carrying on a business; leaving fires unattended; controlling domestic animals; and using

vehicles; on a beach, and operating a vessel within 200 feet of a beach when people are known to be on the beach.

The *Beaches Act* and regulations operate regardless of the ownership of the land defined as a beach. Private lands and federal lands are commonly included within designated beaches and the Act and regulations are applied in the same manner as they are on Crown land.

There are two areas of upland within the Halifax inlet which have been designated as beaches. Both of these are in the Eastern Passage area - they are Noonans Beach and McCormacks Beach.

Perhaps more significantly, at least to this group is the fact that by definition, the entire Halifax Harbour, including Bedford Basin and the Northwest Arm falls under the definition of a beach and is therefore subject to the Act.

A frequently asked question is "how far out does the *Beaches Act* apply?" Since there is no outer boundary specified, it is felt that the Act applies to the outer limit of the Province's jurisdiction.

The Department of Natural Resources therefore administers the *Beaches Act* within the entire Halifax Harbour. When we receive an application for an activity which fall under the definition of "developing" a beach - that is to say the erection or placement on a beach of a building, structure or other manmade feature not indigenous to the site - we review the application in the context of the Act and, if appropriate, the permit, or letter of clearance is issued.

South of the federal/provincial boundary there is more visible evidence of what are commonly understood to be beaches. As one heads out the harbour the natural processes associated with increased wave action and a shoreline which has not been protected against the forces of nature, are more evident. These factors, coupled with the provincial ownership of the submerged land, results in the Department of Natural Resources taking a more active role in monitoring activities affecting the harbour shoreline and bottom.

Policy

The Department of Natural Resources Inland and Coastal Waters Policy provides guidelines for:

(1) issuing permits for structures (wharves, slipways, moorings) and activities (dredging) on submerged Crown lands;

(2) issuing grants, deeds, easements, licenses for submerged Crown lands;

(3) dealing with unauthorized infilling of submerged Crown lands;

(4) issuing permits or letters of clearance for submerged lands, pursuant to the *Beaches Act.*

McNab's Island and Lawlor's Island

McNab's and Lawlor's Islands will figure prominently in future development plans for Halifax Harbour. Under the terms of the 1998 Federal/Provincial agreement, 450 acres of land on McNab's Island and all (143 acres) of Lawlor's Island are to be transferred by the Federal government to the Province, for provincial park purposes. If they cease to be used for those purpose they will revert to Canada. Parks Canada will retain title to the Fort MacNab National historic Site and the Coast Guard will retain some sites of navigation aids. In addition to the lands to be retained by the Federal

government, there are four small private land holdings.

After the transfer to the Province is completed (hopefully by this summer) about 90% of McNab's Island and all of Lawlor's Island will be Provincial Crown land.

The *Crown Lands Act* can be found at www.gov.ns.ca/legi/legc/
The regulations made pursuant to the *Beaches Act* can be found at www.gov.ns.ca/just/regulations/regs/b7O89.htm

The *Beaches Act* has not yet been added to the Province of Nova Scotia web site.

Preserving the Environment of Halifax Harbour

Robert Ogilvie

The *Special Places Protection Act* was passed by the provincial legislature in 1980, replacing the *Historical Objects Protection Act* of 1970. As with similar laws in most Canadian provinces, the intention of the Act is to provide protection for important archaeological, historical and palaeontological sites and remains. The approach is consistent with that of other jurisdictions across Canada and around the world, imposing fines on those who damage important sites, establishing public ownership of heritage objects, and defining acceptable professional standards for site-based archaeological and palaeontological research and exploration. Because of the scarcity of fossils in the rocks surrounding Halifax Harbour, this brief overview will focus on archaeological and historical remains.

The need for heritage protection laws is clear—if important sites and remains are not protected, they will be lost to development, commercial exploitation, and other human activities. Heritage resources are non-renewable, so it is very important that decisions on their fate are not made lightly. Once they are gone, they are gone for good.

Unfortunately, natural processes also degrade the resource, which lends a sense of urgency to the problem. These cannot be easily mitigated. Most sites eventually attain a level of equilibrium with their environment, and after an initial loss of integrity become more or less stable over time. If a site is disturbed, this equilibrium is lost and the rate of degradation increases. Minor disturbance can lead to major disruption by natural processes, so minimizing disturbance is an important focus of the Special Places program.

As one of the oldest cities in Canada, Halifax has more than its share of historic sites. The lives of the more wealthy members of society is reasonably well documented, but the regular folks who made up the majority of the population are poorly represented in our understanding. Our best opportunity to learn more about their daily lives will come from the archaeological record. Unfortunately, urban development in the downtown core has destroyed most of the older parts of town, leaving the few remnants even more valuable.

Prior to settlement of Halifax by Europeans, the harbour had been used for thousands of years by the Native population. Unfortunately, very little evidence remains because of sea level change and urban development. It is possible that there are some small pockets of prehistoric archaeological remains surrounding the harbour, which makes it all the more important that they are not unknowingly lost to development.

The harbour itself contains a suite of archaeological and historical remains. The bottom is littered with various and sundry items that fell from ships or that were unceremoniously dumped over the side. In addition, more than a hundred shipwrecks dot the bottom. These time capsules reflect the evolution of the harbour over time, and unless things change they will soon be lost to us for all time.

Curiously, the act of archaeological excavation is in itself a destructive act. The trade off is that careful excavation recovers the information and artifacts buried in the site. Even then, the standard practice is to leave part of the site unexcavated so that future advances in the science can add to the total picture. Sites that are damaged or destroyed through development provide little or no return, even if some artifacts are salvaged. Without context, artifacts are little more than curiosities.

To garner the maximum benefit from any archaeological work, the Act provides for a system of Heritage Research Permits. It ensures that proper scientific methods are followed, reports are written, documentation is submitted, and artifacts properly conserved and stored. Three permit categories cover archaeological reconnaissance, professional research, and pre-development archaeological impact assessments.

When sites are threatened, damaged or destroyed through development activities, the *Special Places Protection Act* provides for fines and stop orders to limit the loss of sites to development. In most cases the problem is a lack of attention to heritage resources in the early planning stages. Developers don't necessarily mind addressing heritage concerns in their development plans, but unfortunately they are seldom aware of them until faced by the threat of a stop order and large fine. As with any type of planning, early identification of constraints is the key.

Implementing the *Special Places Protection Act* has been a challenge, and will continue to be in future. One of the main problems faced by the Nova Scotia Museum is the lack of good information on the extent and condition of the resource. Archaeological sites are usually invisible from the surface, which makes them difficult to find. An inventory of almost 1300 terrestrial sites represents a small but unknown percentage of what actually may be out there. Many of these 'known' sites have not been visited in years, so their current condition is unknown. Obviously, much more work remains to be done.

To illustrate the shortcoming of the current inventory, we recently made a comparison of the first 15 kilometres of the Dartmouth Lakes system with that of another, less important river system to the west. The heavily utilized Dartmouth Lakes system has sixteen known pre-Contact sites in this stretch, while the other far less important system has 24 known prehistoric sites. The difference can be accounted for in two ways. The Dartmouth system has been far less studied and far more developed, so sites remain to be found or have already been lost.

Shipwrecks are generally scattered across the bottom, totally or partially buried in bottom sediments. They are also hidden from general view by the overlying waters. Locating and recording these sites is especially problematic, as very few people are actively doing this necessary work. Given that the province has no underwater archaeologist or funds to pay for the work, a heavy reliance is placed on volunteers. Though there has been some success, much more remains to be done.

A quick search of the Nova Scotia Museum shipwreck database, which was compiled from archival sources, identified 138 wrecks in the harbour. The dates of these range from 17?? to 19??. In all likelihood, others have yet to be found. Indeed, of the 138 reported wrecks, the present location of only 44 is known to the agency responsible for

their protection. The present condition of the wrecks is also poorly known, but most must be considered as under threat from natural processes, commercial salvage and souvenir collectors.

Enforcement is also problematic. The Museum doesn't have an enforcement arm, and must rely on others to do the policing. Our preference is to protect the resource through early communication, assessment, awareness and education, but that doesn't always work.

Most enforcement efforts have been undertaken in reaction to emergency situations. Reacting to immediate threats is an ongoing problem, and one that drains resources away from proactive parts of the program. As would be expected, it also introduces confrontation into the process. It is hoped that meetings such as this will reduce this problem by increasing awareness of heritage concerns among the various regulatory agencies.

Another constraint on the program is the lack of resources. Staffing and support services fall far short of those in comparable provinces such as Saskatchewan and New Brunswick. Most relevant to this meeting is the lack of an underwater archaeologist, not only from the Museum, but from the Maritime provinces as a whole.

This makes it very difficult to launch a proactive shipwreck protection program. The Museum recently developed a Vision for Marine Heritage Resource Management in consultation with a wide range of stakeholders. It provides focus and direction for future work in this area, but a great deal has to be done for it to be successful.

The purpose of this workshop is to assess the potential for integrated resource management in the Halifax Harbour. From the site protection perspective, the key to successful IRM is adequate information and timely communication. The Museum needs to know what heritage resources are out there, their current condition, and short and long term threats that they face. Provided with this information, the Museum can work with developers, regulatory agencies and other stakeholders to ensure that the fate of our heritage resources is not left to chance. It is hoped that some of the agencies in attendance will be able to work with us to address the shortcomings and enhance the sustainable management of important heritage resources in and around Halifax Harbour.

The Canadian Environmental Assessment Act

Bill Coulter

Definition of Environment

Environment" means the components of the Earth, and includes:

- land, water and air, including all layers of the atmosphere, all organic and inorganic matter and living organisms, and the interacting natural systems that include components referred to in paragraphs (a) and (b).

Definition of Environmental Effect

Environmental effect" means, in respect of the project,

- land, water and air, including all layers of the atmosphere, all organic and inorganic matter and living organisms, and the interacting natural systems that include components referred to in paragraphs (a) and (b).

- any change that the project may cause in the environment, including any effect of any such change on health and socio-economic conditions, on physical and cultural heritage, on the current use of lands and resources for traditional purposes by aboriginal persons, or on any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, and any change to the project that may be caused by the environment, whether any such change occurs within or outside Canada.

Definition of a Project in relation to

- a physical work, any proposed construction, operation, odification, decommissioning, abandonment or other undertaking in relation to that physical work, or
- any proposed physical activity not relating to a physical work that is prescribed or is within a class of physical activities that is prescribed pursuant to regulations made under paragraph 59 (b).

Definition of "Federal Authority"

Includes:

- A Minister of the Crown
- An agency or body of the federal government
- Any department or departmental corporation (Schedule I & II of the FAA)
- Any body prescribed in a regulation under Act

Excludes:

- Government of Yukon or NWT
- Council or band under Indian Act
- Harbour commissions
- Crown corporations
- Provincial Governments

Responsibilities of a Federal Authority

Responsibilities

A Federal Authority must:

- provide specialist or expert information to RA, mediator or panel
- not do anything to cause the project to proceed while the assessment is underway
- not do anything to allow project to proceed if negative assessment result

Definition of "Responsible Authority"

Federal authority which exercises duty, power or function prescribed in section 5. Responsibilities

- must ensure assessment is conducted as early as practicable and before irrevocable decisions are made
- two or more responsible authorities must together determine relative roles

EA Triggers

An EA is triggered under section 5 of the Act if a Federal Authority:

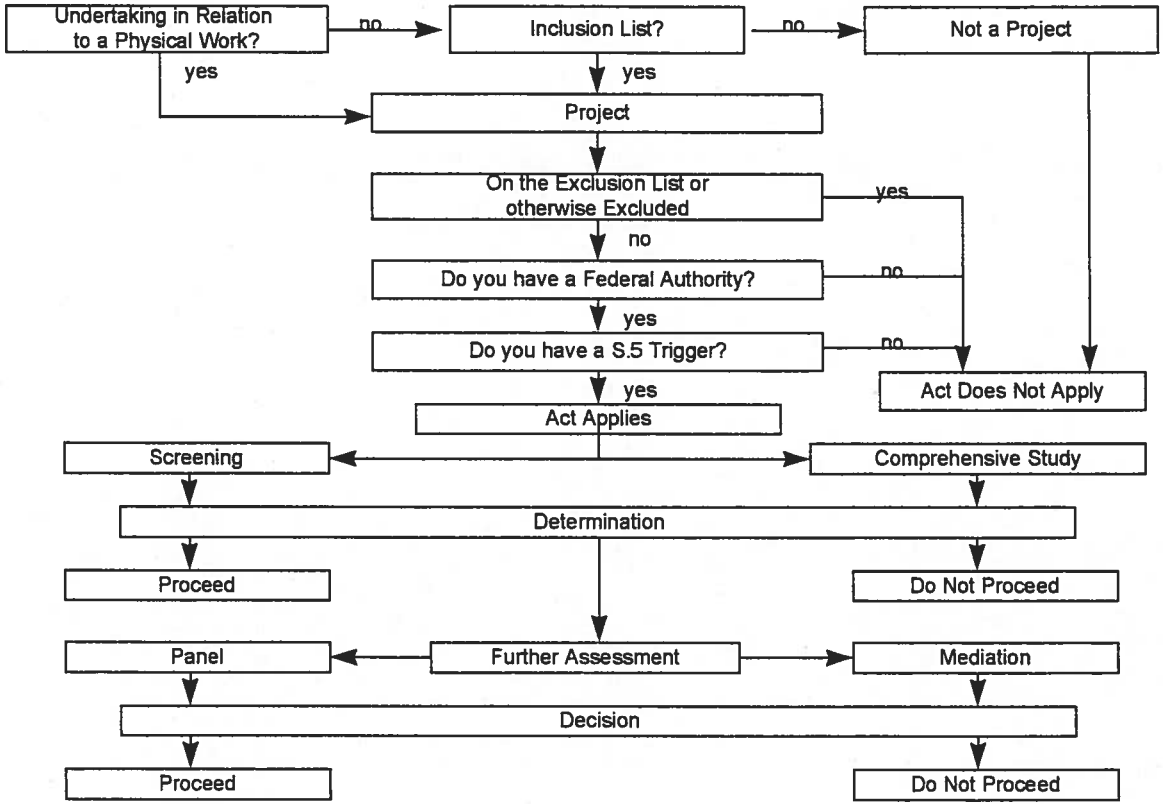
- Proposes a project
- Grants money to a project
- Grants an interest in land to a project Exercises a regulatory duty in relation to a project (Law List)

NB If none of the above triggers exists it is still possible to have a transboundary assessment under certain circumstances

Factors to be Considered

Screening	Comprehensive Study, Mediation, Panel Review
Environmental effects (including accidents/ cumulative)	Environmental effects (including accidents/cumulative)
Significance of effects	Significance of effects
Public comments where appropriate	Public comments
Mitigation	Mitigation
Any matter the R.A. may require to be considered:	Purpose of the project
e.g. need for and alternatives to the project	Alternative means of carrying out the project
	The need for, and the requirements of, any follow-up program
	Sustainability of renewable resources
s.16	Any matter the Minister or R.A. may require to be considered: e.g. need for and alternatives to the project

Environmental Assessment Process



Migratory Birds[1]

Lewis Thomson

The Migratory Birds Convention declares that migratory birds included in the terms of the Convention are:

1. Migratory Game Birds: which include waterfowl (ducks, geese, swans), Cranes, Rails, shorebirds (snipe, woodcock, etc.), pigeons (doves and wild pigeons). It should be noted that not all species listed are permitted to be hunted.
2. Migratory Insectivorous Birds: which include birds that feed entirely or chiefly on insects such as, chickadees, humming birds, robins, swallows, thrushes, warblers, woodpeckers, etc.
3. Other Migratory Non-game Birds: such as Auks, bittern, gannets, grebes, guillemots, gulls, herons, loons, puffins, shearwaters and terns.

Occasional Paper, Number 1 published by Environment Canada's Canadian Wildlife Service lists birds protected in Canada under the Migratory Birds Convention Act. Rather than attaching a lengthy listing of the birds falling under federal jurisdiction a quick look at those not protected under the Migratory Birds Convention Act and falling to provincial, municipal jurisdictions would include: raptors (eagles, hawks, falcons), upland game birds (grouse, pheasants, ptarmigan, quail), cormorants, pelicans, crows, jays, kingfishers, European starling, house sparrow, crested myna and common pigeons.

Migratory Birds Convention Act, 1994

The purpose of the Act is to implement the Convention by protecting migratory birds and nests. The Convention is set out in the schedule to the Act and was signed in 1916 by Great Britain (on behalf of the Dominion of Canada) and the United States. The Convention was put in place to protect migratory birds and to end commercial hunting that was having a devastating effect on bird populations. The Migratory Birds Convention Act was proclaimed by Parliament in 1917 and had remained virtually unchanged until 1994 when major changes were made to the Act to bring it up-to-date with other federal legislation.

The Act prohibits being in possession of a migratory bird or nest or; buying, selling, exchanging or giving a migratory bird or nest or making it the subject of a commercial transaction unless authorized by regulation.

The Minister may designate any person or class of persons as game officers for the purpose of the Act and Regulations and all members of the Royal Canadian Mounted Police are game officers. Nova Scotia Department of Natural Resources Conservation Officers have been class designated and Fishery Officers and Park Wardens are in the process of being class designated. The Act also gives game officers the power of inspection to ensure compliance, at any time to enter and inspect any place (may not enter a dwelling-place except with the consent of the occupant or person in charge of the dwelling-place or under the authority of a warrant) in which the officer believes, on reasonable grounds, there is any thing to which this Act or the Regulations apply and may open any container, take samples, require documents

[1] This article could not be presented at the workshop and does not appear on the agenda

to be produced and seize any thing. For the purposes of carrying out the inspection, the game officer may stop a conveyance or direct that it be moved to a place where the inspection can be carried out. The power of search and seizure is as per the Criminal Code of Canada.

The Act also, makes provision for the Governor in Council to make any regulations necessary to carry out the purposes and provisions of the Acts, Convention and Regulations.

Offences under the Act or any regulation may be proceeded by way of summary conviction or indictable offence and provides for the following punishment:

Summary Conviction

- a corporation, to a fine not exceeding $100,000.00
- an individual, to a fine not exceeding $50,000.00, or to imprisonment for a term not exceeding six months, or to both.

Indictable Offence

- a corporation, to a fine not exceeding $25O,000.0O,
- individual, to a fine not exceeding $100,000.00 or to imprisonment for a term not exceeding five years, or to both.

Where a person is convicted a second or subsequent time, the amount of the fine may be double the amount set out above. A person who commits or continues an offence on more than one day is liable to be convicted for a separate offence for each day on which the offence is committed or continued. Any fine imposed for an offence involving more than one migratory bird or nest may be calculated in respect of each one as though it had been the subject of a separate information and the fine then imposed is the total of that calculation.

Where a person has been convicted of an offence and the court is satisfied that monetary benefits accrued to the person as a result of the offence, the court may order the person to pay an additional fine equal to the court's estimation of the amount of the monetary benefits and the additional fine may exceed the maximum amount of any fine that may otherwise be imposed under the Act.

Forfeiture of seized items upon conviction is at the discretion of the convicting court. Where no forfeiture is ordered items may be retained until the fine is paid or may be sold in satisfaction of the fine and the proceeds applied, in whole or in part, in payment of the fine.

In addition to any punishment imposed the court may make an order prohibiting the person from doing any act or activity that could result in the continuation or repetition of the offence, direct the person to take any action appropriate to remedy or avoid any harm to any migratory bird or nest direct the person to publish the facts relating to the commission of the offence, direct the person to pay the Minister or the government of a province compensation for the cost of any remedial or preventive action taken, direct the person to perform community service, direct the person to provide any information about the activities of the person that court considers appropriate, direct the person to comply with any other conditions and direct the person to post a bond or pay into court and amount of money considered appropriate for ensuring compliance.

Provisions are made for ticketable offences, however, tickets for some summary offences will be available later this year and procedures for their use will be under the Contraventions Act, Contravention

Regulations and the Nova Scotia Summary Proceedings Act.

Migratory Birds Regulations
Although a large percentage of the Regulations and Schedules are devoted to various hunting regulations we will look at the sections more appropriate to activities in the harbour area.

No person shall, anywhere in Canada at any time, sell, expose for sale, offer for sale, trade, barter or buy migratory birds or the eggs, nests, carcasses or skins of migratory birds, except as authorized by Regulation.

No person shall ship, transport or offer for shipment or transport a package or container of any kind that contains a migratory bird or nest or egg thereof unless the exterior the the package or container is clearly marked with the name and address of the shipper, the number of any permit under which the birds, nests or eggs were taken and an accurate statement of the contents of the package or container. No person shall traffic in any way between Canada and the United States in migratory birds, or the nests or eggs of migratory birds that have been captured, killed, taken or shipped contrary to the laws applicable to the areas in Canada or the United States in which such birds, nests or eggs were captured, killed, taken or shipped.

Scientific Permits may be issued to a person from or to a person acting on behalf of a museum, University, scientific society or government for scientific or educational purposes which may allow the holder to kill a migratory bird, take a migratory bird, its nest or eggs or capture and band a migratory bird subject to the conditions set out in the permit and make a response in writing to the Minister within 30 days from the date the permit expires.

Avicultural Permits may be issued to buy, sell, possess or transport live migratory birds or their eggs for avicultural purposes. Every person shall keeps books and records at all times and on or before January 31st next following the calendar year make a report in writing to the Minister in respect of the calendar year for which the permit was issued.

Permits respecting "birds causing damage or danger" Any person without permit, may use equipment, other than an aircraft or firearms, to scare migratory birds that are causing or are likely to cause damage to crops or other property. A permit may be issued to allow the use of aircraft or firearm. No person shall, while scaring migratory birds, kill, wound or take such birds. If scaring migratory birds is not a sufficient deterrent to preventing serious damage to any property, a kill permit may be issued. Upon expiration of the permit it must be returned with a written report on all activities.

Airport Permits may be issued to the manager of a civilian airport, the commanding officer of a military airport or their nominee to kill on the airport migratory birds that are considered to be a danger to aircraft operating at such airport. Annual reports must be submitted on all activities.

No person shall introduce into Canada for the purpose of sport, acclimatization or release from captivity a species of migratory bird not indigenous to Canada except with the consent in writing of the Director.

No person shall destroy, tear down, deface or damage a poster, notice or sign that has been erected pursuant to these regulations.

Pollution: no person shall deposit or permit to be deposited oil, oil wastes or any other

substance harmful to migratory birds in any waters or any area frequented by Migratory birds, unless the deposit of a substance of a type, in a quantity and under conditions authorized by regulation made by the Governor in Council under any Act or the Minister for scientific purposes. The Minister may issue to any person a special permit to kill, capture or possess any migratory birds and collect and possess carcasses, eggs or nests of any migratory birds.

For further information contact:
Environment Canada Canadian Wildlife Service Lewis Thomson Enforcement Co-ordinator - Nova Scotia Migratory Birds and National Wildlife Areas 5~ Floor, 45 Alderney Drive Dartmouth, Nova Scotia B2Y 2N6 Phone: (902) 426-1188 Fax: (902) 426-4457 E-mail: lewis.thomson~ec.gc.ca

Explosives Act[2]

Juri T. Kasements

The Explosives Regulatory Division administers and enforces the Explosives Act, which controls the authorization, manufacture, importation, sale, purchase, possession and storage of explosives. The transportation of explosives on land by means other than public railway is jointly controlled by the Explosives Regulatory Division and the Transport of Dangerous Goods Directorate of Transport Canada. A system of tests, licences and permits, supported by inspections, is used to enforce the act. The term explosives includes blasting explosives, detonators (blasting caps), propellant explosives, sporting and industrial ammunition, and all types of fireworks and pyrotechnic devices.
(The use of blasting explosives is under Provincial OHS jurisdiction.)

[2] *This article could not be presented at the workshop and does not appear on the agenda*

Transportation Accident and Safety Act of Canada[3]

Roger Saunders

The Act basically sets by the Accident Investigation and Safety Board for Air, Marine and Rail accidents and the duties of the Board.

Objective

The object of the Board is to advance transportation safety by:

(a) conducting independent investigations, including, when necessary, public inquiries into selected transportation occurrences in order to make findings as to their causes and contributing factors

(b) identifying safety deficiencies as evidenced by transportation occurrences;

(c) making recommendations designed to eliminate or reduce any such safety deficiencies and;

(d) reporting publicly on its investigations and on the findings in relation thereto.

Regulations relate to mandatory reporting of reportable Accidents

[3] *The article could not be presented at the workshop and does not appear on the agenda*

Questions and Answers
Part 3

Question:

What happens to the projects that are exempted from needing a permit under NWPA?

Larry Wilson:

If a project is exempted, the act does not apply. However, we can go back if traffic patterns shifts and this project poses a problem to navigation.

Question:

Could you elaborate on Historic Ship Wrecks? What happens to the artifacts recovered?

Larry Wilson:

Under the Receiver of Wrecks, if someone were to collect artifacts or even dive on the wreck he must receive permission from CCG and the owner of the wreck (they are named in the Canada Gazette – Receiver). Anything recovered from a wreck must be turned over to the receiver and a portion will be returned to the salvateur. The Province also has legislation on wrecks

Question:

What are the requirements under the regulation for Ocean Dumping? The legislation appears vague with regard to the quantity…teaspoon vs a. ton?

Dave Aggett:

Whatever the amount to qualify for Ocean Dumping, it must be dumped from a man made vessel, i.e., ship, aircraft etc. Substances released to the Ocean via a pipe, do not qualify as Ocean Dumping.

Question:

Are these regulations consistent with International laws and regulations?

Dave Aggett:

These are very similar to the London regulations.

Question:.

What is the status between the provincial EIA process and the Federal EA process? Are they linked?

Bill Coulter:

No, there is no link. Each work independently of each other. We do attempt to work together and integrate the process to avoid having the proponent supply information twice (one-window approach). We are in the process of attempting to enter into bilateral agreements with the province. There are already some agreed to in other provinces. There are no formal agreements at this point.

Question:

Could you clarify "change the approach to the project, not the project itself". Why is it not required in a screening to have public input?

Bill Coulter:

The act requires that the environmental effects of alternative approaches to a project are reviewed, not alternatives to a project. An example of an alternative to a project would be, instead of constructing a highway, we could encourage development of public transport (this is not what the act does).

Question:

Public Consultation – why is it not mandatory under screenings?

Bill Coulter:

If you look at the EA statistics, so far, there are approximately 25, 000. Of those 25,000 only 46 or 47 were comprehensive studies and 9 were panel. Of the percentage of screenings, many are typically routine works that DND, PWGS, would do. There would be no gain to have public input on all of these projects – the act is currently structured to say "where appropriate". It does not say that you do not have to notify the public, it is necessary (ie. public registry (PR)) – but you do not always need to have public input. PR was intended to be early notice to the public. There is no obligation for the RA to publish a notice and meet with public on particular issues (depends on the project).

Part 4

Non Regulatory Primary Stakeholders

Waterfront Development Corporation

Bill Campbell

The mandate of the Waterfront Development Corporation Limited, a Provincial Crown
Corporation, includes:

- Property acquisition, management and development within designated areas in Halifax and Dartmouth.

- Marketing and promotion designed to attract public use of the waterfront; and Coordination and planning of the waterfronts of Dartmouth and Halifax including the stewardship of harbour front assets owned by the Province.

The Corporation was incorporated in 1976 and has been aggressively rejuvenating and redeveloping both the Halifax and Dartmouth waterfronts for over 24 years.

The Corporation's mission is to serve as guardians of the greater Halifax Harbour and to develop properties, coordinate, plan, promote and act as a Provincial agent to assist other Nova Scotia waterfronts in their endeavors.

The values of the Corporation include:

- Guardian of the waterfront.
- Public accessibility.
- Adherence to highest standards of quality.
- Preservation of historic elements.
- Appropriate balance of commercial, residential and public areas.
- Respect for the environment.
- Consultation and communications with stakeholders.

In order to achieve its mandate and values over these 24 years, the Corporation has undertaken:

- detailed strategic planning exercises;
- urban design plans;
- development of land for public uses;
- fostered and encouraged private;
- development of a scale and intensity complementary to the harbour;
- rebuilt and rejuvenated historic wharves and finger piers, (particularly on the Halifax waterfront);
- improved needed facilities such as washrooms and signage; and
- enhanced the necessary physical infrastructure, such as streets, sidewalks, sewer, water and underground electricity, to allow development to proceed.

All of this has been done to meet the Corporation's overall vision of "being recognized as North America's leading agency for creating a vibrant, living and working harbour front."

The investment history and economic impact of the Corporation's activity in the harbour have been significant. Over **$117,000,000** worth of private sector investments has resulted from redevelopment of waterfront lands. Over $31,000,000 of investment by the Federal and Provincial Governments in infrastructure has paved the way for the existing private development and public areas that now form part of both the Halifax

and Dartmouth waterfronts. The Corporation's over $31,000,000 worth of assets have a ratio of about 70% commercial uses and 30% public amenities.

The Corporation has fostered many private developments. These include on the Halifax side:

- The Sheraton Hotel;
- Summit Place;
- Mother Tuckers Restaurant;
- WaterfrontWarehouse Restaurant;
- McKelvies Restaurant
- Nova Scotian Crystal; and
- Bishop's Landing.

Bishop's Landing, the most recent development, is just now under construction at South Battery. This is a 210-unit residential/commercial mix complex valued at over $35,000,000. This development is, arguably, the largest mixed-use commercial / residential public facility undertaken by the Corporation. In Dartmouth, the Corporation has fostered Admiralty Place, Secunda Marine and owns warehousing properties in Dartmouth Cove which it leases to the private sector, particularly marine business. The Corporation has been a leader in increasing public accessibility to the Halifax Harbour.

On the Halifax side over 7.5 acres of public land and wharves have been provided directly adjacent to the water's edge in association with developments, and, as part of the extensive boardwalk system. Measured against all developable land between Lower Water Street and the waters edge between the new Casino and the Old Power Plan this represents approximately 30 percent of the land base!! This boardwalk now extends from the new Casino to Pier 21. In Dartmouth, the development of the Ferry Terminal and the adjacent park and pathways are major Corporation initiatives for regaining public access to Dartmouth's waterfront.

Major Initiatives

Major initiatives of the Corporation over the past five years have resulted in significant improvements and opportunities for both the Halifax and Dartmouth waterfronts. Some of the more important include:

1. **Land Acquisition Program** - In Halifax, the Corporation, over the last number of years, has undertaken a major land acquisition program along the Halifax waterfront. This acquisition program has enabled the Corporation to acquire very strategic development sites along the waterfront including the RCMP garage property, the former DFO property, the properties south of Salter Street known as Marine Towers and Manulife, and the former Cunard property. These acquisitions were necessary to achieve the overall vision and mandate of the Corporation to develop a human scale and publicly accessible waterfront.

In addition to acquisition, the Corporation has entered into a long-term lease with Nova Scotia Power Inc. for the rejuvenated wharf at the Old Power Plant. As part of a financial contribution to the project, a 20-year lease was secured. This lease guarantees public access to an otherwise private facility. We have named this wharf Tall Ships Quay, and it provides much needed, deep water dockage for tall ships or small cruise ships.

2. **Planning** - The Corporation and Halifax Regional Municipality have entered into a partnership to undertake a review of the urban design plan for the Halifax waterfront. This plan will provide a 20-year

vision for development of the waterfront and should be completed this spring. The plan has been conducted with considerable public consultation, urban design analysis and economic modeling to ensure that human scale and fiscally responsible development occurs. The consultants engaged in this planning exercise are EDM Environmental Design Management in association with Sasaki Group of Boston.

In Dartmouth, the Corporation owns significant lands and waterlots within Dartmouth Cove. We are just completing a plan to enable the extension of the existing public pathway system along the water's edge in downtown Dartmouth through to Dartmouth Cove and to the adjoining residential areas further south. In order to fund the implementation of the walkway and purchase the necessary waterlot, the Corporation will be improving its properties (warehousing) for leasing. Our goal is to encourage marine-oriented businesses in the Cove, We have been working closely with the neighbourhood to encourage development in the marine industry which has minimal negative impact on their quality of life. The Corporation also owns non-waterfront land in downtown Dartmouth, one of which is about to be sold for a residential development (Wentworth and King Streets), and another (adjacent to Admiralty Place) which we hope will proceed with residential development in the near future.

3.Waterfront Boardwalk/Public Facilities - A major focus of the Corporation's efforts over the last while has been the creation of a continuous publicly accessible waterfront from the new Casino to Pier 21 and improvement to public facilities. Our goal was to complete the boardwalk by 2000. This has been achieved! Some the major elements of this endeavour include:

- refurbishment of the Queen's wharf at Queen's Landing;
- the South Battery seawall and heliport at South Battery;
- the Cunard wharf redevelopment; and,
- the refurbishment of the Nova Scotia Power Corporation wharf now named Tall Ships Quay.
- Boardwalk extension at Historic Properties

Other projects of earlier vintage include:

- the Nova Scotia Museum of the Atlantic wharves;
- Sackville Landing;
- Sackville Interpretation Centre;
- Children's Play Ground;
- the Wave;
- Nathan Green Square; and,
- the Sheraton boardwalk.

As noted above, all of these constitute an approximate contribution of 7.5 acres of public land within the downtown of Halifax.

While a continuous pedestrian access along the water's edge is in place, there are still some elements which need to be refurbished. At the foot of Prince St., a waterlot exists to enable the construction of an additional finger pier and small gathering plaza. At Cable Wharf, there is the opportunity to expand the wharf to the south, thereby increasing public space and making the Cable Wharf building more economically viable. And just south of Salter Street water lots here will enable further land expansion for additional seawalls and possibly another finger pier adding to the overall public space and marine experience. Additional waterlots including those at South Battery, Museum of

the Atlantic and Sheraton Hotel offer exciting opportunities for development and water based activities.

In Dartmouth, the Corporation, in association with HRM, is looking at the feasibility of relocation of the Marshaling yards to increase access to the waterfront and provide land for development. There are also opportunities for public access / marine use under the abutments of the MacDonald Bridge which are being explored.

4. Promotions / Events

With the amount of public space available on the waterfront and the completion of the boardwalk system, the waterfront has become a favoured event area. Important events include:

- International Buskers holds a two-week event in the summer.
- Natal Day is celebrated at Queen's Landing.
- An Acadian Festival was held in 1999.
- Memorial Cup celebrations will be held here in 2000.

There is also a visiting ships program where we seek out ships to visit the waterfront to add interest and attract local residents and visitors. An excellent example is the Endeavour a replica of Captain Cook's vessel which visited in 1998.

One of the biggest celebrations is, of course, Tall Ships. In 1984, the first Tall Ship event took place in the harbour. It was a spectacular success, owing partly to the excellent weather. This event renewed people's connections with our waterfront and demonstrated its potential, The G-7 Summit of 1995 was a similar event.

The Tall Ships 2000 event will be even more significant. There will be five times the number of ships participating from all over the world. This will be the largest gathering of Tall Ships in history. There are plans to try to have the Tall Ships event every five years.

5. Working Waterfront

The Corporation has attempted to maintain an element of the working waterfront. We are fortunate to have Eastern Canada Tug and the Pilot Boats which are an important features of interest to attract visitors to the waterfront.

Tour boats have been fostered by the Corporation, and we are pleased to have five companies providing a variety of marine experiences.

Our strategic plan calls for a marina on the waterfront, and we hope to secure private sector interest in developing and managing a marina somewhere along the waterfront.

An aquarium or marine centre has long been on our list of initiatives. In the near future, we hope to investigate the feasibility of an aquarium or some form of marine or natural sciences center on the waterfront, perhaps in association with the Maritime Museum of the Atlantic.

Conclusion

After almost 25 years of operation, the Waterfront Development Corporation Limited, in association with other levels of government and the private sector, has had considerable success in the rejuvenation of the waterfronts of Halifax and Dartmouth. More exciting opportunities exist. As we proceed into the new millennium, renewed interest in living, working and entertainment in city centers provides significant opportunity for accomplishing our objectives.

Changing the Environment Safely

Richard Hattin

Presentation Outline

- Correcting historical errors
- Two problems:
- Single solution
- Literature Research
- Field tests
- Laboratory Analyses
- Site Characterization

Who put that railway track there?

- Installed from Halifax to Windsor in 1854.
- Chose simplest route, easiest construction
- Cut people access to west side of Bedford Basin, serious complaints laid at the time
- Some exceptions that have cost people lives over the last 146 years
- first passenger train in NS

Problem #1:
How do you provide people access to the Bedford Basin?

Who put that pyritic slate here ?

- Large amount of acid bearing rock, that if improperly disposed will alter pH of water.
- Result is death of lakes, streams, spawning grounds, fish -
- acknowledged problem in NS
- Airport, Hwy 107 bypass,
- Bayers Lake Industrial park
- caused by development/excavation

Problem #2:
How to safely dispose of pyritic slate in a cost effective manner?

Two problems - one solution

- Make land on the inside of the Railway tracks for people.
- Use pyritic slate as infill material

create enough land to be economically viable

History of BWDC - Phase 1

- Created in 1989 as a government organization
- initial mandate dredge Sackville River, and use dredge material to create land
- 1992 - 24 acres of land created
- 1994 - deeded 12 acres as parkland to HRM
- 1999 - finished selling remaining 12 acres for residential/commercial development

History of BWDCL - Phase 2

- Started infill using pyritic slate in 1992 with CCG and EC approval
- received 80,000 cu yds to date, 4 acres
- 140,000 cu yds yet to go
- generate another 30 acres

provides access to Basin, residential and commercial development

Purpose of this presentation

- Review preliminary results from scientific study underway to measure the effect of disposal of pyritic slate in Bedford Basin

Why is this study needed?

- Halifax slate + water + oxygen (+ iron-oxidizing bacteria) = ARD
- Bedford Basin disposal, early 1990s
- More slate coming - pipeline, airport

- Scarcity of marine related studies

Study Requirements

- Presence or absence of acidic conditions
- Presence or absence of iron-oxidizing bacteria.
- Actual or potential for metals migration

Scope of Work

- Literature Review
- Site Field Investigation
- Laboratory Analyses
- Site Physical Characterization
- Analytical Results
- Preliminary Site Model
- Recommendations

Literature Review

- MEND, late 1980's freshwater, mining and waste rock related
- Water cover is an acceptable acid generation/prevention technology
- Specifics on geochemistry and microbiology

Is placing Pyritic slate in a SALT water marine environment safe and effective?

Acid Rock Drainage

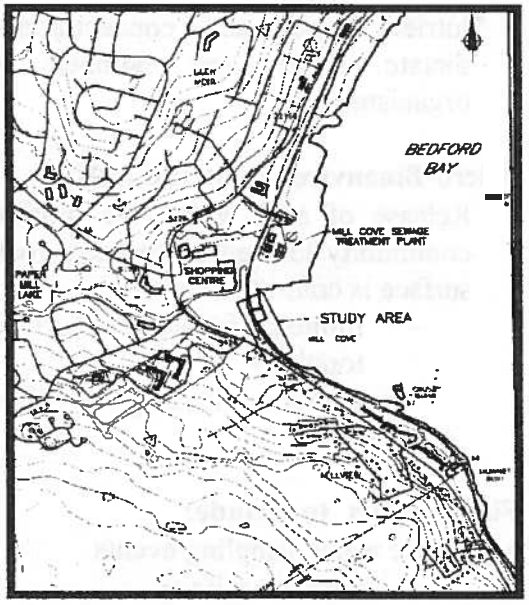
- Results from oxidation of sulphide minerals contained in rock when exposed to air and water.
- Chemical reaction usually expressed for pyrite.
  pyrite + oxygen + water (+ iron oxidizing bacteria) =
  ferric/iron hydroxide + sulphuricacid
- The bacteria *Thiobacillus ferrooxidans* can oxidize sulphide minerals and ferrous iron to ferric iron state.
- Rate of bacteria cell growth and oxidation depends on:
  - temperature and pH
  - availability of oxygen, carbon dioxide (for cell reproduction) and nutrients (nitrogen and phosphorous)
  - surface area of exposed sulphide mineral

Freshwater ARD Studies

- The use of water cover to control acid generation is recognized as a best prevention technology for as yet unoxidized wastes
- Water covers to control acid generation in already-oxidizing wastes is also being investigated and implemented at several sites.
- Natural processes to achieve stability and reduce metals movement from sediments to water column (submerged tails), Robertson et al. (1997):
  - primary process is lower oxygen concentrations
  - sediments form environment for natural reduced sulphides
  - metals cycling and oxide scavenging influence metals movement in aquatic system
  - natural sediment barriers reduce ability of tails to affect water cover quality

Marine Water Studies

Under seawater cover, the longer term flux of metals and acid generation are lower, likely as a result of buffering and neutralization from higher alkalinity levels. Mugo et al. (1997)



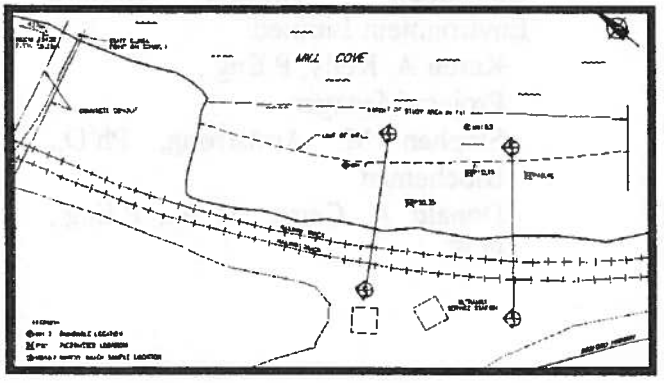
Study Area Mill Cove - Looking W/SW

Study Site - Field Program

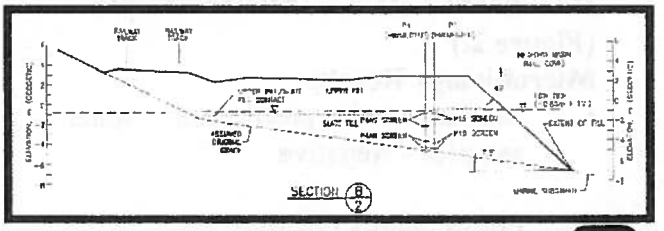
Boreholes - Fill Samples – Nested Piezometers - Groundwater Samples Marine Water Sample – Permeability Testing Tidal Influence Study – Surveying

Drilling Program

- Drill 3 boreholes 7 to 8 m deep
- Continuous, representative fill samples
- Install 2 nested piezometers in each borehole



Borehole, Piezometer & Sampling Locations



Cross Section B - Slate Fill Area

Acid Generation Potential – Trends (Table 1)

- NP:APP or ACA:APP ratio is well below 1:1 criteria
- APP:NP is at least 5:1
- Exceed 0.4% sulphide content
- pH paste 4.80 to 6.45 slate fill and 6.65 to 7.80 mixed fill

Summary APP/ACA Table (Table 2)

Water Chemistry Parameters – ARD (Figure 1)

- Physical Parameters: pH, temperature, conductivity, salinity, dissolved oxygen
- Major Ions: sulphate, nitrogen, organic carbon
- Metals: Al, As, Co, Cu, Fe, Pb, Mn, Ni, and Zn

Water Geochemistry – Summary

- pH levels normal: i.e., slightly lower than in open marine
- D.O. profiles consistent, decrease with depth
- Metals detection limits altered - poor data
- Iron higher at depth (P3 and P4)
- Manganese higher at depth (P3 and P4)
- Zinc detected in some, no trends

D.O. Profile - Marine Water Sample (Figure 2.)

Microbiology Results

- Marine and piezometer water samples - Negative
- Fill samples - Positive
  - *Thiobacillus* cultured microbial counts > 100 cells/mL (qualitative)
  - quantitative results pending

Preliminary Site Model

- Physical Characteristics and Water Geochemistry
  - Fill contains sulphide bearing Halifax slate with acid generation potential
  - Groundwater in fill is influenced directly by tidal fluctuations ... flushing action
  - Groundwater geochemistry no anomolies

Macro-Bioenvironment

- Water column environment
  - pH around 7 vs. *Thiobacillus* preference of 2.8
  - high permeability fill = marine flushing
  - high salinity = buffering action

Micro-Bioenvironment

- Is the immediate environment surrounding the microbial cell or group of cells called the microenvironment ...
- *Thiobacillus* form biofilm communities within the amorphous topology of fill surfaces.

Biofilm Communities of Iron-oxidizing Bacteria

- Influenced by pH, temperature, oxygen concentration and water availability
- Nutrient types and concentrations dictate types and number of organisms

Micro-Bioenvironment and ARD

- Release of acid within the biofilm community located on the acid rock surface is controlled by:
  - limited favorable surface topology
  - constant flushing by tidal action

Final Report to include:

- Future water sampling events
  - measure salinity
  - zero in on specific parameters, especially metals
- Different laboratory analysis for better metals detection limits Laboratory based studies to confirm micro-bioenvironment limitations

Contact:

- Richard Hattin, Waterfront Development Corporation Limited
- Scientific Authority: Mr. Rodger Albright, Head, Environmental Management & Technology Section, Environment Canada
- Consultant: Jacques Whitford Environment Limited:
  Karen A. Keily, P.Eng.,
  Project Manager
  Stephen M. Armstrong, Ph.D.,
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  Donald A. Carey, M.Sc., P.Eng.,
  FGS

Figure 1 Tidal Influence on Piezometric Water Levels, December 1999

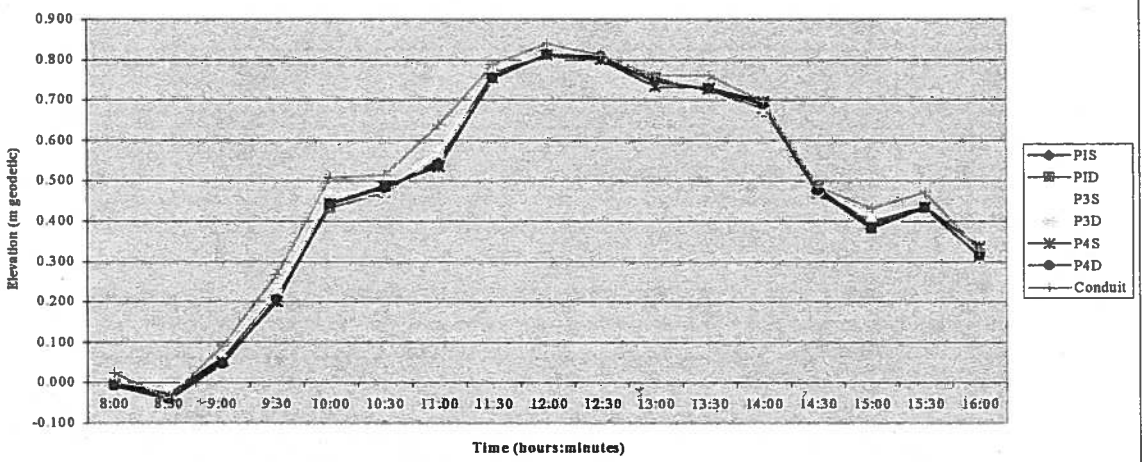


Table 1 Acid Producing Potential and Acid Consuming Ability

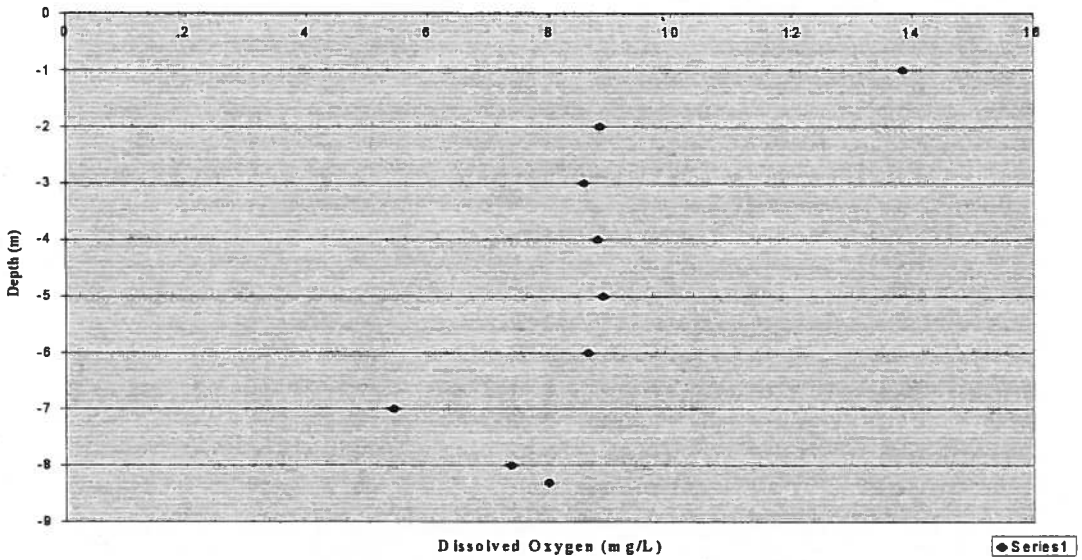
Sample No.	Elevation (m geodetic) from	to	Fill Sample Description*	pH	Sulphur (total) (%)	Sulphate (%)	Suphide (%)	APP (kg H2SO4/t)	ACA (kg H2SO4/t)
P1 Sa2	-1.01	-1.62	Slate Fill	5.30	1.46	0.04	**1.42**	43.44	5.88
P1 Sa4	-2.23	-2.84	Slate Fill	4.80	2.16	0.07	**2.09**	63.93	4.90
P1 Sa7	-4.06	-4.67	Slate Fill	6.20	1.83	0.02	**1.81**	55.37	9.07
BH2 Sa4	-1.257	-1.867	Fill/sand/gravel	6.65	1.29	0.02	**1.27**	38.85	7.60
BH2 Sa6	-2.477	-3.087	Mixed Fill/tr. slate	6.70	0.66	0.03	**0.63**	19.27	6.37
P3 Sa1	0.246	-0.364	Slate Fill	6.45	1.02	0.04	**0.98**	29.98	4.17
P3 Sa2	-0.414	-1.024	Mixed Fill/Siltstone	8.90	0.27	0.01	0.26	7.95	8.58
P3 Sa4	-1.624	-2.234	Slate/Sandstone	7.60	1.10	0.03	**1.07**	32.73	4.90
P3 Sa8	-4.224	-4.834	Mixed Fill/Slate	7.80	0.86	0.04	**0.82**	25.08	5.15
BH4 Sa2	-1.543	-2.153	Slate Fill	6.00	1.09	0.04	**1.05**	32.12	3.68
BH4 Sa4	-2.763	-3.373	Slate Fill	5.95	1.16	0.03	**1.13**	34.57	3.92
BH4 Sa6	-3.983	-4.593	Slate Fill	5.70	1.62	0.04	**1.58**	48.33	6.62

Notes: 1. BC Research Initial Tests done by Minerals Engineering Centre, DalTech University, Halifax, Nova Scotia
2. Study proposed to define "strong potential to generate acid" by required 2 of 3 samples per borehole to contain greater than 0.4 % sulphide (total sulphur minus sulphate) by weight, or 12.51 kg H2SO4/tonne, as defined within the Sulphide Bearing Material Disposal Regulations of the Environment Act, Nova Scotia (April, 1995)
3. "Bolded" value means value exceeds quoted criteria or guideline.
* Refer to borehole and monitoring well records for detailed fill description.

Table 2 Summary APP/ACA per Sample ,

Sample No.	Sulphide Bearing	Strong APP	Comment
P1 Sa2	Yes	Yes	Slate
P1 Sa4	Yes	Yes	Slate
P1 Sa7	Yes	Yes	Slate
BH2 Sa4	Yes	Yes	Mixed fill / fine grained
BH2 Sa6	yes, marginally	yes, marginally	Mixed fill, trace slate
P3 Sa1	Yes	Yes	Slate
P3 Sa2	No	No	Mixed fill, siltstone?
P3 Sa4	Yes	Yes	Slate with sandstone
P3 Sa8	Yes	Yes	Mixed fill, slate
BH4 Sa2	Yes	Yes	Slate
BH4 Sa4	Yes	Yes	Slate
BH4 Sa6	Yes	Yes	Slate

Figure 2. Dissolved Oxygen vs Depth – Marine Water Sample, December 1999



Halifax Harbour Solutions Project

Maurice Lloyd

Introduction

I'm not going to dwell on the History of the attempts to develop a treatment system for the wastewater being discharged untreated into Halifax Harbour, the Northwest Arm and Herring Cove. The History is detailed in Appendix "A", attached, which is taken from the Technical Report of April, 1988 prepared by Jacques Whitford Environment Limited and entitled "Moving Forward: A Concept Plan for Halifax Harbour Wastewater Treatment". Suffice it to say, the number of attempts has been numerous, but without success to date.

That is not to say that there are no treatment plants in the Municipality. The Wastewater Division of the Department of Public Works and Transportation operates four major wastewater treatment plants, eight community wastewater treatment plants, a small leachate treatment facility and a biosolids treatment facility. They also operate a water treatment plant. Two of the major wastewater treatment plants are located on the Harbour at Mill Cove on Bedford Basin and at Eastern Passage on the main harbour.

Nevertheless, over 100 million litres of untreated wastewater flows into the main harbour every day, another 12 million litres flows into the Northwest Arm and 35 million litres flows into the outer harbour at Herring Cove. Faced with this situation, the staff of the Priority & Policy Group of the new Halifax Regional Municipality (HRM) developed a course of action shortly after amalgamation, which was endorsed by the Council and became the basis for moving forward towards a solution.

The process began with a public Symposium hosted by HRM in November of 1996 in order to generate public interest (once again) and seek public input. The Symposium produced a number of principles which were adopted by HRM Council as the basis for moving ahead. Those principles are attached as Appendix "B" of this paper. One of the recommendations was that an advisory committee be formed and this resulted in formation of the Halifax Harbour Solutions Advisory Committee. This committee produced a report entitled "Final Report to Council" which was completed in March, 1998. The committee was to provide a general framework for HRM decisions and progress on the following:

- Northwest Arm Classification
- Cost Driven or Goal Driven
- Separation of storm and wastewater
- Need for innovation and alternative treatments and technologies
- Siting criteria, selection and process
- Mainland South/Herring Cove
- Extent of consolidation of outfalls
- Number and size of plants
- Public/private partnerships
- Integration of water utility and wastewater utility
- Cost-sharing which includes federal and provincial governments

These recommendations of the committee have formed the basis for moving forward.

The Project

As mentioned above, the HRM also commissioned a technical report which was prepared by Jacques Whitford Environment Limited in association with a number of other consultants. This report examined options and

recommended a concept plan. The concept plan was driven by the location of the major outfalls, the recommendations of the Advisory Committee and the Harbour geography. The Advisory Committee recommended, for example, that no treatment plant outfalls be located north of the Angus L. Macdonald bridge, which limited treatment plant location. The Advisory Committee also recommended that the water use classification for the Northwest Arm be upgraded to Class SB, similar to that for the middle harbour and Bedford Basin.

The technical report recommended three alternative solutions involving three, four or five treatment plants and outfalls along with the required collection system. All of the solutions included a single treatment plant in or near Herring Cove. The variances between the solutions focused around the number of plants on the Halifax peninsula and along the Dartmouth shoreline. The five plant solution had two plants located on the peninsula and two on the Dartmouth shoreline. The four plant solution reduced the Dartmouth plants to one. The three plant solution reduced the number of plants located on the peninsula to one.

To a great degree, the final solution selected was dictated by the availability of treatment plant sites of sufficient size. Available land in the more highly urbanized areas is very scarce and it is difficult to assemble sites of a sufficient size. The solution currently being pursued involves the construction and operation of four treatment plants with their accompanying collection systems and outfalls. This solution is shown diagrammatically on the attached Figure 3.4, which is taken from the technical report.

Implementation

HRM Council has decided to implement the Project through the use of a public-private partnership process. Towards this end, the HRM issued a Request for Expressions of Interest (REI) in June, 1998 and over 20 responses were received. This was followed by a Request for Qualifications (RFQ) which was issued at the end of September, 1998. Eight consortia responded to the RFQ indicating qualifications, their financial status and ability to fund the project, and their interest in forming a public-private partnership for the implementation of the Project.

The eight submissions were evaluated based on technical capability, project management experience, the financial health of the principle companies and their ability to Finance the Project. A short-list of three proponent consortia was recommended to Council in March of 1999 and approved by Council. HRM staff also received authorization to proceed with the preparation of the Request for Proposals.

A draft of the RFP was prepared and submitted to HRM Council for review and approval around mid-January, 2000. HRM staff has been authorized to finalize and issue the RFP with the provision that an independent Benchmark cost be prepared. The objectives of the Project, as stated in the draft RFP, are as follows:

1. To maximize environmental benefits;
2. To anticipate, minimize and manage potential adverse environmental effects;
3. To minimize life cycle costs for the Facilities (treatment plant and outfall) and the Sewage Collection System and, therefore, rates to citizens;
4. To achieve the completion of each component of the Project on or before the targeted completion dates at minimum cost to HRM and;
5. To maximize economic benefits to Nova Scotians.

Public Support

During the course of all this work, HRM twice sampled public opinion with regards to the need for the Project and the support for the Project. The first sampling took place in August of 1996 and the second in May of 1999. The numbers shown indicate the 1996 responses first and the 1999 responses second. When queried as to the "Importance of a New Sewage Treatment System" in order to treat the untreated wastewater 87-88% indicated that they felt it was very important. 10-9% felt it was somewhat important.

The 1999 survey also probed the extent of the support for user fees to pay for the sewage treatment system and 40% indicated strong support, with an additional 31% indicating general support. Eight percent indicated general opposition, 16% strongly oppose and 4% had no opinion. When further asked how much they would be prepared to pay, the support remained strong up to $100 per year and began to decline after $120-150 per year (for the average household).

In answer to another question, 71% of the respondents felt that the federal and provincial governments had an obligation to assist in paying for the sewage treatment system. Only 14% felt that the HRM should be responsible for the entire cost.

Project Cost

The capital cost of the Project has been estimated at $315.8m including all engineering fees, taxes, community integration funds, environmental siting funds and Project staff costs. The operating budget has been estimated at $5-6m annually when all four plants are operational. The Project is to be paid for through funds raised in a Pollution Control Charge (PCC) which is a surcharge on the water bill. The PCC is also used to cover the cost to operate, maintain and improve the overall sewer system and to operate, maintain and upgrade the current treatment plants.

HRM Council has agreed to increase the PCC so as to pay for two-thirds of the Project Capital Cost ($210m) and all of the operating cost ($5-6m per year) in addition to the other financial demands as noted above. An additional charge of $0.10 per cubic metre was added to the PCC in July of 1999 and a further increase of $0.10 will be added in April of each of the years 2000, 2001 and 2002. The impact of these increases on the average household water bill is estimated to accumulate to a total of $71 per year by 2002.

Roles and Responsibilities - Public Private Partnership

The RFP, as currently drafted, required that the private partner design, construct and commission the collection system and the facilities. The collection system will be operated by the HRM, while the facilities will be operated by the private partner. HRM will retain ownership of both the collection system and the facilities. The Project will be financed by HRM, unless the private partner can demonstrate that it can finance the project at a cost to the end user which is lower than that of HRM.

The public-private partnership allows the HRM to retain responsibility for the quality of service delivery, but have the service delivered by the private partner. HRM will set the technical standards for construction and operations and the private partner will operate the facilities through an operating agreement. The private partner is responsible for sludge treatment and disposal with disposal to be for a beneficial use. The operating agreement has a 30-year term beginning with the operations of the first facility. Subsequent facilities will be added to the agreement as they are completed and commissioned. HRM will retain the right to

buy out of the agreement at the end of 15 years (average operating time for all facilities 11- 13 years) and 20 years. This allows HRM to obtain a lower operating cost because of the 30-year term while allowing for termination of the agreement if there is any dissatisfaction or other cause.

Remaining Key Issues

The key issues remaining to be completed are:

- Finalize financing - Approaches have been made to both the provincial and federal governments requesting them to cost-share in the remaining one-third of the capital cost ($105m).

- Environmental approvals - The environmental approval process has been initiated and is progressing satisfactorily.

- Treatment plant sites - One of the sites has been publically identified and the neighbourhood consultation process is well advanced. The selection of the other three sites is progressing and their locations will be public in the near future.

- Finalize RFP - The preparation of the RFP is now in its final stages. The most outstanding item left is to decide how to handle the Benchmark bid.

- Source reduction program – Phase 1 of this program is completed and is now being implemented. Future phases will follow very shortly.

- Infiltration and Inflow reduction - The system will serve mainly the older areas of the former Cities of Halifax and Dartmouth. The majority of the sewers are combined systems which carry stormwater as well as domestic sewage. Policies are now being developed designed to reduce the stormwater and other extraneous inflow over time.

- Public information program - As treatment plant sites are identified, a public consultation program is launched to determine how best to integrate the plants into the community. Broader public information programs are also being developed.

Conclusion

The Halifax Harbour Solutions Project will see the design, construction and operation of four advanced primary wastewater treatment plants for the treatment of wastewater currently entering Halifax Harbour untreated. The $315m project will be implemented as a public-private partnership. The private partner will design, construct and commission the four wastewater treatment plants and their ancillary collection systems and outfalls within the technical requirements defined by HRM. The collection systems will be operated by HRM and the treatment plants and outfalls (facilities) will be operated by the private partner.

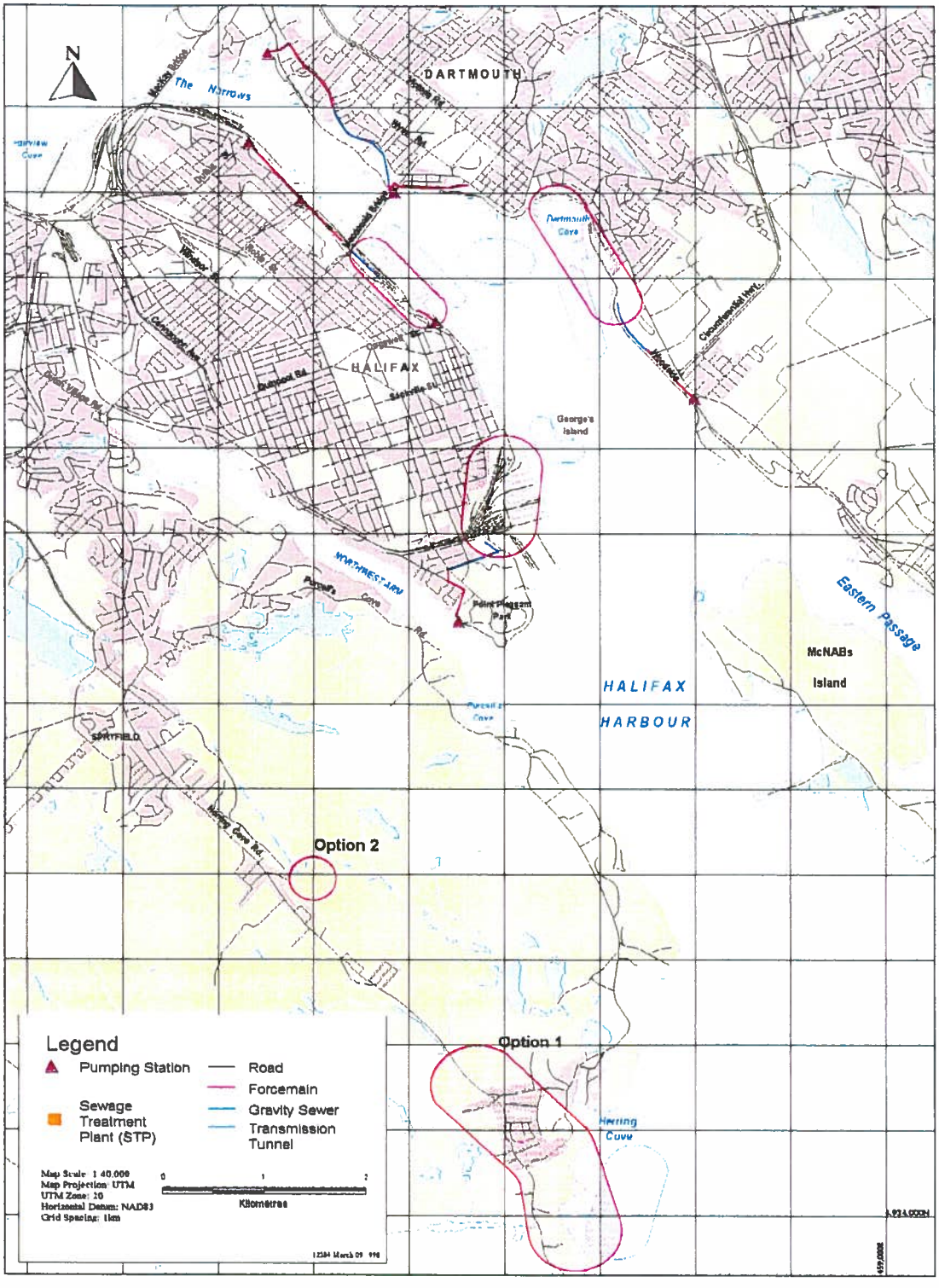


Figure 3.4 Halifax Harbour Solutions - Alternative B
Four Sewage Treatment Plants

Jacques Whitford Environment Limited

HALIFAX REGIONAL MUNICIPALITY

Halifax Harbour Solutions Project
Appendix "A"

Summary of the History of Sewage Treatment Issues for Halifax Harbour

(Modified from background paper prepared for the Halifax Harbour Solutions Symposium, Duerden and Keane 1996)

1749 to 1759

- Halifax and Dartmouth are founded and the area grows as a military and shipping center.

Early 1800's

- A bylaw is introduced to prohibit direct discharge of "slops" to city streets.

Late 1880's to early 1900's

- Combined sewers are constructed to service some areas.

1924

- Scientific studies identify pollution discharges to the harbour in the waterfront area from the Narrows to the Ocean Terminals on the Halifax side of the harbour and from Eastern Passage to the Narrows on the Dartmouth side.
- Thirteen sewers are discharging raw sewage to the harbour.

1956

- Halifax County stipulates that sewage to be discharged to Bedford Basin should be treated to protect the Basin water quality.
- A treatment plant at Mill Cove is recommended to treat Bedford sewage.

1960

- Halifax County recommends that sewage from the Sackville area be collected and also treated in a treatment facility at Mill Cove.
- The provincial government requires complete treatment of any discharges to Bedford Basin.
- The County begins design of a secondary facility for Mill Cove.

1969

- The city of Dartmouth installs a number of relief sewers and overflow devices to alleviate flooding problems, and recommends the construction of five sewage treatment plants for the city sewage, some to discharge to freshwater lakes.
- The provincial government stipulates tertiary treatment for any sewage discharges to fresh water lakes, and the city reconsiders its plan in conjunction with Halifax County, which was evaluating treatment options for the Eastern Passage/Cole Harbour areas.
- A secondary treatment facility is recommended for Eastern Passage.
- The City of Halifax significantly expands its boundaries and commissions a study to evaluate sewage treatment requirements.
- A secondary treatment plant to be located at Purcell's Cove is recommended.

1971

- A secondary treatment plant at Mill Cove is constructed.
- The Metropolitan Area Planning Committee considers a regional treatment facility and proposes a single, regional facility at "Hen and Chickens", a shoal off Point Pleasant Park.
- The Committee also identifies a need for additional harbour studies to establish the degree of treatment required and to evaluate the impacts of sewage discharges on water quality.

1973

- The Metropolitan Area Planning Commission is established as a corporate

body pursuant to the Planning Act of Nova Scotia. MAPC includes the Minister of Municipal Affairs, the Chief Magistrates of the four municipalities and one additional elected representative appointed by each municipality.

- The mandate of MAPC is to advise the Minister of Municipal Affairs; to prepare and revise the Regional Development plan; to facilitate consultation; to assess opportunities for collective action, and to provide input to long range planning activities.

1974

- A secondary treatment plant is constructed at Eastern Passage.

1977

- The Metropolitan Area Planning Commission commissions another study on regional treatment options.
- The adverse impacts of raw sewage discharges to the harbour are documented.
- A regional primary treatment plant is recommended with an outfall to the ocean, in a location A sludge with general offshore drift.

1978

- A sludge management study determines that significant volumes of sewage sludge are being discharged to the harbour daily and recommends more economical and environmentally acceptable sludge disposal options.
- A separate study reveals that large volumes of "special waste" are also being discharged to the harbour on a regular basis.

1981

- Serious inflow and infiltration problems are identified in the sewer systems in the county of Halifax

The lack of a domestic waste pollution control policy is identified as a major constraint to development in the cities of Dartmouth and Halifax and in Halifax county.

1984

- MAPC commissions a three- phase stud to assess conditions in Halifax Harbour, to identify and fill data gaps, and to assemble the data necessary to design a regional sewage treatment facility.

1985

- Phase 1 of the MAPC study is undertaken to review all pertinent data related to physical oceanography, water quality, and sewage loading to the harbour.
- A water quality survey shows high fecal coliforms in the harbour, and acceptable levels of dissolved oxygen, except near sewage outfalls.

1986

- Phase 2 of the MAPC study is completed with the development of a water quality model and field testing of the model.
- Modelling studies show that there will be increased problems in the harbour if no action is taken regarding the discharge of raw sewage.

1987

- Based on the predictions of the model developed in Phase 2 of the MAPC study, the Eastern Passage treatment plant is downgraded to a primary level of treatment.
- Phase 3 of the study is completed and a single, regional primary sewage treatment plant is recommended at Sandwich Point.

1988

- The four municipalities agree in principle with the concept of a single, regional sewage treatment plant and also agree that an assessment of the environmental impacts of the effluent from the proposed plant on the Herring Cove fishery must be conducted.
- The Halifax Harbour Cleanup Review

Committee is established to review public concerns with the Sandwich Point site.

- The Canada-Nova Scotia Subsidiary Agreement on Halifax-Dartmouth Metropolitan Area Development is signed, committing funds to the construction of a regional sewage treatment facility incorporating an oil-from-sludge plant.

1989

- The Halifax Harbour Task Force is commissioned to develop environmental quality guidelines and objectives for uses of Halifax Harbour.
- Halifax Harbour Cleanup Inc. is established to undertake all activities related to the pre-design, design and construction of the regional sewage treatment facility.
- A sludge lagoon is constructed at the Aerotech Industrial Park and sewage sludge from the existing treatment plants in Halifax County is disposed of there.

1990

- Halifax Harbour Task Force (HHTF) recommends a containment approach to sewage management and suggests that the outfall from any regional plant be located in the Inner Harbour.
- The HHTF documents significant public concerns with the recommended Sandwich Point site and with the oil-from-sludge technology.
- The HHTF recommends a single, regional treatment facility, and puts forth siting criteria to be used in the selection of the site for the facility.
- The Project to construct a regional sewage treatment facility is referred to a joint federal/provincial environmental assessment panel.
- The Panel is given specific instructions to evaluate environmental and socio-economic aspects of the construction and operation of a primary sewage treatment facility to be located on an artificial island in Ives Cove off McNab's Island.

1991 to 1993

- The Project Proponent, Halifax Harbour Cleanup Inc. (HHCI) documents the existing conditions, predicted project impacts, and mitigation measures associated with project construction and operation.

1992

- HHCI submits its Environmental Impact assessment reports to the EA Panel.

1993

- The Panel convenes public hearings on the Project.
- The Panel prepares its report after evaluating all project documentation and assessing public input.
- The Panel recommends that the Project proceed, with conditions.
- The federal and provincial governments accept the Panel report and agree with its recommendations.
- The provincial government stipulates that the Project will not proceed until adequate funds are committed. (The Subsidiary Agreement committed $195.7 million to the Project. Another $47.1 million was available from the Halifax and Dartmouth Pollution Funds. The estimated cost of the Project was, however, $385.2 million.)

1994

- HHCI undertakes consolidation of outfalls in Halifax and Dartmouth.
- The provincial government commissions a study into privatization options for the project.

1995

- The Subsidiary Agreement expires and the Project does not proceed.
- HHCI is dissolved.

1996

- Municipal amalgamation creates the Halifax Regional Municipality, incorporating the Cities of Halifax and Dartmouth, Town of Bedford, and County of Halifax. This brings all the communities surrounding the Harbour under one municipal jurisdiction.
- HRM Council hosts the Harbour Solutions Symposium, to gather community input on ways to move a harbour project forward.

1997

- HRM Council appoints the Harbour Solutions Advisory Committee, to provide advice on specific questions and issues not completely addressed by the Symposium.

1998

- The Harbour Solutions Advisory Committee reports it's recommendations to HRM Council. At the same time, the report of a consulting group lead by Jacques Whitford Environment Ltd. is submitted to Council. The consultants worked closely with the Advisory Committee to develop a Concept Plan. Both reports are approved by Council as the basis for moving forward.

1999

- HRM Council approves a short list of three consortia to bid on the project. Council also approves a commitment to two-thirds of the $315,000,000 capital cost, plus the full operating costs. Cost-sharing on the remaining one-third of capital costs is sought from the federal and provincial governments.
- A Request for Proposals is in final preparation for release to the short-listed companies. Responses are expected during the second quarter of 2000.

Halifax Harbour Solutions Project
Appendix "B"

General Principles

1. There should be an immediate start on the planning and public participation process.
2. There should be development of a flexible, comprehensive vision and a long-term strategy with links to other development planning.
3. Proceed on a step-by-step incremental approach, building on past successes and considering innovation and small scale approaches.
4. HRM is the lead agency responsible for achieving a Harbour solution.
5. The "user pay" principle should be implemented on an equitable basis.
6. An on-going informed public participation process is needed and decision-making must be transparent and open.
7. Source control is an integral part of the system.
8. Move forward on the basis of the established water use/quality objectives, revised as necessary.
9. Citizens need to be educated about their roles and responsibilities within the overall waste water and management system.
10. Architectural design for new facilities should be appropriate to neighborhoods and the environments and be aesthetically pleasing.
11. Develop a sludge management strategy which will consider sludge as a resource.
12. There should be integration of legislation and regulations, with effective enforcement and monitoring.

Halifax Regional Municipality
Planning & Development Services

Donna Davis-Lohnes

The Halifax Regional Municipality is not a regulatory agency with direct authority over activities in and around Halifax Harbour. It does however regulate certain activities that directly or indirectly impact on the environment of Halifax Harbour. These include:

a) The discharge of substances to public sewer systems (storm water and sanitary sewers)
b) Land development activities which impact on fresh water resources which ultimately drain into Halifax Harbour.

Sewer Discharge

- HRM's authority to control and manage connections to the public sewer system and the discharge of substances to sewers is derived from the Municipal Government Act (MGA).

- The purpose is to protect the integrity of the systems and to control materials leaving the systems, in particular whether the standards of other jurisdictions are met.

- There are many opportunities for deleterious substances to enter the sewer systems which, in the case of storm water systems, ultimately drain to Halifax Harbour (i.e. grit, oils, direct from streets), improper disposal of material through domestic drains and/or catch basins in the street, improper disposal of chemical and biological wastes from industry and business, runoff from residential subdivision during construction [sediment] and post construction phases [fertilizers, pesticides, etc]

Section 328 of the MGA gives HRM the power to prescribe standards and specifications for connections to wastewater and storm water systems. Connections are controlled through a Sewer Connection By-law, and through permitting and inspection procedures.

Section 333 gives HRM the authority to adopt a Wastewater Management By-law. HRM has exercised its right under Section 333. In September 1996, Bylaw- 100, A By-law Respecting Wastewater Discharge was adopted. It was a harmonization of former by-laws adopted by the pre-amalgamation jurisdictions.

Section 3 of the By-law sets out prohibited discharges as per Section 333 of the Municipal Government Act. Violation of the By-law can result in a fine up to $5000 upon summary conviction. The by-law, however, enables payment of a $100 in lieu of prosecution if paid within 14 days of the charge.

There is not much incentive to comply with the by-law; It is not known if charges have ever been laid under the by-law.

Source Control Program

The Wastewater Management By- law is a regulatory approach to control what enters HRM's sewer systems. HRM has recognized the need to use education to gain compliance with the by-law and its pollution control objectives.

In 1997, staff submitted a report to Regional Council regarding a Source Control

(Pollution Prevention) Implementation Strategy for Halifax Regional Municipality. Council accepted the report and authorized staff to proceed with the implementation of key recommendations.

Staff, in consultation with Vaughan Engineering Ltd., developed an initial work program. On March 31, 1998, Regional Council accepted the work program and approved the appointment of Vaughan Engineering Ltd. to proceed with the initial phase of implementation. The initial phase for the implementation of the Pollution Prevention Program included the following tasks:

- Development of a Pollution Prevention policy statement to provide a vision for future initiatives

- Evaluation of various candidate industrial sectors and selection of three sectors for detailed evaluation and monitoring

- Audit and assessment of those sectors

- Development of a monitoring program to assess the quality of chemical discharges from the individual businesses within each sector, including baseline data collection for typical wastewater quality from non-industrial sources.

- Development of information programs and public relations activities specific to the P2 initiative.

- Review of the current Sewer Use By-law and development of recommendations for a new Sewer Use By-law

- Development of a suitable framework for review and evaluation of program effectiveness

Work began in April 1998 and has steadily progressed to date. The majority of the tasks identified above have been studied and implemented.

Selected sectors studied included photo finishing, metal finishing and vehicle maintenance and repair. Investigations included a pollutant survey of each business by means of a survey questionnaire, personal visits and interviews, as well as identification of current business and operating practices.

Draft BMP (Best Management Practices) brochures for each sector have been developed. To assess sewage effluent quality, a sampling and monitoring program was initiated in the fall of 1998. Background and baseline data were collected in the first round of monitoring. Two additional rounds of monitoring are scheduled to compare sampling results, and program effectiveness.

The objective is to have businesses and industries follow the principles of self-governance and compliance in adhering to HRM's Pollution Prevention objectives. However, from discussions with industry associations, as well as Federal and Provincial Departments, it is generally agreed that the program must be supported by appropriate legislation and enforcement initiatives. As a result, the consultant, in consultation with staff and Legal Services, have produced a revised draft by-law regulating wastewater discharges to public sewers. A final draft will be presented to Regional Council in the next 2-3 months.

Land Use Planning/ Development

It is evident that the approach to land development and subsequent land use can have profound effects on our fresh water

resources, which ultimately drain into the marine environment of Halifax Harbour. During construction there are erosion control and sedimentation issues. We have examples where fresh water resources have been severely compromised (i.e. Sackville River, First Lake). In the post construction phase, the quality of surface runoff is a concern (grit, oil, salt from streets and commercial parking lots, pesticides and fertilizers applied to residential properties). All contribute to the degradation of our fresh water and marine water environments. To date, there have been a few successful attempts to address these issues. In some cases we are still struggling to bring these issues under control (i.e. Morris Lake, Sackville River).

One of the primary regulatory tools used to address development concerns during construction is the Subdivision By-law and Lot Grading By-laws. During the subdivision approval process, erosion and sedimentation control plans are required. Lot grading, site grading and drainage plans address drainage and erosion issues.

Some policies exist which address issues associated with storm water quality after construction is completed. Approaches include reducing impervious surfaces through site disturbance measures, encouraging overland flow through natural buffers, use of natural retention area as natural filtration mechanisms, detention/ retention ponds, and most recently, the use of constructed wetlands (i.e. Home Depot-Dartmouth).

There is growing public concern regarding the impact of storm water runoff on fresh water resources within HRM. In response to this growing concern, HRM has committed to develop a Regional Water Resource Management Policy which addresses storm water quality and quantity issues. To date, quantity has been the primary engineering concern.

HRM currently has 18+ Municipal Planning Strategies and Land Use By-laws which contain a variety of policies, regulations and standards addressing storm water management and the protection of aquatic resources. The objective of the Regional Water Resource Management Policy is to harmonize and update this collection of policies and regulations to reflect current standards and best management practices in this area. The project will be completed in two phases; a) policy review, b) development of a by-law, engineering standards, and specifications. A draft Terms of Reference has been developed and is being circulated to the various HRM Departments for comment. It is anticipated the project will commence within the next two months.

Summary

In the areas of regulation and enforcement, HRM's current initiatives are working towards increased regulation, the development of consistent and up to date approaches in terms of both land development activities and controlling the discharges of substances to public sewers.

In the areas of education, the first phase of a Source Control Program has been completed with a second phase to be initiated shortly.

Lastly, HRM is embarking on a project to develop an integrated and comprehensive approach to the management of fresh water resources within its jurisdiction. This integrated approach is part of a broad Regional Planning exercise about to be commenced in the region.

Questions for Waterfront Development Corporation

Question :
Many of the wharves extend from where the infill exists now, boats tie up and stir up the sediments, is there any consideration given to the archaeological process?

Answer:
In the past we have had archaeological evaluation of the sites, we have not gone into major archaeological evaluation of any of our sites, not in a detailed analysis.

Question:
Is there a plan to build an aquarium?

Answer:
There have been many attempts to build an aquarium, none of which have panned out. They are developing a feasibility study to attract a marine centre, not an aquarium exactly. We want to have something that is related and offshore related.

Question:
On your list of values you had; respect of the environment, could you elaborate?

Answer:
Whatever projects we undertake, we want to ensure we are not polluting the Harbour, the designs meet the needs of the community and create a pleasant environment. When we develop land we ensure that we meet the environmental requirements. We would support projects like the Halifax Harbour Solutions.

Question:
Is the Waterfront Development concerned with Green?

Answer:
We are concerned with providing public access. In Dartmouth, the ferry park has a large green area. Most of our systems put in place in Halifax have been board walk systems. In cases where we have provided landscaped areas, they have been problematic (blocking waterfront from views, i.e. Sackville area – it is not used as we cannot see the area for safety reasons).

Question:
When you are infilling how do you lock in the sediments? How do you constrain the movement of sediments from the area?

Answer:
We do get a plume out of where we infill. It does stir up and push out the top sediments. There really is no way to do the fill without that happening, except cofferdams, but that is very expensive.

Question:
If you change the shape of the harbour, you change the action in the harbour. An example is the finger pier at Point Pleasant Park. Someone should be doing some modelling on impacts on the harbour due to change from infill, wharves etc. Is that done at this point?

Answer:
This has not been occurring at this point. The only analysis done at this point is environmental, and CCG reviews them for navigation. We understand that we must work to determine how the circulation will be effected, ie. Dartmouth Cove.

Questions for Bedford Waterfront Development

Question:
Who is the approving authority for harbour issues?

Answer:
Realignment of Federal and Provincial powers has further muddied the waters. Most government departments are not time sensitive.

Question:
If someone were to look at the situation when 300 years have passed, maybe infilling is the wrong way to approach development?

Answer:
The point is to allow access to the Basin.

Question:
Why do we need two waterfront development corporations?

Answer:
It was a political decision, in 1989 there was no interest in anything north of the new bridge. We may have outlived our existence at this time. The two corporations may be amalgamated.

Comment:
One of the outputs we would like to see from this workshop is a matrix of development types and the regulatory agencies that would have an interest in each type. There are cumulative impacts of major plans, there should be more involvement from all areas to mitigate these impacts.

Questions for HRM- Harbor Project Solutions

Question:
Why was the Narrows rejected out of hand as a possible outflow area?

Answer:
The Narrows is really a conduit, where most effluents are coming out. DFO was saying there were major blooms occurring in the Bedford Basin. There is a lot of stress on the Bedford Basin. We did not want to add to this stress.

Question:
The diffusers will be long diffusers, what do you gain by going into an area of less mixing south of the MacDonald Bridge rather than an area of more mixing?

Answer:
The results show that this minimizes transport of effluent up into the Basin. There are jets within the inner harbour (high energy area) that will allow the effluent to be transported to a larger area (dispersed to a larger area), but there are short comings to this as well.

Question:
Can you get information from other plants that are currently operating successfully to integrate the plant into the community?

Answer:
They have done some of this already. For example we know of a sewage treatment plant where part of the sewage treatment facility is below the parking lot as you go into the plant. These ideas will be incorporated into plants that we want to integrate into the communities. We are also asking the community for their ideas.

Comment:
The Municipal Government Act is the basis for land used planning and watershed planning in the Province. No-one was here to address this issue. Land and watershed planning should be included by the Department of Municipal Affairs

Questions for Planning and Development Services, HRM:

Question:
Is there an evolution in the attitude of the development community? Are they taking a better approach to the environment particularly the water resources?

Answer:
There has been a higher level of consciousness.

Question:
Have you asked for and received approval from EC, Waterfront, etc. that the sewage going into the harbour is within the standards?

Answer:
Wastewater discharge by-law (revised version now drafted), requires even higher levels of protection. There are representatives on stakeholders group from the Fed's and Province on the Panel.

Question:
If the OHWM is artificially moved out then HRM moves out along with it?

Answer:
Yes.

Question:
Has the HRM considered conducting an EIA on the new sewage treatment proposal?

Answer:
They are considering it, but it has not been decided on yet.

Question:
What about fish landings in Halifax? This would add to the flavour of the Harbour. What is the policy on this to encourage some commercial fish landings?

Answer:
We haven't had anyone approach us with such a request except in Dartmouth Cove. The seiners have wanted to tie up at our wharves but we have resisted this because there is a conflict between general public use and fishers use of government wharves. They end up using a lot of space with their vehicles.

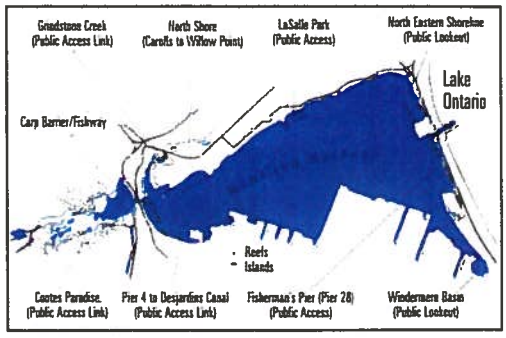
Part 5

The Burlington Harbour Case Study

N.B. *A special presentation "Integrating Habitat Restoration into Existing Situation", had been planned (see appended agenda) Unfortunately this paper was cancelled late in the workshop planning process. A General Information Fact Sheet was substituted in the hope that this information will satisfy the curiosity of the readers.*

A BETTER PLACE TO LIVE

General Information Fact Sheet

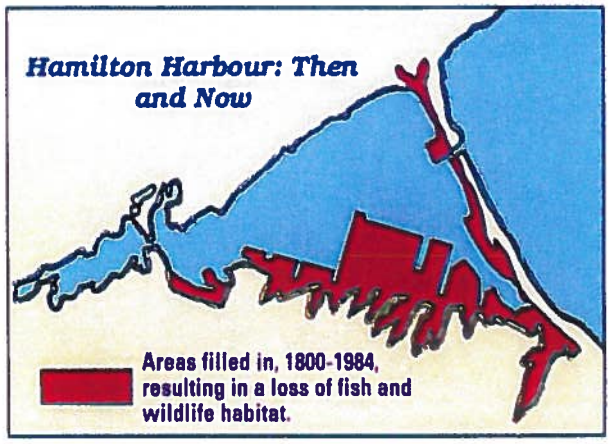


THE DREAM IS BECOMING A REALITY

Imagine hectares and hectares of new habitat for fish and wildlife.... more diverse fish communities....restored wetland vegetation and more public access!

It is the vision of the Hamilton Harbour Remedial Action Plan to rehabilitate and restore fish and wildlife habitat, with the goal of providing 372 hectares of fish habitat, 299 hectares of wildlife habitat, 16 km. of enhanced littoral edge and over 9 km of new shoreline public access.

Included in the project are the eight sites identified below. Restoration initiatives began in 1991. Since then, significant progress has been made at Cootes Paradise, Grindstone Creek, Pier 4 and Bayfront Park, LaSalle Park and Northeastern Shoreline. (There are separate Fact Sheets for these sites.)

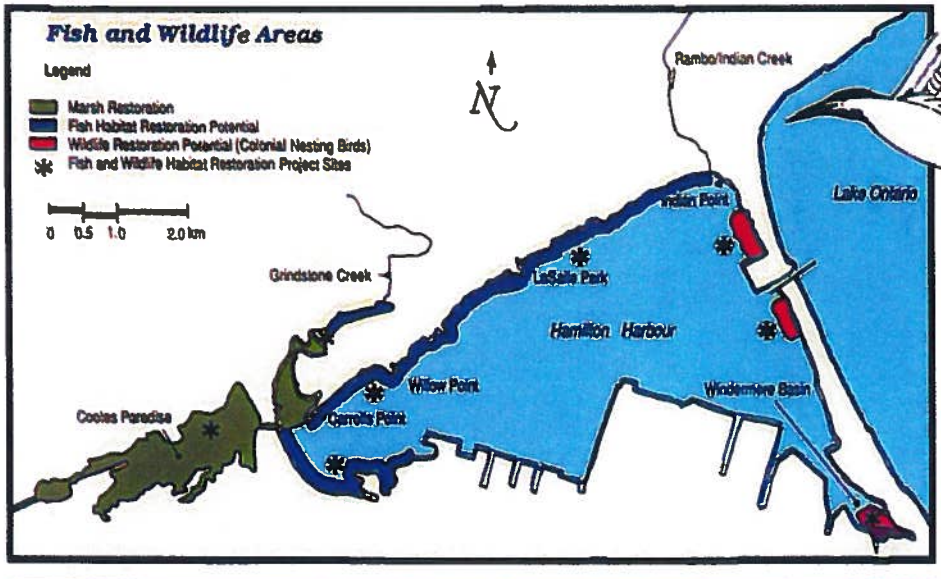


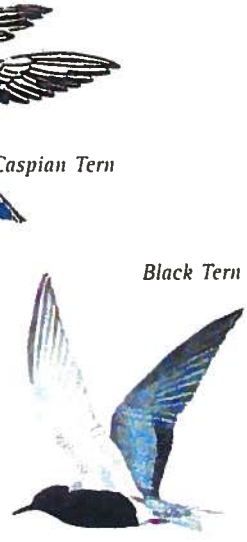
LOOKING BACK

1800: Hamilton harbour, the Bay, teems with countless warmwater fish - bass, pike, yellow perch, sunfish, muskellunge and important cold water species - herring, trout and whitefish. In marshlands, wild celery and wild rice abound. Waterfowl are so plentiful that they block the sun's light in their flight. Wild animals include otter, beaver, mink and muskrat.

1900 to 1975: Contamination from municipal sewers, toxic spills and escalating lakefill for urban development drive a thriving and complex ecosystem of plants, animals and fish to near destruction.

1975 to Present: Concerns for pollution lead to the International Joint Commission designating Hamilton Harbour as one of 43 Areas of Concern in the Great Lakes. A Remedial Action Plan is prepared by 46 community stakeholders and approved in 1992.





During the past twenty years approximately $600 million was spent by industries and government to clean up the Harbour. While considerable work remains, the water quality has improved to the point where fish and wildlife habitat can be restored.

THE REMEDIAL ACTION PLAN...

RAP

...IMPROVING THE QUALITY OF THE HARBOUR

The RAP has adopted the "ecosystem approach" to clean up and restoration. It is premised on a recognition that everything in nature is connected and interacts with everything else. The Fish & Wildlife Habitat Restoration Project for Hamilton Harbour and Cootes Paradise depends on the implementation of the various RAP remedial measures.

The RAP identifies six areas for remediation:

- toxic contaminants (e.g. clean up contaminated harbour sediments)
- water quality (e.g. reduce contaminants from wastewater treatment plants and other sources)
- bacterial contamination (e.g. install holding tanks to prevent sewage overflows)
- urbanization and land management (e.g. develop watershed stewardship programs)
- access and aesthetics (e.g. create new waterfront parks and trails)
- fish and wildlife (e.g. restore fish and wildlife habitat restoration sites)

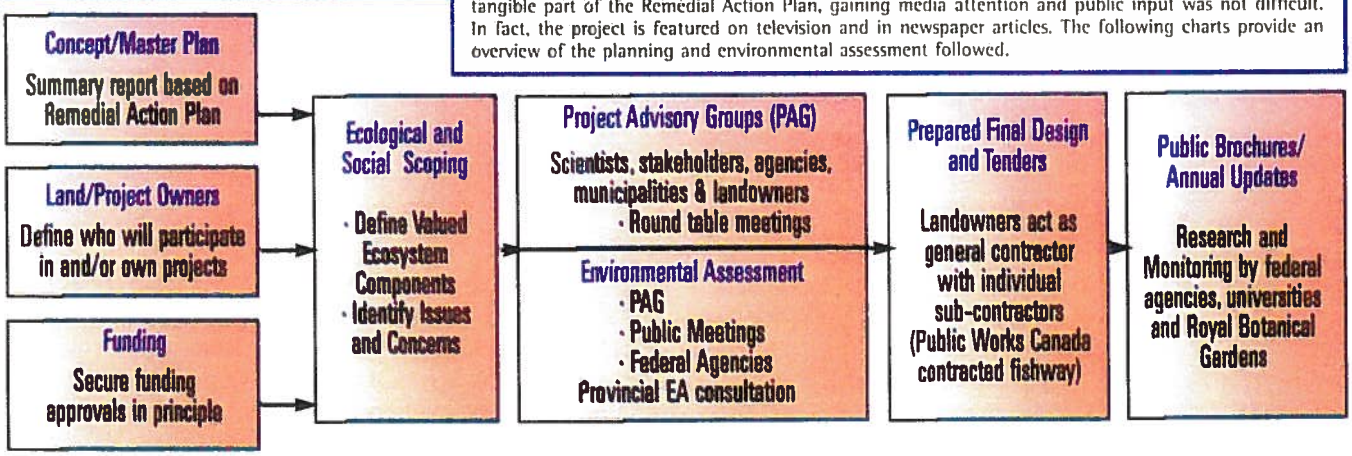
RAP GOALS FOR FISH AND WILDLIFE

"Water quality and fish habitat should be improved to permit an edible, naturally reproducing fishery for warm water species. Water and habitat conditions in Hamilton harbour should not limit natural reproduction or the edibility of cold water species."

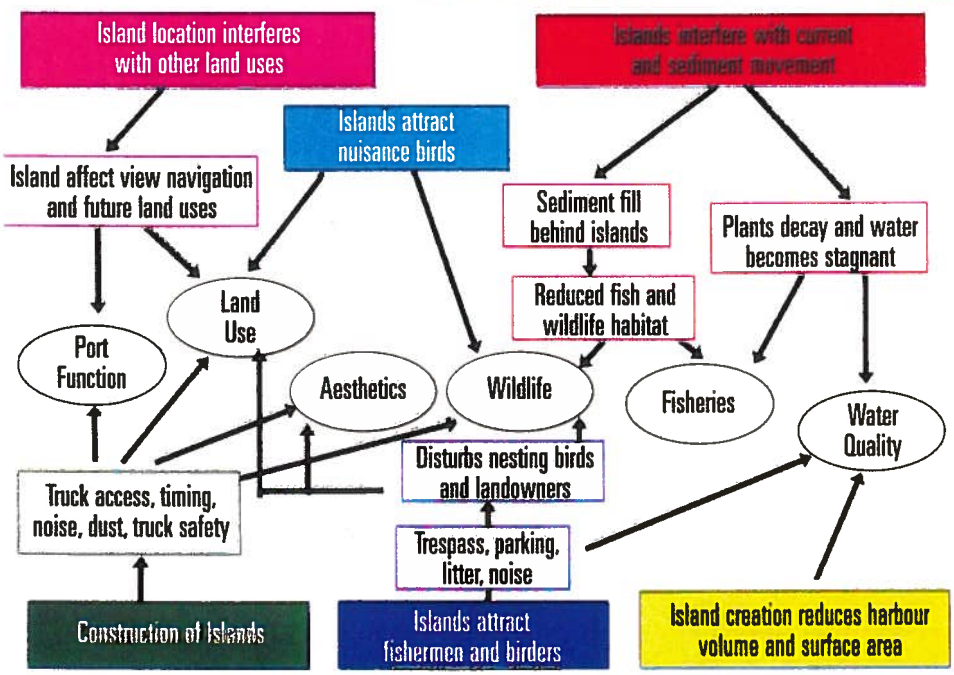
"Healthy and self-sustaining resident and non-resident wildlife populations should be enhanced on a Harbour-wide basis through water quality improvements, habitat rehabilitation and protection."

Planning For Restoration

Science, public desires, landowner responsibilities and regulatory requirements were taken into account within the context of cost effectiveness. As a result of the public identifying with the project as a tangible part of the Remedial Action Plan, gaining media attention and public input was not difficult. In fact, the project is featured on television and in newspaper articles. The following charts provide an overview of the planning and environmental assessment followed.



Example of: Potential Generic Impacts Evaluated



PROJECTION OF HARBOUR-WIDE RESTORATION

The Department of Fisheries and Oceans examined the amount of habitat originally existing in the harbour and projected the amount which could be regenerated. While the current amount of habitat can be doubled this is likely only 36% of the habitat which existed in a pristine state. The majority of permanent habitat loss is due to filling and hardening the shoreline for development and transportation while the greatest potential for habitat restoration exists in the Cootes Paradise marsh.

RESTORATION COMPONENTS

HABITAT, PUBLIC ACCESS, RESEARCH & MONITORING

The project proposes to create 372 ha of fish habitat, 299 ha of wildlife habitat, 16 km of littoral edge and 9 km of trails. Substantial progress is being made: Shoreline rehabilitation and trail at Chedoke Creek; carp barrier/fishway, aquatic nursery and herptile ponds at Cootes Paradise marsh; pike spawning habitat and boardwalk at Grindstone Creek; underwater reefs and shoreline naturalization at Bayfront Park; shoreline naturalization, beach restoration, reefs and trail at LaSalle Park; and shoreline naturalization, colonial nesting bird islands, trail and lookout at the Northeastern Shoreline, sand dune rehabilitation and trail at Burlington Beach.

Aquatic vegetation is making a dramatic recovery in Cootes Paradise and the harbour. Fisheries monitoring indicates an increase in top predators and species diversity. Colonial nesting birds are successfully using island habitat. Scientists at the Department of Fisheries and Oceans, Canadian Wildlife Service, McMaster and Brock Universities and Royal Botanical Gardens are co-ordinating monitoring and research to advance fish and wildlife habitat restoration throughout the Great Lakes.

COOTES PARADISE AND GRINDSTONE CREEK

In 1997, when a fishway and carp barrier began operation, a dramatic change in submerged plant growth occurred throughout the Cootes Paradise marsh. Along the shoreline and in some open water sections, mats of submerged plants covered the bottom. Several varieties of pondweed, waterweed, non-native Eurasian water milfoil and horned pondweed, (considered a rare species in Ontario), were found growing in the marsh. Wild celery, not seen in the marsh for over 50 years, was found growing in open water at the east end of the marsh.

An area in Hopkins Bay, covered by open water for at least 10 years, is now vegetated with cattails and the buildup of sediment around the cattails is a sign of natural marsh functioning.

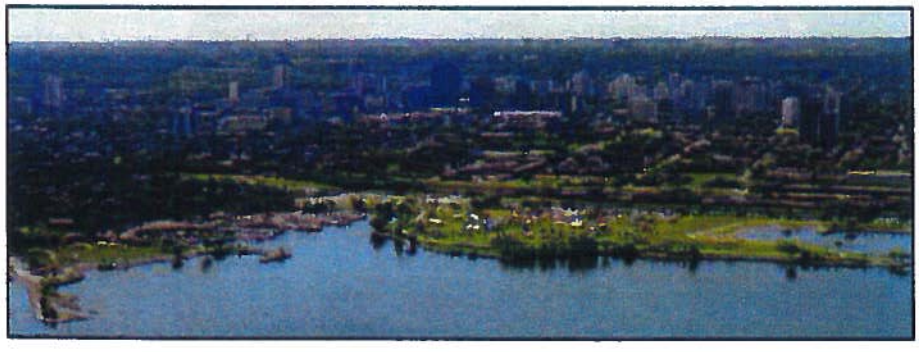
Sago pondweed seeds and wild celery are favourite foods of waterfowl. Waterfowl numbers in Cootes Paradise increased dramatically due to the increased distribution and abundance of aquatic plants and the birds stayed longer in the marsh gaining strength for their migratory flight.

In the Grindstone Creek pike spawning marsh, over 200 spawning pike were counted using the marsh. Prior to restoration, 19 pike were recorded using this area.

The marsh restoration is a 20-year effort. Tours are open to groups and can be arranged by contacting Royal Botanical Gardens. The Grindstone Trail, connecting Cherry Hill Gate to Sunfish Pond is open to the public and provides educational interpretation.

BAYFRONT, PIER 4 & HAMILTONIAN PIER

The western basin of the harbour is fast becoming transformed with the provision of parks, trails, recreational marinas and fish and wildlife habitat. Spawning beds for bass, walleye and underwater artificial reefs have been constructed. Plans propose the creation of a continuous multi-use trail along the water's edge connecting Bayfront Park and Pier 4 Park and the Cootes Paradise fishway at the Desjardins Canal. An important aspect of the trail is the linking of several historic sites of national significance. The restoration and enhancement of fish and wildlife habitat adjacent to the trail is an important component.



LASALLE PARK

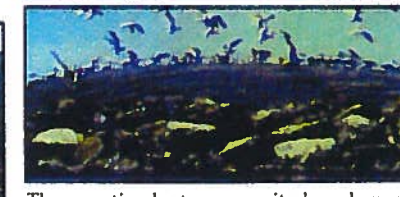
LaSalle Park officially opened August 5th, 1996. A walking path, part of the Lake Ontario Waterfront Trail, includes signs interpreting fish and wildlife habitat.

The shoreline is naturalizing following three years of vigorous growth by the trees and shrubs planted as part of the restoration project. Volunteers from the Bay Area Restoration Council have assisted with marsh planting, maintenance of vegetation and botanical inventories. A "Natural Areas Nurturing" program has been adopted for the shoreline to provide ongoing vegetation maintenance. Anyone interested in volunteering should contact the Bay Area Restoration Council for more information

NORTHEASTERN SHORELINE

Opened in 1996, this project site has proven to be a major success for colonial nesting birds and fish. The Canadian Wildlife Service identifed the following birds using the islands:

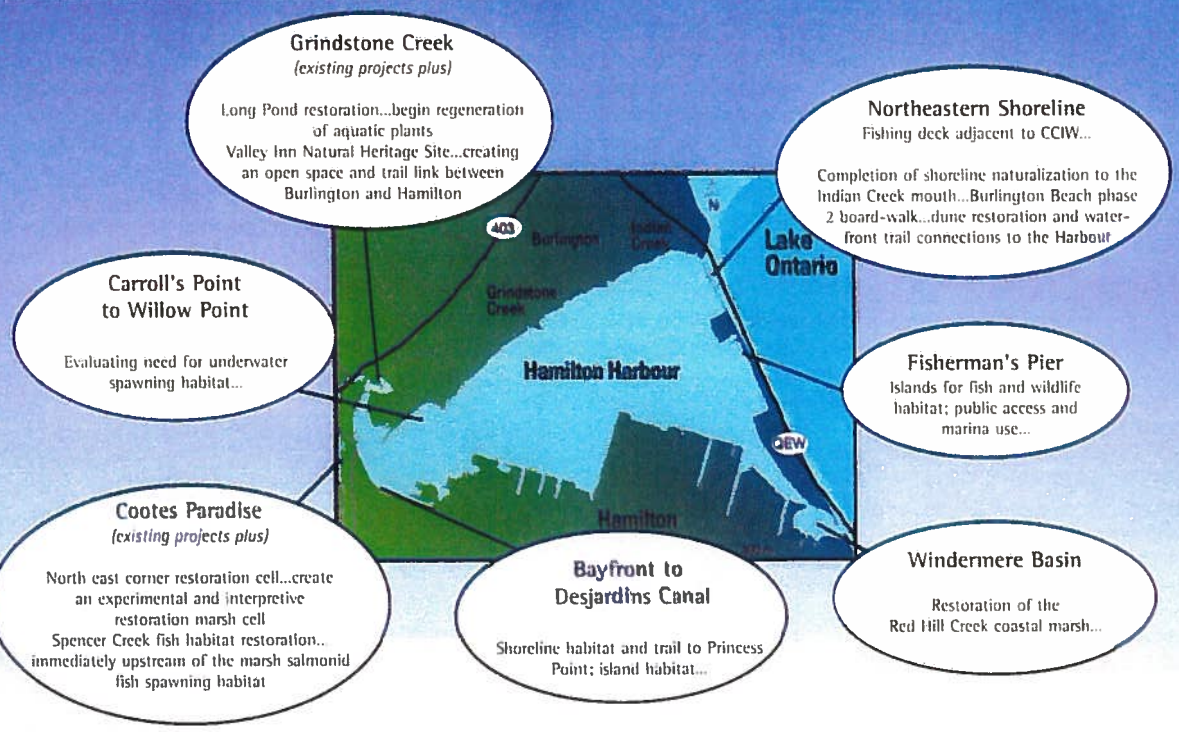
Nesting Pairs	1996	1997
Caspian terns	221	364
Common terns	371	564
Black-crowned night herons	9	19
Ring billed gulls	25	184
Herring gulls	43	62



The aquatic plant community has changed from sparse to moderately vegetated cover because of the reduction in wave action. The fish community using the area has increased from 6 species to 16 species. A natural trail runs along the shoreline and ends at a viewing platform.

INTO THE NEXT MILLENIUM
Highlights of Millenium Projects

Habitat restoration and public access completed to date has laid a strong foundation for continuing improvements. Research and monitoring provide essential feedback for the design and construction of the next phase of habitat and public access projects.



PARTNERSHIPS

The following have contributed time, money and/or expertise to the Fish & Wildlife Habitat Restoration Project for Hamilton Harbour and Cootes Paradise.

- Bay Area Restoration Council (BARC) representing citizens, interest groups, municipalities, industries and landowners
- Department of Fisheries and Oceans
- Environment Canada
- Friends of the Environment Foundation
- Great Lakes 2000 Cleanup Fund
- Halton Region Conservation Authority
- Hamilton Harbour Commissioners
- Hamilton Harbour Remedial Action Plan Stakeholders (RAP)
- Hamilton Naturalists' Club
- Hamilton Region Conservation Authority
- McMaster University
- Ontario Ministry of Environment and Energy
- Ontario Ministry of Natural Resources
- Royal Botanical Gardens Project Paradise
- The Regional Municipality of Hamilton-Wentworth
- The Regional Municipality of Halton
- City of Burlington
- City of Hamilton
- Waterfront Regeneration Trust

For Additional Information Please Contact:

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AUTHORS

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Part 6

Looking to the Future: Workshops

Coming to terms with areas of overlap and/or conflict between regulatory agencies; integrating marine and freshwater resources protection with planning and development activities and; co-operation in restoration of fish and wildlife habitats and aesthetic values of Halifax Harbour.

N.B. For this exercise the participants and presenters were divided into six approximately equal groups and, with the help of appointed facilitators were asked to explore discuss and debate three specific topics (two groups for each topic). A rapporteur was designated for each group and was requested to present to the general assembly the findings and recommendations of the group and respond to questions from the general assembly.

Topic 1

Coming to terms with Regulatory Areas of Overlap

- Identifying the Overlaps.
- Identifying the Conflicts
- Developing Solutions

Group 1 (Topic 1), Rapporteur, Rene Lavoie

The discussions centered around the three main themes suggested in the program : overlaps, conflicts, and possible solutions.

Overlaps

The group identified several pieces of legislation which overlap in some aspects depending upon the nature and scope of projects submitted for approval.

The new Canada Oceans Act with its mandate for Integrated Coastal Zone Management has possibly the Largest potential for overlapping with earlier legislation, both federal and provincial, not to mention HRM's by-laws. This overlap could involve such federal statutes as the Fisheries Act the Canadian Environmental Protection Act, the Canadian Environmental Assessment Act, the Canada Marine Act, the Federal Real Property Act and the Navigable Waters Protection Act. On the provincial side, the Nova Scotia Environment Act, the Nova Scotia Beach Protection Act and the Special Places Protection Act were mentioned.

Conflicts

The group had difficulty separating conflicts between regulations and human conflicts resulting from the application of regulations by various jurisdictions.

-"First come, first served syndrome".

This happens when proponents first obtain an authorization under one Act like NWPA, for example, and proceed on that basis, assuming that it covers everything, leaving other regulatory bodies in a catch-up situation. This can happen because of proponents' real or deliberate lack of knowledge or because of poorly resourced enforcement groups.

-Timing.

Response time between agencies and between agencies and clients create application conflicts and can increase the cost of projects by substantial amounts.

-Funding.

It sometimes happens that funding agencies unwittingly support projects with Public Funds which are conflicting or violating regulations Different Acts have different priorities

-Ownership.

Conflicts arise when ownership and jurisdictions are unclear.

-Narrow focus.

Staff enforcing one set of regulations often do not realize the impact of their interpretations and decisions on other components of an ecosystem or of a bigger picture

-Poorly trained staff.

The recent downsizings and reorganiztions at the three levels of government has produced wide movements and changes in staff. Experienced officers with a wide experience and breath of knowledge have been replaced with junior workers without the benefit of an overlap period of knowledge transfer. The results are inconsistent interpretations, delayed decisions and rulings, and much confusion.

Solutions

-A common vision.

A common vision shared amongst regulators and all potential interveners would help reduce confusion, uncertainty and costs. With a common vision for the greater Halifax Harbour, each agency would find it easier to identify their individual contribution, and the impact of their intervention on other areas of jurisdiction

A possible expression/version of the Common vision :

"Ecological integrity of the greater Halifax Harbour ecosystem including its present human population"

-Roster of experts:

HRM or DFO could compile a list of experts from the various agencies, so that proponents have access to the people who really have the expertise and avoid the run around.

-Information pamphlet for proponents

An information pamphlet specific for each type of proposal could outline the Acts and jurisdictions involved, what is required, who to see etc.

-Competency of consultants :

Encourage the use of consultants trained in the environmental assessment field.

-Training :

Encourage agencies to train their staff in working relationships between departments and agencies

The group was comprised of Brian Jollymore (facilitator), Harry Ashcroft, Kok-Leng Tay, Laurie Gillmore, Rodger Albright and René Lavoie who acted as Rapporteur and presented the findings of the group to the plenary.

Group 2 (Topic 1), Rapporteur, Dave Aggett

Overlaps

A. Ownership:
   (1) – Federal
   (2) – Provincial
   (3) – Municipal
   (4) – Private

B. Jurisdictional Control – who does what?
   (1) - DNR
   (2) – DFO – (Habitat)
   DFO- (NWPA)
   (3) – EC – (FA. 36 (3))
   (CEPA (OD))
   (4) - TC : (CSA)
   (5) - HPA
   (6) - HRM
   (7) - NSDOE

Conflicts

1. Separate approval authorities authorize conflicting projects
2. Conflict between development and environmental protection
3. Potential for incompatible discharge standards set by different agencies
4. Confusion over who to ask
5. No overall strategy

Next Steps/Solutions

1. HRM needs an overall land use policy (Grand Plan).
2. Co-ordinating body led by HRM and formed of representatives from key federal and Provincial agencies.
3. Comprehensive education and public awareness plan.

Topic 2

Integrating Halifax Harbour Marine and Freshwater Resources Management

- How do we ensure that all stakeholder's interests are considered in future projects?
- What are the possible mechanisms available to integrate such a wide spectrum of management activities?
- Explore alternate proposals

Group 3 (Topic 2), Rapporteur, Bill Campbell

How do we ensure stakeholder's input?

Past/Present

- Environmental Review Process – Fed
- Coastal 2000 – Province
- Round Table on the Environment/Economy – called for certain initiatives for coastal management
- Provincial Policy very close
- Member of Under on service to community
- Watershed Boards
- Various Local Community Based Watershed groups
- HRM working on Sewage Water Management Strategy
- Federal Agencies suppose to develop strategy for SDS
- Harbour vision 1995/Federal Action Plan
- Fed. Councils – networking together on global basis (Bureaucrats without Boundaries)
- Harbour Solution Project
- Vision 20/20-Regional Planning Exercise
- Oceans Act- 3 Programs
- Fournier Task Force, Environmental Review Panel

Issues / Problems

- Agencies not sharing information
- Prov. Delegation of Authority
- Understanding and defining Stakeholders interest.
- Trying to integrate at geographical level
- What kind of Forum is realistic?
- How to work at the community level and local agency
- Who should champion this cause?
- Are there many champions?
- Public Consultation
- Integration of Regulatory Maze

Ideas / Suggestions

- Planning Function/Vision Function-building on past initiatives; National as well
- White paper on Goals and Objectives for the Harbour
- Prov / Fed legislation to direct policy on integration
- Environmental Assessment Process
- Review of past studies
- Strategic Environmental Assessment
- Integrated Working groups- Senior level – Director
- Ideas and Issues must come from or be supported by the local community
- Lead should be Municipal – HRM
  - Non regulatory in Harbour
  - responsible for land use
  - closer to people
  - Commitment to public consultation

Alternatives

- Benevolent Dictator
- Major users take direct action
  Identify and attack known key issues e.g. dump
- Turning all authority to HRM or Agency
  Put all three questions in one
- HRM only deals with domestic issues.

Group 4 (Topic 2), Rapporteur, John Sheppard

Inclusion of Stakeholders

- Harbour Management Plan
  - Water quality Objectives for Harbour adopted by HRM
  - How can Agencies collaborate
  - Developers work directly with communities
  - Hierarchy of Harbour uses/resources

- Management Mechanism
  - Partition harbour according to use
  - Tie into land uses
  - No overall mandate to co-ordinate pieces
  - Need blueprint for future harbour use
  - Freshwater integration-watershed through advisory group
  - Provincial and Municipal water resource strategies

- Plan Development
  - Core group of most-involved stakeholders
  - Broader consultations
  - Public venues
  - Symposium

- Who Leads?
  - Few key partners e.g. HRM Transport, Coast Guard, HPA EC, DFO

Topic 3

Opportunities for the Conservation and Restoration of Wildlife Habitat and Aesthetic Values in the Halifax Harbour

- What can realistically be achieved?
- By whom and at what cost?
- What are the Possible Partnerships?
- Are there Precedents to guide us in this endeavour?

Group 5 (Topic 3), Rapporteur, Donna Davis-Lohnes

Inventory

- Efficiencies
- Peoples' needs
- Educate the Public to what we want to protect
- Aesthetics is a separate issue from the rest
- Enhance existing habitat
- Improve appeal and usability
- Generate points of attraction
- Has to have aesthetic value
- Access to location
- Walkway around basin
- General marine clean up
- Getting rid of what is there
- Identify a process to determine peoples'needs (consultations)
- Goal, objective and common vision

What kind of Activities?

- Sink ship
- Enhance birding opportunities
- Wildlife attraction unit (wetlands)
- Aquarium (interactive)
- Create fish habitat (create reef)

Precedents

- Sackville River
- Chest Bay
- CARP
- Paul Dean – CWS

Burlington
Boston Harbour
Thames River

Group 6 (Topic 3), Raporteur, Bob Ogilvie

a) Issues

- actions should not be in isolation;
- constraints, e.g., financial;
- need for zoning of the harbour;
- community awareness needs to be improved, e.g., go into the schools.

b) Goals and Mechanisms

- identify projects, cost them, establish priorities;
- confine expertise in specific areas;
- examine governance models;
- develop baseline inventory;
- publicize successes.

c) Solutions

- develop vision of the harbour;
- HRM is the logical agency to take the lead.

Part 7

Essence of the Workshop

Summary & Conclusions of Workshop.

Brian Nicholls, Chair.

Part 1, The Halifax Harbour–An Ecological Entity.

In his paper, "The Living Estuary," **Dr. Ken Mann** provided an introduction to the ecology of Halifax Harbour as a living ecosystem by explaining the physical and biological principles of such a system. Viewed as a functioning ecosystem, he noted, Halifax Harbour has preserved most of its basic functions, but these have been modified by the presence of man; so that the harbour has lost much of its biological diversity and is much less productive of fish and shellfish than it was 250 years ago.

Paul Brodie provided specific information on the sightings of marine mammals, including whales, dolphins, porpoises and seals, throughout Halifax Harbour. The variety of species sighted is perhaps surprising, given the amount of shipping, industrial, military and other activity in the harbour. Dr. Brodie added that the harbour remains popular for eco-tours, sports-fishing, bird-watching and whale-watching.

Ron MacDonald and Harry Beach of Parks Canada outlined their agencies involvement in the harbour at five sites: Halifax Citadel, Prince of Wales National Historic Site (NHS), Fort McNab NHS, York Redoubt, and Georges Island NHS. They suggested that the concepts of commemorative and ecological integrity could be useful in any subsequent initiative pertaining to the preservation of the environment of Halifax Harbour.

Gordon Fader, Geological Survey of Canada (GSC), presented a comprehensive overview of his research on the surficial geology, sediment transport and anthropogenic features of Halifax Harbour, which has extended from 1988 to date. A geological history of the harbour has been interpreted from the data collected, and a regional synthesis of its marine geology is in the final stages of preparation, to be published as a GSC Bulletin. In concluding his presentation, he posed a number of pertinent questions to the workshop pertaining to the management of the harbour that have arisen from his investigations.

Part 2, Anthropogenic Stresses.

The first item comprised three papers from Environment Canada (EC) on domestic pollution input into Halifax Harbour. **John Clarke** provided an historical summary of the sewage disposal issue and reviewed problems arising from the discharge of sewage effluents. **Roger Percy** outlined the reporting and alerting system pertaining to spills into the harbour, and provided statistics derived from EC's spill trends data base for the period 1994-99. **Dr. K. L. Tay** described ocean disposal activities in the harbour. He noted that the legacy of contaminated sediments, together with the lack of disposal options for the dredging of these materials, will be with us for many years.

Under the title "Keys to Environmental Quality Management in Marine Areas of Halifax Harbour, **Dale Buckley's** presentation noted that there are three types of environmental issue of concern. These are: the aesthetics of the harbour, as determined by the senses of sight, smell and taste; the alteration or destruction of biological habitats and the resulting impacts on the corresponding species; and human health risks, for example arising from toxins in food products or human exposure to microorganisms in the water. Dr. Buckley stated that contaminant sources in the harbour are not solely due to the discharge of untreated sewage, citing the leaching of solid waste deposits and drainage of land surrounding the harbour, and also industrial effluents, as other sources.

The final paper in this part of the program, presented by **Capt. Randy Sherman** of the Halifax Port Authority, quantified shipping traffic in Halifax Harbour. This body of water represents the busiest harbour on the east coast of Canada, with several thousand ship movements per year. In 1999 there were 2436 commercial ship calls to the harbour, excluding DND and DFO vessels; of this total, 504 were in respect of container vessels, 108 in respect of fishing boats, and 78 in respect of cruise ships. The five yacht clubs in the area account for some 2500-3000 vessels; in addition, many recreational boaters make use of the nine launching ramps around the harbour.

Part 3, The Regulatory Environment. Thirteen federal acts and five provincial acts were identified as being applicable to the regulation of Halifax Harbour. These are listed below together with the responsible agency. Of these eighteen acts, nine federal and four provincial acts were summarized at the workshop by representatives of the respective agencies. Descriptions of all acts will be included in the proceedings of the workshop.

3.1 Federal Acts.

- Navigable Waters Protection Act (*Canadian Coast Guard*)*
- Canada Marine Act (*Halifax Port Authority*)*
- Canada Shipping Act (*Transport Canada*)*
- Transport Accident Investigation & Safety Board Act (?)
- Public Works Act (*Public Works & Government Services Canada*)*
- Federal Real Property Act (*Public Works & Government Services Canada*)*
- National Parks Act (*Parks Canada*)
- Fisheries Act (*Sect. 35 & 37– Department of Fisheries & Oceans*)* Fisheries Act (*Sect. 36–Environment Canada*)*
- Oceans Act (*Department of Fisheries & Oceans*)*
- Canadian Environmental Protection Act (*Environment Canada*)*
- Migratory Birds Act (*Environment Canada*)
- Explosives Act (*Natural Resources Canada*)
- Canadian Environmental Assessment Act (*Canadian Environmental Assessment Agency*)*

3.2 Provincial Acts

- The Environment Act (*N.S. Department of Justice*)*
- Crown Lands Act (*N.S. Department of Natural Resources*)*
- Beaches Act (*N.S. Department of*

Natural Resources)*

- Special Places Protection Act (*Nova Scotia Museum*)*
- Municipal Government Act (*N.S. Department of Municipal Affairs*)

* Presentation at workshop (refer to Appendix C, Workshop Agenda, for speakers).

Part 4, Non-regulatory Primary Stakeholders.

Papers were presented on behalf of the two Provincial Crown Corporations that have responsibilities for waterfront development around Halifax Harbour, The Waterfront Development Corporation, whose mandate covers the Halifax and Dartmouth waterfronts, and the Bedford Waterfront Development Corporation. **Bill Campbell** spoke to the former. The mission of The Waterfront Development Corporation includes the development of specific properties, and overall coordination, planning and promotion. Its stated "values" include public accessibility, preservation of historic elements, and respect for the environment. Highlights of development activities and projects were provided by both Bill Campbell and **Richard Hattin** (on behalf of the Bedford Waterfront Development Corporation). In the case of the latter, a current study pertaining to the use of pyritic slate as a fill material for waterfront projects was described.

Maurice Lloyd, on behalf of the Halifax Regional Municipality (HRM), provided a description of the HRM's Harbour Solutions Project. The decision has recently been taken to proceed with the development of a four-plant sewage treatment system involving installations in Dartmouth Cove, Central Halifax Peninsula, South-End Halifax Peninsula, and Mainland South. The Central Halifax Peninsula site has recently been announced. The total capital cost will be of the order of $315 million; the project will be implemented and operated through a public/private partnership; and citizen's water bills will be increased (by an average of $71) to contribute towards the costs.

Donna Davis-Lohnes, HRM Planning & Development, spoke to the other activities of the municipality pertaining to the marine and associated environments of Halifax Harbour: storm water and waste water discharges; source control; and land-use activities impacting on the harbour. The regulations that address these activities are promulgated under the Nova Scotia Municipal Government Act. Ms. Davis-Lohnes advised the meeting that the development of an integrated regional water resources management plan has been suggested and is receiving preliminary consideration.

Part 5, The Hamilton Harbour Case Study

Unfortunately the speaker on this project, Victor Cairns, Department of Fisheries & Oceans, Canada Centre for Inland Waters, Burlington, had to withdraw from the meeting at short notice. The Chairperson, Brian Nicholls, provided a brief summary of the initiative based on material in his possession. The project involves some eighteen agencies in the Hamilton region, and has been successful in protecting and restoring marine, freshwater and terrestrial habitat in and around Hamilton Harbour. The project has been ongoing for several years and has gained international attention.

Part 6, Looking to the Future: Workshops.

Participants were divided into six groups. With the help of facilitators, the following three subjects were considered (two groups per subject):

- Coming to terms with regulatory areas of overlap;
- Integrating Halifax Harbour marine & freshwater resources management;
- Opportunities for the conservation & restoration of wildlife habitat and aesthetic values in Halifax Harbour.

A key aspect of these deliberations was consideration of "where we go from here" in pursuing the preservation of the environment of Halifax Harbour.

Following the group sessions, rapporteurs presented the findings to the full workshop in a plenary session. The following summary presents the findings in point form as they were presented and according to sub-categories reflecting the breakdown provided in the agenda.

6.1 Coming to terms with regulatory areas of overlap (Group #1).

(a) Overlaps:

- there is a lot of overlap;
- hard to see where the boundaries are.

(b) Conflict (reasons for):

- first-come, first-served syndrome;
- timing;
- funding;
- different acts have different priorities;
- narrow focus;
- poor staff training.

(c) Solutions:

- seek a common vision;
- compile list of experts;
- disseminate information to proponents;
- encourage use of trained consultants;
- train staff on interdepartmental working relationships.

6.2 Coming to terms with regulatory areas of overlap (Group #2).

(a) Overlaps:

- ownership (federal, provincial, private, municipal);
- jurisdictional control (who does it?).

(b) Conflict (reasons for):

- various approval authorities authorizing conflicting projects;
- conflict between development and environmental protection;
- confusion on who to ask for permission;
- no overall strategy.

(c) Solutions:

- Coordinating body led by HRM (with participation of decision-making authorities);
- HRM needs a grand plan (overall land-use policy);
- Comprehensive education & public awareness plan.

6.3 Integrating Halifax Harbour marine & freshwater resources management (Group #3)

(a) Stakeholders(issues & interests):

- sharing of information;
- delegation;
- understanding interests of all stakeholders;
- working at the community level;
- need a "champion;"
- public consultation;
- integration of the "regulatory maze."

(b) Mechanisms:

- consider past/present initiatives;
- "benevolent dictator" concept;
- direct action by key stakeholders;
- strong planning function;
- strategic environmental assessment;
- ideas/issues must come from the community.

(c) Proposals & ideas:

- produce White Paper on goals & objectives;
- HRM, or "special"agency to lead;
- federal/provincial legislation to clarify role of HRM.

6.4 Integrating Halifax Harbour marine & freshwater resources management (Group #4).

(a) Stakeholders (issues & interests):

- large number of stakeholders (HRM, Transport Canada, CCG, DFO, Halifax Port Auth., Environment Canada, DND, industry, etc.);
- many competing harbour uses (fisheries, defense, recreation, heritage, tourism, shipping, industrial, aesthetics);
- will be more pressure as the community grows.

(b) Mechanisms:

- appointment of lead agency;
- "tie-in" land uses;
- partition harbour into various uses;
- prioritize uses.

(c) Proposals & ideas:

- harbour management plan (analogous to Regional Plan);
- HRM could be the "champion."

6.5 Opportunities for the conservation & restoration of wildlife habitat and aesthetic values in Halifax Harbour (Group #5).

(a) Issues:

- public consultation;
- multi-stakeholder;
- requirement for baseline inventory;
- public health aspects.

(b) Goals and mechanisms:

- create opportunities for access to harbour (walking paths, aquarium, sunken vessel for diving);
- clean-up of floatables, etc. (by community groups);
- enhance existing habitats;
- create new fish habitat;
- consider habitat needs of other wildlife, including birds;
- safeguard wetlands;
- get people involved;
- coordinated effort with a variety of players.

(c) Solutions:

- develop vision / grand plan;
- establish special coordinating agency;
- provide one-stop shopping;
- HRM is the logical lead agency.

6.6 Opportunities for the conservation & restoration of wildlife habitat and aesthetic values in Halifax Harbour (Group #6).

(a) Issues:

- actions should not be in isolation;
- constraints, e.g. financial;
- need for zoning of the harbour;
- community awareness needs to be improved, e.g. go into the schools.

(b) Goals & mechanisms:

- identify projects, cost them, establish priorities;
- combine expertise in specific areas;
- examine governance models;

- develop baseline inventory;
- publicize successes.

(c) Solutions:
- develop vision of the harbour;
- HRM is the logical agency to take the lead.

Poster Papers

A key part of the deliberations of the workshop involved the review and consideration of several poster papers presented by experts on specific topics pertaining to the preservation of the environment of Halifax Harbour:

- The Fisheries of the Halifax Inlet (Paul Rozee, DFO).
- Two Centuries of In-filling Activities in the Halifax Harbour (Paul Rozee, DFO).
- Freshwater Stream Losses in the Halifax Harbour Watershed (Jenna Bruin, Nova Scotia College of Art & Design).
- Seasonal and Geographical Distribution of PAHs in Mussels in Halifax Harbour (Jocelyne Hellou, DFO).
- Geological Interpretation of Inner Halifax Harbour (Gordon Fader, NRCan).
- Environmental Quality Assessment of Halifax Harbour: Geological and Geochemical Perspective (Dale Buckley, NRCan).

Part 8

Poster Presentations

The Fisheries of the Halifax Inlet

Paul Rozee

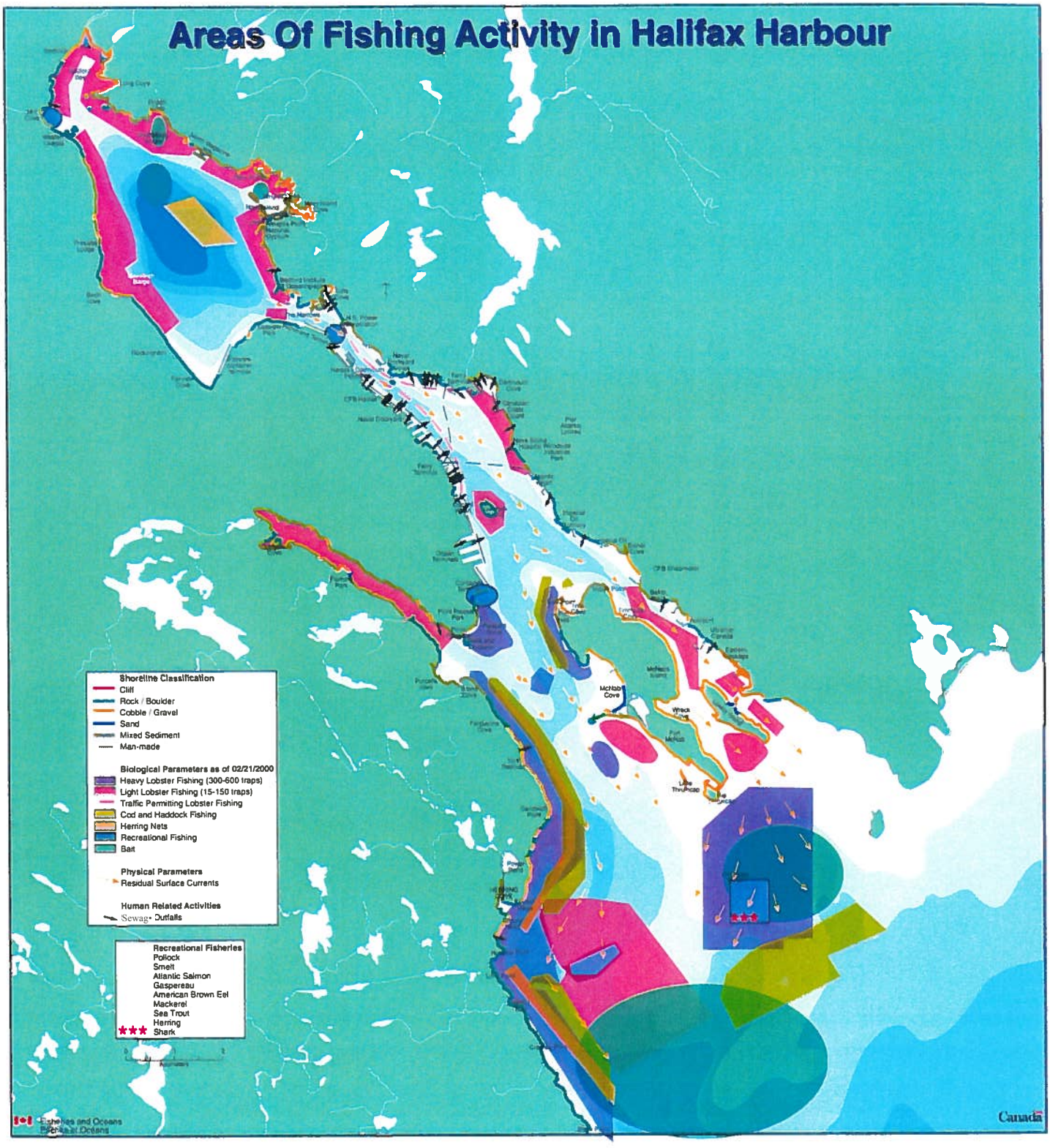
Lobster is the primary species harvested commercially within Halifax Harbour. The majority of the fishery takes place in the vicinity of McNabs Island and adjacent locations to the south. Ducharme (1991) states that serious lobster fishing occurs through the inner and outer harbour from the northeastern tip of McNabs Island (Ives Knoll) south to Sambro Head and eastward from Thrumcap Shoal to Devil's Island and beyond to West Lawrencetown (Heavy Lobster fishing 300-600 traps). Other areas where lobster fishing is conducted on a smaller scale include the Northwest Arm and portions of Bedford Basin (Light Lobster Fishing 15-150 Traps).

There are mussels and clams in abundance throughout the harbour but there is no commercial or recreational fishing permitted because of the high fecal coliform levels.

A small commercial fishery for finfish species takes place mainly in the outer harbour, in an area located seaward of McNabs Island. This includes groundfish species such as cod, haddock, pollock and halibut. Pelagic species (herring and mackerel) are also fished.

There is a bait fishery that occurs in Bedford Basin and throughout the harbour. This includes pollock, herring, mackerel and smelt. This bait is used for commercial fisheries as well as recreational.

Atlantic Salmon, Sea Trout, Gaspereau and American Eel also come into the harbour and hold up in Bedford Basin. Most migrate up the Sackville River. There are three other brooks that empty into Bedford Basin that might support salmon and trout. The brook that empties into Mill Cove Paper Mill Brook has shown signs of Salmon and Gaspereau. There is no data collected for Parkers Brook and Wrights Brook.


Areas Of Fishing Activity in Halifax Harbour
Shoreline Classification
Cliff
Rock / Boulder
Cobble / Gravel
Sand
Mixed Sediment
Man-made
Biological Parameters as of 02/21/2000
Heavy Lobster Fishing (300-600 traps)
Light Lobster Fishing (15-150 traps)
Traffic Permitting Lobster Fishing
Cod and Haddock Fishing
Herring Nets
Recreational Fishing
Bait
Physical Parameters
Residual Surface Currents
Human Related Activities
Sewage Outfalls
Recreational Fisheries
Pollock
Smelt
Atlantic Salmon
Gaspereau
American Brown Eel
Mackerel
Sea Trout
Herring
Shark
Fisheries and Oceans
Pêches et Océans
Canada

Two Centuries of Infilling Activities in the Halifax Harbour

Paul Rozee

In March 1999 the Department of Fisheries and Oceans identified infilling and habitat alteration in Halifax Harbour as an issue for various proponents to request approval for infilling of water lots in Halifax Harbour. The purpose of most of such requests is to make new land for property development for a variety of uses. Granting of approvals without reasonable justification gives a mistaken impression that the Habitat Management Division is not consistently and adequately protecting Fish habitat of Halifax Harbour as required under Section 35 of the Fisheries Act. Section 35(1) of the Fisheries Acts states "no person shall carry on any work or undertaking that result in harmful alteration, disruption or destruction of fish habitat" (HADD) unless authorized by the Minister of Fisheries and Oceans, pursuant to Section 35(2) of the Fisheries Act.

"The Policy for the Management of Fish Habitat" issued by the federal department of Fisheries and Oceans (DFO 1986) provides interpretation and directions for implementing the habitat protection provisions of the Fisheries Act. The Policy's guiding principle is "no net loss of productive capacity of fish habitat". Another issue that has been identified is that some infilling projects have taken place without prior approval. This has occurred in areas in the harbour that were likely fish habitat and Habitat Management did not have the opportunity to assess the project prior to the work being completed. There was no real idea of whether habitat actually existed in the effected areas so no charges under the Fisheries Act could be made. Assessing the potential impact of development activities on any renewable natural resource is complex.

Proponents can be classified into several categories

- private individuals
- municipalities or community councils
- voluntary or service organizations
- commercial developers

History

The Choice of Chebucto

Chebucto, the Halifax of today, had long been used by the French; and, longer still, by the Mi'kmaq. Brouillan had put into Chebucto in 1701 and from there travelled overland to arrive at the French community of Les Mines (Grand Pré). For the migratory Mi'kmaq, Chebucto was indeed the terminus as they made there way along the watery way of the Shubenacadie route; inland to their wintering places and out again in the summer to their traditional fishing grounds along the Atlantic shores.

On the 14th of June 1749 (OS) Edward Cornwallis, the English officer in charge, was aboard, off the coast of Nova Scotia. It was Governor Cornwallis' intention to proceed to Annapolis, but "the wind not serving the Bay of Fundy, and the officers assuring him that in case of foggy weather setting in they might be a long time in getting to Annapolis. He concluded on proceeding at once to Chebucto, rather than risk the possibility of being separated for

any length of time from the fleet [which was still making its way across the broad Atlantic]. He also felt, that by so doing, he would save the Governor of Louisbourg [Hopson] the bad and long navigation to Annapolis..."

So, on June 21st, the Sphinx cast her anchor in Halifax Harbour; and for a time, she was the only vessel that would have been seen off the wild shore above which Halifax was to be built. A number of days would pass before the transports (13 of them had left England with Cornwallis) showed up. Within a day of his arrival, Cornwallis penned his first report to the authorities at London. In part, it read:

"The coasts are as rich as ever they have been represented; we caught fish every day since we came ... The harbour itself is full of fish of all kinds. All the officers agree the harbour [Halifax] is the finest they have seen. The country is one continued wood; no clear spot is to be seen or heard of."
"I have seen few brooks, nor as yet have found the navigable river that has been talked of. There are a few French families on the East Side of the bay, about three leagues off. Some have been on board."

And, so, on this wild shore, land was cleared and structures of a new community went up: houses, a church, warehouses, wharves -- a new town, the first English town in Nova Scotia, came into being. In addition to the physical structures, with two or three thousand people living in close proximity, a civil government was to be immediately put in place. On Friday July 14th, Cornwallis gathered his advisors around him and formed his first council and it proceeded to its first meeting. This first council deliberated on board the spacious Beaufort, one of the transports anchored just off the shore in Halifax Harbour

The Constitution Act of 1867

The Constitution Act of 1867 (British North America Act) gave the issue of free navigation primacy over all other uses within public harbour areas. Public harbours were the property of the federal government. Harbour jurisdiction extended to the bed and the foreshores of the harbour, where these foreshores were actually used for harbour purposes. By Act of Parliament of Canada in 1927 the Corporation of Halifax Harbour commissioners (HHC) was created, to manage and administer public harbours on behalf of the federal government

Concerns

Protection from loss or degradation of fish habitat (HADD) as a result of development along Halifax Harbour is a growing concern for the present day Fish Habitat Management Division of DFO. The near shore areas of the harbour, are key areas for habitat management due to the importance of the relatively narrow band of inshore fish habitat to inshore and offshore fish (Halifax Harbour Sensitivity Mapping B.E. McGuire March 1993), and due to increasing development pressure. The ecosystem approach to fish habitat management is explicit in the federal fish habitat policy. Numerous legislative guidelines and policies have been developed to protect aquatic habitat. These are contained in the Federal Fisheries Act, the Department of Fisheries and Oceans' (DFO) Policy for the Management of Fish Habitat (1986), the Canadian Environmental Assessment Act and the Department of Natural Resources' Act and Regulations. The federal policy for management of fish habitat underlies all federal and provincial policies and guidelines. The ultimate objective of the policy to be achieved through the three stated goals: 1) conservation of habitat; 2) restoration of damaged habitat; and 3) development of new habitat, is that a net

gain of productive capacity of fish habitat should occur. On a project specific basis the guiding principle is "no net loss" of productive capacity of fish habitat. The Fisheries Act is the primary statute for the protection of fish habitat in Canada and overrides all other guidelines and policy for fish habitat protection.

Authorities

Federal

The authorities for federal jurisdiction in Halifax Harbour derive primarily from the Canada Shipping Act, the Navigable Waters Protection Act, and the Public Works Act as it pertains to navigational dredging, and the Fisheries Act. The federal Fisheries Act provides the means to protect fisheries habitat from degradation through pollutant discharge and spills into the aquatic system or by direct physical destruction.

Under the Canada Water Act, the federal government has authority to enter into agreements with the provinces regarding special interest watersheds or basins. Such agreements allow joint research and study efforts or the implementation of various or specific measures to manage the watershed for the enhancement of water quantity or quality.

Provincial

By virtue of the Constitution acts of 1867 and 1982, the provinces generally hold the prime jurisdictional authority over water management. Therefore, the province is the main "water manager" and can determine its apportionment or regulate its quality to meet provincial economic and social objectives. The Constitution Acts give the provinces ownership of public lands, minerals, rivers, and watercourses, and jurisdiction over generally all matters of a local/private nature in the province

Amalgamation

On April 1, 1996 Halifax, Dartmouth, the town of Bedford and Halifax County amalgamated to form the Halifax Regional Municipality (HRM) of approximately 330,000 residents. Before amalgamation each Municipality had their own planning committee for water development on Halifax Harbour, and they are still in existence after amalgamation. Now the new city (HRM) also has a development Committee for Halifax Harbour this has lead to confusion with the process that takes place when an application comes in for work on Halifax Harbour. To get control of the situation new communication between Federal, Provincial and Municipal must take place and a clear policy to handle applications that come in for Halifax Harbour must be made.

Waterfront Development

Bedford

The Town of Bedford has Approximately 12.87km (8 miles) of shoreline along the Bedford basin and the Bedford Bay. This shoreline was initially used by water-related industry such as pulp and paper, ship repair and other marine transportation uses.

In recent years, the main use of Bedford Bay and Basin shoreline has been for public and private recreational uses such as the Bedford Basin Yacht Club and numerous small docks for recreational boating.

Small Infill Projects:

There are a number of water lots that are privately owned and infilling is taking place on a number of these lots. They were given an exemption under the *Navigable Waters Protection Act.*

Large Infill Project
This site will be approximately 55 acres along the southwestern portion of the Bedford bay starting at Boutilier's Boat Yard and extending to Crosby Island, is own by Bedford waterfront Development Corporation

Planning Strategy
Town of Bedford Municipal Planning Strategy is to approve developments that enhance the unique nature of the Waterfront project area and that will improve and enhance the environmental features of the Bedford Bay and the Basin.

Eastern Passage / Cow Bay
Eastern Passage / Cow Bay has Approximately 26.35km (14.5 miles) of shoreline along Halifax Harbour. The water lots in that area have "Special Area Designation" classification.

Special Area Designation
Special Area Designation are areas which are environmentally and historically significant and which should be protected from indiscriminate development. These include both public and private lands.

Provincial Parks
There are provincial parks on the Halifax Harbour McNab's-Lawlor Island Park and a portion of the Cole Harbour-Lawrencetown Heritage Park Coastal Development control recommendations have been generally implemented by provincial authorities. The document contains specific recommendations for lands outside of the Coastal Heritage Park boundary in Cow Bay area including a 200-foot setback for all developments from waterbodies forming the buffer/conservation zone to the park.

Dartmouth
Dartmouth has Approximately 17.28km (10.7 miles) of shoreline on Halifax harbour. In the past this shoreline was used by water related industry, whaling ship base and processing site, various shipyards and other manufacturing uses such as chocolate, and soap factories. Presently the main use of Dartmouth shoreline is for ship repair and other marine services industries. Its importance is expected to increase with the development of the offshore industry in the region and this is why it has become a problem with some residents in the area (Noise Dust from ship repair etc....)

Future Expansion
The need for industrial expansion, particularily in the offshore related shipping industry and the need for valuable employment in the area pretty well guaranties the continued character of the Dartmouth shoreline as a "Working Waterfront". Past proposals have included a marine business park on infill lands in the Dartmouth Cove as well as maintenance of the Shubenacadie Canal.Recent studies have confirmed that a market exists for a marine businesses to service the emerging offshore industry. However there are new land use recommendations that will limit industrial expansion and improve existing sites. Some infilling is also planned to take place to increase lands for residential uses.

Halifax
The Halifax side of the harbour has Approximately 6.6km (4.1 miles) of shoreline from A Murray Mackay Bridge to Point Pleasant Park. In the past this area was used by water related industry such as ship repair, Military Naval Base and other marine transportation uses. Presently the main use of Halifax shoreline is for ship repair, marine transportation and Military Naval Base and activities.

Northwest Arm

The Northwest Arm has Approximately 8.4km (5.2 miles) of shoreline from Point Pleasant Park to Purcell's Cove. In the past it was used largely for recreational uses such as the Royal Nova Scotia Yacht Squadron and numerous small docks for for recreational boats and a park area (Dingle) Presently very little is changed except a lot more infilling takes place by small landowners.

Water Lots:

There are approximately 200-250 water lots on Halifax Harbour, several of them are privately own. Where a landowner does not own a water lot and wishes to construct large wharves, causeways, infills, or breakwaters they must, apply for a waterlot land lease. The submerged lands in Halifax Harbour excluding the waterlots granted before confederation are under the administration and control of Halifax Port Authority. The Halifax Port Authority allocates berths and anchorages; works closely with Navy and Coast Guard in planning for harbour emergencies; and promotes its own facilities and the harbour in general.

Freshwater Stream Losses in the Halifax Harbor Watershed

Jennifer Bruin

Introduction

The natural environment has taken billions of years to evolve. This gradual process of evolution is threatened by increasing demands for natural resources to support human communities. The results are seen in the decrease of streams and the aquatic life within them. The physical and chemical composition of streams are changing, affecting stream water quality and quantity These alterations are irreversibly changing the original pattern of stream evolution.

Project Summary

This study is a pilot project that seeks to develop and test a method to identify and map lost streams and habitat. The project focuses on changes to watersheds that drain into the Bedford Basin and Halifax Harbor over the past 250 years. These watersheds have been grossly affected by development primarily of an urban nature. Urban development is capable of altering the natural environment through the removal of vegetation, construction of impermeable surfaces, infilling of wetlands, excavation of soils, and the deposition of waste. Specific problems are associated with alteration of the natural environment include flooding, erosion, sedimentation, piped storm water drainage, infilling, and poor river aesthetics. The cumulative effects of poor river management are responsible for causing drastic changes in the water quantity of rivers and streams.

For the purpose of this study we have used a classification system indicating whether streams are existing or lost. Existing streams show up on current mapping but can potentially be in danger of becoming lost streams. These streams can have low water quantity due to such developmental factors as channelization, altered topography, water diversion, and removal or alteration of riparian vegetation. Lost streams are those that were represented on earlier maps and not observed on later maps. These streams are not necessarily irretrievable. The disappearance of a stream can be due to developmental practices, seasonal lows, or incorrectly mapped information.

Method

Anecdotal information and mapped sources have been collected and interpreted to determine the location of lost streams. Many early descriptions of the Halifax area have been recorded from explorers and settlers who noted the location of lakes and streams.

To compare the maps all information was scaled at 1:50 000 which made matching similar areas possible. In order to then interpret the information the most recent geological survey from 1992 was used as a base map. Information from single maps was compared with the 1992 map, making it possible to establish an understanding of missing streams. The 1992 map contrasted earlier archival mapping and distinguished existing streams from lost streams.

The streams identified as "lost" are those that did not show up on current map sources yet were present on archival map sources. Some of them are no longer in existence or severely altered with much of the waterway now underground (man made conduits).

They may have been channelized, redirected into other watersheds, cut from their tributaries, culverted, drained, filled and/or paved over.

Archival maps are illustrative representations of the landscape because line widths, shoreline widths and the size of water bodies are inaccurately represented. This report has identified the location of lost streams, yet the true volume of these lost streams is difficult to determine as a result of illustrative mapping techniques.

Some of the streams that disappeared from mapped records may be a result of incorrectly mapped information. Seasonal lows in water quantity may also have contributed to the apparent disappearance of a stream. Finally, information in this report is limited because the landscape is continually being altered and manipulated, so that streams continue to be lost or damaged.

The differentiation between lost streams and lost fish habitat is significant as a stream can continue to flow but may not be able to sustain a healthy fish population. The mapping portion involves visually illustrating a water quantity study. The identification of lost and existing species, however, involves an analysis of both water quantity and water quality issues.

Areas of endangered water quantity are at risk of becoming lost habitat. The following list of criteria which affect water quantity has been adapted from a classification process developed by the Lower Fraser Valley Stream Review. A stream that has any of these characteristics can be in danger of becoming lost.

Endangered Stream Criteria

1) Significant loss of riparian vegetation along more than 50% of the fish frequented length of the stream.
2) Channelization, or dyking of over 50% of the fish frequented length of the stream.
3) Effective impermeable area (measure of total water area does not infiltrate into the soil that is connected directly to the drainage network) covering approximately 10%, or greater, of the stream's watershed.
4) Greater than 50% diversion of stream flow (out of the system), or significant manipulation of flow.
5) Significant water quality problems, e.g. temperature, water chemistry.
6) Urbanization (settlement) in the watershed has significantly altered the stream basin.
7) Cleared pine forests in the watershed have significantly altered the stream basin.
8) Industrial and domestic sewage in the stream have significantly altered the water quality.
9) Other impacts (e.g. agricultural and cumulative effects of these impacts).

Findings

Today many streams have been lost either by burial or culverts. The Halifax and Dartmouth areas have been subject to intense urban development. The Sackville watersheds have encountered both urban and rural development pressures. Earlier settlement patterns relied on rural agriculture until about the 1960s when Sackville developed into a suburban community. Alterations to the environment occurred during the mechanical farming age from the 1800s to the 1900s, yet urban

development had the greatest impact on the entire study area.

The findings of this report are illustrated in a series of single factor maps from 1749 to 1992. These maps have been arranged according to approximately fifty-year intervals. The single factor maps have all been contrasted with the 1992 mapping to determine lost streams over time. The earliest comprehensive study that was conducted within the study area was complete in 1865. This early mapped information provides a picture of stream losses today.

Recommendations

The mapped information now requires ground truthing to determine that each Stream has been represented in mapped form as it appears in the field. The landscape is constantly changing which could render the current 1992-mapped source incomplete. Inconsistencies in archival mapping styles can create further difficulties in correctly representing the area.

Aerial photographs have been recorded since 1930 covering much of the Province of Nova Scotia. The use of these photographs and fieldwork can assist in determining if the mapped information is correctly represented.

In closing a summary of the recommendations are presented in Table 1 below. These recommendations are documented in a sequential order because each point depends on the knowledge obtained from completing the strategy recorded before.

Table 1 Recommendations for the recovery of lost streams in the Sackville River Watershed

Recommendation	**Method For Achieving**
More accurate mapping of information needed to verify method findings	Use fieldwork and aerial photographs
Assess all streams within the Halifax Regional Municipality	Develop a methodology derived from the method employed in this study
Develop stream reclamation program	Evaluate project findings to determine streams in need of recovery
Begin restoration with those watersheds that have suffered the greatest impact.	Begin restoration on watersheds draining into the Bedford Basin and Halifax Harbor
Determine source of environmental damage to streams	Examine land use from 1749 to 1992
Determine the impact of lost habitat on living organisms	Map areas where species diversity has changed (possibly using an indicator species)
Identify areas in need of habitat protection	Create synthesis map integrating lost streams, land use, and changes in species diversity

Lost Freshwater Streams in the Halifax Harbour Watershed Between 1865 and 1992

Jennifer Bruin N·S·C·A·D Nova Scotia College of Art and Design

INTRODUCTION

This study identifies lost streams and habitat. The project focuses on changes to watersheds that drain into the Bedford Basin and Halifax harbour. These watersheds have been grossly affected by development primarily of an urban nature.

Urban development is capable of altering the natural environment through the removal of vegetation, construction of impermeable surfaces, infilling of wetlands, excavation of soils and the deposition of waste.

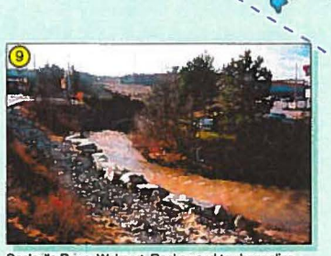
Specific problems associated with alteration of the natural environment include flooding, erosion, sedimentation, vegetation loss, piped storm water drainage, infilling of wetlands, and poor river aesthetics. The cumulative effects of poor river management are responsible for causing drastic changes in the water quantity, and water quality of rivers and streams.

Little Sackville River, Glendale St. Ditching has exposed soil which creates silty water.

Heflers Mill, Lucasville. Atlantic Salmon tagged at fish counting facility.

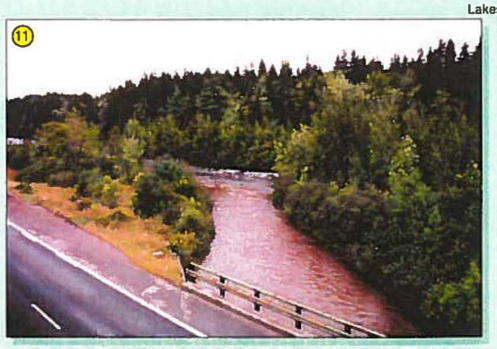
Little Sackville River. Feederbrook, highway #1. Brook placed into an above grade culvert which prevents spawning routes and fish passage.

Webber Lake. Stone lined drainage ditch increases water temperature and prevents natural vegetation on bottom of wetland.



Sackville Drive, Walmart. Rocks used to channelize stream flow through a highly developed area.

Little Sackville River, above Sackville crossroad. Construction of impermeable surfaces create poor ground water recharge resulting in low summer water levels.



Little Sackville River meets the main Sackville River, highway #101. The Little Sackville River's muddy water floods into the clean Sackville River. The main Sackville River once flowed where highway #101 is located.

Sackville River headwaters, Mt Uniacke.

Silt entering Drain Lake.

McCabes Lake drainage. Clear cutting for golf course has exposed soil.

Sackville Drive Conservation strategy using digger logs. Creates fish habitat by improving oxygen and meanders in river.

Bedford. Development is built within the floodplain.

Bedford Mall. Bedford community clean-up collected waste from the river bed.

STREAM CLASSIFICATION

For the purpose of identifying stream conditions we have used a classification system indicating whether streams are existing or lost.
Existing streams show up on current mapping but can potentially be in danger of becoming lost streams. These streams can have low water quantity due to such developmental factors as channelization, altered topography, water diversion, and removal or alteration of riparian vegetation.

Lost streams are those that were represented on earlier maps and not observed on later maps. These streams are not necessarily irretrievable. The disappearance of a stream can be due to developmental practices, seasonal lows, or incorrectly mapped information.

ENDANGERED STREAM CRITERIA

The following criteria affects water quantity. A stream that has any of these characteristics can be in danger of becoming lost. *(Adapted from the Lower Fraser Valley Stream Review)*

1) Significant loss of riparian vegetation along more than 50% of the fish frequented length of the stream

2) Channelization, or dyking of over 50% of the fish frequented length of the stream.

3) Effective impermeable area (measure of total water area that does not infiltrate into the soil and is connected directly to the drainage network)
covering approximately 10%, or greater, of the stream's watershed.

4) Greater than 50% diversion of stream flow (out of the system), or significant manipulation of flow.

5) Significant water quality problems, e.g. temperature, water chemistry.

6) Urbanization (settlement) in the watershed significantly altering the stream basin.

7) Cleared forests in the watershed significantly altering the stream basin.

8) Industrial and domestic sewage in the stream significantly altering the water quality.

9) Other impacts (e.g. agricultural and cumulative effects of these impacts).

Legend

- Existing Streams
- Water Bodies
- Lost Streams
- Lost Water Bodies
- Existing Wetlands
- Lost Wetlands
- Infill

Sources of Information
Nova Scotia Research Foundation Corporation

Survey and Mapping Branch,
Department of Energy Mines and Resources

This study has utilized archival mapping and anecdotal information. Ariel photographs and field work will be further used for ground truthing.

Fisheries and Oceans Pêches et Océans Canada

Canada

Seasonal and Geographical Distribution of PAHs in Mussels, *Mytilus edulis*, collected from Halifax Harbor in 1997-1999.

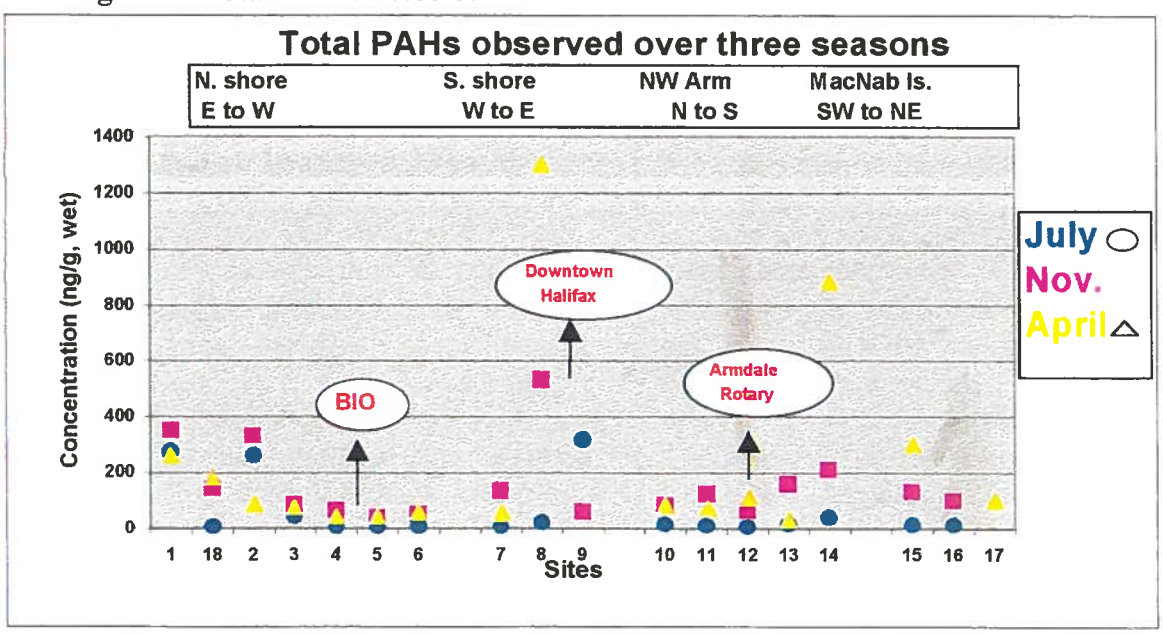
Jocelyne Hellou

Introduction:

PAHs are the most predominant group of organic contaminants in coastal locations world wide, and are recognised or recommended as priority pollutants by Canada, the US and the European Community. Hydrocarbons originate from combustion and petroleum sources, as well as to a lesser extent in urban harbours, from diagenic and biological sources. Their continuous production associated with human activity and resulting increasing levels in the environment has raised health concerns internationally. This has motivated assessment and research studies in numerous environmental sectors and resulted in many multidisciplinary investigations. Biological effects associated with the presence of PAHs include behavioural, carcinogenic, immunologic, narcotic, physiological and reproductive.

Mussels, *Mytilus edulis*, are sedentary intertidal filter feeders and good indicator organisms of contaminants present in the water column and circulating on particles (algae, sediments and/or colloids). Previous studies have shown a yearly cycle for biological and/or chemical variables in mussels. In cases where there are continuous inputs of organic contaminants, bioaccumulation in bivalves is at a minimum after spawning, increasing over a period of months and eventually reaching an equilibrium with the environmental levels. Our interest has been to determine the concentration of polycyclic aromatic hydrocarbons (PAHs), condition index (CI) and lipid content (LC) in mussels collected from Halifax Harbour, over three seasons. The latter two parameters would reflect the health of the animals on a limited level of complexity indicative of the effect of cumulative biological, physical and chemical stresses.

Figure 1. Total PAHs detected in



Results and Discussion:

Concentrations of PAHs for *Mytilus edulis* collected in July and November 1997, and April 1999 are represented in Figure 1. PAH concentrations varied per site and season, and as expected, spawned mussels collected in July, generally displayed the lowest concentrations. Mussels collected from 5 sites, i.e. sites 3, 4, 5, 6 and 10, displayed a relatively similar and low level of contamination over the next two sampling periods, indicating that there is a relatively uniform background level of PAH available to these animals (Figure 1). Blue mussels from at least 5 sites, i.e. sites 1, 2, 8, 9 and 14, displayed increased concentrations, in November and/or April, more than 10 times higher than the mean background level.

The source of PAHs can be distinguished by the pattern of single compounds present and by examining and comparing other groups of hydrocarbons and hetero-aromatic compounds. The higher bioavailability of combustion sources was generally observed in mussels, although some exceptions were apparent. Bivalves obtained from site 2 in July and November showed enrichment with petroleum PAHs. November mussels from site 13 bioaccumulated more weathered petroleum than those at site 2. In April, mussels from sites 18, 13 and 17 displayed a higher petroleum input than those from other sites, while animals from sites 8, 14 and 15 bioaccumulated the highest levels of combustion PAHs. It is of interest to report that only dead mussels could be found around site 9 in April 1999, and that samples collected at the next Eastern and Western sites, i.e. sites 14 and 8, respectively, had PAH concentrations up to more than 50 times those observed as background levels.

The term condition index (CI) refers to a comparison between the soft tissue content of bivalves relative to their external dimensions. It was first developed to determine the marketability of fisheries products and can be measured in a variety of ways that correlate well with each other. This index is affected by at least respiration, density and feeding of animals, and temperature, and varies throughout the reproductive cycle. The CI responds to multiple/cumulative stresses, where PAH pollution has been observed to reduce growth and therefore the CI. In the present investigation, the mean CI was 0.38 in July and 0.56 in April, with different values and trends observed between sites and/or seasons. Animals from site 4 showed the least change in CI over time, possibly associated with a high density of bivalves, while blue mussels from sites 8 and 9 displayed the highest CI in July.

Proteins, carbohydrates and lipids are the three major classes of natural products found in organisms. Lipid content (LC) can vary with the age and sex of animals, as well as with season, food uptake and temperature. Therefore, this parameter is commonly used as a health indicator; and it also responds to multiple/cumulative stresses. However, exposure of aquatic organisms to PAHs has been associated with an impairment of lipid metabolism, e.g. changes in sub-classes of lipids, membrane fluidity, transport of lipids and an increase in LC. Presently, mean LC was lowest in April

and highest in July (2.5 vs 4.9%, dry weight), with mussels at site 8 showing some of the highest LC values at all times.

This study represents a first step in assessing the fate and effects of the most predominant organic contaminants in *Mytilus edulis* collected around the perimeter of Halifax Harbour. Our results suggest that human activity affects the level of PAHs in mussels. We identified several locations needing further work. The biological assessment using two samples to measure cumulative indicators does not readily correlate fate with effects. This is not surprising in view of the complexity of living organisms, of chemical-biological interactions, the range of possible effects and the scarcity of our measurements over time.

Conclusion:

Halifax Harbour receives an intermittent and sometimes elevated input of PAHs. More work is required on mussels inhabiting Halifax Harbour and other coastal environments. It is also important to examine harbour sediments, which represent a sink for many types of contaminants and to investigate the fate and effect of pollutants in higher and lower links of the food chain.

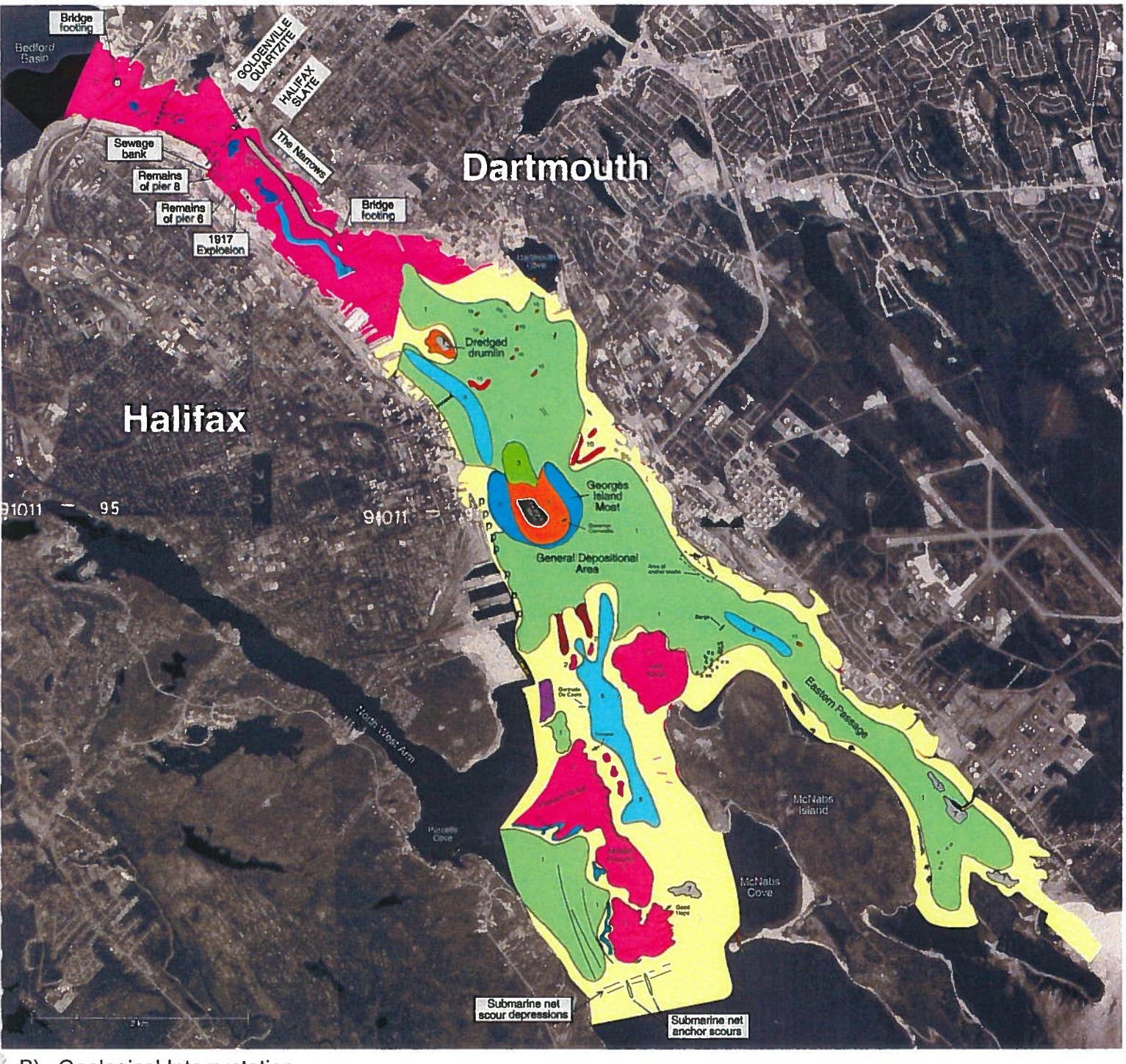
Acknowledgements:

The authors would like to thank Dale Ashfield and Carol Anstey for collecting and dissecting mussels and the Toxic Chemicals Program for funding (1997-2000). Ken Freeman helped to identify the blue mussels from the second species commonly available in harbours.

Geological Interpretation of Inner Halifax Harbour

G.B.J. Fader, R.O. Miller and R.C. Courtney

Geological Survey of Canada (Atlantic) Dartmouth Nova Scotia



B). Geological Interpretation

1 General depositional area
2 Hard bottom (non-depositional area)
3 Georges Island lee-side sediment drift
4 Obstacle-induced sediment drift
5 Moat (non-depositional zone)
6 Area of current erosion and/or periodic deposition
7 Dredged area
8 Glacially-overdeepened depression
9 Drumlin
10 Till topographic high
11 Dredge spoil area
12 Channel of Ancestral Sackville River

Bedrock ridge or seabed expression of subsurface bedrock ridge
Blasted bedrock topographic high
Relict beach ridge
Boulder berm (former shoreline)
Sedimentary furrows (linear current-formed erosional scours)
1917 Explosion location of Mont Blanc (Halifax Explosion Ground Zero)
1864 & 1932 Narrows bridge footings and remains
Dredge spoils
Jack-up oil rig spud can impressions

Trongate depression (impression of hull of salvaged shipwreck)
Shipwreck (unidentified)
Sewage outfall
Borrow pits (circular aggregate mining depression)
Linear aggregate mining depression
Mini-Trongate depression (ship hull impression)
Propeller-scoured areas

Note: Large areas of seabed are covered with anchor drag marks but only a few of the large ones show on the multibeam image. Most are concentrated in the southern Narrows and to the north and southeast of Georges Island.

Recommended citation:
Fader, G.B.J., Miller, R.O., Courtney, R.C., 1996. Interpretation of Multibeam Bathymetry, Inner Halifax Harbour. Geological Survey of Canada, Open File 3411, 1 sheet, map scale 1:5 000.

ENVIRONMENTAL QUALITY ASSESSMENT OF HALIFAX HARBOUR : GEOLOGICAL AND GEOCHEMICAL PERSPECTIVE

DALE BUCKLEY

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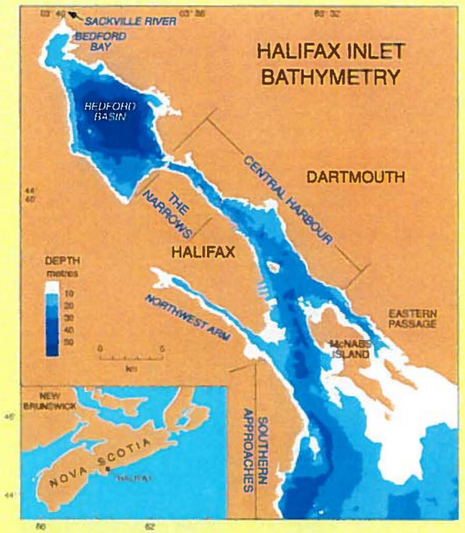
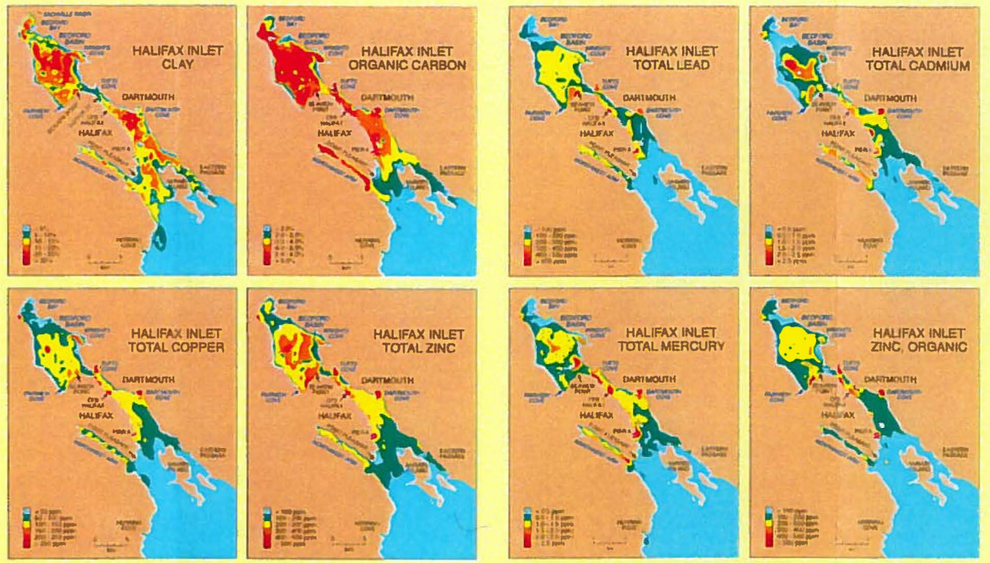
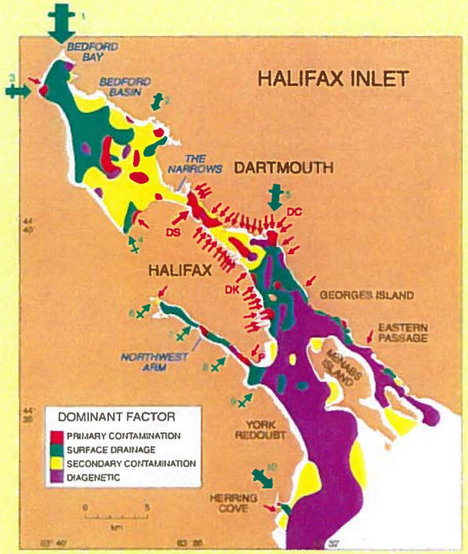


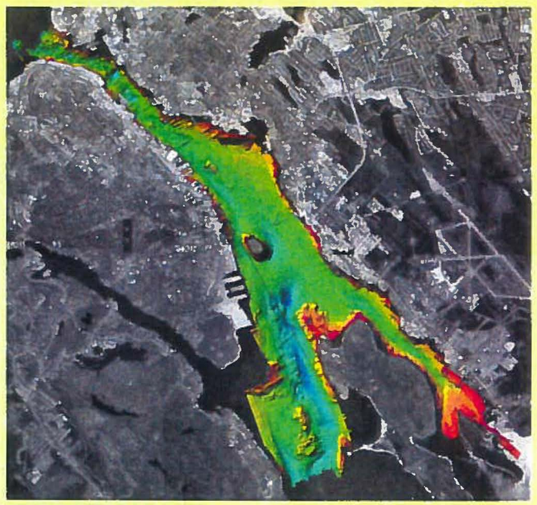
The cities of Halifax and Dartmouth and the adjacent metropolitan communities have developed around Halifax Harbour since 1749. These urban centres have contributed contaminant metals and organics to the harbour through discharge of sewage and industrial waste, leaching of land fill sites, and ocean dumping. The distribution of contaminated sediments reveals containment sources and the estuarine circulation in Halifax Harbour.



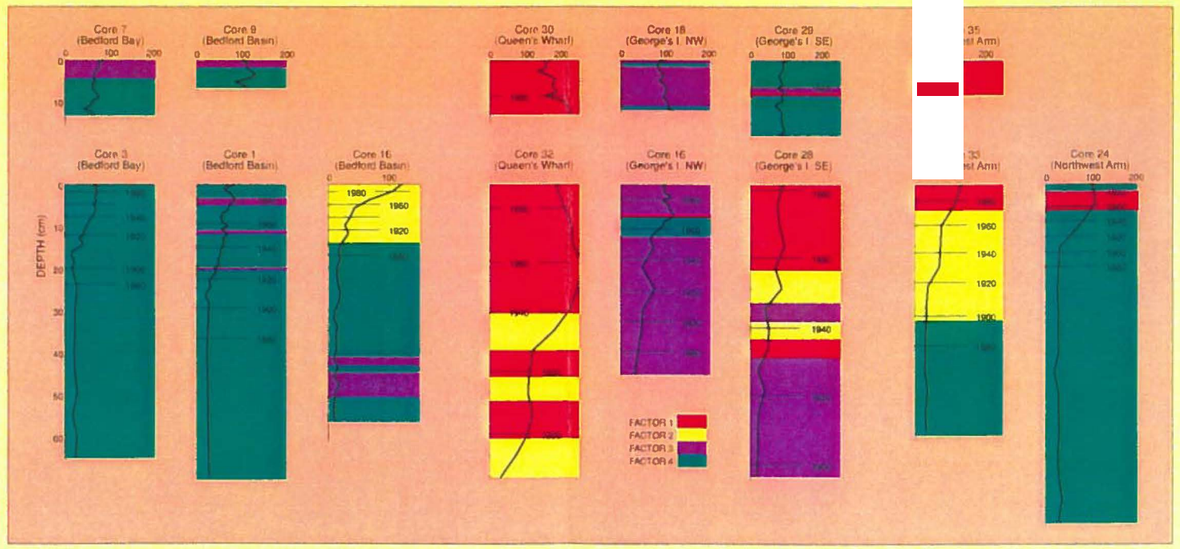
Results of geochemical analyses of 274 surficial sediment samples have been compiled on maps which show that most of the contaminants in sediments are confined to the central harbour and Bedford Basin. (Buckley and Winters 1992)



Statistical analyses of geochemical data have been used to classify four sediment types (factors) related to processes of contamination and metal accumulation. Distribution of dominant factors helps to identify areas being impacted by sewers, land fill sites, surface drainage, and by modification of older deposits. (Buckley and Winters 1992)

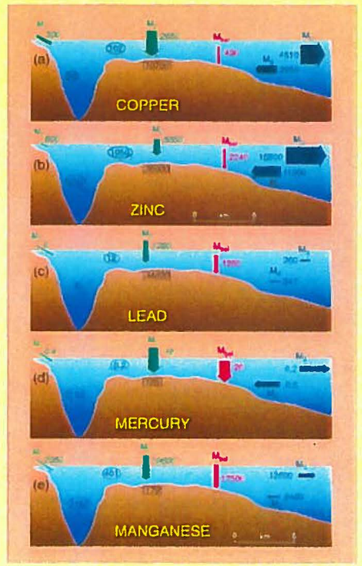


Detailed bathymetry of the central part of Halifax Harbour has been revealed by acoustic swath surveys compiled in digital format. (Courtney and Fader 1994)



Profiles of dated sediment cores showing concentration of total copper with depth in core. Dates have been determined by 210Pb and 137Cs method. Colour zones represent dominant environmental factors prevailing at time sediments were deposited; factor 1 represents primary contamination, factor 2 represents secondary contamination, factor 3 represents remobilization by diagenesis, factor 4 represents inputs from surface drainage. (Buckley et al. 1994)

Annual transport of dissolved metal through Halifax Harbour is depicted in units of Kg per year. Inputs from sewers are depicted as M2, surface drainage as M1, exchange with the open ocean as M3, and M4, and dissolved metal scavenged from the water column as Mbal. Annual accumulated reactive metal in sediments is shown in rectangular box below seafloor in central harbour. Numbers in ovals represent standing mass (Kg) of metal dissolved in water column. (Buckley and Winters 1992)



REFERENCES

Buckley, D. E., and Winters, G. V., (1992). Geochemical characteristics of contaminated surficial sediments in Halifax Harbour: impact of waste discharge. Canadian Journal of Earth Sciences, 29: 2617-2639.

Buckley, D. E., Smith, J. N., and Winters, G. V., (1994). Accumulation of contaminant metals in marine sediments of Halifax Harbour: historical trends (in prep.).

Courtney, R. C., and Fader, G. B. J., (1994). A new understanding of the ocean floor through multibeam mapping. Bedford Institute of Oceanography, Biennial Review, 1992-1993. (in press).

Appendices

A.....Workshop Invitees

B..... Federal and Provincial Acts that regulate Halifax Harbour

C..... Workshop Agenda

D..... Matrix of human activities vs. Regulatory and Administrative responsibility in Halifax Harbour

Appendix "A"

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Federal and Provincial Acts that regulate Halifax Harbour

- **Navigable Waters Act:** *Canadian Coast Guard* (CCG)

- **Canadian Migratory Birds Act:** *Canadian Wildlife Service* (CWS)

- **Fisheries Act:** *Department of Fisheries and Oceans* (DFO)
Department of Fisheries and Aquaculture (DFA)

- **Oceans Act:** *Department of Fisheries and Oceans* (DFO)
(*Responsibility for integrated management of all activies or measures in or affecting estuaries, coastal waters and marine waters)*

-**Canada Environmental Protection Act:** *Environment Canada* (EC)

-**Canada Environmental Assessment Act:** *Environment Canada* (EC)

-**Canada Marine Act:** *Halifax Harbour Master*(HHM)

- **Real Property Act:** *Dept. of Public Works* (PWGSC))

- **Public Works Act:** *Dept. of Public Works* (PWGSC)

- **Canada Explosives Act:** *Natural Resources Canada* (NRCan)

- **The Nova Scotia Environment Act:** ***Nova Scotia Dept. of Environment*** (NSDOE)

- **The Nova Scotia Crown Lands Act:***Nova Scotia Dept. of Natural Resources* (NSDNR)

- **The Nova Scotia Beach Protection Act:** *Nova Scotia Dept. of Natural Resources*

- **National Parks Act:** *Parks Canada* (PCH)

- **Canada Shipping Act:** *Transport Canada & Canadian Coast Guard* (TC) & (CCG)

- **Canadian Transportation Accident Investigation and Safety Board Act:** *Transportation Safety Board of Canada* (TSB)

- **Special Places Protection Act:***Dept. of Tourism and Culture* (DOT)
Dept of Natural Resources (DNR)

Appendix C

WORKSHOP, March 14 & 15, 2000
Preserving the Environment of the Halifax Harbour

Location: *The Art Gallery of Nova Scotia, 1723 Hollis St., Halifax, NS*
Sponsors: *DFO and the Halifax Regional Municipality (The Harbour Solutions Project)*

A gathering of regulatory stakeholders to discuss regulatory overlaps, assess the potential for integration of all marine resource management in the Halifax Harbour, and identify opportunities for the conservation and restoration of wildlife habitats and aesthetic values.

Agenda
Tuesday, March 14th

08:00 **Registration** (Name Tags & Registration Package)

08:30 **Opening welcome from DFO**
George DaPont, Associate Regional Director-General

08:40 **Welcome, introduction, purpose & objectives**
Chair, Brian Nicholls, DFO-Retired

Part 1 - The Halifax Harbour - An Ecological Entity

09:00 **The Living Estuary**
Dr. Ken Mann, DFO Emeritus Scientist

09:30 **Historical/Ecological Integrity**
Dr. Ron MacDonald, Parks Canada

10:00 **Coffee Break**

10:15 **Halifax Harbour and Marine Mammals - Life in the Shipping Lanes**
Dr. Paul Brodie, Consultant

10:45 **Geology & Anthropogenic Features of the Halifax Harbour**
Gordon Fader, NRCan. Scientist

Part 2 - Anthropogenic Stresses

11:15 **Domestic Pollution Input**
Roger Percy, John Clark, Dr. Kok-Leng Tay, EC Scientists

11:45 **Keys to Environmental Quality Management In Marine Areas of the Halifax Harbour**
Dale Buckley, NRCan, Emeritus Scientist

12:15 **Lunch Recess (Lunch Provided)**

13:15 **Traffic Quantification, (Shipping, Yachting)**
Capt. Randy Sherman, Harbour Master, Director of Operations

Part 3 - The Regulatory Environment

N.B. *Here follows a series of brief presentations by representatives of the principal regulatory agencies who, either unilaterally or in consultation with one or more regulatory bodies, make important decisions on matters of a development nature in or near the Halifax Inlet. The presenters will endeavor to fully identify the authority or law base that supports their decision making responsibility. The presentations will be limited to 15 minutes and to save time questions relating to these topics will be addressed in a 30-minute period reserved at the end of the session. The chairperson will have to exercise somewhat strict control to remain on schedule.*

13:45 **Canadian Coast Guard (Navigable Waters Protection Act)**
Larry Wilson, CCG Regional Director

14:00 **Halifax Port Authority (Canada Marine Act)**
Capt. Randy Sherman, Harbour Master, Director of Operations

14:15 **Transport Canada (Canada Shipping Act)**
Mike Balaban, TC Senior Marine Surveyor

14:30 **Public Works & Government Services (Public Works Act)**
Dr. Hari Samant, PWGSC, Regional-Manger
Ray Lewis, PWGSC, Client Services

14:45 **Fisheries and Oceans Canada (Oceans Act)**
Faith Scattolon, DFO Regional Director, Oceans Branch

15:00 **Coffee Break**

15:15 **Fisheries and Oceans Canada, (*Fisheries Act S. 35 & 37)***
Brian Thompson, DFO Manager, Habitat Management Division

15:30 **Department of National Defense**
Carol Lee Giffin, DND Formation Environment Officer

15:45 **Environment Canada (Fisheries Act S. 36, and the Canadian Environmental Protection Act)**
Dave Aggett, EC Enforcement

16:00 **Department of Environment Nova Scotia, (The Environment Act)**
Christine Mosher, NSDOJ, Solicitor

16:15 **Department of Natural Resources Nova Scotia, (Crown Lands Act, Beaches Act)**
Harry Ashcroft, NSDNR Manager, Land Services

16:30 **Department of Tourism & Culture, Nova Scotia (Special Places Protection Act)**
Bob Ogilvie, Nova Scotia Museum

16:45-17:15 **Question and Answer Period - Regulatory Environment**
Participants will put forward as many questions relating to the eleven previous presentations, particularly on areas of possible overlap, as can be entertained in the half hour provided and save other questions or comments on cards, provided in the registration package, to be dealt with during the workshop sessions on day two.

Wednesday, March 15th

08:30 **Environment Canada, Canadian Environmental Assessment Agency**
Bill Coulter, Director, CEAA

Part 4 - Non-Regulatory Primary StakeHolders

09:00 **Waterfront Development Corporation**
Bill Campbell, Director, Planning & Development

09:30 **Bedford Waterfront Development Corporation**
Richard Hattin, BWDC Manager

10:00 **Coffee Break**

10:15 **Halifax Regional Municipality (HRM) Harbour Solutions Project**
Maurice Lloyd, HSP Director

10:45 **Planning and Development Services**
Donna Davis-Lohnes, HRM, Planning and Development

Part 5 - The Burlington Harbor Case Study

11:15 **Integrating Habitat Restoration into an Existing Situation**
Victor Cairns, DFO Burlington, Ontario

11:45 ***Part 6 - Looking to the Future: Workshops***

Coming to terms with areas of overlap and/or conflict between regulatory agencies; integrating marine freshwater resources protection with planning and development activities and; co-operating in restoration of wildlife, fish habitats and aesthetic values of the Halifax Harbour.

N.B. *The participants have been divided into six approximately equal groups and, with the help of DFO appointed facilitators, they will explore, discuss, debate and record their findings on the following three subjects (two groups per subject). Each group will be expected to give a 10-minute presentation relating their findings, proposals and recommendations. A rapporteur appointed from each group will present their findings to the general assembly of participants. A five minute period will be allocated for Questions and Answers at the end of each presentation.*

Group 1 and 2

Coming to Terms with Regulatory Areas of Overlap
- *Identifying the overlaps*
- *Identifying the conflicts*
- *Developing solutions (Hierarchy in the regulations)*

Group 3 and 4

Integrating Halifax Inlet Marine and Freshwater Resources Management
- *How do we ensure that all stakeholder's interests are considered in future projects?*
- *What are the possible mechanisms available to integrate such a wide spectrum of management activities?*
- *Explore alternate proposals.*

Group 5 and 6

Opportunities for the Conservation and Restoration of Wildlife Habitat and Aesthetic Values in the Halifax Inlet
- *What can realistically be achieved?*
- *By whom and at what approximate cost? Possible partnerships?*
- *Are there precedents to guide us in this endeavor?*

12:30 **Lunch Recess (Lunch Provided)**

13:30 **Workgroups: Presentation of Findings**
Rapporteurs

14:45 **Part 7 - Summary Conclusions of Workshop**
Brian Nicholls, Chairperson

15:15 **End of Workshop**

N.B. *The Proceddings of the Halifax Harbour Workshop will be published by Fisheres and Oceans Canada in partnership with the Halifax Regional Municipality (The Harbour Solutions Progect). The document will include the papers presented, the four workshop session repots, the summary conclusion and the recommendations made by the working groups.*

POSTER PRESENTATIONS

- **The Fisheries of the Halifax Inlet** — **Paul Rozee**
- **Freshwater Stream Losses in the Halifax Harbour Watershed** — **Jenna Bruin**
- **Two Centuries of In-filling Activities** — **Paul Rozee**
- **Geological Interpretation of Inner Halifax Harbour** — **Gordon Fader**
- **Environmental Quality Assessment of Halifax Harbour: Geological and Geochemical Perspectives** — **Dale Buckley**
- **Seasonal and Geographical Distribution of PAHs in Mussels in the Halifax Harbour** — **Jocelyne Hellou**

Matrix of Human Activities vs. Regulatory and Administrative Responsibilities in Halifax Harbour

**** Refer to Appendix "B: for explanation of acronyms"***

Activities	Administrating Stakeholders in Halifax Harbour																		
	Federal												Provincial				Municipal		
	DFO		Transport Canada		EC			DND	NRCan[1]	PCH	HHM	PWGSC	DOE	DNR	DFA	DOT	HRM	WDC	BWDC
	CCG NWPA	HMD	TC	TSB	WMRS	CWS	CEAA												
Aquaculture cage or similar structure	X	X			O	X	X								X				
Blasting underwater	X	X					X	X			X				X	X	X		
Bridge constructing or maintenance	X	X			X		X	X			X		X	X	X	X	X	X	
Bulk Storage on waters' edge		X			X		X						X		X	X	X		
Commercial fishing activities		O					X	X			X				X				
Constructing or Maintaining a Culvert	X	X						X					X	X	X	X	X	X	
Constructing or Maintaining a wharf, skidway or boat ramp	X	X			O		X	X			X			X	X	X	X	X	X
Diverting a watercourse	X	X			O	X	X	X					X	X	X	X	X		
Diving	X		X					X			X					X			
Dredging	X	X			O		X	X			X		X	X	X	X		X	
Fish destruction other than commercial fishing		X				X	X	X							X	X			
Fish habitat improvement structure,		X					X	X						X	X				
Fishway, counting fence, constructing or maintenance	X	X					X								X				
Gravel extraction		X					X						X	X	X	X			
Infilling		X				X	X	X		X	X		X	X	X	X	X	X	X
Install or maintaining a submerge pipeline, cable or other equipment	X	X			O		X	X			X			X	X	X	X	X	
Intakes		X					X	X			X		X	X	X		X	X	
Land development on waters' edge		X				X	X	X				X	X		X	X	X	X	X
Leasing of a waterlot		X				X	X	X		X			X	X	X		X	X	X
Marinas	X	X					X			X			X	X	X	X	X	X	X
Marine animals destruction other than commercial harvest		X				X	X								X				

"O" - Activities of indirect concern

[1] no information available

Activities	Administrating Stakeholders in Halifax Harbour																		
	Federal												Provincial				Municipal		
	DFO		Transport Canada		EC			DND	NRCan[1]	PCH	HHM	PWGSC	DOE	DNR	DFA	DOT	HRM	WDC	BWDC
	CCG NWPA	HMD	TC	TSB	WMRS	CWS	CEAA												
Marine animals commercial harvest		X					X								X				
Marine plants removal		X				X	X							X	X				
Ocean disposal		X			X		X	X						X	X	X			X
Naval activities					X	X	X	X			X				X			X	
Off loading and loading vessels			X	X	X		X				X		X						
Other Navigation obstructions (moorings etc)	X			X				X			X			X	X	X		X	
Outfalls		X			X		X	X		X	X	X	X	X	X		X	X	
Placing Rock or other Erosion Protection (works)		X					X	X			X	X	X	X	X	X	X	X	X
Recreational boating	X										X							X	X
Reef Creation	X	X			X		X	X			X			X	X	X			
Removal of (beach) material		X					X	X						X	X	X			
Research		O			X	X		X		X					X	X			X
Ship yard activities		X			X										X				
Spills	X	X			X	X				X	X		X		X		X		
Surface runoff		X					X	X				X	X		X		X	X	
Using equipment less than 3m from waters' edge		X						X					X		X		X	X	
Vessel traffic > 20m				X				X			X		X						
Wastewater discharge marine		X			X	X		X		X					X		X		X
Wildlife habitat restoration development		X			X	X	X	X						X	X	X	X		

"O" - Activities of indirect concern

[1] no information available