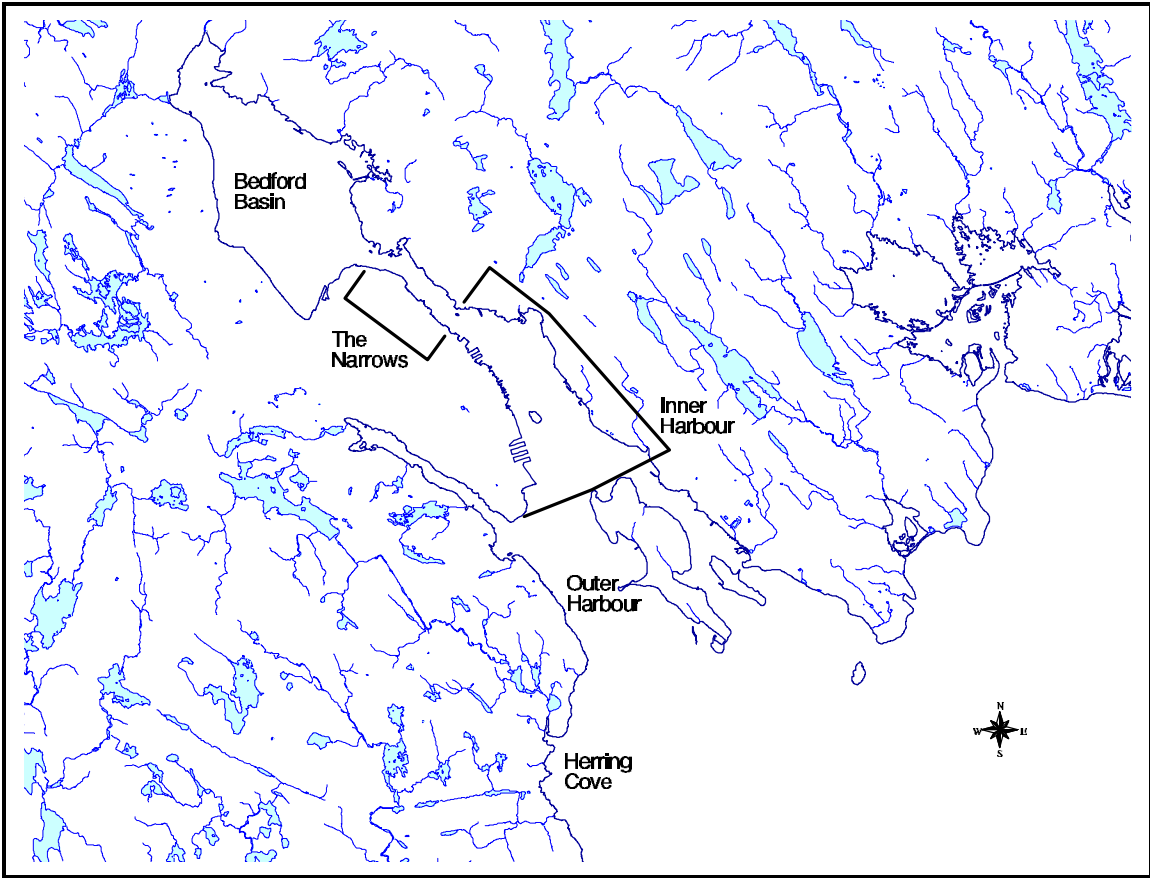


HALIFAX HARBOUR SOLUTIONS ADVISORY COMMITTEE

FINAL REPORT TO COUNCIL **Halifax Regional Municipality**



March, 1998

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1.0 INTRODUCTION

1.1 Background

Sewer construction in Halifax began in the 1880s and by 1924 approximately thirteen sewers were discharging raw sewage into the Harbour. Since then, there has been considerable discussion on that issue and some advances have been made. Numerous committees have been established to determine a long term solution and many studies have been done to assess the situation from all perspectives. In spite of this work, a comprehensive, long term solution has not yet been achieved. One hundred years later, raw sewage is still being discharged into the Halifax Harbour.

In November of 1996, a two-day symposium on finding solutions to the Halifax Harbour pollution problem, was held at Dalhousie University. It was sponsored by Halifax Regional Municipality (HRM) in cooperation with Environment Canada and the Nova Scotia Department of the Environment. It was one of the first public initiatives of the new Regional Council. It was a success, locally and nationally. It provided advice to the Council on the community's parameters for proceeding to resolve this important issue. As a result of this symposium, the Halifax Regional Council appointed an advisory committee to complete and focus the guidance in developing harbour solutions.

The Halifax Harbour Solutions Advisory Committee is pleased to have been asked to make its contribution and applauds all levels of government in their desire and commitment to solve the Harbour pollution problem. Specifically, it appreciates the action of the Regional Council in recognizing the importance of this issue to the citizens of the Municipality and in its zeal in exercising its responsibility to find long term, sustainable solutions to the problem for the benefit of the greater community.

1.2 Objective

The committee was to develop a framework, within which HRM could work, to provide specific solutions to the Harbour problem. The committee used the unresolved issues and questions that arose from the Halifax Harbour Solutions Symposium to develop standards and processes that could be implemented in designing appropriate solutions for wastewater treatment and other elements of wastewater management.

2.0 BACKGROUND

2.1 Committee Background

The committee was comprised of 16 interested stakeholders from the Halifax Regional Municipality (See Section 6.0 for list of committee participants). It was a multi-disciplinary group that represented a wide range of stakeholders. It included knowledgeable citizens with past involvement or experience in dealing with harbour issues and those with technical expertise in one or more aspects of wastewater treatment. For all of these volunteers, there was and is to be no personal or company gain, forthcoming from their appointment to the Committee. The Committee was to be representative of community groups, organizations, academic and business communities, and provincial and federal governments. The intention was to obtain a range of representation from the community, within the functional limits of a working group, in order to enhance the quality of the recommendations that would be forthcoming from the Committee to the Council.

The Committee members attempted to reflect, to the best of their abilities, the views of the larger community and they did not hold positions to speak only for specific groups or constituencies.

2.2 Information Base

The 12 general principles arrived at by the symposium participants were adopted by the Halifax Regional Council as a basis for moving forward. The Committee used these principles as its information base. The principles are:

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.

3.0 THE PROCESS

3.1 Administrative

The Committee was to meet every two weeks for six months, for a total of 12 meetings, to develop its recommendations. The resulting recommendations were to be reported directly to Council. The committee added extra meetings in order to have sufficient time to deal with the issues. Starting in January of 1998 the Committee met every week to accomplish its appointed task. It also used sub-committees, meeting on an interim basis, to develop proposals. In addition to meeting on the issues, the Committee toured the Harbour and visited local wastewater treatment facilities.

The Committee did not appoint a chair for its meetings but chose to allow all members to work as equal partners and to use a facilitator to manage the meeting agenda. The Committee specifically acknowledges Sunday Miller for her work in facilitating the efforts of a diverse group on a complex topic. Several HRM staff also contributed to the Committee's success.

The Committee attempted to arrive at its decisions via consensus. In the minority of instances where that was not possible, a vote was taken and the majority position was accepted. When a member was required to be absent from a planned time for a Committee decision, that person's written view was provided to the group. The absent members agreed to uphold decisions taken by the Committee in their absence.

The Committee also agreed that confidentiality was of the utmost importance and that no information was to be given out that the Council had not already received or was aware of. If speaking publicly, members agreed to identify their personal views and to not divulge the positions taken by others. The Committee also chose to meet as a working group, without public or media attendance, in order to develop a complete set of recommendations for the public forum of Regional Council and not to be distracted by others' agenda, as could arise on any isolated topic. The Committee's motivation was to make as much progress as possible in the limited amount of time available.

3.2 Mission Statement

The Halifax Solutions Advisory Committee devised a mission statement to guide it in this process:

Guided by the 12 principles of the 1996 *Halifax Harbour Solutions Symposium*, the Committee will make recommendations to HRM Council concerning a wastewater management plan, including the 11 unresolved symposium issues, for Halifax Harbour based on available scientific, engineering, and public information and concerns.

3.3 Priorities

The committee organized the 11 unresolved issues into three groups and prioritized the groups to determine which issues would be dealt with first. The committee was to provide a general framework for HRM decisions and progress on the following:

- A**
 - 1. Northwest Arm classification
 - 2. Cost-driven or goal-driven?
 - 3. Separation of storm and wastewater
 - 4. Need for innovation and alternative treatments and technologies

- B**
 - 5. Siting criteria, selection, and process
 - 6. Mainland South/Herring Cove
 - 7. Extent of consolidation of outfalls
 - 8. Number and size of plants

- C**
 - 9. Public/Private partnerships?
 - 10. Integration of water utility and wastewater utility
 - 11. Cost-sharing which includes federal and provincial governments

3.4 Context

The Committee was provided with the specific issues from the symposium and the specific mandate from the

Regional Council. The reality is that these are part of a larger perspective. During the course of the Committee's deliberations, the need for integrated strategies to respond to the complex environmental, community and financial problems which characterize the matter of sewage treatment was repeatedly identified. In the recommendations which follow, it is intended that the Council will appreciate the extent to which apparently independent conclusions, about water quality, priorities in treatment, sewer separation and other matters, are really parts of integrated wastewater and stormwater management strategies. One encompassing goal, which speaks to the future of general watershed management is provided with some detail at the end of this report.

4.0 RECOMMENDATIONS

To assist the reader in understanding the context for the present state of the harbour, Maps 1 and 2 (See end of report, Section 7) show the municipal and private outfalls on the Halifax and Dartmouth sides of the Inner Harbour between McNab's Island and Bedford Basin. Map 3 shows a schematic diagram of the harbour from Bedford Basin (Box A) and the Narrows (Box B), the inner harbour (Box C), through the outer harbour (Box D), to the harbour approaches, outside McNab's Island (Boxes E & F). The water quality classifications, as discussed below, are indicated. These maps were drawn from reports of Halifax Harbour Cleanup, Inc. issued in 1992 and 1993. Map 4 shows the Mainland South area which could be serviced by gravity sewer lines. This forms part of the Committee recommendations in regard to Mainland South.

4.1 Northwest Arm Classification

It is recommended that the classification of the Northwest Arm, as identified by the water quality objectives of the Halifax Harbour Task Force (1990), be upgraded to at least an SB classification.

The Halifax Harbour Task Force (HHTF) established environmental quality guidelines (water quality objectives) for the Harbour. These were based on the understanding that different uses of the Harbour would require different minimum levels of environmental quality. The HHTF concluded that the water quality objectives could be met through primary level treatment and a good source control program. The Task Force adopted a principle of containment: the effluent from outfalls in the harbour should fall within the Inner Harbour. The Committee accepted this principle.

Classification Scheme

Classification	Description
Class SA	<ul style="list-style-type: none"> • bathing and contact recreation • shellfish harvesting for direct human consumption • fish and wildlife habitat
Class SB	<ul style="list-style-type: none"> • shellfish harvesting for human consumption after depuration • bathing and other primary contact recreational activities • fish and wildlife habitat
Class SC	<ul style="list-style-type: none"> • boating and other secondary contact recreational activities • fish and wildlife habitat • industrial cooling • good aesthetic value

Source: Halifax Harbour Task Force Final Report, p. 48, August 1990.

The SA classification refers to areas that require the most stringent of environmental quality levels due to the primary (human body) contact that is involved at these locations. The Northwest Arm was classified as “SC”. This is the lowest of the water quality designations along the inner Harbour. The SC classification maintains acceptable conditions for fish and wildlife habitats and permits any secondary contact recreational activities to occur as well as permitting industrial use of the water.

This classification does not acknowledge the activities that take place in the Arm on a regular basis. The Arm is the site for regattas, for training in many forms of boating and for other activities such as fishing and bathing. These activities cause the participants to have some degree of water contact. Therefore, the Arm’s classification should ensure basic human health standards for primary contact activities.

The above reclassification could be achieved by extending the boundary from north of McNab’s Island, west across the Harbour to the outer point of the breakwater at the south end of the container pier. This would also cause Black Rock Beach and Pleasant Shoal to be reclassified as SB sites in the Harbour. Black Rock Beach is still a popular spot and Pleasant Shoal is an important lobster fishing ground.

These are the only modifications to the HHTF water quality objectives which the Committee recommended.

Further comment, however, is warranted on the water quality of Bedford Basin. This was a recurring consideration in the Committee's deliberations and supports several of the recommendations in this report.

Bedford Basin has limited water circulation and recurring problems with algal blooms. The assimilative capacity of the basin is not completely known, as was indicated in the Halifax Harbour Task Force reports. In recommending the principle of containment, neither the HHTF nor the Committee recommended that the water quality of Bedford Basin be eroded in the longer term. The Basin's contribution to overall water quality and to its role as a multi-purpose resource which includes human contact led the Committee to frame several of its recommendations to protect against any further deterioration in the Basin and to allow for improvements. Notably, the matter of water quality in the basin is subject to decisions regarding future outfalls in the Narrows, north of the MacDonald Bridge. Similarly, the existence of sewage overflows in the Basin is of concern. Finally, the improvement of water quality in the Basin to meet the needs of those who are currently using it for a variety of purposes has implications, beyond sewage treatment, which are discussed below.

General Implications

The Committee realized that reclassifying the Northwest Arm would create other issues that would have to be dealt with. They are the following:

- * the movement of and / or the treatment of: 1) the sewage outfall at Chain Rock Drive and, 2) overflows within the Arm.
- * the separation of sanitary and stormwater pipes
- * the boating industry: in particular the marina discharge
- * Black Rock Beach
- * cost implications of the above.

Black Rock Beach has been a regular spot for summer swimmers in spite of the quality of the water. This familiar beach will continue to be used by those accustomed to doing so and they in turn will teach others to use this beach.

There are several marinas and other activities in the Arm which add up to hundreds of people boating, in some form or another, in the Harbour. The discharge from these boats must be dealt with, whether they are moored or moving, to ensure that the water quality objectives can be met. This situation is no different in Bedford Basin or other areas of the Inner Harbour where marine traffic affects water quality.

Unless the Municipality is prepared to take unprecedented action, it is unlikely that people will stop using the

Arm, Bedford Basin and other locations as they have been. Thus, treating and/or moving the outfalls and putting guidelines in place, as regards marina discharge, appear to be the only avenues of solutions to the problem. This contributes to a comprehensive strategy on Harbour use. The Committee understood that the cost implications and engineering options of the above recommendation will have to be fully identified.

4.2 Cost-Driven or Goal-Driven?

It is recommended that, in order to achieve the Halifax Harbour Task Forces's water quality objectives, as modified by the Advisory Committee, a phased approach, affordable to ratepayers, should be implemented

The main issue here is whether the decision making and the project planning for wastewater treatment in the Regional Municipality can be best achieved through a cost or goal driven mandate. The costs of treatment systems are considerable and there are real limitations to taxpayers' capacity and expectations. On the other hand, this is an environmental problem with far-reaching consequences, demanding long term goals for the community's quality of life.

The Committee concludes that both costs and goals are important and must be properly and carefully balanced in any undertaking. Over-emphasizing environmental goals in relation to costs, or vice versa, may polarize public debate and skew the project's design such that successful completion of the project can be threatened. This is not an either/or situation. The public must be able to see, in future, that there is not only cost containment but environmental worth for the money spent.

Goals must be set that meet the regulatory requirements of wastewater management and also reflect the values, needs and intentions of the community that will be required to bear the costs. The Committee understands that the timing of the project can and will greatly affect the overall cost. The question is: *Does it all get done at the same time or will a phased- in approach be used?* The symposium recommended a phased approach. The Committee makes the following recommendations with respect to priorities in treatment facilities:

- a. All components of the Harbour Solutions program should be completed as rapidly as is feasible. A concerted effort should be made to advance planning and site acquisition for all parts of the system. Partial implementation of components should be considered if, and only if, it will not reduce the momentum or likelihood of the project completion.**

- b. Recognizing that a variety of factors may make it impossible to proceed on all aspects of the program simultaneously, the priorities are as follows:**
- i. The sewage effluent from Duffus Street and Halifax waterfront should be treated first. There is an immediate need to improve the water quality and the aesthetics along the Halifax shoreline from the Narrows to downtown.**
- the sewage from Duffus Street constitutes the greatest single volume of discharge into Halifax Harbour.
 - the sewage from Duffus Street constitutes the most substantial impact on water quality in the Narrows and ultimately, Bedford Basin.
 - The sewage from the Narrows to downtown constitutes the most substantial negative impact on the aesthetics and economic potential of Halifax and its historic waterfront.
- ii. Treat the sewage effluent on the Dartmouth side of Halifax Harbour with particular attention to Dartmouth downtown.**
- The sewage effluent from Dartmouth represents a relatively large portion of the total sewage discharge into the Harbour.
 - The sewage effluent off Dartmouth Cove represents a relatively large portion of the total sewage discharge from the Dartmouth side of the Harbour.
 - There is the possibility of increased flows to the Dartmouth Cove area should the substantial development potential in Dartmouth be realized.
- OR (as an equal priority)**
- ii. Treat the balance of sewage flows from the Halifax Peninsula, with particular attention to the flows that currently discharge at the Chain Rock outfall directly into the Northwest Arm.**
- Treatment of the Chain Rock sewage effluent is needed to meet the upgraded water quality objectives within the Northwest Arm.
 - There are substantial recreational uses within the Arm.
 - Untreated sewage has aesthetic and human health impacts on the southern end of the Halifax Peninsula and especially Point Pleasant Park.

Consideration should be given to treatment of Chain Rock Outfall on site, if a plan can be developed for a facility in the vicinity of Point Pleasant Park or at other sites elsewhere along the Arm which would be feasible for alternative technologies that meet aesthetic and visual requirements

iii. Treat the sewage of Mainland South

- **There is recognition that broader community development and planning issues affect decisions on sewage treatment.**
- **Opportunities for site facilities and/or outfalls in locations beyond Herring Cove have yet to be explored.**

c. The above priorities do not suggest an absolute order of implementation if opportunities appear that could accelerate or obstacles impede various components of the plan relative to their priority.

4.3 Separation of Storm and Wastewater

It is recommended that the priority objective is to minimize the flow of stormwater into the (sanitary) sewer system through and in accordance with the following strategies:

- 1. Sewer separation as a general policy should be considered on an individual sewershed and/or treatment outfall basis.**
- 2. The existing policy of full separation of storm and sanitary sewers for all new developments must be reaffirmed.**
- 3. Implement sewer separation as a specific policy whenever there is reconstruction or replacement of a portion of the existing combined system or where there is major street reconstruction which would permit access to the sewers.**
- 4. Develop non-compliance criteria which includes alternative strategies to reduce stormwater volumes when it is not possible to separate the sewers.**

Much of the area which requires sewage treatment relies on a combined sewer system, accepting stormwater as well as domestic, commercial and industrial wastewater. This has implications for both the volume of water which treatment facilities must handle and for the quality of the water which must be treated and discharged.

The Halifax Harbour Task Force documented the concerns of stormwater runoff, including the concentration of suspended solids resulting from erosion, the bacteria concentration from animal droppings, the nutrient concentration from fertilizers and other contaminants, including metals. The level of pollution in stormwater can equal that of wastewater.

The Municipality's sewers have Combined Sewer Overflows (CSOs) which discharge both stormwater and raw sewage directly into the Harbour when the stormwater volume is too great for the interceptor pipes. The pipes are sized to handle four times the anticipated dry weather volume but this does not deal with the higher volumes experienced in rainy seasons. At these times, the water which enters the system from road runoff has been estimated at 50 to 80 per cent of the average wet weather flow.

In municipalities where the sewage from combined sewers is being treated, the normal practice during the wet season is to capture up to the peak dry level flow and to allow the excess to discharge directly into the receiving

waters. Therefore, whether or not there is sewage treatment, combined sewer systems result in raw sewage discharge. In particular, the “first flush” of the sewer, following 15 - 30 minutes of steady rain, disturbs the solids accumulated on the bottom of the pipe and releases contaminants. To deal effectively with the volumes associated with combined sewers, storage facilities to hold back the potential overflows must be constructed. These often take the form of deep tunnels and can be very costly.

The alternative is to provide separate storm and sewage systems. This can be accomplished by using the existing sewer as the sanitary or storm water line and installing a new sewer to receive the other flow. Presently, HRM requires that all new developments have separate storm and sanitary pipes. Extending this requirement through a program of remedial action for the combined sewer areas would divert the costs of constructing storage facilities to a program of sewer replacement.

The Committee concluded that making this investment in creating a separated system is preferable and advantageous in the long run. In particular, separation allows a more predictable, steady flow, which creates operational efficiency of the treatment facilities. In addition, removing the stormwater volume creates capacity at the facilities to deal with the additional flows from new development and to upgrade to higher levels if treatment should the water quality objectives change in the future.

The Committee recognized that it may not be practical to remove all of the stormwater entering the system. For example, it did not intend that all homeowners automatically be required to disconnect roof drains from the public sanitary sewer. In addition, there may be portions of some sewersheds in which separation is not feasible. These require guidelines to support on-site management and alternate technology solutions.

Sewer separation is one part of a program of long term urban stormwater management. Source controls are also required to reduce the quantity of pollutants in the storm system. Controls include street cleaning, enforcement of the anti-litter bylaw, requiring pet owners to deal with droppings, erosion control and improving the quality and use of lawn treatment chemicals. A source control program would be able to address many of the concerns regarding the “first flush” of untreated stormwater. The Municipality has embarked on source control for its sewage system and the Committee reinforced the importance of a comprehensive program of source controls from a stormwater perspective. Improvements in the quality of both storm and wastewater are required to meet the long term water quality objectives.

4.4 Alternative Technologies

- 1. It is recommended that there is a need to consider innovative and alternative technology options which may be appropriate as components of the overall harbour solution for storm and sanitary water treatment in order to meet the water quality objectives.**

- 2. It is recommended that the candidate technologies be assessed by criteria such as:**
 - Is the technology appropriate?**
 - Is the technology proven in similar situations?**
 - Does the technology create other problems that will have to be addressed?**

 - Is the technology economical?**

The Halifax Harbour Symposium suggested that alternative technologies be examined and consideration be given to innovation. In accord with this, the Committee discussed a number of different types of technology. Some of these are attractive, even intriguing, if their requirements can be matched to portions of the Municipality's sewersheds.

For example, constructed wetlands need a significant amount of land area and related drainage and environmental parameters. Solar aquatic treatment, which is already found in the Municipality, offers an advanced level of treatment, but has not been proven for quantities of flow larger than 500,000 gallons per day. Portions of the Municipality's sewage flows might feasibly be treated in this fashion.

Although the area of biological treatment (sequencing batch reactors, biological filters, nutrient removal) is a relatively new technological approach (the first batch reactor was installed in 1985), it may also merit further attention.

The Committee did not see its mandate as involving the Municipality in demonstration projects. This does not mean that there may not be alternative solutions to the problem but it is not acceptable to ask the public to pay for a technology that has not been proven to do the job in a similar situation. It is important to have an appropriate technology for the size and scale of facility that is needed.

4.5 Biosolids Management

The Committee did not have the information and opportunity to delve into the matter of biosolids or “sludge” management. Factors ranging from land availability to treatment technology and the timing of construction will affect biosolids strategy and much of this information is yet to be developed. Nonetheless, the Committee did not lose sight of biosolids as a critical element of any sewage treatment plan. This goes beyond the provincial regulatory requirements, which are likely to include biosolids disposal as part of the approvals process.

Council has already adopted the symposium principle that “sludge” be considered as a “resource”. This is in keeping with modern biosolids management, which no longer considers historical approaches such as incineration, landfilling and ocean disposal. The use of processed biosolids for composting, as processed fertilizers or other uses which develop in future should be part of a biosolids management strategy. The Committee reinforced this principle.

4.6 Siting Criteria, Selection & Process

In accordance with the principles developed by the Halifax Harbour Solutions Symposium, the Committee recommends that the following fundamental principles and criteria be adhered to in siting any wastewater treatment facilities. Any candidate site must conform to the principles, and such sites will then be ranked and judged according to the criteria.

Fundamental Principles

1. There will be a net benefit to the sewershed community
2. The siting will conform to a WINBY (Want it in My Neighbourhood's Backyard) approach - John Lang, Portland Oregon, 1997C. The public should be presented with several siting scenarios to choose from and cost benefit analyses to assist them in understanding the site selections that must be made.
3. There will be a net benefit to the natural environment (air, land, marine habitat and water)
4. There will be adherence to HHTF water quality objectives and points of agreement from the Harbour Symposium
5. All regulatory requirements will be satisfied
6. Noise and odour control as well as aesthetically pleasing and other design features will be employed as fundamental design elements to mitigate nuisance effects on surrounding communities.

Criteria

The criteria were placed in three main categories:

A. *Outfalls*

Marine outfalls should be located on appropriate areas of the Harbour seabed to:

1. Achieve the agreed water quality guidelines (HHTF and SAC)
2. Follow the containment approach of the HHTF
3. Not interfere with existing Harbour anchorages
4. Refrain from areas of sediment deposition
5. Avoid visible, near shore areas

6. Conform to applicable regulatory requirements of the Nova Scotia Standards and Guidelines Manual. This is normally achieved by placing outfalls in the deepest, fastest, flowing water available. Although most areas of the Inner Harbour are ones of sedimentations and would not be suitable, specific deep water areas occur that are locally scoured by stronger currents. An appropriate buffer zone may be required around Black Rock Beach.

B. *Design/Site Specific*

Specific sites and the design of those sites should be evaluated according to:

1. The potential for expansion in terms of land that may be required for upgrading in the future to higher levels of treatment and/or to increase capacity
2. The minimum siting requirements in the Nova Scotia Provincial guidelines in respect to buffering from adjacent properties. A lesser separation distance can be agreed upon if special design components for noise, odour or nuisance are approved by the residents within the required buffer zone and implemented at the facility
3. Adequate road access
4. The acceptability of infilled areas and subterranean or multi-level units
5. The availability of municipal services that would be adequate for the operation of a treatment plant
6. Compatibility with surrounding land use.

C. *Social, Economic/Environmental*

The sites should reflect the social, economic, and environmental concerns of the community such as:

1. The preservation of significantly environmentally sensitive, historical, archaeological sites
2. Relocation costs
3. The social and environmental concerns of the community
4. Availability of land.

Facility siting considers two issues: location of land based facilities (plant and outfall) and location of marine facilities (outfall/diffuser). Land based issues involve land availability and it's proximity to and compatibility with surrounding land uses. Marine issues involve the potential effects of the effluent on the receiving waters and marine environment. In dealing with this issue the committee looked at the marine environment first.

Marine Considerations

Put simply, the water activity in the Harbour is: surface waters flow seaward (south) and bottom waters flow landward (north). This circulation is not constant and sometimes reverses. Nonetheless, the water quality of the Harbour is generally good due to this natural flushing process, and to the tides, which are reliable. Due to the tides, complete exchanges of water occur in the Harbour. This results in the level of suspended solids in the Harbour, as a whole, being naturally low.

Where the currents are strong, the seabed is covered in gravel and sand or is exposed bedrock. The exposed bedrock indicates that the currents are so strong that no sediment is able to accumulate. These are preferred locations for diffuser siting. The Committee concluded that depth of the Harbour will ensure enhanced diffuser operation at numerous sites and there are sufficient currents to ensure a 50:1 dilution factor. It is recognized that a small area around the diffusers will have a higher concentration than this 50:1 requirement. This may mean establishing exclusion zones at those locations.

There are also areas where the currents are weak, as evidenced by silt and mud on the Harbour bottom. It is very important that the diffusers not be located where sedimentation rates are high. The diffuser can become buried by sediments and will not achieve adequate dilution. In addition, if outfalls are placed in areas of sediment deposition, a large proportion of the material which is deposited will be sewage particles and, in the case of combined sewers, silt and other contaminants from storm water. Treatment will certainly reduce the levels of these from what currently is deposited but the concern remains valid.

A problem that needs to be considered is anchorage use. The Harbour shows evidence of anchors being dragged for long distance and this can be hazardous to effluent lines on the bottom. Moving anchors can disrupt outfalls and thus prevent the effluent from being diffused as required to meet water quality objectives.

In concluding its deliberations on marine issues, it appeared to the Committee that options exist for siting diffusers and the major concern was not the marine siting but finding a land based site for the facility. Once that has been found and obtained, the siting of the effluent line and diffuser will follow.

Land Based Considerations

In regards to the land based aspect of the siting issue a 'Want It In My Neighbourhood's Back Yard' (WINBY) strategy was considered desirable. This strategy was used by a group in Portland Oregon when siting a sewage treatment facility and resulted in residents requesting that the facility be placed in their area. The overall thrust of the strategy is for the communities to become aware that: 1) wastewater treatment facilities can be developed and operated without negative impacts such as noise, odour, etc. and, 2) facilities can be developed in such a way as to support community needs such as infrastructure, parks, access to beaches, etc. The people involved in the siting process must be aware of this information and be willing to inform the public of how a facility in their neighbourhood could benefit them.

The Committee recognized that the major problem is going to be the land acquisition, especially on the Halifax peninsula. There is very little land available on the peninsula and the Nova Scotia Department of Environment has a buffer requirement for the siting of any sewage treatment facility. The size of a conventional facility plus the land necessary to achieve the buffer requirement make finding a suitable site on the peninsula very difficult. This also would limit the ability of future expansion depending upon the growth and future needs of the community. A number of suggestions were brought forward to deal with this problem: 1) the buffer does not have to be land. If a waterfront site is available, then a large part of the buffer would actually be the waterfront; 2) obtain a smaller piece of land and construct a multi-level sewage treatment plant. This may include some subterranean construction; 3) rezoning may be required in order to construct a facility in certain areas of the peninsula

4.7 Mainland South/Herring Cove

- 1. Recognizing HRM's current growth strategy, which discourages growth in Mainland South, the Committee recommends that any sewage treatment facility that is to be built to treat Mainland South sewage should be designed to treat, primarily, the gravity serviceable sewershed, as per the map (Map 4), except by an agreement to allow service for Herring Cove. There should be no expansion to the serviceable area until the regional growth strategy is changed.**
- 2. The Committee recommends that no sanitary sewage effluent (treated or untreated) be discharged into MacIntosh Run.**
- 3. MacIntosh Run is an important water course and must be protected from any negative impact and enable rejuvenation of the Run.**
- 4. Notwithstanding 1 and 2, all siting options remain open, including inland sites.**
- 5. a. Mainland South should continue as a separated system and HRM should continue to remove infiltration into the system and construct additional storm sewers as needed.**
b. Ensure Mainland South is a completely separated system with the construction of separate storm systems as needed.
- 6. Consideration should be given to an outfall site further south to give a better natural dispersion and to permit land acquisition for preliminary and higher levels of treatment.**

Mainland South is serviced by a trunk sewer which runs along the Herring Cove Road and discharges at Herring Cove. The greater community includes areas of wilderness, known as the 'wildlands' or 'backlands'. These wilderness areas are considered to be important to the way of life in Mainland South and are assets to preserve. A number of communities need to be considered and need to come to a united decision as to what shall be done with the 'wildlands'.

MacIntosh Run is one of the important natural sites in Mainland South that must be cleaned up and permitted to rejuvenate, understanding that a pristine state is not achievable. The Committee agreed that no effluent

should be discharged into the Run. There were those who felt that nothing should be allowed to be discharged into the Run under any conditions, including potential overflows.

The Committee recognised that Herring Cove residents may assume that, if no effluent is to be discharged to the Run, then a treatment facility at the Princeton Avenue area would not be possible. However, treated effluent could, in fact, be pumped into the trunk at Princeton for discharge through the existing pipe.

Sewer separation is another issue for Mainland South. According to HRM, the system in Mainland South is separated. Some Committee members were quite surprised at this information due to the significant increase in flow within the sewer pipe lines during a time of rainfall. They thought that the difference between the wet weather flow and the dry weather flow had to be due to the presence of some combined sewer system in Mainland South. They also acknowledged the possibility of illegal connections to the sanitary sewer lines.

Suggestions were made to: 1) stop the overflow, which feeds directly into the Run, 2) stop the infiltration, which will reduce the wet weather flow, and 3) replace faulty connections. It was thought that if these actions were taken they could reduce the flow problem and prevent any discharge into the 'Run'.

The existing area of Mainland South which can be serviced by gravity flows does not automatically change by virtue of those flows being treated. It was not in the Committee's mandate to plan the Regional growth strategy for Mainland South or any other parts of the Region. The Committee recognized that there are policy issues that have to be dealt with in order to plan area development. Therefore, the Committee's recommendations leave the matter of future expansion in Mainland South to the Municipality and residents.

The issue of municipal services being available to Herring Cove residents was discussed and it is understood that there are various concerns and opinions in the community. There has been an outfall at Herring Cove for the past number of years and residents have been affected by, but have not benefitted from, its presence. A benefit could be municipal services, if desired.

4.8 Extent and Consolidation of Outfalls/Number and Size of Plants

The Committee recommends:

- 1. No treated effluent or raw sewage outfalls in the Narrows.**
- 2. 3 - 6 plants in HRM - 1 - 3 in Halifax Peninsula
1 - 2 in Dartmouth
1 for Mainland South (at least)**
- 3. Consolidation should proceed only when the infrastructure is part of planned servicing of a chosen sewage treatment facility or to a fully approved and acquired site.**
- 4. Full source control and pre-treatment at all industrial sites.**
- 5. The long term objective to minimize number of CSOs and eliminate them north of the Macdonald Bridge.**
- 6. All CSOs should receive preliminary treatment (screened) before discharge of effluent.**

The two issues of consolidation and number and size of plants brought forward from the symposium are so intertwined that the Committee dealt with them as a single topic.

4.8.1 Extent and Consolidation of Outfalls

Reductions in the number of outfalls involve constructing collector sewers to convey all flows from one or more sewersheds to another sewershed. Here, the dry weather component can be intercepted for appropriate treatment and disposal and the wet weather flows can be discharged through either combined sewer overflow facilities or separate stormwater lines.

Some anticipated results of outfall consolidation are:

- improved water quality in an area due to the removal of the outfall from the area
- the opportunity of constructing a treatment facility away from a sensitive area
- the benefit of avoiding trying to construct a treatment facility in areas that would present an engineering challenge
- a reduction in capital and operating costs

There are approximately 65 outfalls being discharged into the Halifax Harbour. Twenty nine of these are municipal outfalls, two of which are from completely separated systems. It was not considered feasible to put a plant at each outfall site due to: the costs of construction, operation and maintenance; and the location of effluent discharge. If it is feasible to construct and operate a few sewage treatment facilities, extensive consolidation must take place in order to treat all outfall effluent, including all the institutional and industrial outfalls. How these private outfalls are to be brought into the equation still remains to be determined. However, water quality objectives will be jeopardized if these other outfalls are permitted to continue discharging their effluent into the harbour. The Municipality will be required to work with the owners to develop a program, in line with its overall strategy for consolidation and treatment.

It was suggested that certain questions needed to be asked and answered at potential sites for future outfalls. They are as follows:

1. Will it be environmentally acceptable to overflow partially treated wet weather flows (CSO) at this site?
2. Will it be environmentally acceptable to construct a wastewater treatment facility and to treat dry weather flows at this site?
3. Is it feasible, from an engineering and economic perspective, to construct a sewage treatment facility at this location?
4. Will it be environmentally acceptable and is it feasible to treat flows from other sewersheds at this site?
5. Is it feasible to construct consolidation piping from this site to adjacent outfall locations?

The objectives of evaluating outfall sites according to these questions are to eliminate from further consideration any sites where a treatment facility cannot be constructed, and to rate the remaining sites on degree of difficulty and acceptability in implementing the consolidation and facility. The general siting criteria for treatment facilities would have to come into consideration here.

4.8.2 Number and Size of Plants

There are two main considerations in regards to the number and size of plants: 1) land use efficiency and , 2) economic optimization.

Land use efficiency is very important due to the lack of available land on the Halifax Peninsula and in Dartmouth. The larger the plant the more land is required to meet the siting criteria. Conventional facilities require approximately 4.2 hectares of land. Therefore, the construction of a conventional sewage treatment facility on the Halifax Peninsula does not appear to be feasible. The Committee suggested compact plants for

the Halifax and Dartmouth treatment facilities. A compact site requires a land area of approximately 1.1 hectares of land.

Mainland South does not present the same land availability problem. Therefore, the size of the facility is not constrained in Mainland South and a conventional one could be constructed.

The size of the plant does not dictate how it operates, the quality of the effluent that is produced, etc. That is determined by sewage characteristics, level of treatment, design and layout decisions, level of staff training, and many other elements.

Economic optimization involves determining the least cost solution for the combination of capital costs associated with plant construction, sewers, and outfalls. As more outfalls are consolidated and the interceptor pipes become longer, the cost of sewer construction increases due to the increasing diameter of the sewers or tunnels.

There appears, to the Committee, to be an optimum number of plants that would give the lowest capital cost considering the cost of land, pumping, consolidation, tunneling, etc. One plant results in a higher level of capital costs as compared to multiple plants. The optimal numbers are three to six plants, with the capital costs expected to rise above six plants.

One plant would require a significant amount of tunneling under two parts of the Harbour and a significant amount of reconstruction to enable the present system to handle the expected flows. Two plants remove the need for tunneling on one part of the harbour and three plants remove all of the cost of tunneling under the Harbour. The capital costs for pipes, tunnels and pumping for two or more plants falls dramatically and then levels off between three and six plants.

Multiple plants involve the duplication of services such as access roads, municipal utilities, etc. Therefore, there is some repetition of capital and operating costs. On the other hand, multiple plants would enable some benefit to be realized fairly early on in the process of wastewater treatment. The Committee sees the multiple plant option as more “do-able” earlier.

4.9 Public/Private Partnerships

- 1. The Committee recommends that the sewage treatment facility be operated as a public utility.**
- 2. The Committee recommends that whatever mechanisms are chosen for financing, design, construction, and startup, they should only be entered into if an incentive is established for both the public and private partners to encourage water conservation and to reduce both stormwater inflow and water infiltration into the sewer system.**

Committee members were able to demonstrate the range of public philosophy and debate on the concept of public private partnerships. The area of greatest concern is that of ensuring that the community's dependence on a service as important as sewage treatment is reflected in guarantees that the service is driven by public priorities as opposed to private sector priorities. Ultimately, the safeguard is public ownership and control of the facilities.

The Committee did not make assumptions about the extent and nature of potential privatization. Whether or not the collection system continues to be managed by HRM, concerted action is required to reduce the "non-sewage" volumes of water which are produced and paid for by the public. In keeping with the thrust of its other recommendations, the Committee recommends that long term arrangements with a private partner not be based on current flows and include an incentive for that partner to work with HRM to reduce flow, infiltration and educate the public in water conservation.

4.10 Integration of Water Utility and Wastewater Utility

The Committee recommends that the issue of integration be further explored with respect to the following:

- efficiency**
- the achieving of water quality objectives**
- cost effectiveness**
- water conservation and operation**

The method by which Regional Council pursues long term environmental management is the Municipality's decision to make but the Committee concludes that integration should be assessed at some point.

4.11 Cost -Sharing

The Committee recommends that Municipal Councillors, HRM staff, and Consultants should actively lobby relevant political officials (Cabinet Ministers, MP's, Senators, Ministerial Aides) to explore all possible avenues for federal/provincial sources of financial and other support.

5.0 GENERAL CONSIDERATIONS

5.1 Watershed Management

The Halifax Harbour is impacted by many activities which occur on lands within its sewer/watersheds. Protection of natural drainage and water bodies will reduce the impact of pollutants, erosion, nutrients and stormwater runoff on both treatment facilities and the harbour. The preservation and use of natural systems to help regulate runoff quantity and quality will achieve efficiencies in wastewater management and treatment, to meet sustainable development goals for the future. Although not specifically included in the Committee's mandate, an outcome of the Committee's deliberations is its conclusion that there is more to be done on a broad scale in the matter of watershed management. Achieving Harbour solutions requires setting wastewater treatment in a larger context, as a component of watershed management.

The Committee recommends that:

1. Watershed management be required for all watersheds in HRM (regional planning should reflect watershed principles). HRM shall promote water management and watershed planning through activities such as community education (for schools, institutions, industry and the general public) on watershed management and protection; water quality monitoring; and implementation of the Source Control Strategy (1997).
2. HRM develop a consistent stormwater management policy to address water quantity and quality.
3. Master stormwater plans be developed for each watershed and identify priority areas for implementation - for example the Sackville, Musquodoboit and Shubenacadie watersheds.
4. HRM Promote individual stewardship methods for areas with existing development, and provide opportunities for concerned individuals and organizations to provide input, share perspectives, and coordinate stewardship efforts.
5. HRM should preserve natural systems (e.g. vegetation, wetlands, floodplains) and processes (e.g. erosion control, natural rates of percolation and filtration) as components of stormwater management for areas undergoing new development.
6. HRM should support water resource management strategies such as the Provincial Water Resources Management Strategy (WRMS) in a cooperative approach to watershed management, and work in partnership with other agencies to identify and prioritize water management issues.

5.2 Nutrients

Human impacts on coastal waters often include the phenomenon of toxic algal blooms, which result from nutrient enrichment from sources such as sewage. A bloom is a temporary, huge increase in the numbers of microscopic algal cells suspended in the water. Over the past number of years, there have been some indications that such algal blooms have become more frequent and more severe in the Harbour and Bedford Basin. Because of the prevailing water circulation patterns, nutrients introduced into the Narrows will tend to be transported into the Basin. Normal algal life cycles involve spring and summer blooms of various species. However, artificially increased levels of phosphorus and nitrogen can cause excessive blooms which may be toxic, and which will consume oxygen in the water as the algal cells die and decompose. This can result in the death of fish and other aquatic species.

For this reason, the Committee has focused on the need to limit inputs of nutrients into the Narrows, which ultimately affect Bedford Basin. The Basin is thought to be presently at or near its capacity to absorb extra nutrients, making it susceptible to adverse effects. Primary or secondary sewage treatment does not significantly reduce nutrients, and extra technology must be added to effect such reduction at additional cost. The current state of knowledge about the Basin indicates that sewage outfalls, even if treated, should not continue to enter the Narrows in the long term.

The consulting group have investigated this issue, and have presented a background report on the issue, the current situation in the harbour, options for addressing nutrients.

6.0 ADVISORY COMMITTEE MEMBERS

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7.0 MAPS

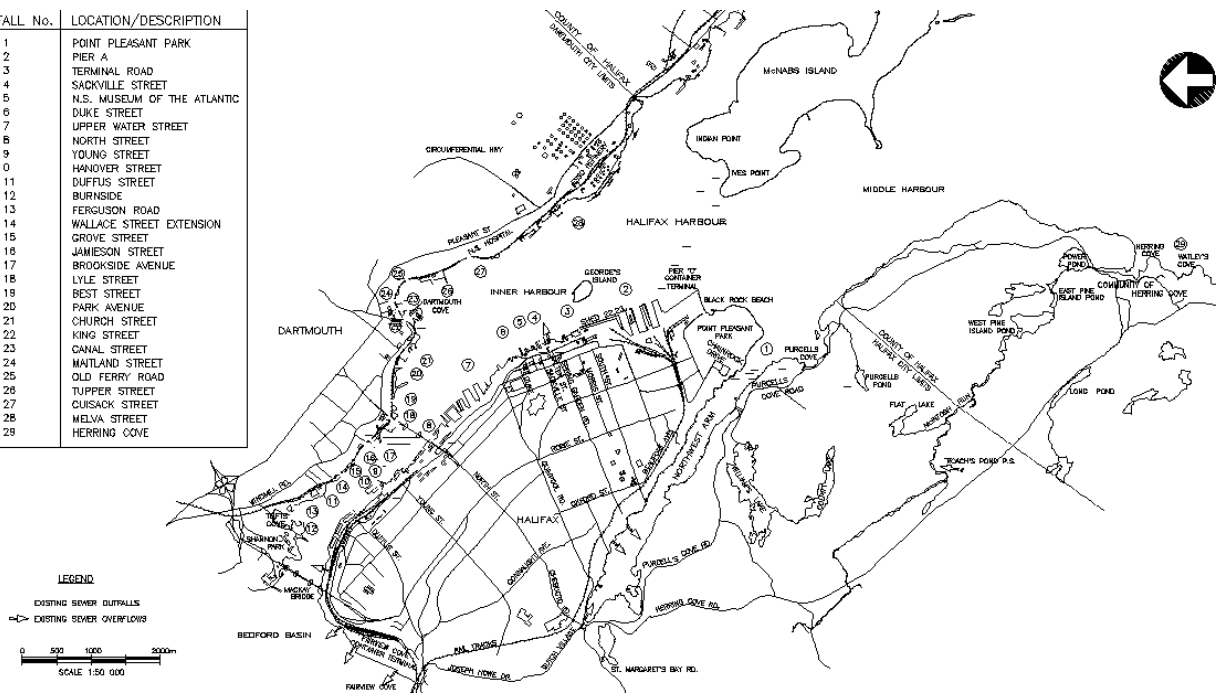
Map 1 Municipal Outfalls

Map 2 Private Outfalls

Map 3 Water Quality Classes

Map 4 Mainland South - Gravity Serviceable Boundary

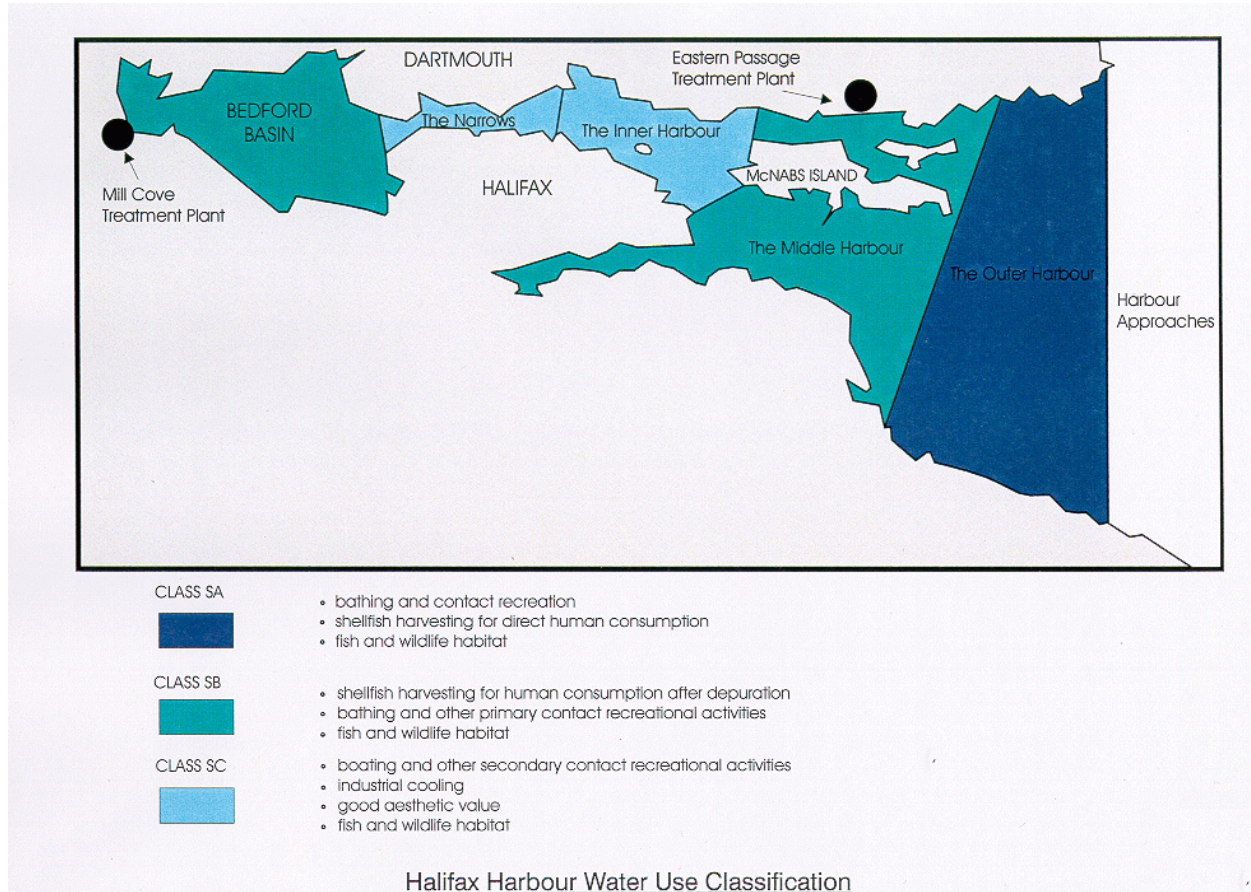
OUTFALL No.	LOCATION/DESCRIPTION
1	POINT PLEASANT PARK
2	PIER A
3	TERMINAL ROAD
4	SACKVILLE STREET
5	N.S. MUSEUM OF THE ATLANTIC
6	DUKE STREET
7	UPPER WATER STREET
8	NORTH STREET
9	YOUNG STREET
9	HANOVER STREET
11	DUFFUS STREET
12	BURNSIDE
13	FERGUSON ROAD
14	WALLACE STREET EXTENSION
15	GROVE STREET
16	JAMESON STREET
17	BROOKSIDE AVENUE
18	LYLE STREET
19	BEST STREET
20	PARK AVENUE
21	CHURCH STREET
22	KING STREET
23	CANAL STREET
24	MAITLAND STREET
25	OLD FERRY ROAD
26	TUPPER STREET
27	CUISACK STREET
28	MELVA STREET
29	HERRING COVE



Map 1. Municipal Outfalls

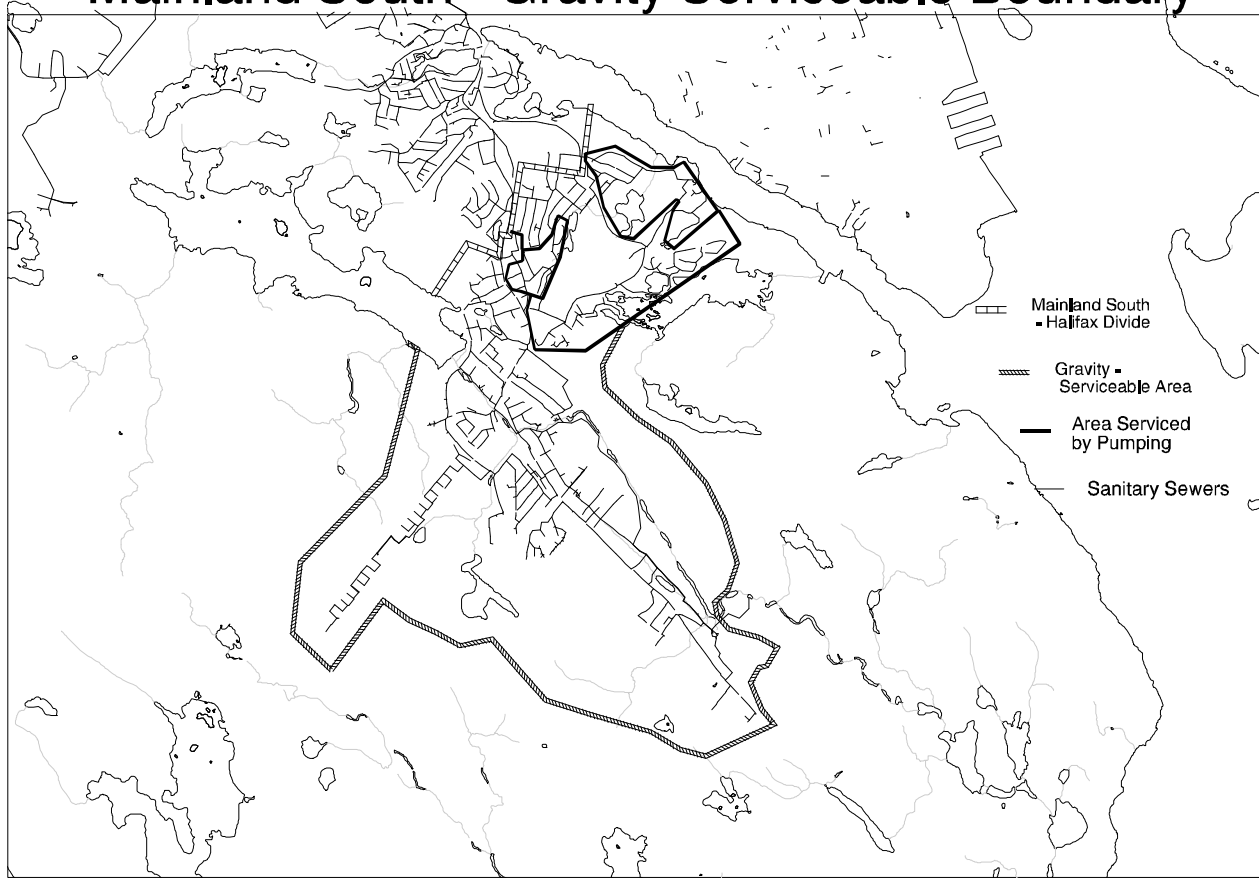
Map 2. Private Outfalls

Not Available in Electronic Version



Map 3. Water Quality Classes (from HHTF)

Mainland South - Gravity Serviceable Boundary



Map 4. Mainland South - Gravity Serviceable Boundary

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