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Royal Commission on the Future of the Toronto Waterfront

Memorandum
Note de Service

Commission royale sur l'avenir du secteur riverain de Toronto

To: **Environmental Audit Steering Committee and Workgroups**

From: **Suzanne Barrett**

Date: **October 4 1990**

Subject: **Agenda and Materials for October 12 steering committee/workgroup meeting, 9.00 am - 4.00 pm**

All members of the steering committee and workgroups are invited to attend the meeting.Unless otherwise noted, presentations of the findings of the workgroups will be made by the consultant(s) for each group.

9.00 am	Introductions	
9.10 am	General business and schedule: comments on Watershed Report, approach to Stewardship and Accountability, upcoming meetings.	
9.20 am	Natural Heritage	Sarah Kalff, Gord McPherson, Gavin Miller
10.00 am	Air	Lou Shenfeld
10.30 am	**Break**	
11.00 am	Hazardous Materials	Laura Jones
11.30 am	Water	Joanna Kidd
12.00 pm	Presentation on Flood Potential	Craig Mather, MTRCA
12.30 pm	**Lunch**	
1.30 pm	Built Heritage	Jeffery Stinson
2.00 pm	Soils and Groundwater	Paul Beck
2.30 pm	Soil Clean-up Concept	Dennis Lang, THC
2.45 pm	**Break**	
3.00 pm	Quality of Life/Health	Kate Davies
3.30 pm	Synthesis Report: form and content Any other business	

N.B. This sequence of topics for discussion is obviously not the most appropriate, but is dependent on the schedules of the workgroup members.

Attendance:

Please call 973-7185 to confirm that you will be attending the meeting. A light lunch will be provided.

Steering Committee members:

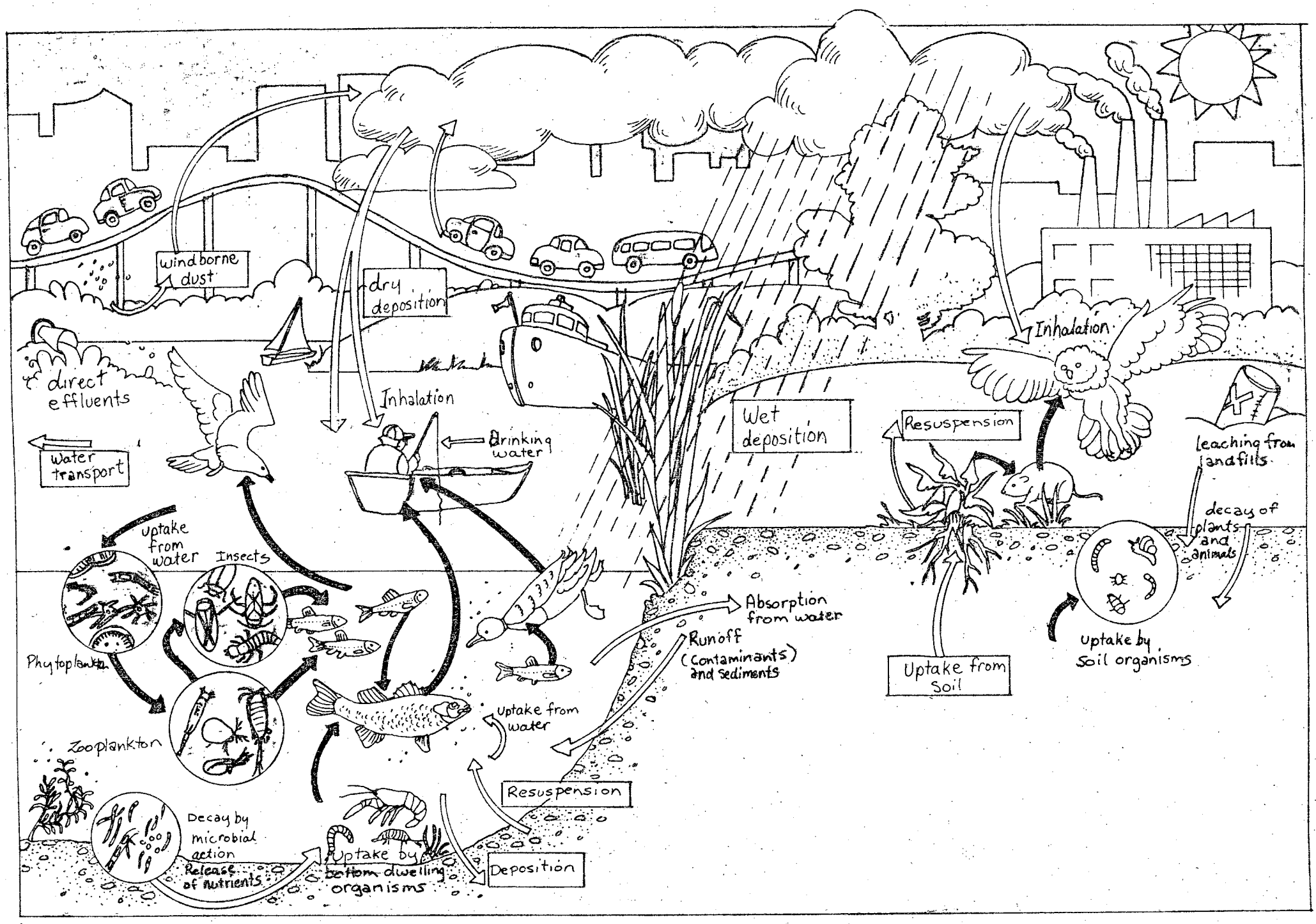
I am sending you two packages of bedside reading! Altogether, you should receive:

- Atmospheric Environment (second draft)
- Soils and Groundwater (second draft)
- Natural Heritage (second draft)
- Hazardous Materials (first draft)
- Water (first draft)
- Quality of Life/Health (first draft)
- Illustration of the EB/PIA ecosystem for the Quality of Life report (first draft)

Please try to get comments back to me or to the workgroup chairperson by 19 October - thanks!

Workgroup members:

I am sending you the report for your workgroup only. If you would like a copy of any of the other materials, please contact me.



DRAFT SKETCH OF EB/PIA ECOSYSTEM

FIRST DRAFT

ENVIRONMENTAL AUDIT OF THE PORT INDUSTRIAL LANDS AND EAST BAYFRONT PHASE II

WATER AND SEDIMENTS TECHNICAL PAPER

Prepared by the Water Work Group
for

THE ROYAL COMMISSION ON THE FUTURE
OF THE TORONTO WATERFRONT

OCTOBER 3, 1990

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WORK GROUP MEMBERS

Beth Benson	Department of Public Health, City of Toronto
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Dennis Lang	Toronto Harbour Commission
Melanie Neilson	Environment Canada
Sarah Miller	SCOW
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Bob Shaw	Ministry of the Environment
?	Lower Don Task Force

WATER AND SEDIMENTS TECHNICAL PAPER

INTRODUCTION AND PURPOSE OF THE REPORT

Phase I of the Royal Commission's Environmental Audit attempted to develop a description and understanding of the environmental conditions of Toronto's East Bayfront/Port Industrial Area. Phase I work undertaken by the Water Working Group utilised available information and allowed a fairly good characterisation of the aquatic environment in the area. This included the physical characteristics (water levels and currents), water and sediment quality, and aquatic biota.

The Phase I work found that generally, water quality in the study area can be described as poor. The waters are characterized by high levels of nutrients, with the Inner Harbour bordering on a eutrophic state, and the Keating Channel already eutrophic. In the waters of the Keating Channel and occasionally in the Inner and Outer Harbours, levels of some metals exceed Provincial Water Quality Objectives. Throughout the study area, bottom sediments are extensively contaminated. Although the benthic organisms dwelling in these sediments do not appear to be bio-accumulating metals to a significant degree, in some areas there is significant bio-accumulation of some organic compounds. The diversity of benthic organisms is directly related to pollutant levels, with the least diversity being found in the most contaminated areas, such as the Keating Channel. Because of contamination, there are restrictions on eating six species of fish taken from the Outer Harbour or Ashbridge's Bay.

While Phase I work identified many problems existing in the study area, it also identified some positive aspects to the state of the aquatic environment. Bacterial contamination, for example, is not a great problem at Cherry Beach which remains one of the cleanest along the Central Waterfront. Phosphorous levels in the area and along the waterfront have been dropping over the last 15 years. The Don River, while remaining a major source of pollutants to the Inner Harbour, is much cleaner than it was 20 years ago. The Outer Harbour and Ashbridge's Bay still contain significant fish habitat, and the waters of the study area remain a major site for migrating and overwintering wildfowl.

The Phase I report concluded that the sources of the problems affecting the aquatic environment in the study area generally originate outside it. Water quality is affected by rural run-off from York Region, stormwater from the entire Don watershed, sewage produced by hundreds of thousands of Metro area residents, and long range transport of air pollutants. Sources from within the study area include stormwater, spills, and contaminated groundwater, although the relative proportions of pollution contributed by these sources is not known.

Phase I work also identified a number of information gaps including:

1) limited information is available on water quality in the study area, particularly with regard to levels of organic chemicals, which makes it difficult to accurately assess trends over time;

2) there is a lack of recent information on loadings of sediments and contaminants from the Don River;

3) there is a lack of information on loadings to the Inner Harbour of heavy metals and organic contaminants from storm sewers and combined storm sewer overflows; and

4) no specific information exists on the toxicity of contaminated bottom sediments in the area to aquatic life.

The Phase I report prepared by the Water Working Group has been published as the Royal Commission's Technical Paper No. 5, and a summary and synthesis of the information can be found in the Commission's report number 10, "East Bayfront and Port Industrial Area: Environment in Transition".

The objectives of this Phase II report are to:

* review existing and proposed research and clean-up programs which address the data gaps identified in Phase I;

* review and summarise any new or unpublished data on water and sediment quality;

* outline the possible effects on the aquatic environment of existing and proposed projects such as the upgrade and expansion of the Main Sewage Treatment Plant; the re-start of the Hearn Generating Station, dredging of the Keating Channel; and the construction of the Outer Harbour Marina; and

* explore linkages between water and sediments and air, soils, groundwater, and biota.

RESEARCH AND CLEANUP PROGRAMS

Combined and Storm Sewers

Storm sewers and Combined Sewer Overflows (CSOs) have been identified as major sources of pollutants to the study area. During rainfall events, storm sewers discharge rainwater contaminated with heavy metals, organic compounds and animal feces. When it rains, combined sewers discharge a mixture of stormwater and untreated sewage containing

high levels of metals and bacteria into the waters of the study area.

There are 14 storm water outlets and 10 CSOs which discharge directly into the Inner Harbour, Keating Channel and the Ship Channel. Although there are data on bacterial loadings, Phase I work identified a lack in information regarding loadings of metals and organic contaminants from these sources.

Two programs recommended as part of the Metro Toronto Remedial Action Plan (RAP) will address the lack of information on loadings of metals and organics from storm sewers and CSOs in the study area.

1) Studies of Toxic Contaminant Sources

This study is listed as RAP Initiative 7.1.2 in the Metro Rap Draft Discussion Paper on Remedial Options. This study is intended to fill in missing information on loadings of toxic contaminants to the Metro Waterfront. The sources to be studied include storm sewers, CSOs, sewage treatment plant (STP) effluents, and water filtration plant backwash water. The objectives of the study are to:

* assess and compare loadings from the various sources;

* rank the outfalls for remediation on the basis of contaminant loadings during both dry weather and rainfall conditions;

* assess seasonal effects of these loadings;

* provide sufficient data for near-shore modelling; and

* provide a baseline against which the effects of future remediation activities can be measured.

These studies are currently being conducted for the Ministry of the Environment at a cost of approximately $470,000 over two years. An interim report on this program is expected in the fall of 1990, with the final report expected in 1991.

2) Fate and Transport Modelling Study

Information gathered from the above study will allow the quantification of inputs of metals and organics from CSOs and storm sewers (and the Main STP) in the study area. The Fate and Transport Modelling Study (listed as RAP Initiative 7.1.2 in the Metro RAP Draft Discussion Paper on Remedial Options) has been undertaken by the Ministry of the Environment in conjunction with Environment Canada to predict the relative impacts of discharges on the nearshore environment. The information collected in the above study will be fed into the modelling which is undertaken. The Fate and Transport study should allow predictions of impacts of discharges on water quality, sediments and biota, as well as the

extent of improvement which can be expected from remediation activities. The objectives of the study are to:

* simulate concentrations of contaminants in water, suspended and bottom sediments, and biota;

* estimate the relative contribution of various sources to the contaminant concentrations along the waterfront; and

* estimate the extent of loading reductions required to limit the zone of non-compliance with the Provincial Water Quality Objectives to 0 and 0.5 km around the Main STP outfall.

A preliminary report dealing primarily with the Main STP will be produced in 1990. The rest of the modelling will be done after the results of the Toxic Contaminant Sources Study are ready. The final Fate and Transport Modelling Study should be available by late 1991 or 1992. The cost of this study for 1990 is $85,000.

Toxicity of Sediments to Biota

Phase I work determined that bottom sediments are extensively contaminated throughout the study area. Sediments in all areas -- the Inner and Outer Harbours, the Keating and Ship Channels, and Ashbridge's Bay -- exceed the Ministry's Open Water Disposal Guidelines for at least six pollutants. However, Phase I also identified a major information gap -- that there is no specific information on the toxicity of sediments in the area to aquatic life. To remedy this, it was recommended that a program of bioassays be conducted on biota from benthic communities in order to determine the toxicity of bottom sediments to these organisms.

Two reports have been reviewed which include some biomonitoring in the study area. The first is a study carried out in 1989 by the Metropolitan Toronto and Region Conservation Authority (MTRCA) on the Outer Harbour Marina. The second is a study carried out by MTRCA as part of the Keating Channel Environmental monitoring Program. A study being conducted as a MISA pilot study is also gathering information on toxicity of sediments to aquatic life. In addition, the Ministry of the Environment has two programs underway dealing with contaminated sediments -- the first, to gain a better understanding of the biological significance of contaminated bottom sediments, and the second, to develop guidelines for contaminants in aquatic biota. As part of the Great Lakes Action Plan, Environment Canada is undertaking work dealing with the assessment, removal and treatment of sediments. These studies and programs are reviewed below.

1) <u>The 1989 Outer Harbour Monitoring Program</u>

In 1989, the Toronto Harbour Commissioners (THC) retained the MTRCA to carry

out a program of monitoring on the environmental impacts of the lakefilling used to create the Outer Harbour Marina. Part of this program involves biomonitoring using freshwater clams, Elliptio complanatus.

Caged clams were placed at the active fill site at station OHM2, as indicated on Figure 1. After a six-week exposure period, clam body burdens were analyzed for number of parameters including polycyclic aromatic hydrocarbons (PAHs), trace metals, PCBs and organochlorines. The results indicate that mercury was the only metal which was bioaccumulated by the clams. No PCBs were detected. Three of the organochlorines were detected at or just above the laboratory's minimum detection limits. The results are listed in Table 1, which also lists comparable data from Balsam Lake controls, the Outer Harbour, and Colonel Sam Smith Park.

2) The 1988 Keating Channel Environmental Monitoring Program

As a condition of the Environmental Assessment approval for the dredging of the Keating Channel, the MTRCA is required to implement an annual Environmental Monitoring Program to monitor the quality and quantity of material dredged, and the quality of material lost through the dredgate disposal cells within Tommy Thompson Park, (the Leslie Street Spit). Part of the program includes biomonitoring with caged clams.

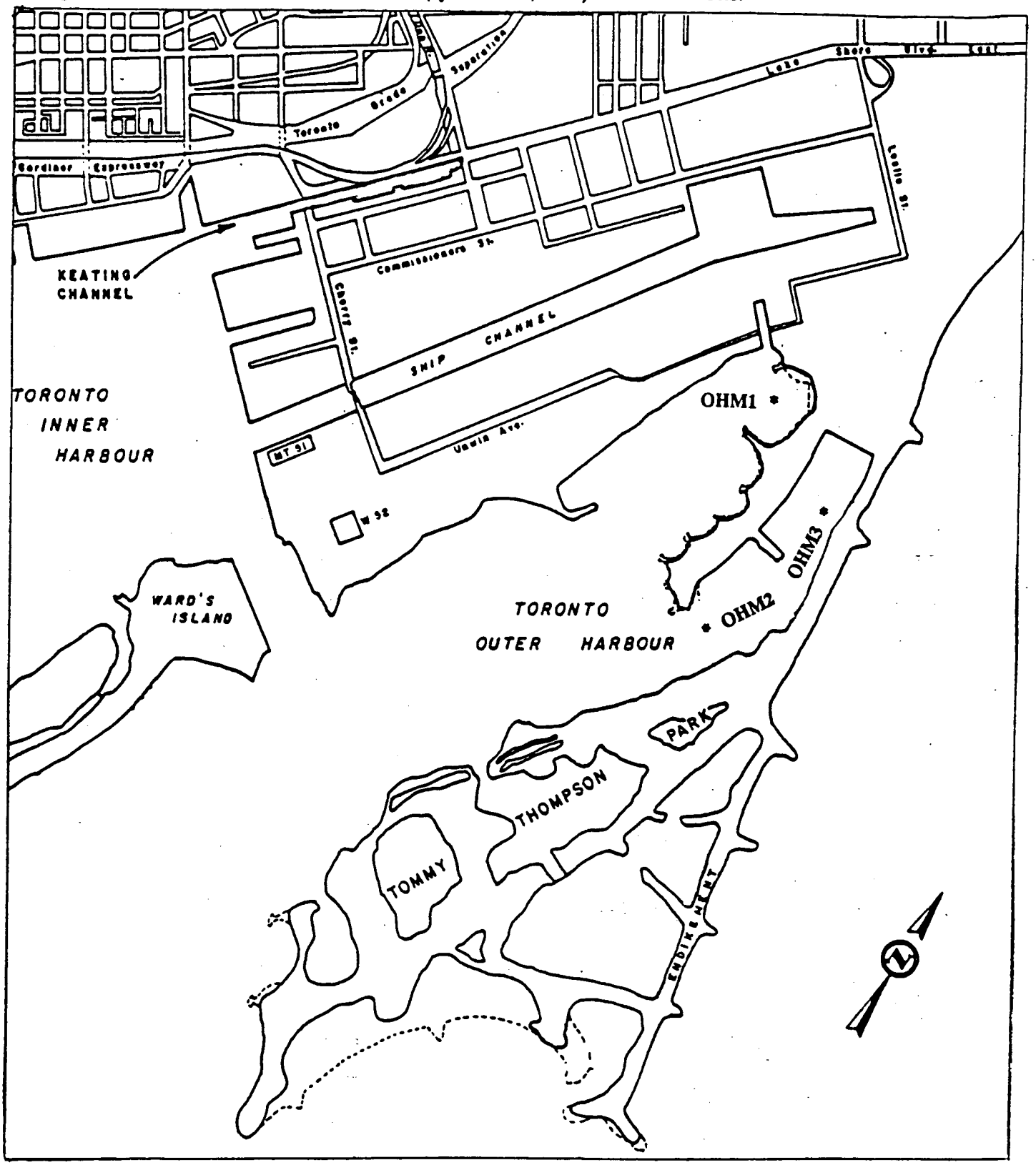
Caged clams were placed for six weeks at one site in the Outer Harbour in close proximity to the Spit, at three sites in the disposal cells, and at one site in the nearest embayment to the cells. The results are listed in Table 2, and show that the bioavailability of contaminants is confined to the disposal cells, and is not occurring in the Outer Harbour.

3) MISA Pilot Site Study of the Main STP

As part of the provincial MISA (Municipal-Industrial Strategy for Abatement) program, a pilot study is underway at the Main STP to determine the impact of the sewage treatment plant on the adjacent nearshore and derive effluent limits for the plant. The study is described in Initiative 7.2.2 of the Metro Toronto RAP Draft Discussion Paper on Remedial Options. The study includes:

* mutagenicity testing
* acute toxicity
* chronic toxicity
* modelling (fate and transport)
* sediment bioassays
* in-place pollutants (sediment contamination)
* sediment trap and clam/leech exposure
* in-situ bioassays (bioaccumulation)
* spottail shiners (bioaccumulation)
* phytoplankton bioassays
* water quality (chemistry)

Figure 1 Outer Harbour Marina (*after* THC,1989) Site Locations.



Legend:

* = site location

Taken from: The 1989 Outer Harbour Environmental Monitoring Program, (Unapproved Draft), MTRCA, July 1990.

Table 1 Trace metals, PCB/OCs and PAHs detected in Elliptio complanatus

	Balsam Lk.	OHM2	OH	SS23	MDL
Trace Metals (mg/kg)					
arsenic	<0.05	<0.05	0.05	0.05	
cadmium	0.51	0.49	0.51	0.7	
copper	0.18	0.17	0.25	0.26	
lead	<0.5	<0.5	<0.5	<0.5	
mercury	0.56	0.81	0.48	0.66	
zinc	23.0	21.0	23.0	24.0	
PCBs/OCs					
PCBs (μg/g)	ND	ND	ND	ND	0.01
pp,-DDE	ND	ND	ND	0.002	0.001
α-Chlordane	ND	0.001	ND	ND	0.001
τ-Chlordane	ND	0.001	ND	ND	0.001
pp'-DDD	ND	0.001	ND	0.001	0.001
PAHs					
Fluorathene	ND	0.01	0.01	ND	0.01
Pyrene	ND	0.02	0.01	ND	0.01

ND = NOT DETECTED MDL = MINIMUM DETECTION LIMIT

OH = Outer Harbour SS23 = Colonel Sam Smith Park

Taken from: The 1989 Outer Harbour Marina Environmental Monitoring Program, *Unapproved Draft), MTRCA, July 1990.

Table 2. Detection of Trace Metals, PCB's/Pesticides, and PAH's within Clam Tissue exposed in Tommy Thompson Park,1988.

PARAMETER	CONTROL	CELL 1	CELL 2	CELL 3	EMBAY. "C"	OUTER HARB.
Metals (mg/Kg)						
Cadmium	0.55	0.041	0.62	0.61	0.60	0.67
Copper	2.4	2.4	2.5	2.6	2.5	2.9
Lead	0.35	2.0	2.8	3.3	1.5	1.2
Mercury	0.014	0.012	0.023	0.014	0.018	0.022
Zinc	24	25	27	27	29	31
PAH's (ug/g)						
Pyrene	ND	0.54	0.48	0.15	0..07	0.10
Flouranthene	ND	0.33	0.36	0.10	0.06	0.09
Benz[a]anthracene	ND	0.08	0.10	0.03	ND	0.02
Crysene	ND	0.45	0.46	0.11	0.06	0.09
Benzo[b]fluoranthene	ND	0.21	0.15	ND	ND	ND
Benzo[k]fluoranthene	ND	0.09	0.08	ND	ND	ND
Benzo[a]pyrene	ND	0.09	ND	ND	ND	ND
Indeno[123-cd]pyrene	ND	0.04	ND	ND	ND	ND
Benzo[ghi]peryiene	ND	0.10	0.05	ND	ND	ND
PCB's/Pesticides (ug/g)						
1,2,4-Trichlorobenzene	ND	0.030	0.010	ND	ND	ND
Beta-BHC	ND	0.001	ND	ND	ND	ND
alpha-chlordane	ND	0.004	0.003	ND	0.003	ND
gamma-chlordane	ND	0.005	0.010	0.002	0.005	0.003
p,p'-DDD	ND	ND	0.002	0.002	ND	ND
Methoxychlor	ND	0.017	ND	ND	ND	ND
beta-Endosulphan	ND	0.002	0.002	0.002	ND	ND

ND: None Detected

Taken from: The 1988 Keating Channel Environmental Monitoring Program, MTRCA, November 1989.

It is expected that the MISA Pilot Site Study report will be available by the spring of 1991.

4) Development of Provincial Sediment Quality Guidelines

Present guidelines are not satisfactory for assessing the biological significance of contaminants living in bottom sediments. The Ministry of the Environment has been conducting programs (as part of the In-Place Pollutants Program) over the past five years to obtain information which will provide a better understanding of the biological significance of contaminants in sediments. This is most recently described as Initiative 1.4.4 in the Metro Toronto RAP Draft Discussion Paper on Remedial Options.

The Provincial Sediment Quality Guidelines are intended to address the following:

* lethal and sub-lethal effects of contaminants in sediments on benthic organisms;

* bioaccumulation of contaminants from sediments by benthic biota, and the potential for biomagnification and transfer up the food chain; and

* the release of contaminants from sediments to ambient water.

The intention is to set limits on acceptable concentrations of contaminants in bottom sediments. Sediment contamination above these would not be permitted, and loadings would therefore need to be controlled to prevent exceedance of these limits. When limits are exceeded, a remediation response would be required.

In _____ 1990, the Ministry released its Draft Sediment Quality Guidelines for Public review. Final guidelines are expected by the spring of 1991. These will replace the current Open Water Disposal Guidelines.

5) Development of Contaminant Residue in Biota (CRAB) Guidelines

The Ministry of the Environment has initiated the development of CRAB guidelines -- guidelines that will define allowable concentrations of contaminants in aquatic biota to protect against harmful effects to an organism and its predators, including humans. The Ministry currently has no such guidelines, and uses those developed by other agencies to aid in interpreting information on contaminant residues. The CRAB guidelines are not intended to be applied to human consumption of sportfish, as such guidelines are developed primarily by Health and Welfare Canada.

The development of the CRAB guidelines is outlined in Initiative 7.2.3 in the Metro Toronto RAP Draft Discussion Paper on Remedial Options. A review of literature pertinent to setting guidelines for contaminants in biota was completed in the fall of 1989. It is expected that a draft methodology for setting the CRAB guidelines will be available by the fall of 1990.

6) Sediments and the Great Lakes Action Plan

The Great Lakes Action Plan (GLAP) is a new program aimed at ensuring federal participation in the Remedial Action Plans being carried out in the Great Lakes. The Cleanup Fund is one component of the GLAP, and will provide $55 million between 1990 and 1994 to assist with cleaning up pollution sources and impaired uses within areas of federal jurisdiction. A number of work groups, containing members from agencies on both sides of the border, have been set up by Environment Canada to manage initiatives supported under the Cleanup Fund. These are described below.

* A Sediment Removal Work Group has been set up to provide scientific and technical advice and direction on state-of-the art sediment removal and handling options. The Group is currently developing criteria for assessing the performance of removal technologies and selecting suitable locations for demonstrations of such technologies.

* A Sediment Treatment Technologies Work Group will provide guidance, direction and advice on treatment options for contaminated sediments. The Group will be reviewing and assessing available technologies under development or in use.

* A Sediment Assessment Work Group has been set up to provide guidance and direction with regard to the biological effects of contaminated sediments. Ministry of the Environment representation in this group is intended to ensure a coordinated federal/provincial approach to developing biological criteria, and examining the use of sediment toxicity and benthic community structure for developing sediment criteria.

Outlines for calls for proposals to assess removal and treatment technologies are being developed for release in the Fall of 1990.

EFFECTS OF EXISTING AND PROPOSED PROJECTS

The Outer Harbour Marina

The Outer Harbour Marina is located on the north shore of the Leslie Street Spit. In 1986, the THC began lakefilling to create the Marina. The majority of the lakefilling was completed by 1989, with some final "touch-up" filling done in 1990. The MTRCA was contacted by the THC in 1989 to initiate an Outer Harbour Marina Environmental Program. The objective of the program is to monitor and evaluate the environmental impacts that the ongoing lakefill program has on the aquatic environment. The results of the 1989 biomonitoring program have been reported above. Additional monitoring carried out in 1989 included water quality, sediment quality, and an assessment of the benthic invertebrate community.

Assessments were carried out at the three monitoring stations indicated in Figure 1. A total of seven water samples were collected (from May to August 1989) at one station, OHM2, (the active fill face), and were subsequently analyzed for physical parameters, nutrient parameters, trace metals, PCBs, organochlorine pesticides and bacterial densities. Water quality parameters were compared to the Provincial Water Quality Objectives where applicable. Parameters not covered by the Provincial Objectives were compared to the federal CCREM guidelines. The only guideline exceeded was that for suspended solids, as indicated in Table 3.

Sediment samples were collected at all three sampling stations and were analyzed for nutrients, trace metals, PCBs, organochlorine pesticides, and grain size composition. The results obtained were compared to the Provincial Open Water Disposal Guidelines (PWQO), and are listed in Tables 4 and 5. Levels of lead exceeded the PWQO at all three sampling stations, and zinc and arsenic exceeded guidelines at OHM1 and OHM2. Sediments were found to be contaminated with PCBs at levels exceeding the PWQO at all three sampling stations. The Province does not have guidelines for organochlorines in sediments, but most of those detected were at or near the lab's minimum detection limit.

Sampling of benthic invertebrates was carried out to provide "more holistic view of environmental conditions" at the sampling stations than is provided by water or sediment sampling alone. Based on the oligochaete-density index, the station OHM1 was classified as having a severe pollution level, OHM3 as having a mild pollution level, and OHM2 as having a negligible pollution level.

The Keating Channel

As it makes its right hand turn to enter the Keating Channel, the Don River deposits much of the sediments carried from upstream sources. Phase I work determined that the waters and sediments of the Keating Channel are among the most degraded in the Toronto Waterfront.

Table 3 Mean, maximum and minimum values for trace metals, nutrients and bacteria densities collected at OHM2 during the seven 1989 LFMP water sampling runs.

Parameters	Maximum	Minimum	Mean	Guidelines/Objective
Physical				
pH	8.3	7.5	8.0	6.5 - 8.5[1]
Conductivity	350	300	318	NG[2]
Suspended Solids	31	1	11.1	10 mg/L when background levels <100 mg/L[3]
Turbidity	25.4	3.2	9.9	NG
Nutrients				
Total Phosphorus	0.044	0.014	0.02	0.02 mg/L[1]
Ammonia	0.044	0	0.02	0.93 mg/L[1]
Trace Metals				
Total Cadmium	0.0003	0	0.00009	0.0002 mg/L[1]
Total Lead	0.008	0	0.003	0.025 mg/L[1]
Total Zinc	0.011	0	0.004	0.03 mg/L[1]
Mercury	ND[4]	ND	ND	0.3 mg/L[1]
Bacteria				
Faecal coliform	110	2	6.3[5]	100/100 ml[1]
E. coli	8	2	2.9[5]	NG
P. aeruginosa	ND	ND	ND	< 1/100ml[6]
Enterococci	ND	ND	ND	NG

[1] PWQO (MOE, 1984)
[2] No Guidelines
[3] CCREM (1987)
[4] Not Detected
[5] based on Geometric Mean calculations
[6] IJC (1983)

Taken from: The 1989 Outer Harbour Environmental Monitoring Program, (Unapproved Draft), MTRCA, July 1990.

Table 4 Nutrient and trace metals results (mg/kg) from the 1989 Outer Harbour Marina surficial sediment samples.

Parameter	OHM1	OHM2	OHM3	OWDG
Nutrients:				
Total Organic Carbon	1.96	2.01	1.01	1000
Oil and Grease	430	540	550	1500
Total Phosphorus	905	725	595	1000
TKN	1560	870	425	2000
Trace Metals:				
Total Arsenic	12.3	11.0	6.9	8.0
Total Cadmium	0.8	0.8	0.4	1.0
Total Lead	120	100	100	50.0
Total Mercury	0.15	0.18	0.02	0.3
Total Zinc	190	140	70	100.0

Table 5 PCB/OCs detected ($\mu g/g$) in the 1989 Outer Harbour Marina surficial sediments.

Parameter	OHM1	OHM2	OHM3	OWDG	MDL
Total PCBs	0.12	0.13	0.15	0.05	0.02
OCs:					
Heptochlor	0.001	ND	ND		0.001
Aldrin	0.003	ND	0.001		0.001
pp'-DDE	0.001	0.001	0.002		0.001
α-chlordane	0.003	0.002	0.002		0.002
τ-chlordane	0.006	0.002	0.002		0.002
dieldrin	0.003	ND	ND		0.002

Taken from: The 1989 Outer Harbour Environmental Monitoring Program, (Unapproved Draft), MTRCA, July 1990.

In order to reduce the flooding hazard caused by reduced channel capacity, and to improve Inner Harbour navigability, the Keating Channel requires dredging on an ongoing basis. Because of the 1972 Canada/US agreement to ban open water disposal of contaminated sediments, dredging was halted between the years 1974 and 1987, which caused extensive sedimentation of the channel to occur. In 1986, the THC undertook an Environmental Assessment which outlined a method of dredging and disposal of sediments (at the confined disposal cells on the Leslie Street Spit).

As a condition of EA approval, the MTRCA is required to implement an annual Environmental Monitoring Program to monitor the quality and quantity of material dredged from the Keating Channel, and monitor the quality of material lost through the dredgate disposal cells. These results are published in an annual report. The results of the biomonitoring program have been reviewed earlier in this report. In addition to biomonitoring, the MTRCA carries out monitoring of sediment quality and benthic communities.

In the 1988 monitoring program, sampling was done at many stations in the Keating Channel, and sediment samples were taken from within the confined disposal cells, from two of the embayments on the Spit, and from the Outer Harbour. The 1988 results indicate that the Keating Channel dredgate fails to meet the Open Water Disposal Guidelines (OWDG). Parameters exceeded included oil and grease, zinc, lead and PCBs. Although there are no PWQO for organochlorine pesticides, DDT, DDD, dieldrin and chlordane were detected throughout the sediments. HCB, endrin, gamma-BHC and beta-BHC were found primarily in the disturbed sediments of the channel.

Results of sampling in and around the confined disposal cells indicate that there is little similarity in the chemical composition of sediments deposited within the cells as compared to those outside of the cells. These results suggest that there is no noticeable transport of sediments from the disposal cells to other areas in and around the Spit. Sampling carried out in the Outer Harbour found that sediment chemistry levels there can generally be considered clean.

Research on benthic communities found that benthic density is increasing within the disposal cells, and that this may be in part attributable to the relocation of immature invertebrates within the dredged sediments. The benthic communities at all stations are dominated by pollution-tolerant tubificids, and the domination of tubificids increased substantially in the disposal cells from 1987 to 1988.

Main Sewage Treatment Plant Upgrade and Expansion

Metro Toronto Main Sewage Treatment Plant (STP) is one of the largest in Canada, servicing a population of approximately 1,200,000 people. Its service area includes much of the City of Toronto and the Borough of East York, and parts of Scarborough and North York. The Phase I work of the environmental audit identified that the discharges from the Main STP are significant sources of phosphorus, copper, zinc and lead to the waters on the

eastern side of the study area. Metals and chemicals dumped into the system from residences and industries "upstream" are for the most part passed through the STP and cause a zone of impairment around the existing outfall.

The Main STP has an average rated flow capacity of 180 million imperial gallons per day (180 MIGD, or 818,280 m^3/day). The plant is presently at near capacity levels, with a current average flow of about 175 MIGD (795,550 m^3/day). Metro Toronto has proposed to conduct a Class Environmental Assessment on an upgrade and expansion of the plant. This is being conducted to meet Ministry requirements for effluent quality and air emissions, and future needs for wastewater treatment.

This Class EA is currently in the first, or "Problem Definition" phase in the Class EA Process. Metro has identified a number of existing problems which contribute to the need for the upgrade and expansion. These include:

* There is a need to reduce combined sewer overflows into the Don River, Inner Harbour, Ashbridge's Bay, Eastern and Western Beaches. Expansion of the plant will allow CSOs and stormwater to be temporarily stored in detention tanks and later treated at the Main STP. Metro has drafted a policy which proposes that the frequency of combined sewer overflows be reduced to one overflow per year on average.

* There is a need to reduce bypasses of the secondary treatment plant during storm events. When flow to the plant exceeds 180 MIGD, effluent is chlorinated after primary treatment and discharged through the STP outfall. When flow exceeds 240 MIGD, liquids are chlorinated after primary treatment and discharged out the Seawall Gates into Ashbridge's Bay. This contributes to local impairment of water and sediment quality. In 1989, secondary bypassing occurred nine times, discharging 2.4 MIGD (10.8 m^3) through the Seawall Gates.

* Primary Treatment Capacity is exceeded when flow to the Main STP exceeds the firm peak flow capacity of 557 MIGD (2,532,122 m^3/day). When this occurs, motorized gates are activated on the Mid-Toronto Interceptor to prevent excess flow to the plant. This forces untreated sewage to be discharged into the Inner Harbour via CSOs and occurs about four times a year.

* Population Growth is expected to continue within the current "sewershed" of the Main STP. Predictions are that population will grow by 12.3% by 2001 (using a medium growth scenario), and will grow by 22.7% by 2001 (using a high growth scenario). A growth in population means an increase in the volumes of wastewater which must be treated.

* Solids Loading is also expected to increase because of two factors -- incineration of sewage sludge from the Humber STP, and because of increased population growth. About half (?) of the sludge from the Humber plant is currently piped to the Main STP, treated, and incinerated. The balance of the Humber sludge is currently landfilled, but in the fall of 1990, the landfill site will reach capacity. It is proposed

that all the Humber sludge be transferred to the Main STP for treatment and incineration. Current loadings of solids to the plant are 230 dry t/d. With a medium growth scenario and the Humber sludge this is predicted to rise to 316 t/d by the year 2001. With the high growth scenario and the Humber sludge, this is expected to rise by ____ t/d.

* Water consumption has been increasing in Metro Toronto. Without water conservation programs, consumption in East York, North York and Scarborough is expected increase over the next 20 years to about 100 gallons per capita per day (gpcd) (450 l/c/d) from the existing rate of between 65 and 77 gpcd (300 to 350 l/c/d).

* There is a possibility that the North Toronto STP may be decommissioned. The North Toronto Plant is small, servicing some 55,000 people and operating at a controlled rate of 7.5 MIGD (34,095 m^3/day). Metro is currently undertaking a physical audit of the plant to evaluate its efficiency. If the decision is made to decommission the plant, its effluent would require treatment at the Main STP.

* Future Regulatory Requirements by the Ministry of the Environment will likely mean stricter discharge limits for STPs. These requirements, produced under the Province's MISA program, may mean the installation of tertiary treatment at the Main STP, as well as tougher Sewer Use controls on "upstream" discharges of pollutants. A requirement for tertiary treatment will require space for additional treatment facilities at the Main STP.

As required under the EA Act, Metro is also evaluating alternatives to the upgrade and expansion of the Main STP. Currently, these include:

* reducing sewage flows through water conservation programs and controlling infiltration of stormwater into the sewage treatment system;

* improving stormwater management through activities such as separating sanitary and storm sewers, disconnecting roof leaders, construction of detention tanks, etc.;

* constructing a new sewage treatment plant; and

* the "do nothing", or null alternative.

The proposed upgrade and expansion of the Main STP can be expected to have a number of effects on the aquatic environment in the study area -- both positive and negative. There are also a number of outstanding questions which have been raised by the public. These are briefly itemized below:

Possible Positive Effects

* A reduction in bacterial and chemical loadings to the waterfront will result through reduction in frequency of CSOs.

* An improvement in water quality in Ashbridge's Bay near the Seawall Gates and around the existing outfall will occur through reducing or eliminating secondary bypasses.

* A reduction in bacterial and chemical loadings to the Inner Harbour through reduction or elimination of bypasses when primary treatment capacity is exceeded.

* A new outfall placed farther into the lake will reduce the zone of impairment around the STP outfall.

Possible Negative Effects

* An increase in air emissions will occur due to the incineration of the remainder of the sludge from the Humber STP.

* One alternative for expansion of the Main STP involves landfilling at the southern end of the property. This can cause disruption of coastal processes and local impairment of water quality during construction.

Outstanding Questions

* Will the increase in incineration at the Main STP increase the problems of odours for local residents?

* Are there methods of disposing or using sewage sludge which would eliminate the need for incineration at the Main STP?

* Are there alternatives to the use of chlorine for disinfection which would be less environmentally harmful and eliminate the need for storage of chlorine?

* Are there alternatives to lakefilling to provide the space needed for expansion at the Main STP?

* Should reducing sewage flows through water conservation and better control of infiltration be considered as alternatives in the Class EA process, or should they be "built into" the planning process?

* Should improvement of stormwater management be considered as an alternative in the Class EA process, or should it be "built into" the planning process?

* How does the Main STP Class EA fit into the Metro Toronto RAP process?

* Is there a way of predicting the future regulatory requirements under MISA and building to meet those targets?

The Re-Start of the Hearn Generating Station

to come...

LINKAGES

to come...

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