Chapter VIII

FINDINGS AND RECOMMENDATIONS

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8.1 FINDINGS

8.1.1 Point Source Discharges

69 municipal and industrial point source discharges to the Niagara River and its tributaries were sampled during this project. For the most part surveys were based on a limited number (1-8) of samples for each facility. The findings below are restricted to EPA priority pollutants although some additional compounds were measured.

To reduce the number of facilities requiring detailed discussion to a manageable number, a significant point source was defined as one whose effluent contained at least one individual priority pollutant in an amount exceeding an agreed to arbitrary cut-off level for various categories of pollutants.

It should be noted that the loading data presented below represent only the relative contributions from the point sources at the time of sampling and cannot be extrapolated to long term annual loads for each facility. Loading will vary with the level of production. At the time of sampling, a number of facilities sampled were not operating at full capacity.

Because of the large flows from some facilities that discharge treated waste waters and cooling waters, reasonably large amounts of certain pollutants might be discharged without being detected at the analytical detection limits used during the project. This may be particularly significant for municipal wastewater treatment plants that handle industrial wastes.

The loadings to the river reported for most point sources sampled during the project are gross (total) loadings and may therefore include contaminants present in the intake water.

A summary of the results of the point source survey is as follows:

1. Of the 69 municipal and industrial point source discharges to the Niagara River and its tributaries sampled during the project, 29 were designated as significant (as defined in Chapter II p. 2-9) on the U.S. side of the river and 8 on the Canadian side.

2. The total quantified load of EPA priority pollutants from these 69 point sources was approximately 1400 kg/d. The 37 significant point sources account for 95% of the total quantified loading of EPA priority pollutants from all point sources sampled during the project.

3. American and Canadian sources accounted for 89% and 11% of this total load respectively.

4. Of the 1400 kg/d, 83% was inorganic EPA priority pollutants (i.e. metals and cyanides) and 17% was organic EPA priority pollutants. Fifteen compounds made up 90% of the latter category. Of these 15 compounds, 8 were on the Group I (chemicals requiring immediate action) List reference.

5. Ten facilities out of the 37 (9 U.S. and 1 Canadian) accounted for 90% of the load of EPA priority pollutants from all point sources sampled during the project.

6. On the U.S. side, the Buffalo-Lackawanna Sub-Area received the highest loadings although loadings to the Tonawanda-N. Tonawanda and the Niagara Falls, N.Y. sub-areas were also significant. The Niagara Falls, Ontario sub-area received the majority of the loadings on the Canadian side.

7. The loading contributions of many compounds from urban run-off can represent an important addition to that from point sources. For some compounds (e.g. PAHs) the contribution from run-off can be greater.

8. Results of U.S. studies of urban storm sewers under dry weather conditions indicated no significant concentrations of toxic contaminants in water samples collected. Sediment deposits, however, indicated elevated levels of selected substances in some instances.

8.1.2 Non-point Sources

The objective of the non-point source program was to characterize toxic contaminants and determine the potential for contaminant migration from hazardous waste landfills on the U.S. side and closed and active landfills on the Canadian side. On the U.S. side, significant landfill sites within a 3 mile wide band along the river were identified. On the Canadian side all landfills within the Niagara and Welland River drainage basin were considered. It should be noted that the criteria for determining significance were different between Canadian and U.S. agencies. The U.S. sites were selected on the basis of site investigations. On the Canadian side, any site known or suspected to contain or have received any industrial wastes was designated as significant. As a result, the two groups of sites are not directly comparable.

The data used have come from a variety of sources and the quantity and quality, therefore, varies considerably among sites. Sub-surface hydrogeological investigations were conducted on a sub-area basis at sites on the U.S. side of the river as part of this project. Although not collected specifically as part of this project, sub-surface information was available for twelve out of the seventeen Canadian sites identified. This included two of the five sites that were identified as being significant.

In general, the information on U.S. sites is more extensive than that for Canadian sites. Hence the findings summarized below address to a large extent, conditions on the U.S. side of the river.

1. Over 215 hazardous waste disposal sites have been identified in Erie and Niagara counties (New York). One hundred and sixty-four of these are

within 3 mi. of the Niagara River and include sites used by major industries along the river for the disposal of large quantities and a wide variety of hazardous wastes. Based on specified U.S. criteria, sixty-one of these one hundred and sixty-four sites have been determined to have a significant potential to impact the Niagara River. Of these 61 sites, the following, in the best judgement of the Committee, have contributed or are contributing contaminants to the Niagara River.

SITES THE COMMITTEE BELIEVES HAVE CONTRIBUTED OR ARE CONTRIBUTING CONTAMINANTS TO THE NIAGARA RIVER

-Bethlehem Steel
-DuPont Buffalo Avenue (6 sites)
-Gratwick-Riverside Park
-Hyde Park
-Love Canal
-Occidental, Buffalo Ave., Plant area (9 sites)
-Occidental Durez
-Occidental 102nd Street
-Occidental S area
-Olin Buffalo Avenue (3 sites)
-Olin 102nd Street
-Squaw Island
-Times Beach

2. Seventeen landfill sites have been identified in the Niagara and Welland River drainage basins in Ontario. Of these, based on specified Canadian criteria, five have been identified as having a significant potential to impact the Niagara River. Of these sites, it is the Committee's opinion the Atlas Steels landfill is contributing contaminants to the Niagara River via the Welland River.

3. General overall groundwater contamination with metals and synthetic organic chemicals covers a large areal extent in the three mile band along the U.S. side of the river.

4. The Niagara Falls, N.Y. sub-area, which has the highest density of waste landfill sites, was found to have the highest concentrations of a number of chemicals in the groundwater.

5. The horizontal movement of groundwater in the unconsolidated deposits in this three mile band on the U.S. side is generally toward major surface water bodies including Lake Erie the Niagara River and its tributaries. Contamination has also been detected in the bedrock in the Niagara Falls' N.Y. sub-area and this is believed to be an avenue of chemical migration to the Niagara River.

6. It was not possible during the present project to quantify loading contributions from these non-point sources to the river.

8.1.3 Ambient Measurements

The extent of the occurrence of toxic substances in the Niagara River was assessed and an attempt made to locate areas in the Niagara where significant inputs of toxic substances were occurring. Twenty-eight sub-projects were carried out to monitor toxic substances in water, suspended sediment, bottom sediment, fish and other biota (clams, algae). Approximately 105,000 chemical analyses were done. More than 75% of these analysis indicated results less than the analytical detection limits. The major findings are summarized briefly below:

1. Detectable levels of contaminants are present in Lake Erie water, sediments and biota entering the Niagara River.

2. Twenty-four chemicals were shown to have a statistically significant higher concentration at the Lake Ontario end of the Niagara River as opposed to the Lake Erie end indicating inputs of these chemicals along the river. It is probable that virtually all the toxic chemical input occurs above Queenston/Lewiston. Eleven of these chemicals occur on the Group I list (chemicals requiring immediate attention), a further 11 occur on the Group II list (chemicals for which additional work is required), and two are considered to be of no concern.

3. Although whole water measurements (MOE Drinking Water Project) at both ends of the Niagara River occasionally show exceedances of the most stringent ambient water quality criteria and IJC objectives, none of the 45 chemicals measured that have ambient criteria or objectives, showed exceedances that are statistically significant at either end of the river. The median value of chloroform, at both ends of the river, was indistinguishable from the criterion by the statistical tests that were used.

4. The most stringent agency ambient water quality criteria including GLWQA specific objectives were exceeded at least once for aluminum, cadmium, chromium, copper, lead, silver and zinc somewhere in the river. For organic contaminants: alpha, beta, gamma, - hexachlorocyclohexane; chlordane; and total phenols exceeded minimum agency ambient water quality criteria at least once somewhere in the river. The frequency of exceedances in the river were usually not much greater than in inlet water samples from Lake Erie.

5. IJC objectives for the protection of fish consuming birds were exceeded by concentrations of PCBs in young-of-the-year spottail shiners from 21 of 23 collection sites in the Niagara River but not at the Lake Erie collection site. The objective for mirex in these fish at the same 23 sites was exceeded only at 3 sites in the Tonawanda Channel and from all 4 sites in the lower river.

6. The extent of chemical contamination by different substances varied considerably along the length of the river. Elevated concentrations of a number of toxic chemicals in water, sediment, fish and other biota in localized areas indicate inputs of these substances in these areas along the river.

7. Highly contaminated pockets of bottom sediments were found at many locations in the study area. Criteria based on guidlelines for disposal of contaminated dredged material were available for some metals,

cyanide, and PCBs. Exceedances of one or more of these criteria were noted in all segments of the river with the exception of the Bird Island-Riverside and Fort Erie segments. The overall pattern of sediment contamination is as follows:

- low pollutant levels in the Bird Island-Riverside, Fort Erie, and Chippawa segments
- intermediate levels of pollutants in the Lake Erie, Black Rock Canal, and Lower River segments
- high pollutant levels in the Buffalo River, Tonawanda-North Tonawanda, and Wheatfield-Upper River segments.

8. Some species of sports fish in the lower river have size restrictions on the suitability for human consumption as a result of exceeding human health protection guidelines i.e. PCBs and mirex.

9. Niagara River water at existing drinking water intakes is within the drinking water supply guidelines promulgated by Canadian and U.S. agencies. However, the agencies have not established guidelines for many of the substances found in the river nor have interactive effects among chemicals been assessed for.

10. The following conclusions can be drawn from connections between ambient and source data. These connections could only be established when a possible source point upstream of the ambient monitoring station reported the presence of a substance that was measured in high levels at the ambient monitoring station:

a. Lead, zinc, and PAHs found in the sediments around Bethlehem Steel have probably originated from past discharges by this facility.

b. The Buffalo Color hazardous waste site has probably contributed mercury to the Buffalo River where it now appears in river sediments and these contributions may be continuing.

c. Storm water sewers leading into the Black Rock Canal segment probably have contributed PCBs, chromium, lead, zinc, and mercury to the sediments in the Canal.

d. The Occidental Durez facility and associated landfills are the likely source of hexachlorobenzene, found in sediments at the mouth of the Pettit Flume. The presence of 2,3,7,8-TCDD in spottail shiners in the Pettit Flume suggests that this substance may have migrated from the sites to the river.

e. Mirex and 2,3,7,8-TCDD, found in fish taken from the Little River probably originated from the Love Canal or 102nd Street hazardous waste sites, or both.

f. High PCBs and mercury in Cladophora at the mouth of Gill Creek probably originated at the DuPont and Olin Buffalo Avenue plant sites.

11. Data for sediments and for some sports fish from the western basin of Lake Ontario indicate declines in the input of PCBs, DDT, mirex and chlorinated benzenes between the early to mid-1970s and 1980. This is confirmed by the significant declines in PCBs and DDT residues since 1975 in spottail shiners collected at the outlet of the Niagara River. Mirex levels in these fish have declined since 1978, whereas trends with time appear to be absent for chlordane and hexachlorocyclohexane (BHC) isomers. Since 1980, however, levels of PCBs and DDT in spottails are no longer declining. However, fluctuations make it difficult to determine any new trends.

8.1.4 Current Control and Remedial Programs

1. The SPDES program provides the control and remedial program mechanisms for point source dischargers of toxic substances on the U.S. side. SPDES permits have been or are currently being issued to address the point source discharges of toxic substances. Mechanisms (such as Superfund) also exist to address the non-point sources remedial programs. Accelerated clean-up of waste sites is necessary to address confirmed and potential contaminant entry into the Niagara River.

2. The limits in second round SPDES discharge permits currently being issued, when achieved, will reduce the amount of contaminants entering

the Niagara River from that allowed in the first round permits. Evaluation of the second round permit limits indicates that a number of substances will still exceed the minimum agency ambient water quality criteria in the U.S. portion of the river. The permits require review for these substances.

3. The loading data from municipal and industrial facilities sampled during the project indicate that present discharges are in some cases below the final permit limits set for some of these facilities because of the lower production as a result of the current downturn in the economy. It may be, therefore, that loadings for some chemicals from some point sources to the river will increase if facilities increase production to full operating capacity with a change in economic circumstances.

4. Control and remedial program mechanisms also exist on the Canadian side for the control of point and non-point sources of toxic substances and consist of Certificates of Approval and Control Orders. Control program development including requirements for discharge monitoring, pretreatment, application of best available technology and governmental waste site remedial action are provided for under environmental legislation, but require implementation.

5. Evaluation of Ontario's Certificates of Approval indicates that contaminants limited in those certificates are adequately controlled to protect water quality in the receiving water course. There is a need however to include other parameters present at trace levels in the discharges, and not presently controlled. A more universal responsibility for self-monitoring by the discharger is required.

8.1.5 Chemicals and Levels of Concern

1. Chemicals found in point-source effluents along the Niagara River were not always reported in the ambient environment because the chemicals

were not looked for or concentrations were too low after river dilution, degradation, or other losses.

2. Major gaps exist in basic information about the nature and environmental effects of most of the contaminants which have been placed on the NRTC inventory in the Group II category. To fully assess the characteristics of the chemicals in Group II, more monitoring and research work is required.

3. Two hundred and sixty-one chemicals have been found at least once in the water, sediment or biota of the study area and the eastern end of Lake Erie and the western end of Lake Ontario. Based on these findings, these chemicals have been grouped as follows (individual chemicals have not been ranked within each group.):

   a) Group I chemicals require immediate attention. Fifty-seven chemicals fall into this category. These chemicals have been detected at least once at levels which exceed some human health or environmental criteria or are considered to pose a human health or environmental risk.

   b) Group II chemicals have varying requirements dictated by priorities ranging from those marginally below Group I down to those almost equal to Group III. One hundred and seventy chemicals fall into this category. These chemicals have been identified as having the potential to adversely affect the Niagara River ecosystem in some way. At the present time, the data are incomplete so that a thorough assessment of all of these chemicals cannot be made.

   c) Group III chemicals require very little attention. Thirty-four chemicals fall into this category.

4. Agencies have derived individual criteria for each chemical, however, because these criteria are not always uniform it is difficult to assess the environmental or human health effects of these chemicals.

8.2 RECOMMENDATIONS

The Niagara River Toxics Committee has developed recommendations, on control programs and on long term water quality monitoring programs that will allow evaluation of the effectiveness of control programs. The latter recommendations have been addressed in Chapter VII. (Recommendations for Long Term Monitoring) and will not be discussed here.

The specific recommendations based directly on project findings are presented first and are followed by the more general recommendations.

8.2.1 Recommendations Pertaining to Point Sources

There are twenty-nine significant industrial and municipal point sources on the U.S. side of the river and eight on the Canadian side. The total EPA priority pollutant load from these sources was estimated, on the basis of the limited sampling of this project, to be approximately 1400 kg/d of which 80% were metals. American point sources were responsible for 89% of this total and Canadian point sources were responsible for 11%.

The programs for control of point sources have a different legal basis on the two sides of the border. The program on the U.S. side is implemented by a permit system based on national technology standards and legally enforceable State water quality standards, whichever is more stringent. The Canadian program establishes effluent requirements on a case-by-case basis making use of discharge objectives which apply across the Province and which can be made more stringent when there is a need to protect water quality.

The control program for toxics on the U.S. side has been established and permits are in place or are in their final stages of promulgation. Its effectiveness in terms of protecting water quality has been assessed in Chapter V and the Recommendation 1 below, addresses deficiencies that need correction.

The program for toxics control on the Canadian side of the river is currently under development and, although its effectiveness cannot yet be assessed, areas for improvement have been developed in Chapter V and addressed in Recommendation 2.

RECOMMENDATION 1

Discussion:

Evaluation of the New York State SPDES permit program indicates that when final permit limits are achieved, there will be a reduction in contaminant entry to the river. There are a number of substances for which the cumulative permit limits from all dischargers along the river are calculated to cause the U.S. portion of the river to exceed the minimum agency ambient water quality criterion based on discharges by all facilities at the permit limit. Silver and chloroform are substances that are calculated to exceed the minimum agency criteria for the U.S. portion of the river when loads from all facilities are combined although the discharges from the individual facilities would not.

Heptachlor and mirex limits are set at values of the analytical detection limit in the discharge. This results in levels which exceed the minimum agency criteria in U.S. receiving waters in one reach of the river. To lower the permit limits for these substances in order to adequately protect the receiving water, new analytical methods for wastewaters with lower detection limits need to be developed.

Recommendation:

New York should revise permit limits so that the cummulative impact of all discharges will not exceed criteria at the edge of defined mixing zones.

RECOMMENDATION 2

Discussion:

Evaluation of Ontario's point source control program, based on Certificates of Approval and Control Orders, shows that the current system is capable for controlling the entry into the environment of conventional and hazardous contaminants. At present, the program is used to control known contaminants characteristic of the given industrial plant process. It has not been applied to toxic substances that may be present in industrial or municipal discharges at low levels as a result of contamination from various sources.

It is recognized that conventional treatment, as currently required, is partially effective in removal of trace levels of hazardous contaminants, but the degree of removal is not currently measured or controlled.

In order to assess the impacts of trace levels of hazardous contaminants on treatment at municipal plants or the receiving waters of the Niagara River or its tributaries, assessments of the effect of these discharges to municipal sewer systems and to water courses are required. The results of these assessments would provide the basis for determining what additional control measures are appropriate. A formal source monitoring program for toxic substances would provide information in support of enforcement and the recommended long-term monitoring program (Chapter VII).

Recommendation:

Ontario should further assess the potential for impact of hazardous contaminants in trace amounts on receiving water and then:

a. Determine the need for and degree of new or additional industrial pretreatment prior to discharge to a municipal sewer system or watercourse.

b. Determine the need for biological treatment at primary WPCPs as a means of reducing the discharge of toxic contaminants.

c. Establish a formal monitoring system to provide periodic information on levels of parameters included in the Certificates of Approval, and to provide a basis for inclusion of additional parameters.

RECOMMENDATION 3

Discussion:

Good housekeeping and maintenance is a means by which a facility can reduce the discharge of toxic pollutants, without resorting to additional treatment either on-site or at municipal systems. Best Management Practice (BMP) is being developed in N.Y. as part of the SPDES permits.

Recommendation:

Good housekeeping and routine maintenance, where not in effect in a formalized sense at present should be adopted by all industrial and commercial facilities along the river, including dischargers to a municipal system, to reduce or eliminate inadvertant discharges of toxic substances.

RECOMMENDATION 4

Discussion:

Industrial and municipal self monitoring data, in conjunction with agency data, are necessary to measure the effectiveness of point source control programs and to contribute to the recommended long-term monitoring program (Chapter VII). To insure that the data serves these purposes, they must be of high quality.

Recommendation:

Point source self-monitoring programs should include a quality control program and a laboratory certification process.

RECOMMENDATION 5

Discussion:

Results of this study have shown that the Niagara Falls Waste Water Treatment Plant is the most significant contributor of organic priority pollutants and phenols to the Niagara River.

The facility, which was designed as an advanced technology plant using activated carbon treatment went into operation in 1978. The plant treats municipal waste as well as waste from a number of industrial facilities. Shortly after going into operation, carbon beds failed and were rendered useless in the treatment of waste entering the plant. For various reasons, repair of the carbon beds has been delayed and for the last six years the plant has operated below design specification. While the Committee recognized that repair work to the carbon beds is now underway, the comnpletion of the work is again behind schedule. The Committee feels that further delays are unacceptable.

Recommendation:

Restoration of the Niagara Falls Waste Water Treatment Plant carbon filter beds should be completed and the plant brought up to its original design capability as quickly as possible.

8.2.2 Recommendations Pertaining to Non-Point Sources

Sixty-one hazardous waste sites have been identified as significant on the U.S. side of the river within a three-mile band of the river's edge. These sites have the greatest potential for contaminant migration to the river because of their location near the river, the nature of the materials disposed there, and the levels of contaminants found in surrounding groundwater or soils.

Five waste sites in Ontario have been identified has having a significant potential to affect the adjacent surface water and groundwater.

General overall contamination of the groundwater in the overburden on the U.S. side of the river has been identified in the vicinity of Niagara Falls, New York, and this contamination will generally flow toward the river or its tributaries. Contamination has also been detected in the bedrock and this may constitute a significant flow of chemicals toward the lower Niagara River.

Because of the complex sub-surface flow regimes and the limited data based with which modeling of contaminant migration could be undertaken, quantification of contaminant loadings from the waste sites and the groundwater was not possible.

RECOMMENDATION 6

Discussion:

Many of the waste disposal sites along the Niagara River are not being dealt with as expeditiously as possible. Some procedures (such as the use of litigation) are so lengthy that remedial programs often do not take place until many years after a problem, real or potential, has been identified.

Recommendation:

Once a problem site has been identified, the fastest means of clean-up should be adopted. If the site owner's voluntary cooperation cannot be obtained, governmental funds should be used for investigations and remedial actions, and legal action commenced concurrently for cost recovery.

RECOMMENDATION 7

Discussion:

On the New York State side of the river, hazardous waste sites within a three mile band of the shore were included in the Project investigation reported in Chapter III. Although these represent the greater part of the potential contributors to the river from New York according to

present knowledge, sites outside this band and within the drainage basin to the river may be contributing contaminants to the river via tributary streams and creeks.

Recommendation:

The United States should extend the investigation of sub-surface hydrogeology and contaminant migration to all hazardous waste sites within the drainage basin of the Niagara River in New York State.

RECOMMENDATION 8

Discussion:

Special recognition of responsibilities in connection with the Great Lakes system is needed in the setting of pollution reduction or elimination priorities for most sites along the Niagara River. In particular, the Committee is concerned that the potential impact of waste sites along the Niagara River on Lake Ontario is not adequately addressed when national priorities are established. Current priority ranking schemes on both sides of the river take account of the full range of effects on the area near the disposal site but do not give weight to downstream low-level long-term effects.

Recommendation:

In setting priorities for the clean-up of waste disposal sites, the United States and Canada should take account of the long term effects of low level contamination of Lake Ontario as well as the effects on the area near the disposal site.

RECOMMENDATION 9

Discussion:

Based upon the findings of the hazardous waste site and landfill investigation programs carried out in both New York and Ontario, and reported in Chapter III, 66 of these disposal sites hold the potential for contaminant

migration to the Niagara River through surface or sub-surface leachate. The Committee believes that a number of these sites have contributed or are contributing contamination to the Niagara River.

Recommendation:

The responsible agencies should carry out a detailed site and area investigation program for sites not presently under such investigation. These agencies should implement appropriate remedial action, as determined by such investigations, to preclude contaminant migration to the Niagara River system.

RECOMMENDATION 10

Discussion:

While the Committee was not specifically charged with investigating the feasibility of implementing specific remedial programs, it was charged with identifying sources of contaminants and recommending appropriate remedial programs.

In making the following general recommendation regarding appropriate remedial programs that may be required at these waste storage and disposal sites, the Committee notes that there is scientific consensus that no matter how well a waste site is designed, it will require maintenance and monitoring for long periods of time, probably in perpetuity.

Landfills appear to be an inexpensive method of waste disposal; however, the technologies currently available to confine or contain hazardous toxic substances (eg. use of liners, caps, leachate collection systems, etc.) do not ensure protection for future generations without maintenance, continous monitoring, and appropriate corrective action. Elimination at source reduction or reuse of hazardous waste, and conversion of hazardous waste into non-hazardous or less hazardous material are more effective control options and in the long run should be far cheaper than perpetual storage.

Recommendation:

While long term passive maintenance (including cap integrity, plume monitoring, etc.) is required for all hazardous waste sites, on-site confinement or containment of hazardous toxic substances requiring perpetual leachate removal should not be considered as the final answer for dealing with historic disposal sites, or the ultimate answer to future toxic waste disposal. Innovative, more effective techniques must be developed for existing and future waste generation and disposal operations, including preventive strategies such as recycling, phasing out the use of many toxic substances and development of less toxic substitutes, and treatment technologies such as incineration or chemical fixation.

8.2.3 Recommendations Pertaining to Findings of the Ambient Sub-Projects

RECOMMENDATION 11

Discussion:

The Niagara River Project has shown that there are pockets of contaminated bottom sediment in nearshore portions of the Niagara River and in its tributaries with the highest contamination in the Buffalo River, Tonawanda-North Tonawanda, and Wheatfield-Upper River segments. These sediments can contribute toxic contaminants to the Niagara River. Before remedial action can be initiated, much more systematic and detailed information will be required about the amount, nature, and transport of contaminants. An initial side-scan sonar survey was conducted under this Project to determine the location and areal extent of sediment deposition areas in the main channel of the Niagara River.

Recommendation:

A complete picture of the bottom sediment contaminant load in the river should be developed including mapping of the sediment deposition areas and sampling and analyses of these areas. Concurrent with this, bioavailability and transport studies should be carried out. The findings

from these studies should be assessed to determine an appropriate remediation program.

RECOMMENDATION 12

Discussion:

A number of chlorinated organics (DDT and chlorinated benzenes) were identified in bottom sediment samples from the Fort Erie and Chippawa segments and in water samples from the Chippawa Channel. However, the sparseness of sample sites or samples in these segments hampered efforts to locate areas of elevated contaminated sediments and sources.

Recommendation:

Responsible Agencies should conduct investigations to determine the extent of chlorinated organics in the bottom sediments in the Fort Erie and Chippawa segments and in water of the Chippawa Channel.

RECOMMENDATION 13

Discussion:

Ambient measurements undertaken in this Project, as well as monitoring information published elsewhere, have shown that certain toxic chemicals are entering the Niagara River Project study area from the Lake Erie basin.

Recommendation:

The Parties to the Great Lakes Water Quality Agreement of 1978 and jurisdictions in the upstream basins should control persistent toxic substances as called for by the Agreement. The IJC should evaluate and compare control programs used by other jurisdictions in the Great Lakes Basin with those proposed for the Niagara River.

RECOMMENDATION 14

Discussion:

Strong linkages have been established in Chapter IV between the appearance of certain chemicals in ambient river samples and the sources of these substances. A summary of these findings is given on pages 4-104 and 4-105. In all cases where a clear link has been established, remedial actions or investigations are either underway or have been completed.

Recommendation:

The responsible parties should continue the remedial and investigative work underway to eliminate the sources of contamination to the river established in Chapter IV and summarized on pages 4-104 and 4-105. Where remedial work has been completed since the Project, monitoring should be conducted to assure that the remedial work has been effective.

8.2.4 Recommendations Pertaining to Chemicals of Concern

Two hundred and sixty-one chemicals have been found at least once in the water, sediment, or biota of the study area and adjacent parts of Lake Erie and Lake Ontario. These chemicals have been placed into groups to define their health and environmental effects.

Many of the recommendations arising from classifying chemicals found in the ambient environment into groups have already been made in Chapter VI. However, several general recommendations can be made.

RECOMMENDATION 15

Discussion:

Nine groups (I, IIA-G, III) of chemicals have been established, ranging in order from Group I (containing chemicals posing a potential threat to human health or the environment) to Group III (containing chemicals of little concern). All Group I chemicals have been found at least once in the

Niagara River environment at levels in excess of environmental or human health criteria or they are considered to pose risks to human health or the environment.

Recommendation:

To determine the origin of Group I chemicals, they should be included in source monitoring programs as appropriate.

RECOMMENDATION 16

Discussion:

Chemicals have been assigned to groups based, in many instances, on limited data. Depending on the changes in their environmental levels, chemicals could move from one group to another. For example, a chemical listed in Group IIA could become a Group I chemical if additional sampling (at a different location or in the future) shows it to exceed a criterion. In addition to this, many chemicals have only been monitored in one environmental medium. Levels for the same chemical could be different in other media and could, therefore, influence the concern associated with each chemical.

Recommendation:

Chemicals in Group I and IIA should be included, as appropriate, in ambient monitoring programs to establish both temporal and spatial trends and to determine their existence in other media.

RECOMMENDATION 17

Discussion:

Chemicals have been detected in the environment both qualitatively and quantitatively . A qualitative determination involves identification of the chemical species without determination of concentration. In some cases, the qualitative determinations were tentative. The capability to measure quantitatively is influenced by limitations in sampling or analytical procedures.

Recommendation:

All chemicals determined only qualitatively should be included in ambient monitoring programs to confirm their existence or to determine their levels.

RECOMMENDATION 18

Discussion:

Many of the contaminants found in the environment are manufacturing process by-products, not specifically manufactured for sale or use. Thus, often very little is known of their basic chemical, physical, or biological characteristics. Without this information it is not possible to assess the environmental significance of these chemicals.

Recommendation:

Characteristics data should be obtained or developed by the agencies for the chemicals as indicated in Chapter VI. This information should be assembled in order of priority amongst the groups.

RECOMMENDATION 19

Discussion:

One of the major limitations in establishing priorities for each of the chemicals found in the environment is that, in many cases, there are no agency criteria against which to compare the environmental levels. Thesignificance of many of these environmental levels is therefore unknown. In some cases where agencies have developed criteria, they have arrived at different numbers. Although the IJC has proposed uniform criteria (objectives) for some chemicals, jurisdictions are still using different criteria upon which to base regulatory action.

Recommendation:

Environmental and human health criteria should be established for the many chemicals for which none exist. Criteria should be developed in

order of priority among the groups in this report (i.e., Group I before Group IIA before Group IIB, etc.). Agencies should establish uniform criteria for water bodies which are a shared resource.

Chemicals in Groups I and II that have not been evaluated by the International Joint Commission's Human Health Effects Committee, should be referred to the Great Lakes Water Quality Board for assessment of the effects on human health and the Great Lakes environment. The chemicals should be assessed in order of priority among the groups.

8.2.5 General Recommendations

RECOMMENDATION 20

Discussion:

The Data Quality Sub-Committee established by the Niagara River Toxics Committee has made a number of recommendations with regard to quality assurance for the long-term monitoring program discussed in Chapter VII. The full recommendations are included in Chapter VII and summarized here.

Recommendation:

The Long Term Monitoring Program should contain a quality assurance program instituted concurrently with the Program. The overall objectives of the Program should be clearly communicated to all involved. Before the Program is initiated, agreement should be reached on analytical laboratory performance criteria, parameters, and detection limits. Contract laboratories should have a satisfactory intralaboratory and interlaboratory quality assurance program. There should be close consultation between the chemical analyst and the data user so that the data user will understand the limits that must be placed on the interpretation of the data.

RECOMMENDATION 21

Discussion:

The Committee found that the lack of a common international data base has created mechanical barriers to the prompt completion of its charges.

Recommendation:

To ensure that future activities such as the recommended Long Term Monitoring Program not suffer the same constraints and delays, the agencies should ensure that information is promptly exchanged and made available on centralized data bases on both sides of the River.

RECOMMENDATION 22

Discussion:

This report provides the basis for a number of measures to improve the quality of the Niagara River and measure this improvement. There is a need to ensure that the recommendations in this report are carried out in a coordinated manner by all agencies which have a responsibility for the quality of Niagara River water.

Recommendation:

A binational committee should be identified to coordinate the implementation of the recommendations in this report.

THE FOLLOWING TWO RECOMMENDATIONS, ALTHOUGH EXTENSIVELY DISCUSSED BY THE COMMITTEE ARE ONLY SUPPORTED BY THE CANADIAN MEMBERS. A STATEMENT BY THE U.S. MEMBERS IS INCLUDED FOLLOWING THE TWO RECOMMENDATIONS.

RECOMMENDATION 23

Discussion:

The Niagara River is a major tributary to Lake Ontario, and, although it is not the sole source, the River contributes a signficant portion of the toxic substances load to the Lake.

In order to ensure adequate protection of the resources, an overall allocation plan should be developed for the river, as a first step towards a similar plan for Lake Ontario and eventually the whole Great lakes basin. This allocation plan is seen as a key ingredient of the management approach that requires decisions on the location, extent and form of control programs to be made in advance of problems being identified, rather than on a reactive basis. While it is recognized that the development of a large scale allocation plan, such as that required for Lake Ontario, will be a complex undertaking, the Canadian members of the Committee feel that a precedent has been established by the Parties to the 1978 Great Lakes Water Quality Agreement through the control of phosphorus, and that this should be extended to toxic substances.

The initial development of the allocation plan for the River should use a mass balance approach in order to assist the jurisdictions in setting priorities for control among point and non-point sources of toxic substances. The effort should proceed in stages, and address the following.

1. Determine loadings of selected persistent toxic substances from Lake Erie to the Niagara River, and from the river to Lake Ontario. (This will allow the determination of the total input of these selected substances along the length of the river).

2. Identify more accurately the contribution from all signficant point sources to the river. The non-point contribution, as a first approximation, can be assumed to be the difference between the point source and total load to the river. Improved estimates can be derived by incorporating transport and decay mechanisms of chemicals.

3. Set a ceiling for allowable total river loadings of selected persistent toxic substances as determined in (1) above.

4. Set targets in an appropriate time frame for a progressively more stringent level of the water quality limits for each persistent toxic substance selected, and hence of the total loading to the river of these toxic substances. This approach fully accords with the philosophy of Annex 12 of the Canada/U.S. Great Lakes Water Quality Agreement 1978.

Recommendation

That the Niagara River be the pilot site for implementing a toxic loading allocation plan based on a mass balance concept and incorporating a progressively reducing ceiling on loading levels, simultaneously leading toward the development of a conceptional allocation plan for toxic contaminants for the whole of Lake Ontario and eventually the whole Great Lakes basin. Consideration should be given in the renewal of the Canada/U.S. Agreement on Great Lakes Water Quality to the development of target loads for toxic substances for each lake, similar to the target loadings for phosphorus in the Supplement to Annex 3.

RECOMMENDATION 24

Discussion:

Because of the long retention time of persistent chemicals in Lake Ontario, and their potential to bioaccumulate in fish and other biota in both the River and the Lake, the Canadian members of the Committee is concerned that the objectives and standards, as given in Annex 1 of the Great Lakes Water Quality Agreement 1978 upon which control programs for point and non-point sources along the river are based, may not be stringent enough to protect the receiving waters from the effects of such substances.

The philosophy of zero discharge of hazardous toxic substances, as expressed in Annex 12 of the Agreement, is accepted by the Canadian members of the Committee as the ideal approach to be followed.

Recommendation

That Annex 1 of the Great Lakes Water Quality Agreement be updated and expanded by the Parties to include at least those chemicals addressed in the allocation plan; that the Parties examine Article 2, Annex 1 of the Agreement, to revise and make progressively more stringent the objectives as currently established, in order to more closely follow the zero discharge philosophy of Annex 12.

Position of the U.S. Members of the Committee on Recommendations 23 and 24

While the Niagara River Toxics Committee recognized that a major impact of the inputs into the Niagara River is likely to occur in Lake Ontario, it did not study the inputs from other sources to Lake Ontario. The U.S. members of the Committee, while in agreement with the need for binational management of toxicant inputs into the Lake Ontario Basin, believe that the first step in the implementation of such a plan is the review of all sources of toxic substances to Lake Ontario to ensure all major inputs are defined and the criteria needed to protect Lake Ontario are adequate.

The U.S. members note that past actions along the river have led to a significant, documented reduction of specific persistent chemicals entering Lake Ontario from the Niagara River since the peak loading occurred in the mid 1960s to early 1970s. The load of persistent toxic chemicals to the river is expected to continue to decrease based on current control programs. The recommended long-term monitoring program will test whether or not this actually occurs and provide a basis for considering possible future changes to control strategies.

The U.S. members support further work by the Parties to the 1978 Great Lakes Water Quality Agreement to refine and expand the Agreement's numerical objectives for persistent toxic substances to insure that they are adequate for protection of the Great Lakes. Annex 1 of the 1978 Great Lakes Water Quality Agreement specifies numerical levels for selected persistent contaminants while Annex 12 specifies a philosophy of zero discharge. The apparent conflict between Annex 1 and Annex 12 of the Agreement requires clarification by the Parties to the Agreement.