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Review of the Research Advisory Board/Science Advisory Board Recommendations and Supporting Reports with IJC and Government Responses, 1973 through 1985

International Joint Commission. Great Lakes Regional Office

Clayton J. Edwards

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Report to the

Great Lakes Science Advisory Board

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**Review of the
Research Advisory Board/
Science Advisory Board
Recommendations and
Supporting Reports with IJC
and Government Responses**

1973 through 1985

INTRODUCTION

NUMBER TITLE

1973 RESEARCH ADVISORY BOARD ANNUAL REPORT

Staffing and Funding of the IJC Regional Office

Special Session: Social Sciences

Research Needs

Public Hearings

1974 RESEARCH ADVISORY BOARD ANNUAL REPORT

Viruses

Disinfection of

Specific Contaminants

Cladophora Workshop

Water Quality Objectives

Recommendations

Specific Contaminants

Indication of Human Health Risks

1975 RESEARCH ADVISORY BOARD ANNUAL REPORT

Advocates

Cladophora in the

Structure-Activity Correlations in Studies of Toxicity and

Bioconcentration with Aquatic Organisms

Measurements of Long-Term, Large-Scale Drift

and Dispersal Patterns

1976 RESEARCH ADVISORY BOARD ANNUAL REPORT

Research Needs

Workshops

1977 RESEARCH ADVISORY BOARD ANNUAL REPORT

Environmental Mapping and the Regional Approach

Phosphorus Limitation

Toxic Substances

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Research Advisory Board/
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and Government Responses**

1973 through 1985

by Clayton J. Edwards

International Joint Commission
Great Lakes Regional Office

March, 1988

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INTRODUCTION

Central to the reporting process of the International Joint Commission (IJC) are the recommendations that accompany its Board's reports. As one of two permanent Boards established by the 1978 Great Lakes Water Quality Agreement, the Science Advisory Board (SAB) functions as the scientific advisor and makes recommendations to the IJC " ... on all matters related to research and the development of scientific knowledge pertinent to the identification, evaluation, and resolution of current and anticipated problems related to Great Lakes water quality." The terms of reference for the Research Advisory Board (RAB), predecessor to the SAB, were more specific to research in that they were charged with making recommendations to the IJC following review at regular intervals of the "adequacy and reliability of research results ... deficiencies in scope ... funding ... and identify additional research projects ... (especially those conducive to) international cooperation."

This review endeavors to follow the course of these recommendations through the 'system' which, for convenience, has been defined as the RAB/SAB Report followed by the IJC report to government and the Government's response. When a recommendation was not addressed in the sequential IJC report it was so noted with "not specifically recognized by the IJC," and when not addressed by the Governments it was so noted by a "no response."

It should be noted that the recommendations cited throughout this review have been transported without change from the reports to which they are linked in the text of this review. Visual appeal and ease of reading have militated against the use of quotation marks.

In addition, when evaluating the reporting process, or lack thereof, it should be appreciated that both the Commission and the Science Advisory Board are obligated by Agreement to file reports, to the Governments in the former and the Commission in the latter. However, no provision exists in the Agreement or otherwise that mandates the Governments to formally respond to IJC reports. Without Government response, assessing the effectiveness of the Commission and the SAB is a difficult task (e.g. see section on Research Needs). This inability to make a judgement on effectiveness was noted by the Commission in October 1974 and subsequently when it stated "it is of concern to the Commission that to date it has not received from the Governments an indication as to the disposition of these (our) recommendations" and further "it is hoped that specific procedures will be developed for assessing timely consideration of Commission reports and recommendations."

During a 1974 meeting of the Parties and the IJC, an understanding was reached that written responses to the 2nd Annual Report, and presumably all subsequent Annual Reports, would be prepared and submitted to the IJC. The Canadian Government submitted their response on June 17, 1975 and the U.S. response was completed on October 14, 1975.

The reader is also cautioned that the process evaluated herein constitutes the sole formal mechanism open to the SAB but does not de facto represent the only

mechanism available to the IJC. Indeed, perhaps as important as the Annual Report are the irregular communiques between the Commission and the Governments. However, these files are not necessarily accessible to the Board and their inclusion would, in any case, not be appropriate for this review. Likewise the effects of SAB recommendations are not necessarily restricted to the Annual Report. For example, the recommendations contained within the Ecosystem Approach report have generically influenced the Commission's Poplar River Report, Special Report on the Niagara River, Pollution from Land Use Activities Report, Phosphorus Report, Upper Lakes report and others. However, the evaluation of these influences are difficult to quantify and, in any case, are only marginally pertinent to the intent of this review.

Throughout its history the Board has relied on an infrastructure of standing committees, task forces, Regional Office staff, and contractors to supply input in the form of reports on matters relevant to meeting the Terms of Reference. These reports have invariably contained recommendations, many of which were accepted by the Board and forwarded to the IJC. For completeness, these reports are briefly reviewed and cross referenced to the appropriate Board recommendation(s).

1973 RESEARCH ADVISORY BOARD ANNUAL REPORT

Number: 1

YEAR: April, 1973

SUBJECT: Staffing and Funding Regional Office

That IJC approve the proposed method of operation and budget.

That high priority be given to assignment of staff members to assist the Research Advisory Board and its standing committees from the IJC Windsor office.

IJC FIRST ANNUAL REPORT

The Commission recommends that the United States, as a matter of urgency, increase its levels of staff authorization and funding to those jointly recommended by the Commission and accepted by Canada. The Commission also recommends that Canada consider exceptional measures to reduce the time required to conform to the hiring procedures required under its Public Service Commission Regulations.

IJC SECOND ANNUAL REPORT

In its first annual report, the Commission called attention to difficulties in Canadian hiring procedures which had delayed staffing the Regional Office. The Canadian Government, the Commission is pleased to note, moved quickly and effectively to overcome the problems and Canadian staffing is on schedule. The Commission has, however, experienced difficulty in hiring United States personnel and obtaining needed financial resources to meet its joint commitments to support the Regional Office.

GOVERNMENT RESPONSE

No response.

Number: 2

YEAR: April, 1973

SUBJECT: Special Session

That IJC approve the holding of a special evening session, convened by the Research Advisory Board, at the time of the Annual Conference of the International Association on Great Lakes Research (April 16-18, Huron, Ohio) to obtain input from the scientific community on research priorities. If approved the Co-Chairmen of the Research Advisory Board will chair the session and the Board would welcome participation of Commissioners.

Number: 2 (continued)

Not specifically recognized by IJC.

GOVERNMENT RESPONSE

No response.

Number: 3 (See numbers 5, 19b, 42, 43, 45, 59 and 69)

YEAR: April, 1973

SUBJECT: Social Sciences Study

That IJC approve in principle a social sciences study on improved methods of involving the public in Great Lakes Water Quality decision-making, as outlined in the letter from the Board Co-Chairmen to the Commission of March 7. The Research Advisory Board would prepare to table a detailed study plan with the Commission prior to proceeding with such a study.

Not specifically recognized by IJC, but a workshop on Public Participation sponsored by the RAB's Social Sciences, Economic and Legal Aspects Committee was held in Ann Arbor, Michigan on June 24 and 25, 1975. Attended by ninety-four participants the areas of discussion focussed mainly on: the need for and the means to accomplish increased public information and involvement, the effectiveness of various media for communication, advantages and disadvantages of various information/involvement techniques such as public hearings. Further details are elaborated within item 18b.

GOVERNMENT RESPONSE

No response.

Number: 4 (See number 18)

YEAR: September, 1973

SUBJECT: Research Needs

Accept the Report on Research Needs and convey the Report to Governments recommending appropriate action and to permit the Board to publish separately the Report on Research Needs for distribution to the scientific community.

Not specifically recognized by IJC.

NOTE: The contents of this separate report represented an initial assessment of research needs pertaining to water quality of the Great Lakes. The ten recommendations focussed on areas not adequately addressed by ongoing governmental programs.

A similar but more detailed effort was presented to the Commission in July 1976, and appears as number 18.

Number: 4 (continued)

GOVERNMENT RESPONSE

No response.

Number: 5 (See numbers 3 and 19b)

YEAR: September, 1973

SUBJECT: Public Hearings and Increasing Public Awareness

To review the draft for an "evaluation of the IJC public hearings" with the Standing Committee on Social Sciences, Economics and Legal Aspects of the Board.

Increase citizen awareness of IJC, Boards and Reference Group activities by all appropriate methods including, where practicable, naming citizens to some Boards and Reference Groups.

Not specifically recognized by IJC, but responses pertinent to this recommendation appear in the following IJC reports and Government responses.

IJC FIFTH ANNUAL REPORT

The Commission believes that substantial progress is being made in better informing the citizens of the Great Lakes basin of the many programs and activities being carried on in both countries pursuant to the Great Lakes Water Quality Agreement and the Commission's two special efforts under reference, the Upper Lakes water quality baseline study and the Pollution from Land Use Activities investigation.

A new program was undertaken by the Commission this past year in an effort to increase and improve the public's understanding of a major technical report by the Upper Lakes Reference Group. The report culminated an intensive four-year effort to establish substantial baseline water quality data for Lakes Superior and Huron. The Commission contracted with a private organization concerned with public awareness and public participation in government matters to conduct a series of workshops in basin locales where Commission public hearings were to be held on the Reference Group's final report. While the workshops did not attract the numbers of basin citizens hoped for, attendance was sufficient to indicate the absence of great controversy or disagreement with the findings and recommendations of the Reference Group. Attendees of the workshops were enthusiastic about the process as a major step forward in citizen/federal government communications.

The Commission also approved the conduct of a series of special public participation panels by the Pollution from Land Use Activities Reference Group (PLUARG) throughout the Great Lakes basin, to obtain public response to preliminary information being generated by this study, also underway since April 1972. These panels are designed to test the reaction of local interested citizens to some of the information that is being developed by the study. These panel reactions will assist PLUARG in the preparation of its final report to the Commission in July, 1978.

Number: 5 (continued)

Three major workshops were conducted by the Research Advisory Board during 1976. These workshops, while not primarily designed to inform the public, were open to it. They are an important part of a continuing program to bring together experts on water quality from the United States, Canada and elsewhere, and thereby assemble current knowledge on various topics, develop new information and describe gaps in current understanding. Recent workshops include one on Economic and Legal Mechanisms for Achieving Environmental Objectives, another on Fluvial Transport of Sediment-Associated Nutrients and Contaminants, and a third on Environmental Mapping of the Great Lakes.

GOVERNMENT RESPONSE

CANADA

The Governments support the Commission's efforts to better inform the public about programs and activities being carried out under the Agreement and support public participation in the Commission's hearings and public participation panels.

UNITED STATES

No response.

IJC SIXTH ANNUAL REPORT

Public Information and Involvement

During 1977 the Commission undertook several experimental programs. One was to better inform people of the Great Lakes basin of the results of one of its major investigations, and a second to develop a mechanism for assuring substantial public involvement in the conduct of a study and preparation of a report.

First, the Commission sponsored a series of information workshops on the report of the Upper Lakes Reference Group prior to IJC hearings on the reference. The workshops were designed to inform an interested public as well as to assure meaningful testimony for the Commission's consideration in preparing its report and recommendations to the Governments. Second, the Commission authorized the Pollution from Land Use Activities Reference Group to conduct a public consultation program throughout the Great Lakes basin. The public consultation process provided a testing ground for the recommendations of PLUARG and as well gave extensive coverage to Agreement activities.

Over the last several years the Commission has taken other steps to involve the public. It has changed its hearing procedures to lessen formality and provide for interaction between presentors and those who prepare the reports which are the subject of the hearings. Since 1976, the IJC's Annual Meeting on the Great Lakes Water Quality Agreement has been open to the public and the media. In that same year the Commission's Water Quality Board began to hold news conferences after its regular meetings and in 1977 the Board opened these meetings to the public.

Number: 5 (continued)

Each year, more representatives of special interest groups (environmental, academic, industrial, civic) attend the Commission's Annual Meeting. They have also been invited to special seminars and symposia such as the one which the Great Lakes Water Quality Board sponsored in 1977 on the transport and disposal of hazardous wastes.

The Great Lakes Regional Office's information program has also been expanded to serve the needs of a larger audience. Each year there has been an increasing public demand for copies of Commission reports. In 1978 the reports request list was placed on an internal office computer to improve control and distribution.

Several surveys on public perception were reported to the IJC this year which indicated that people are generally not aware of the magnitude of the clean-up efforts of the two nations. Those who used the Great Lakes thought conditions are improving; and that those who did not use the lakes took their information mainly from the mass media and believed that water quality was deteriorating. The results underline the importance of the Commission's past recommendations to increase public access to information and to broaden public involvement opportunities. Governments should work to expand their environmental education programs in the Great Lakes basin through the appropriate jurisdictions.

GOVERNMENT RESPONSE

CANADA

The Governments actively support the Commission's efforts to educate all segments of the public, including decision makers and advisors at all levels of government, with respect to the condition of the Great Lakes and the progress made in cleaning them up.

Initiatives by the Governments in this regard include proposed multi-agency collaboration on a one-hour Great Lakes documentary film to be shown on both sides of the border. Ontario Educational TV and PCS outlets are among a number of sources being considered for maximum exposure. As well, funds have been committed to the NFB film "Water Within A Watershed." Other government agencies have also made contributions and it is expected that production will be completed before the end of 1979. Prints of the film will be made available to schools and libraries and will also be shown through traditional NFB outlets.

An ever-evolving modular display on the Great Lakes has been developed in conjunction with the Ontario Ministry of the Environment and has been exhibited across the Province of Ontario, from Manitoulin Island to Windsor. External Affairs is proposing to sponsor the display through its Consulates along the Great Lakes basin and it is currently on an itinerary which will bring it to Metro Toronto's largest shopping malls and commercial exhibitions. A brochure on the Great Lakes is available with the display and has proved to be a popular item.

A separate, albeit similarly designed, component on acidic precipitation was completed recently and was displayed at the Canadian National Exhibition in Toronto in late August.

Number: 5 (continued)

Over the past four years, a program to alert the public to the dangers of flooding and shoreline erosion has been coordinated by Environment Canada and the Ontario Ministry of Natural Resources. Dissemination of brochures and pamphlets, and the presentation of slide shows in affected communities have been the main initiatives of this effort.

The public participation program of the Strategic Plan for Ontario Fisheries (SPOF) emphasizes the inter-relationships between water quality and fisheries programs.

The Canada Centre for Inland Waters held an 'open-house' to acquaint the public with its activities relative to all aspects of water quality research. An estimated 20,000 people visited the Centre during this event.

Increased initiatives by the Commission to augment these programs, such as the reactivation of PLUARG community groups, would assist materially in promoting public interest and information exchange.

IJC SPECIAL REPORT

Public Information

Many of the recommendations which the Commission makes under the Agreement, if implemented, would have significant social and economic impacts on residents of the Basin. The Commission has therefore attempted to better inform the public on Great Lakes water quality issues and to provide opportunities for public comment. For instance, the Commission's annual meeting with its Great Lakes Water Quality and Research Advisory Boards is now open to the public, and the Water Quality Board has recently established a policy of meetings with the public.

The Commission believes that the value of a well informed public should be recognized by the Governments in their implementation of the Agreement.

1974 RESEARCH ADVISORY BOARD ANNUAL REPORT

Number: 6

YEAR: April, 1974

SUBJECT: Viruses

The Research Advisory Board recommends to the International Joint Commission that the Board's report on virology research be transmitted to the involved governments with a strong recommendation that significantly greater emphasis be placed on research concerning potential epidemiological hazards of waterborne viruses associated with man's activities.

IJC SECOND ANNUAL REPORT

The presence of viruses in man's environment is obviously a hazard to him. The extent of the hazard as it exists in the Great Lakes is unknown, and will remain so until serious research has been undertaken to establish the quantitative relationships of specific waterborne viruses to infectivity in man, with particular attention to people living or working in or near sewage treatment plants and to swimmers and bathers using beaches affected by treatment plant discharges. Research is also needed to improve the effectiveness of sewage treatment processes and plant operations in removing viruses from sewage, and to develop standard methods for sampling and laboratory procedures and adequate measures for baseline and monitoring studies.

The Commission has recently forwarded to Governments a report with recommendations on Virology Research Needs prepared by its Research Advisory Board.

The Commission recommends that the two Governments place greater emphasis on research concerning the epidemiological hazards of waterborne viruses associated with man's activities; and further recommends that increased, coordinated research efforts on the disinfection of sewage effluent, including chlorination and ozonation, be directed toward the determination of the potential harmful effects of such practices as compared with the benefits.

GOVERNMENT RESPONSE

CANADA

Surveillance of sewage sludges in Ontario since 1972 has shown virus prevalence to be quite low. This work will be continued and extended in 1975 to determine the level of viruses in sewage effluents and the water environment and whether an objective can be set for water quality.

Number: 6 (continued)

During the past year at the Canada Centre for Inland Waters, a consultant has been retained to provide advice and guidance on virus studies. These studies are designed to develop suitable techniques for the detection of viruses in surface waters and in wastewaters. Another study is concerned with the detection of viruses in fish in the Great Lakes.

UNITED STATES

The Government of the United States has recognized the need for greater emphasis on research concerning viruses as recommended by the Commission.

Current EPA research efforts deal primarily with the health implications of land applications of wastewater and sludges. Epidemiologic-microbiologic studies are being conducted on marine and fresh recreational waters to determine the correlation between incidence of acute disease and the presence of microbiological indicators and confirm cause-effect relationships. Such data will be used for developing water quality criteria based on human health effects.

In fiscal year 1975, the United States has:

- initiated studies to determine dispersion of pathogens and toxic chemicals in aerosols from conventional wastewater treatment plants;
- expanded its program to include an epidemiological study on the human population associated with conventional wastewater treatment plants, including the workers, their families and the people living around the plant;
- obtained statistically significant differences in the incidence of illness associated with the 'barely acceptable' versus the 'relatively unpolluted' beaches; and
- conducted studies to determine the frequency, distribution and cause of amoebic meningoencephalitis, a usually fatal disease believed to be acquired following swimming in fresh or brackish waters.

In addition to the allocations of over \$2 million for the above studies for FY 76, an additional \$1 million for FY 77 has been requested to expand the program dealing with viral problems related to land applications of wastewater and sludges and for our program on viruses on shellfish from marine waters.

Number: 7

YEAR: April, 1974

SUBJECT: Disinfection of Municipal Wastewater

The Research Advisory Board recommends to the International Joint Commission that increased, coordinated research efforts on the disinfection, including chlorination and ozonation of sewage effluent, be directed toward the determination of the potential harmful effects of such practices versus the benefits.

IJC SECOND ANNUAL REPORT

The Commission recommends ... that increased, coordinated research efforts on the disinfection of sewage effluent, including chlorination and ozonation, be directed toward the determination of the potential harmful effects of practices as compared with the benefits.

NOTE: For the complete response see number 6.

GOVERNMENT RESPONSE

CANADA

As results of companion research on disinfection of sewage effluents by ozonation, chlorination, chlorine dioxide and bromine chloride become available, the efficacy of further control by removal of the virus hazard in sewage effluents will be determined. In excess of \$60,000 has been committed to these projects, which are being financed under the Canada-Ontario Agreement. The estimated cost may well be considerably larger.

UNITED STATES

No response.

Number: 8 (See number 12)

YEAR: April, 1974

SUBJECT: Specific Conductance

The Research Advisory Board recommends to the International Joint Commission that the measurement of specific conductance be substituted for conventional gravimetric determinations of total dissolved solids in the open waters of the Great Lakes and that appropriate correlation factors be used to relate the specific conductance values to water quality standards expressed as T.D.S.

Not specifically recognized by IJC.

GOVERNMENT RESPONSE

No response.

Number: 9 (See number 15)

YEAR: April, 1974

SUBJECT: Cladophora Workshop

The Research Advisory Board recommends to the International Joint Commission that support be given to a workshop or seminar on nearshore eutrophication problems as evidenced by Cladophora or other attached algae with special emphasis directed toward the quantitative determination of biomass.

Not specifically recognized by IJC.

GOVERNMENT RESPONSE

No response.

Number: 10 (See numbers 47, 66 and 71)

YEAR: April, 1974

SUBJECT: Water Quality Objectives

The Research Advisory Board recommends to the International Joint Commission that the Commission approve the establishment of a Research Advisory Board/Water Quality Board Joint Committee on Water Quality Objectives. This joint committee would replace the RAB Standing Committee on Scientific Basis for Water Quality Objectives and the WQB Subcommittee on Water Quality Objectives.

Not specifically recognized by IJC, but the RAB had established the Scientific Basis for Water Quality Criteria Committee (later a Task Force) in order to provide the Water Quality Objectives Subcommittee of the Water Quality Board with scientifically defensible water quality objectives based on the most sensitive use. This was a joint activity but not a joint committee as requested by this recommendation. During 1978 both committees were disbanded with the RAB subsequently approving a reference for what has become of the Aquatic Ecosystem Objectives Committee. The Water Quality Board considered the formation of an Objectives Assessment Committee (OAC) but deferred a decision until receiving a final recommendation from its Task Force on the Chlorine Objective. The report from that Task Force stated that Socio-economic Impact Assessment (SEIA) of objectives should be carried out by the jurisdictions. The WQB has apparently heeded that recommendation, as no OAC has yet to be constituted.

NOTE: Further detailed information may be secured from a report entitled "A Review of the Impact of Water Quality Agreement Objectives on Water Quality Standards" by K. H. Walker, June 1980, at the International Joint Commission Regional Office.

GOVERNMENT RESPONSE

No response.

Number: 11

YEAR: April, 1974

SUBJECT: Recommendations

The Research Advisory Board recommends to the International Joint Commission that this 'Preceding Five' list of recommendations be forwarded to governments by the Commission with its expressed endorsement for appropriate programs and funding.

Not specifically recognized by IJC, but it is obvious that this recommendation was carried out by the IJC.

GOVERNMENT RESPONSE

No response.

Number: 12 (See number 8)

YEAR: October, 1974

SUBJECT: Specific Conductance

Following the earlier recommendations by the Board, the Standing Committee on Analytical Sampling and Measurement Methods concluded that by use of a given correlation factor, the total dissolved solids values determined gravimetrically could be estimated from specific conductance measurements.

The Board therefore recommends the use of this correlation factor and the notation described in the Standing Committee's report, for water quality studies on the Great Lakes.

Not specifically recognized by IJC, but this recommendation obviously found its way into the following report:

IJC REPORT ON NEW AND REVISED GREAT LAKES WATER QUALITY OBJECTIVES

On the basis of a recent report on the relationship of TDS and conductivity in the Great Lakes, the Great Lakes Water Quality Board's Surveillance Subcommittee recommended that the existing objective for TDS be replaced by an objective for conductivity. Using a standard conversion factor of 0.65, the numerical conductivity objective for the Lower Lakes would be 308 $\mu\text{mhos/cm}$. The Committees had no objection to measuring TDS by conductivity methods. It was anticipated that as the importance of individual components of TDS were identified, measurement of those individual components would be required.

It is recommended that the existing specific objective for Total Dissolved Solids stipulated in Annex 1, paragraph 1(c) of the Water Quality Agreement be retained.

Number: 12 (continued)

GOVERNMENT RESPONSE

On November 22, 1978, both Canada and the United States signed the 1978 Great Lakes Water Quality Agreement which contained this objective and by reference the conversion factor.

Number: 13 (See number 2)

YEAR: October, 1974

SUBJECT: Indication of Human Health Hazards

It was concluded that direct epidemiological evidence is lacking in support of any health related indices of water pollution and that there is no demonstrated relationship between coliform counts and diseases.

The Board recommends that increased, coordinated research efforts be directed to determine valid indicators of human health hazards in drinking and recreational waters.

Not specifically recognized by IJC.

NOTE: This subject is still pending before the Aquatic Ecosystem Objectives Committee of the SAB.

GOVERNMENT RESPONSE

No response.

1975 RESEARCH ADVISORY BOARD ANNUAL REPORT

Number: 14

YEAR: July, 1975

SUBJECT: Asbestos

On the basis of the report "Asbestos in the Great Lakes Basin", the Board recommends that:

- Extension of existing sampling and monitoring programs be limited until the most important sampling and analytical problems are resolved and there is more knowledge of health effects.
- The Commission request our respective governments to set up a joint task force to initiate and coordinate the investigation of sampling and analytical problems, and health effects.

IJC THIRD ANNUAL REPORT

IJC recommends the Federal Governments formalize current informal practices by setting up a joint task force for the purpose of coordinating the investigation of sampling and analytical problems as well as health effects, from asbestiform fibres: also the extension of existing monitoring programs be limited until sampling and analytical techniques are more reliable and can be integrated.

GOVERNMENT RESPONSE

CANADA

Canada is of the view that it is not essential at this time to formalize current bilateral practices by establishing a joint task force to coordinate the investigation of sampling and analytical problems as well as health effects from asbestiform fibres. The flexibility of current bilateral procedures tends to promote frequent and productive exchanges between Canadian and American scientists on problems under investigation in these areas. Scientific evaluations are more easily carried out by ad hoc groups formed as the need arises. Canada recognizes, however, the need for a concerted effort in the evaluation and standardization of analytical and sampling techniques for asbestos in water. It is for this reason that the federal departments of health and welfare and environment are evaluating methodologies and attempting to develop more reliable monitoring techniques as required.

With respect to the Commission's recommendations to limit the extension of existing monitoring programs until sampling and analytical techniques are more reliable and can be integrated, Canada recognizes the need to ensure effective coordination of Canadian and American programs in this area. Canada, however,

Number: 14 (continued)

wishes to determine the extent of pollution in Canadian waters by asbestos and is of the view that it would be inappropriate to curtail existing monitoring efforts at this time.

The Province of Ontario, on its part, has appointed a committee comprising representatives of federal and provincial environmental agencies, the Ontario Research Foundation, and two universities to resolve the matter. Until this work is completed in December 1976, the Governments of Canada and Ontario agree that existing sampling programs should not be extended.

An Advisory Council on Occupational and Environmental Health was recently established by the Ontario Government to advise the Minister of Health on these matters, on the adequacy of provincial standards as they relate to known or suspected health hazards, and on the effectiveness of government programs and priorities for applied health research. The Advisory Council, consisting of management, labour, and citizen representatives, is supported by representatives from the Ontario Ministries of the Environment, Health, Labour, and Natural Resources. It is expected that the question of health effects of asbestiform fibres will be brought to the attention of this Council.

UNITED STATES

The IJC has a legitimate concern regarding asbestiform fibres in the Great Lakes, and the U.S. Government agrees that establishment of a joint task force should be considered. Research regarding improved methods for the measurement of asbestiform fibers is being pursued at the U.S. Environmental Protection Agency's laboratories at Athens, Georgia; Duluth, Minnesota; and Cincinnati, Ohio. Current emphasis is on evaluation of sample collection and measurement methods in order to determine which method comes closest to meeting Federal needs. This effort is expected to be completed by December, 1976.

Further work is planned to develop a qualitative rapid screening method for asbestos in water and is expected to be available by October 1979.

Number: 15 (See number 9)

YEAR: July, 1975

SUBJECT: Cladophora In The Great Lakes

It is recommended that investigations be undertaken to define this role with particular emphasis on interrelationships with fish populations and fish productivity as well as biomagnification of pollutants through food chains. Additional investigative effort should be directed to clarify the societal impact of the present Cladophora problem and alternative remedial programs. Further experimental work to identify potential uses for harvested Cladophora is needed.

IJC THIRD ANNUAL REPORT

The Governments investigate the role of Cladophora and its effect on fish populations and fish productivity. Additional investigative efforts should be

Number: 15 (continued)

directed to clarify the socio-economic impact of the present problem and alternative remedial programs. For example, further experimental work is needed to identify potential users for harvested Cladophora.

GOVERNMENT RESPONSE

CANADA

Canada and Ontario share the Commission's concern regarding the continuing occurrence of Cladophora in nearshore waters and its adverse impact, particularly on swimming and other water-based recreation. As part of a research program on waste heat, the Great Lakes Biolimnological Laboratory at the Canada Centre for Inland Waters is investigating the impact of thermal discharges on the growth of Cladophora. Because they recognize the noxious growth of Cladophora is a manifestation of eutrophication, Canada and Ontario believe that rather than investigation of the effect of Cladophora on fish populations, emphasis at the time should be placed on continuing programs to limit the growth of Cladophora by control of nutrients that reach the Great Lakes.

With respect to investigation of potential users of Cladophora, the Ontario mechanical harvesting program on the Kawartha Lakes and studies at the University of Guelph may lead to applications for beneficial uses of Cladophora.

An experimental harvesting program to study potential uses of aquatic plants was initiated by Ontario in Southern Chemung Lake in the Lake Ontario Basin in 1973. To date no undesirable environmental effects of the harvesting program have been observed.

Chemical analyses indicated that the aquatic plant products had nutritional values similar to alfalfa. Processed aquatic plants were evaluated using chickens and sheep and were found acceptable to the test animals, although the high moisture and mineral content affected the ability of the sheep to use the product. The ensilaging process used for these trials was primitive and subsequent trials now underway using better quality silages are showing considerable promise. In other studies the vegetation was readily composted in an 8-day period. Preliminary green house trials with the composted material demonstrated the value of the product as a plant growth media.

UNITED STATES

The U.S. Government endorses the above recommendation. The State of Michigan has emphasized the need for accurate delineation of the Cladophora problem areas in the upper Great Lakes.

EPA's Large Lakes Research Station at Grosse Ile, Michigan is continuing to investigate the nutrient requirements of Cladophora. In addition, the Grosse Ile Laboratory has recently initiated extramural research on the role of Cladophora in supporting fish food-chain organisms. Due to other research priorities, no work is in progress or presently planned to identify users for harvested Cladophora.

Number: 16 (see number 54)

YEAR: July, 1975

SUBJECT: Structure-Activity Correlations in Studies of Toxicity and Bioconcentration with Aquatic Organisms

There are useful correlations between the structure of organic chemicals and biological effects such as toxicity and bioaccumulation on aquatic organisms. It is recommended that such correlations be used in the laboratory screening of new chemicals and that further work be undertaken to widen and improve such applications.

IJC THIRD ANNUAL REPORT

The Governments endorse and financially support the development of data bases for 'structure activity' correlations, because of the immediate foreseeable application of this tool in predicting environmental hazards of organic chemicals. ('Structure-activity' correlations represent early warning mechanisms for screening new chemical substances for hazards.)

GOVERNMENT RESPONSE

CANADA

Canada recognizes the value of the correlation technique to assist in prediction of the environmental effects of chemicals within a homologous series. Such testing would provide an additional clue to the determination of potential hazards but would require a great commitment of resources as research in this area is very expensive. A watch will be kept on the possibilities of adapting this technique to environmental research as this tool becomes applicable.

UNITED STATES

The U.S. Government supports the development of a standard technique for 'structure-activity' correlations to predict environmental hazards.

The Federal Government would like to compile a data base for 'structure-activity' correlations with respect to pollutant behavior in the environment, i.e. identifying which physical and chemical processes are predominant in the transport and transformations associated with given 'classes' of pollutants. However, other higher priority research needs have prevented the undertaking of such an effort to date.

Number: 17

YEAR: July, 1975

SUBJECT: Measurements of Long-Term, Large-Scale Drift and Dispersal Patterns in the Great Lakes

Transboundary pathways and scales of pollutant dispersal and diffusion in the Great Lakes are at present poorly known. Equipment and techniques for

research drift and general patterns with progress are improving particularly through the development of a variety of methods and instruments systems. It is recommended that research in this area be directed towards developing reliable systems for the measurement of drift and general patterns. The following components within the research program are suggested:

UC THIRD ANNUAL REPORT

Transboundary patterns and sectors of industrial activity and distribution in the Great Lakes are at present poorly understood. A study on the dynamics of transboundary patterns of industrial activity and distribution in the Great Lakes was presented to the IJC in 1970. The study was conducted by the University of Michigan and the University of Toronto. The study was presented to the IJC in 1970. The study was presented to the IJC in 1970.

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INTEGRATED RESEARCH PROGRAM ON Large Scale Drift and Disposal Factors in

Transboundary patterns and sectors of industrial activity and distribution in the Great Lakes are at present poorly understood. A study on the dynamics of transboundary patterns of industrial activity and distribution in the Great Lakes was presented to the IJC in 1970.

1976 RESEARCH ADVISORY BOARD ANNUAL REPORT

Number: 18

YEAR: July, 1976

SUBJECT: Research Needs

A separate report on research needs for enhancing water quality in the Great Lakes system accompanies this Annual Report. The Research Advisory Board recommends to the Commission that the entire report be forwarded to the Governments of the United States and Canada with the request that: it be distributed to all government agencies having research and development responsibilities relative to water quality in the Great Lakes System; and, that these agencies compare their present research programs with those outlined in this report. Further, the Board recommends that the Commission advise these agencies that follow-up contact will be made to them by the Research Advisory Board to ascertain the degree of responsiveness of the total United States - Canadian programs to the needs defined in the Great Lakes Water Quality Research Needs document.

IJC FOURTH ANNUAL REPORT

The Great Lakes Research Advisory Board has again compiled an extensive Directory of Great Lakes Research and Related Activities, and is continuing its efforts to coordinate as closely as possible the Great Lakes related research programs in both countries. These efforts are reported in the attached Annual Report of the Board.

GOVERNMENT RESPONSE

CANADA

The Research Needs recommendations of the IJC's Research Advisory Board are being examined by federal and provincial research centres. The outcome of this examination will be reviewed provincially by the Interministry Committee on Great Lakes as new efforts are considered in exploring technological and economic possibilities of further pollution control programs. Federal review is being conducted by the Canada Centre for Inland Waters, the Freshwater Institute, the Great Lakes Forestry Research Laboratory, the Great Lakes Biolimnological Laboratory and the Wastewater Technology Centre.

UNITED STATES

No response.

NOTE: In continuing the Research Needs response the following occurred.

Number: 18 (continued)

IJC SIXTH ANNUAL REPORT

In 1976, the Great Lakes Research Advisory Board forwarded to the Commission a "Great Lakes Water Quality Research Needs" document which reflected the opinions of the Great Lakes research community as to the research needs relative to the water quality problems of the Great Lakes. A subsequent effort was made by the Board to ascertain the degree of responsiveness of the total Canada-United States program to these research needs. Despite a significant attempt by a Committee of the Board, it was soon obvious that the requirements for such an assessment were much beyond the resources available to the Committee to define deficiencies in scope, adequacy and reliability of research results, and inadequacies for funding the specific research program areas.

Nonetheless, the resulting document entitled "Canada-United States Research Programs Pertinent to the Water Quality of the Great Lakes," submitted in July 1978, provides a perspective on the scope of research activity currently operative in the two countries. The Commission brings to the attention of Governments, the Committee's following assessment:

"In terms of general program objectives and research thrusts, it has been demonstrated that current efforts are responsive to major ecological and technological research issues identified as critical by the Research Advisory Board. Moreover, the concentration of mutual agency interest in issues previously highlighted suggests significant opportunities to foster both formal and informal international cooperation. Such cooperation would be particularly appropriate to research endeavors exogenous to the basin that produce results that can be transferred. Primary candidate areas include programs focussed on the identification of health and environmental effects of toxics and trace organics and the development of technology for the control of such contaminants."

Recognizing that efforts are underway, for example by the Great Lakes Research Advisory Board and the Commission's Committee to Assess Health Effects of Great Lakes Water Quality to identify specific research programs for which international cooperation will be productive, and recognizing that long range environmental research programs are under continuous review and planning, the Commission recommends that Governments utilize the document "Canada-United States Research Programs Pertinent to the Water Quality of the Great Lakes" to minimize overlapping efforts and to facilitate international cooperation in such critical areas as the assessment of health and environmental effects of contaminants.

GOVERNMENT RESPONSE

CANADA

The Governments of Canada and the Province of Ontario support the Commission's call for inter-agency and international cooperation in research endeavors which may have application to programs directed towards achieving the goals of the Agreement.

Number: 18 (continued)

Canada also recognizes that the Science Advisory Board's document: "Canada-United States Research Programs Pertinent to the Water Quality of the Great Lakes" will be useful in minimizing overlapping efforts and facilitating international cooperation to this end.

An example of such cooperation is the Canada-United States Bilateral Research Consultation Group on the Long-Range Transport of Air Pollutants, which provides a mechanism for the exchange of information in this area in both countries.

An example of international cooperation in the health field relates to the development of standard and improved methods to measure asbestos in drinking water. Through informal cooperation, scientists from federal agencies have developed a standardized method which is being applied in both countries. Concurrent epidemiological research aimed at determining whether such levels correlate with cancer incidence is based upon this work. Although these endeavours are not restricted in scope to the basin, the results will have evident importance within that context.

UNITED STATES

No response.

Number: 19

YEAR: July, 1976

SUBJECT: Workshops

The recommendations of the workshops held this year were considered for inclusion in the above Research Needs report, and only the conclusions are presented here.

- (a) The workshop on "Toxicity to Biota of Metal Forms in Natural Waters" sponsored by the Standing Committee on the Scientific Basis for Water Quality Criteria concluded that:
- ° The impact of metals entering the Great Lakes depends on: their chemical form in the Great Lakes waters; the rates and processes involved in the equilibria established between the various forms; and the toxicity of the various forms of each heavy metal.
 - ° The current field testing techniques are inadequate to discriminate between and measure the various forms of metals in the Great Lakes. Efforts to address this problem are quite limited.
 - ° There are inadequate data on the biological impact of the various forms of heavy metals with the exception of mercury. Considerable recent work was reported on copper.

Number: 19 (continued)

- Until the above noted concerns are adequately addressed, water quality objectives based on total metal concentrations cannot be refined.
- (b) The conclusions of a workshop on "Public Information and Participation" sponsored by the Standing Committee on Social Sciences, Economic and Legal Aspects were:
- Governments are not adequately utilizing accepted procedures for public information and participation techniques.
 - Agencies do not adequately employ available techniques for determining the knowledge level and interest intensity of publics potentially affected by decisions.
 - Governmental methods for choosing media channels and messages to most effectively reach specified public sectors appear inadequate.
 - The general public, although affected by governmental decisions made at any level, indirectly, is often apathetic; thus unrepresentative samples in surveys and over representation of some viewpoints at meetings and hearings result.
 - Governmental decision-making processes should utilize a weighting system to assure consideration of social, emotional and aesthetic human values as well as technical and scientific information.
- (c) The Standing Committee on Lake Dynamics held a workshop on "Stratified Flows in Large Lakes" from which it was concluded that:
- Stratified flows, (i.e. underwater currents) are significant in lakewide, vertical mixing processes, but their role in releasing and distributing nutrients and contaminants from sediments has not been defined.
 - Within a given stratified layer, differences in dispersal rates may occur. The designation of a mixing zone, therefore, requires a detailed understanding of the internal dynamic behavior of the waterbody within the area of concern.
 - Likewise, the interpretation of the results of vertical sampling techniques must take hydrodynamics into account.
 - New methodology is badly needed to better define the vertical profiles of both density and flow.
 - Effective modelling of changes in environmental quality requires solutions for the above noted problems.

Number: 19 (continued)

NOTE: A review of the RAB report and the Workshop Proceedings disclose that the conclusions presented within the RAB report do not necessarily coincide with those in the reports, nor do the recommendations presented in RAB Research Needs document necessarily coincide with the recommendations within the proceedings publication. No explanation for this discrepancy is offered.

IJC FOURTH ANNUAL REPORT

Several effective seminars were held during the year under Commission auspices and others are planned for the current year. All are designed to focus on problems related to Great Lakes water quality.

The Commission wishes to commend the individual and collective efforts of a significantly large number of persons, including skilled scientists, effective administrators and dedicated public servants who have worked hard during recent months to collect large amounts of data, assess and evaluate it, and prepare these excellent documents. It reflects great credit on the cooperative efforts of both countries to correct the very complex problems of Great Lakes water quality which have resulted from human neglect over many years.

GOVERNMENT RESPONSE

CANADA

Canada appreciates the commendation by the Commission of the efforts of the members of the Boards and Committees involved in this vast program and wishes to add its thanks to the members of other governments for the dedication and cooperation displayed by all. Canada will continue to provide support and encouragement to achieve the intent of the Agreement. Canada notes with satisfaction that the Commission will provide advice and recommendations to assist in the review of the Agreement, and wishes to advise that similar considerations are currently being undertaken by the various concerned agencies within the federal government and by the Interministry Committee on the Great Lakes of the Province of Ontario.

UNITED STATES

No response.

NOTE: A review of the IAB report and the Working Party's findings and recommendations is contained in the IAB report. The report also contains a list of recommendations which are being followed up by the Working Party. The Working Party is currently reviewing the recommendations and will report on its findings in the next report. The Working Party is currently reviewing the recommendations and will report on its findings in the next report.

THE FOURTH ANNUAL REPORT

The Working Party has reviewed the progress made in the implementation of the recommendations of the IAB report. The Working Party has found that the progress made has been satisfactory and that the Working Party is confident that the recommendations will be fully implemented in the next report. The Working Party has also identified some areas where further action is required and will report on these in the next report.

GOVERNMENT RESPONSE

The Government has responded to the recommendations of the Working Party and has taken steps to implement them. The Government has also identified some areas where further action is required and will report on these in the next report. The Government has also identified some areas where further action is required and will report on these in the next report.

UNITED STATES

The United States has responded to the recommendations of the Working Party and has taken steps to implement them. The United States has also identified some areas where further action is required and will report on these in the next report. The United States has also identified some areas where further action is required and will report on these in the next report.

1977 RESEARCH ADVISORY BOARD ANNUAL REPORT

Number: 20 (See numbers 28 and 33)

YEAR: July, 1977

SUBJECT: Environmental Mapping and The Ecosystem Approach

The Great Lakes Research Advisory Board recommends that the Commission:

- recognize that the degradation of the Great Lakes must not be evaluated on just 'water quality', but also on all aspects of the lakes' ecology. Furthermore, the Research Advisory Board believes that continued emphasis on 'water quality' will be to the detriment of the eventual restoration of the lakes and therefore urges the IJC to adopt the broader concept of 'ecosystem quality';
- encourage the Parties to the Agreement to initiate environmental mapping of a sub-area of the Great Lakes to determine the cost/benefits, the potentials, and the liabilities of such an effort, as a basis for future mapping; and
- articulate the specific goals of the Parties for and the desired uses of the Great Lakes so that more direct efforts can be formulated to reach these expectations.

IJC FIFTH ANNUAL REPORT

In this report the Commission has not attempted to provide a summary of the 1976 Annual Reports of the Great Lakes Water Quality Board and the Great Lakes Research Advisory Board which have been transmitted to the Governments and are available to the general public. While the Commission, in general, supports the Boards' recommendations, it is now providing its own comments and recommendations on the conditions relating to Great Lakes water quality in 1976, and on progress under the Agreement date.

AN ECOSYSTEM APPROACH TO GREAT LAKES RESTORATION

The Great Lakes Water Quality Agreement of 1972 focuses on the restoration and enhancement of the water quality in the Great Lakes in terms of its physical and chemical characteristics. Inherent in this approach are water quality objectives which specify limits for the concentration of various substances in the water of the Great Lakes. The revised water quality objectives, which the Commission will continue to recommend to Governments from time to time, have been based on the best available scientific information about the requirements of the most sensitive beneficial use of boundary waters. Their formulation and implementation remain essential elements in basin planning and management under the Agreement.

In its July 1977 report to the Commission, the Research Advisory Board suggested that continued emphasis on the measurement and control of the chemical and physical characteristics of water quality, while necessary, many not be sufficiently broad in scope for effective, long term planning and management of boundary waters such as the Great Lakes. The physical and chemical qualities of water are but two aspects of a complex system consisting of many interrelationships with physical, chemical, biological and socio-economic components. Reliance on these two aspects of the ecosystem alone to guide planning and management decisions could be misleading. The elimination of or failure to recognize one problem on the basis of a set of indicators for only one or two dimensions could result in unexpected, detrimental changes elsewhere in the system, either immediately or in the future. Thus, it is important, in addressing the problems of the Great Lakes, to take account of contributing factors within both the natural and societal sectors of the ecosystem and, in the latter, of the cumulative impact of environmentally harmful actions.

The 'ecosystem approach' recommended by the Research Advisory Board may have significant benefits for the long term management of the Great Lakes, by placing it in a wider context and providing a framework for assessing the real impact and significance of changes within the Great Lakes System. Such an approach should for the present at least be considered as complementary to, rather than replacing, efforts to address specific problems such as phosphorus and toxic substances on the basis of water quality objectives.

Therefore, the time may be appropriate to begin considering the wider implications of Great Lakes programs, within the concept of 'ecosystem quality'. However, the Commission believes that the scope and implications of ecosystem analysis in relation to current activities under the Water Quality Agreement merit more detailed investigation and it has requested that the Research Advisory Board and the Water Quality Board advise the Commission further on this aspect, to provide the basis for further recommendations to the Governments.

ENVIRONMENTAL MAPPING

An essential part of the understanding and assessment of the impact of man's activity on the resources of the Great Lakes is improved knowledge of the nature and location of the resources and social use patterns. An inventory or 'environmental mapping' of resources and use patterns is required. The Research Advisory Board has investigated recent experience with environmental mapping in other locations and sponsored a workshop to evaluate the possibility of developing environmental maps for the Great Lakes. Environmental maps appear to be valuable tools in making optimal resource management decisions, including such matters as guidelines for rehabilitation based on historical knowledge, identification of priorities for conservation and protection, and minimizing the environmental impact of proposed activities.

The Commission endorses the concept of environmental mapping for the Great Lakes, and encourages the Parties to the Agreement to initiate an experimental international project to map a sub-area of the Great Lakes in order to determine the costs, benefits, potentials and problems of such a mapping program.

Number: 20 (continued)

GOVERNMENT RESPONSE

CANADA

The Governments have acknowledged the Commission's recommendation of the need for considering the wider implications of Great Lakes programs within the concept of 'ecosystem quality'. The Governments await further Commission recommendations as to the scope and implications of the ecosystem approach in relations to current activities under the 1978 Agreement.

The Governments acknowledge the Commission's endorsement of the concept of environmental mapping and will consider the recommendation for initiation of an experimental international project to map a sub-area of the Great Lakes.

UNITED STATES

No response.

Number: 21

YEAR: July, 1977

SUBJECT: Phosphorus Limitation

The Great Lakes Research Advisory Board recommends that the Commission:

- encourage additional efforts to remove phosphorus, even if more stringent regulations on phosphate levels in detergents are implemented;
- urge the Governments to improve treatment plant operations by increasing operator training, increased monitoring of plant operations, consideration of economic incentives, and through public education and pressure;
- initiate studies through the IJC institutions to identify the most cost-effective programs for reducing phosphorus loadings by examining the potential control of other sources such as urban runoff and agricultural drainage and as well examine lower cost alternatives for municipal discharges;
- urge Great Lakes surveillance efforts to be in part directed towards the provision of adequate data to enable development and verification of improved eutrophication models; and
- bring to the attention of the United States and Canadian Governments the Board's report on the health implications of NTA for review to enable their evaluation on the use of NTA.

IJC FIFTH ANNUAL REPORT

Phosphorus is the primary factor in the eutrophication of the Great Lakes and it remains a serious problem, especially in Lake Ontario and Lake Erie. Phosphorus

levels in Lake Ontario have been essentially stable throughout the period of the Agreement but, as this lake will be slow to respond to changes in loadings, a continuing long term phosphorus reduction program is required. Mathematical models have assisted in understanding and predicting the response of the lake to phosphorus control programs. The further development and testing of these models should continue, and should be coordinated with surveillance activities to ensure the provision of adequate data.

In the western and central basins of Lake Erie, concentrations of phosphorus have continued to increase though at a declining rate, while in the eastern basin of the lake, they have decreased from previous years. A major decline in concentrations is expected following completion of the Detroit and Cleveland treatment plants, as these municipal sources account for most of the phosphorus discharged into the lake. Industrial discharges of phosphorus to Lake Erie, although now a small portion of the total phosphorus loading, increased markedly over 1975 levels. They declined on all other lakes except Lake Superior, which experienced a marginal increase in industrial phosphorus loadings in 1976.

The Commission believes that, while the studies and observed trends in phosphorus concentrations show hope for improvement, current efforts directed at further restricting the input of phosphates to the Great Lakes must continue with vigor.

MUNICIPAL TREATMENT

Overall phosphorus removal by wastewater treatment plants in the Great Lakes basin is improving slowly and there have been significant reductions in phosphorus loadings to Lake Ontario since 1975. However, as noted elsewhere in this report (Section 1) total municipal loadings in 1976 remained much higher than overall target loadings, and a large number of treatment plants in the Lower Lakes had not achieved the target effluent limitation for phosphorus. Every effort should be made to remedy this situation without delay throughout the basin.

DETERGENTS

Phosphorus: The Commission continues to believe that phosphorus should be controlled to the extent possible at its source rather than relying solely on its removal by municipal treatment plants. As detergents are a major contributor, a strict limitation on their phosphate content would have a significant impact on the effectiveness and operating costs of municipal treatment plants in meeting phosphorus effluent targets, especially where there have been no controls to date. Further, the sludge disposal problems of treatment plants should be reduced and the discharge of phosphates from the non-sewered population, while small in proportion, should be sharply reduced. The Commission therefore reaffirms its support of a 0.5 percent limit on phosphorus by weight for all detergents. The Commission notes both the action of the United States Environmental Protection Agency in endorsing such a policy for the Great Lakes, and the failure of the legislation necessary to implement this policy in the United States Congress. Notwithstanding this action, and the position of the Government of Canada that further detergent phosphate restrictions below 2.2 percent are not justifiable at present, the Commission again urges all jurisdictions in the Great Lakes basin to take the necessary measures to achieve this limitation.

NTA: In recognizing the need for an alternative to phosphorus in detergents, the Research Advisory Board has implemented a program of studying in depth the possible impacts of such alternatives on human health and on the environment. As a likely substitute nitrilotriacetate (NTA), already in wide use in Canada, has been studied first. Other non-phosphate compounds will be examined by the board in due course.

A Research Advisory Board Task Force on Health Effects of NTA, has carefully reviewed available data including animal feeding studies on possible effects on human health. The Commission draws the attention of the Governments to the Research Advisory Board's Task Force Report on the Health Implications of NTA, and to the board's conclusion that, on the basis of health hazard, there is no reasonable cause for restricting the use of NTA as a replacement for phosphate in detergents in the Great Lakes basin. A second task force studied the ecological effects of NTA and found that nothing in the literature or in Canadian experience would indicate an obvious environmental hazard from its use. The task force also concluded that NTA need not be prohibited from continued use in Canada on the basis of current knowledge, but that further environmental studies should be undertaken as outlined in the Task Force's report, if NTA is put into widespread use in the United States and the Great Lakes basin.

GOVERNMENT RESPONSE

CANADA

MUNICIPAL TREATMENT

Reduction of Phosphorus Loading: The Governments of Canada and Ontario note the Commission's reaffirmation of its previous recommendation of a 0.5% limit on phosphorus by weight for all detergents, especially where there have been no controls at municipal sewage treatment plants.

In August 1970, Canada began a series of reductions in Canadian laundry detergents to a level of 2.2 percent of phosphorus to achieve, among other environmental benefits, early control of phosphorus discharges to the Lower Great Lakes. Also, pursuant to the Canada-United States Agreement, phosphorus removal facilities were installed by major municipal dischargers in the lower lakes basin. The Province of Ontario extended this requirement in the Lake Erie Basin to dischargers of less than 1 MGD. Approximately 99% of the sewered population on the Canadian side of the Great Lakes basin is now served by adequate wastewater treatment.

The latest information indicated that Canadian sewage treatment plants not meeting 1 mg/L represent a small percentage (6%) of the total phosphorus loading from these municipal sources to the lower lakes. The Canadian Government encourages the application of all financial and other resources to complete construction of outstanding municipal projects, particularly at Detroit and Buffalo which account for more than 50% of the excess phosphorus from plants not meeting the 1 mg/L target, being discharged to the lower lakes.

Both Governments concur with the Commission that failure to meet the Agreement effluent limitation of 1 mg/L results mainly from the inefficient operation of municipal sewage treatment facilities. The Province is currently meeting the limitation in Lake Erie and is close to meeting it in Lake Ontario. In those cases where the effluent target has not been met, the Province of Ontario will concentrate its efforts to achieve the target.

Operational experience in Ontario with phosphorus removal at 1 mg/L indicates that little, if any, additional reduction in phosphorus discharged to the lakes would be achieved by a further limitation of phosphorus in Canadian laundry detergents from the present 2.2 percent to 0.5 percent by weight. Accordingly, both Governments consider further limitation of detergent phosphorus to be only one of several strategies and they understand that all possible strategies are being re-examined by the Commission's advisory boards. The Governments expect that future recommendations on detergent control will consider the relative inputs from both countries, the cost-effectiveness of alternative strategies, and the environmental and other consequences of phosphorus substitutes.

Plant Operation: With respect to the Commission's recommendations that a review be initiated of all existing facilities considering improved operator training, procedures of operation and maintenance, etc., Canada and the United States held a workshop in March 1978 to develop strategies and recommendations necessary to improve the operation and maintenance of municipal wastewater treatment plants in the Great Lakes basin.

Representatives included design engineers, equipment manufacturers, plant managers and operators, municipal decision-makers, state, provincial and federal regulatory authorities and others. The most significant problems were identified and alternative solutions proposed. A report is in preparation.

The Government of Canada had previously recognized the need to improve operator training and in 1972 undertook a program to develop operator training material. This material is available to individuals and municipalities through the International Water Pollution Control Federation. The Province of Ontario has maintained a long standing program of operator training and sewage treatment plant improvement.

Control of Combined Sewers and Urban Drainage: In order to better define the problem, and develop control strategies, the Canada-Ontario Urban Drainage Program was initiated to address problems of combined sewer overflows, storm water runoff from separate sewage systems, flood control, and sediment transport. Studies have been conducted in several municipalities to characterize rainfall-runoff relationships. Quality and quantity determinations from combined sewer overflows, storm water, runoff and snowmelt have also been made.

A special investigation has been conducted to define the gross pollution load from Ontario cities to the Great Lakes basin and the costs associated with various levels of runoff control.

Emphasis in these studies was placed on the development of solutions employing storm water management models. Supportive studies in storm water treatment

Number: 21 (continued)

alternatives and control devices included pilot and full scale applications. Several demonstration projects, technology transfer seminars, and workshops were undertaken. In light of the high cost of implementing solutions, attention is being given to applying them in priority problem areas.

Phosphorus Replacement in Detergents: With regard to the use of NTA as a phosphorus substitute, both Governments acknowledge the Commission's Research Advisory Board conclusion that "on the basis of health hazard, there is no reasonable cause for restricting the use of NTA as a replacement for phosphate in detergents in the Great Lakes Basin," and further that "nothing in the Canadian experience would indicate an obvious environmental hazard from its use." The Governments look forward to the results of the proposed study by the Research Advisory Board concerning the human health and environmental impact of non-phosphate detergent builders.

UNITED STATES

No response.

Number: 22 (see number 35)

YEAR: July, 1977

SUBJECT: Toxic Substances

The Great Lakes Research Advisory Board recommends that the Commission:

- urge all jurisdictions to develop loading data for each lake for toxic substances which will aid in obtaining accurate mass balances for these substances;
- urge the Governments to adopt water quality objectives for metals on the basis of total concentrations of each metal in water, and ensure that the objectives are conservative with a reasonable margin of safety due to the potential interconversions of the metals to hazardous forms;
- urge Governments to undertake studies to determine the exchange of persistent toxic materials between air, water, sediment, and biota;
- request from jurisdictions more complete information on toxic or potentially toxic chemical substituents of complex effluents, especially for discharges from installations using or making many types of chemicals;
- urge jurisdictions to assure appropriate funding for expanded fish tissue monitoring programs for toxic chemicals;
- urge jurisdictions to support increased research to develop better analytical methods for toxic organic chemicals; and

Number: 22 (continued)

- ask the Governments to assure that agencies with responsibilities for toxic substances control, be guaranteed access to precise information (IUPAC name, quantities, etc.), for all chemicals currently in use.

IJC FIFTH ANNUAL REPORT

The Commission believes that the control and monitoring of toxic substances within the Great Lakes ecosystem is the most urgent problem facing the Governments under the present Water Quality Agreement. Among the problems associated with toxic substances in the Great Lakes are their persistent nature, transformation, bioaccumulation, transport, complexity and the lack of basic information on quantities being discharged. The Commission re-emphasizes the strong statements made in its Fourth Annual Report and its Special Report to Governments on the Water Quality Agreement wherein the need for stringent controls, effective monitoring and increased research on toxic and potentially toxic substances was stressed.

Both Governments have now passed legislation and are developing regulations and programs to deal with toxic substances. The Toxic Substances Control Act in the United States and the Environmental Contaminants Act in Canada relate to the control of toxic substances and include the prohibition of PCBs. The Commission strongly urges that regulations covering specific toxic substances be implemented quickly so that this legislation may be vigorously enforced in the respective countries.

The Commission's 1970 Report on Pollution of the Lower Great Lakes identified the problems associated with the synergistic effects of organic contaminants in the Great Lakes. In 1977 this remains a vital concern to be dealt with and the Governments are again urged to develop standard procedures for assessing the problem and the associated hazards to human health and the environment. The Commission supports the program being undertaken by the Great Lakes Research Advisory Board to prepare an inventory of chemicals used in the Great Lakes basin as the basis for developing structure-activity correlations. These correlations will relate chemical structure to biological activity for different chemical compounds in order to assist in predicting their toxic effects and bioaccumulation potential. Both the Commission and environmental agencies have experienced difficulties in obtaining the required information on manufacture, distribution and use of chemicals within the Great Lakes basin.

As a matter of utmost priority the Commission urges the two Governments to work towards implementing, as soon as possible, the Great Lakes Water Quality Board's recommendations for the control of toxic substances in the Lake Ontario Basin, and the recommendations of the Research Advisory Board concerning toxic substances, both attached to this Report as an Appendix.

Finally, the Commission wishes to draw the attention of Governments to the Water Quality Board's recommendation on mirex in the Great Lakes basin (see Section 8) and to the information on lead in the Great Lakes environment derived from the PLUARG study. Preliminary information on lead and lead compounds indicates that a potential environmental problem with lead may exist similar to that experienced with mercury.

Number: 22 (continued)

GOVERNMENT RESPONSE

CANADA

The Governments concur with the Commission's concerns about toxic substances and the actions that should be undertaken. The specific recommendations on the need for stringent controls, effective monitoring and increased research on toxic and potentially toxic substances have been addressed in the 1978 Agreement.

The federal departments of National Health and Welfare and Environment Canada have promulgated a regulation restricting the use of PCBs and another regulation further restricting their use has been proposed. Proposed regulations to ban Mirex and proposed regulations for the control of polybrominated biphenyls and polychlorinated terphenyls have also been published.

The Governments agree that synergistic effects of organic contaminants is a vital concern because of their potential effects on human health and fisheries. Major research into these effects in Great Lakes fish has begun. Cooperating agencies include: National Health and Welfare, Fisheries and Environment Canada, and the Ontario Ministry of the Environment.

The United States is making use of the Canadian computer information system concerning hazardous materials (Hazmat) to store data on the physical-chemical properties of substances and on their toxicity and bioaccumulative potential. Information on importation, manufacture and use of selected priority chemicals is being collected to aid in the assessment of the hazard posed by these chemicals.

The gathering and compilation of information on the manufacture, distribution and use of chemicals within the Great Lakes basin is impeded because of the high costs involved in identifying the various chemicals in the vast number of manufactured products.

The Governments take note of the Commission's report concerning preliminary information on lead and lead compounds and that a potential environmental problem with lead may exist similar to that experienced with mercury. It is understood that automobile exhaust is a major factor in this problem and some time ago the Canadian Government promulgated a regulation on lead-free gasoline under the Clean Air Act. The Governments support continuing research on the problem of lead methylation and await the Commission's further recommendation.

UNITED STATES

No response.

NOTE: The following appeared in the IJC Special Report of February 1977.

IJC SPECIAL REPORT

Toxic substances, e.g. heavy metals and persistent organic contaminants, may well be the most serious problem Governments face in ensuring future beneficial

Number: 22 (continued)

uses of the Great Lakes. They pose serious threats to water quality, the fishery, human health, and the ecosystem in general. Too little is known of the identity of these substance, their sources, amounts present, characteristic forms and behavior, and their effects. Control and monitoring programs are imperative, but research is urgently required to permit both the early identification of such substances and the establishment of appropriate water quality objectives.

The Commission recommends that the Governments make it a matter of the highest priority to undertake jointly, with the assistance if desired of the Great Lakes Water Quality Board and Great Lakes Research Advisory Board, a special program to assess the problem of persistent toxic contaminants in the Great Lakes with a view to developing and implementing programs for their control. It is especially urgent that early warning mechanisms be developed to identify new chemical substances that might present risks to health and the environment if discharged into the waters of the Great Lakes basin.

The Commission is aware that legislation for the control of toxic substances has now been enacted in both countries but has not yet been implemented. The Commission urges the Governments to implement this legislation as quickly and as comprehensively as possible.

1978 RESEARCH ADVISORY BOARD ANNUAL REPORT

Number: 23 (See number 31)

YEAR: July, 1978

SUBJECT: Hazard Assessment

The Great Lakes Research Advisory Board recommends that the International Joint Commission:

Request Governments to assure coordinated efforts in both countries to identify existing data bases and to develop new data bases with information on physical, chemical and toxicological data, to enable assessment of chemicals. The Board offers the suggestion of utilizing United States and Canadian national correspondents to the International Register of Potentially Toxic Chemical of the United Nations Environment Programme, for coordination.

IJC SIXTH ANNUAL REPORT

The Research Advisory Board with the approval of the Commission therefore undertook a program aimed at developing the means to forecast and aid in the control of organic compounds with potential for manifestation within the Great Lakes. A prototype search and retrieval system was developed by the board to determine which of the many compounds manufactured, used or imported into the basin, have the potential to concentrate in the Great Lakes biota. The technique used within the system to evaluate bioconcentration potential has been referred to as the 'structure-activity correlation' technique. The Commission notes the board's views that the approach will simplify the analyses for contaminants in Great Lakes waters and biota by identifying possible compounds of concern, aid in Great Lakes surveillance efforts by identifying the sites to monitor for specific compounds, and delineate compounds for which objectives are required. As an example, the Research Advisory Board illustrated the usefulness of the prototype system by noting that one of the compounds, pentachloroaniline, selected by the system was selectively found recently in a fish sample which had been previously analyzed without pentachloroaniline having been detected. The Commission recommends to identify existing data bases and to aid in the development of a major coordinated (or joint) data base with information on physical, chemical, and toxicological data to enable assessment of chemicals used, manufactured, processed, or imported into the Great Lakes basin.

The Commission therefore recommends that the Parties to the Agreement initiate the development of a continually updated inventory which identifies chemical compounds used, manufactured, processed or imported in the Great Lakes basin. Further, the Commission recommends with a sense of urgency that the Governments collaborate in evaluating the risk of toxic chemicals to human health and the environment and ensuring that control programs are intensified and coordinated.

GOVERNMENT RESPONSE

CANADA

The Governments of Canada and the Province of Ontario recognize the severity and complexity of the problem of toxic chemicals in the Great Lakes and have invested substantial resources to investigate the level of contamination, sources and effects upon biota and human health. As already noted, a considerable portion of the Canadian allocation for Great Lakes Agreement activities is committed to the investigation and assessment of these substances.

Indicator organisms have been selected to study the long-term trends in both the degree of contamination present in these organisms and the effects on their reproductive capability. Analytical studies have also shown the vast array of anthropogenic compounds that contaminate the Great Lakes biota. Despite the size and complexity of the toxic chemicals problem there is evidence from these long-term studies that the severity of the effects and the level of toxic substances in biota are decreasing.

Research on persistent toxic substances has shown that their pathways through the environment involve complex routes to biota, including man. The ecosystem approach advocated by the International Joint Commission will appreciably aid in the conceptual understanding of man as an integral part of ecosystems and in the clarification of critical pathways of pollutants to man.

The detection and identification of new pollutants in fish and wildlife tissues has resulted in a much better appreciation of the scale of the toxic substances problem in the Great Lakes. The sophistication of the analytical techniques and equipment have led to new perspectives on the role and importance of contaminants such as 2,3,7,8-tetrachlorodibenzo-p-dioxin. Both Governments have undertaken major laboratory renovations to enable monitoring for dioxins. They intend to continue supporting these activities as a high priority. The evaluation of data submitted on new chemicals, reported under Sub-Section 4 (6) of the Environmental Contaminants Act, provides a means of ensuring that chemicals hazardous to human health or the environment are not permitted in commerce. This evaluation procedure has shown that the vast majority of chemicals reported have been used for some time in other countries and are thus not new to industry. The Government of Canada has promulgated regulations for several organohalogen contaminants.

The Governments of Canada and the Province of Ontario agree that a coordinated search and retrieval system for data on commercial use of suspected chemicals, their physical/chemical/biological characteristics, and data on environmental effects and releases to air, water and land is desirable. Discussions among government agencies are proceeding to plan the most cost-effective means to achieve these ends, including provision for assessment of risk to human health and the environment of such substances. The Province has developed an information management system for hazardous/toxic substances to enable the continuous tracking of releases to the environment from significant industrial and other sources.

Number: 23 (continued)

UNITED STATES

No response.

Number: 24

YEAR: July, 1978

SUBJECT: Disposal Sites

Recommend an immediate joint United States-Canada effort to review and assess alternative dredged material disposal policies in the Great Lakes basin. The assessment should be based on the intensive and recently completed Canadian and United States research efforts. If no mechanism is available under the current or the future revised Agreement, the Board is willing to organize a task force to undertake this effort.

IJC SIXTH ANNUAL REPORT

On the basis of these research efforts, the Research Advisory Board's Expert Committee on Engineering and Technological Aspects has now reported to the Commission that the current research suggests that criteria for classifying dredged sediments (bulk analysis) might possibly be over-estimating the environmental impact of dumping dredged sediments in the open waters of the Great Lakes. Conversely, research has indicated that confined disposal of dredged sediments which is widely practiced in the Great Lakes area may have greater adverse environmental impact than originally perceived. Considering that confined disposal costs in the United States portions of the Great Lakes have been approximately \$263 million, and that these confined disposal costs have been estimated to be at least 350% greater than open water disposal, the United States and Canada should undertake a joint effort to review and assess alternative dredged material disposal policies in the Great Lakes basin. The assessment should be based on the intensive and recently completed Canadian and United States research efforts.

GOVERNMENT RESPONSE

CANADA

The Governments of Canada and the Province of Ontario take note of the Commission's recommendation of an immediate joint Canada-United States effort to review and assess alternative dredged material disposal policies in the Great Lakes basin.

The two Governments concur with the need for such a review and assessment in view of the high cost of confined disposal facilities for dredged materials and the potentially significant environmental impact of these facilities. At present, the Governments have insufficient information by which the relative impacts of confined disposal and open water disposal can be determined.

Number: 24 (continued)

The two Governments are supporting the efforts of an International Dredging Sub-Committee which has been established by the Water Quality Board. The Sub-Committee is reviewing existing policies with the intent of developing compatible guidelines and criteria for dredging activities in the Great Lakes. It is suggested that the terms of reference of this Sub-Committee be broadened, if necessary, to consider the environmental implications to the Great Lakes of the confined disposal program for polluted dredged material.

UNITED STATES

No response.

Number: 25

YEAR: July, 1978

SUBJECT: Toxic Substances

Express to the Government of Canada its concern on the limitations of the Canada Environmental Contaminants Act to control and prevent future manifestation of man-made chemicals within Canada and the Great Lakes because of the inability of the Act to assure that the Departments, with responsibility for enforcement of the Act have access to information which will identify all substances in use, manufactured or imported within Canada.

IJC SIXTH ANNUAL REPORT

The Commission concurs in the board's concern that the two Canadian departments with responsibility under the Environmental Contaminants Act may not be aware of many compounds manufactured, processed or imported in Canada, while two other departments with no obligations under the Act do have such information. The continually updated data of Statistics Canada and Revenue Canada is by Canadian law, confidential and inaccessible to any other federal departments.

Furthermore, the Commission expresses its concern that some information of a confidential nature will be difficult to obtain under existing laws in Canada and recommends that Canada take measures to make such information available to the regulatory agencies. In addition, efforts should also be made to prepare an inventory and evaluate various by-products in industrial effluents to the Great Lakes. Therefore, the Commission strongly urges the Canadian Government to undertake whatever legislative actions are necessary to require that industries report all chemical compounds in use, manufactured or imported, and to ensure that this information is made available to the appropriate regulatory agencies.

GOVERNMENT RESPONSE

CANADA

The Governments of Canada and the Province of Ontario commend the International Joint Commission for the preliminary study it undertook to identify

Number: 25 (continued)

over 2,800 compounds being used, manufactured or imported into the Great Lakes basin. The Government of Canada, using sources and powers currently available, has begun to determine the amounts of those 2,800 compounds currently used in commerce in Canada. The legal and organizational bases for sharing information between regulatory agencies are being critically examined by the Federal Government.

UNITED STATES

No response.

Number: 26 (see numbers 56, 57 and 72)

YEAR: July, 1978

SUBJECT: Phosphorus Limitations

The Great Lakes Research Advisory Board reiterates two recommendations from last year to the International Joint Commission:

- encourage studies through the IJC institutions to identify the most cost-effective programs for reducing phosphorus loadings by examining the potential control of other sources such as urban runoff and agricultural drainage and as well examine lower cost alternatives for municipal discharges; and
- urge Great Lakes surveillance efforts to be in part directed towards the provision of adequate data to enable development and verification of improved eutrophication models.

IJC SIXTH ANNUAL REPORT

The Commission wishes to advise Governments of the concern expressed in the board's report that the lack of knowledge on the biological availability of the various forms of phosphorus may cause tremendous resources to be unnecessarily expended to control forms which would not normally be biologically available. More cost-effective control will result if resources are concentrated on sources with a high degree of biologically available phosphorus. For example, while it is known that phosphorus from point sources is highly available, the proportion of availability of phosphorus from land use and erosion runoff is not known and seems to vary from place to place. The task force will consider this issue. The Commission requests that the Governments delineate their programs directed to the determination of biological availability of phosphorus together with an evaluation of funding adequacies, as well as current agency assessments of biological availability. Support by the Governments of the task force activities is strongly urged by the Commission.

GOVERNMENT RESPONSE

No response.

Number: 27 (See numbers 20 and 28)

YEAR: July, 1978

SUBJECT: The Ecosystem Approach

Recognizing that many of the Commission's Boards, Reference Groups, Committees and Task Forces have focused on aspects of Great Lakes basin problems other than water quality, including human health;

and that the significance of ecosystem quality and integrity is implicit in many of the directives and activities of the Parties, the State and Provincial Governments, and the Commission;

and believing that it is the intent of the Parties, as expressed in the Boundary Waters Treaty of 1909 and the Water Quality Agreement of 1972, to protect and enhance the Great Lakes Basin Ecosystem as defined in this report;

and knowing that the individual programs and activities of the Parties, the State and Provincial Governments, and the Commission are extensive, but collectively fail to provide the integrated management of an ecosystem approach.

The Great Lakes Research Advisory Board recommends to the International Joint Commission:

- that the Parties and the Commission explicitly recognize as policy the need for an ecosystem approach to problem identification, research and management in the Great Lakes basin;
- that the Parties extend or amend the Boundary Waters Treaty of 1909 and the Great Lakes Water Quality Agreement of 1972, in accordance with the philosophy of the ecosystem approach outlined in this report;
- that the Parties, the State and Provincial Governments, the Commission, and the people of the Great Lakes basin demonstrate by example their ability to apply an ecosystem approach to one or more transboundary problems of common and current concern; and
- that the Parties articulate specific goals and desired uses of the Great Lakes, invoking, if necessary, the power of decision that can be given to the Commission under Article X of the Boundary Waters Treaty of 1909, so that more direct efforts can be formulated to reach these expectations.

IJC SIXTH ANNUAL REPORT

There has been a succession of problems facing the Great Lakes basin over the years, such as waterborne transmission of typhoid fever and other diseases, eutrophication and, more recently, persistent organic chemical contamination. In its 1977 report to the Commission, the Research Advisory Board stated that continued emphasis on the measurement and control of the chemical and physical qualities of water, while necessary, may not be sufficiently broad in scope for effective, long term planning and management of boundary waters such as the Great Lakes. As a result, the board recommended the adoption of an ecosystem approach to the Great Lakes basin. In a special report, The Ecosystem Approach,

presented to the Commission July 1978, the board further elaborated on the scope and implication of its 1977 recommendation.

Substantial gains have been made under the Boundary Waters Treaty and the Great Lakes Water Quality Agreement of 1972 in the restoration and enhancement of the Great Lakes Boundary Waters. It is, however, becoming increasingly apparent, as pointed out by the Research Advisory Board's report and PLUARG studies, that water and water quality considered in isolation of other system components, stressors, or measures may be insufficient to restore and enhance the quality of the Great Lakes. Long range transport of airborne pollutants and the associated acid rain, nutrient loading and persistent organic contaminants illustrate the need for such a broader perspective and approach to these problems.

Population growth in the basin further points to the need for a broader perspective to program planning and management. The increased impact on the Great Lakes of man and consumption patterns resulting from water use must be recognized and considered as an integral, interactive component of the Great Lakes Basin Ecosystem of which man is both a product and an integral part. Use of resources should be within the limits imposed by the carrying capacity and resilience of the system. Attitudes, perceptions and behavior must receive public and political recognition in this regard. Further, there must be recognition that man discharges his wastes and pollutants in the ecosystem of which he is part rather than to an environment which surrounds him.

The ecosystem approach should not divert attention from the gains to be made through the present water quality approach and the ongoing development of water quality objectives. The Commission views the ecosystem approach as providing the necessary means by which existing programs, which deal with environmental interests and responsibilities in the Great Lakes basin, can be more fully integrated. For example, using the ecosystem approach, surveillance programs currently being conducted in support of the Great Lakes Water Quality Agreement could better integrate and evaluate changes occurring elsewhere in the system such as shifts in fish abundance and species composition, or better evaluate the influence of water quality on human health. Adoption of an ecosystem approach will provide a sounder and more comprehensive basis than is currently available for the prevention of transboundary injury to health or property on both sides of the border.

Recognizing that many of the Commission's activities have focused on aspects of Great Lakes basin problems other than water quality, including human health; that ecosystem quality and integrity are implicit in many of the directives and activities of the Parties, the state and provincial governments; and believing that it is the intent of the Parties, as expressed in the Boundary Waters Treaty of 1909 and the Great Lakes Water Quality Agreement of 1972, to protect and enhance the Great Lakes Basin Ecosystem, the Commission supports the Research Advisory Board's recommendations contained in The Ecosystem Approach report. The Commission endorses as policy the need for an ecosystem approach to problem identification, research, and management in the boundary waters of the Great Lakes Basin Ecosystem. Further, the Commission urges the Parties to undertake a thorough review of the views and philosophies in the board's report for consideration of adoption of these recommendations. Most specifically the

Commission urges that the Parties, the state and provincial governments, and the people of the Great Lakes basin demonstrate by programs and policies their desire and ability to apply the ecosystem approach to one or more transboundary problems of common and current concern.

GOVERNMENT RESPONSE

No response.

NOTE: The Great Lakes Water Quality Agreement, signed November 22, 1978, makes several specific references to the ecosystem concept especially as it relates to governmental policy implied by their signatures.

1979 SCIENCE ADVISORY BOARD ANNUAL REPORT

Number: 28 (See numbers 20, 27 and 29)

YEAR: July, 1979

SUBJECT: The Ecosystem Approach

The Great Lakes Science Advisory Board recommends that the International Joint Commission:

- Immediately implement, as specified in Article VII(6) of the 1978 Great Lakes Water Quality Agreement, liaison among institutions established under the 1909 Boundary Waters Treaty, appropriate United States and Canadian agencies, and international organizations which address concerns relevant to the Great Lakes Basin Ecosystem to ascertain and ensure that all facets and concerns of the Great Lakes Basin Ecosystem, as outlined in this report, are adequately considered. Particular emphasis on the problems associated with long range transport of airborne pollutants should be given high priority.
- Encourage the Parties to formulate a reference within the context of an ecosystem approach on the causes, effects and measures for the control of long range transport of airborne pollutants with special attention to acid rain. Such action will serve to accelerate efforts to develop necessary information for rapid action.

The transmission of toxic and hazardous substances to the Great Lakes via long range atmospheric transport and deposition is a serious problem which requires further research efforts and control measures.

The Commission urges Governments to consider not only relatively short-term economic goals (regional, national and international), but also the long-term costs to society in both countries of not controlling acid rain and other air pollution problems. Furthermore, the Commission suggests that the costs of pollution control in the case of thermal power generation in both countries should be compared not only with the cost of burning coal without stringent emission controls, but also with the higher real cost of the alternate energy sources in the context of the overall energy supply situation.

The Commission notes that the Governments have initiated considerable bilateral work to address the problems associated with acid rain and other forms of long-range air pollution. It is also aware of the negotiations leading towards an international air quality treaty or agreement, concurrent with the domestic research and more stringent control programs recently announced in both countries.

Nevertheless, while the Commission has in the past communicated with the Governments on the problems of long-range transport of air pollutants under

Number: 28 (continued)

other References, the significance of atmospheric pollution to Great Lakes water quality as reported by the Great Lakes Water Quality and Science Advisory Boards, compel the Commission to advise the Governments of the extent and possible consequences of the acid rain problem to the Great Lakes Basin Ecosystem. In this regard, the Commission believes that the potential for impacts on the Great Lakes is sufficient to require consideration of this problem under the provisions of Article VI(1)(e) of the 1978 Great Lakes Water Quality Agreement.

There is also a need to clarify and expand on knowledge concerning the linkage between the acid rain problem in the Basin ecosystem and the boundary waters. The Commission recommends that the Governments of the United States and Canada consult in a timely manner on appropriate actions to substantially reduce atmospheric emissions of sulphur and nitrogen oxides from existing as well as new sources, and that the Governments ensure that adequate, comprehensive research programs are underway to provide information on the causes, effects on the ecosystem and measures for the control of the long-range transport of airborne pollutants, with special attention in the near future to acid rain.

Water quality and other ecological changes in the Great Lakes basin have resulted from emissions to the atmosphere from many sources. The Commission recommends that the Governments:

- undertake further actions to reduce atmospheric emissions of the oxides of sulphur and nitrogen from existing as well as new sources; and
- ensure the expansion of research programs to provide information on the causes, effects and measures for the control of the long range transport of airborne pollutants, especially acid rain.

GOVERNMENT RESPONSE

No response.

Number: 29 (See numbers 20, 27 and 28)

YEAR: July, 1979

SUBJECT: The Ecosystem Approach

Request that agencies responsible for assessment of living resources, such as fish stocks, dedicate and/or expand a portion of their current management programs which would coordinate with air quality and water quality surveys enabling improved assessment and understanding of the overall quality of the Great Lakes Basin Ecosystem.

IJC SEVENTH ANNUAL REPORT

In 1977, the Science Advisory Board cautioned the Commission that the plan, although useful in determining compliance with water quality requirements, was

Number: 29 (continued)

of limited value as a basis for addressing progress in ecosystem quality. This was because the elements of the plan were static, that is, the interactions and interdependencies of ecological parameters were not considered.

The Commission urges that research and program assessment needs be closely coordinated in the implementation of the surveillance program in order to assure the maintenance of expertise, and to integrate research results into the further development and improvement of surveillance activities.

The Commission recommends that:

- governments ensure that adequate funds are made available to prepare and implement their surveillance and monitoring programs called for in the 1978 GLWQA, and that such programs be modified to take into account the revised Surveillance Plan being developed by the Commission; and
- research and program assessment needs be closely coordinated in the implementation of the surveillance program in order to ensure the maintenance of expertise and integrate research results into the further development and improvement of surveillance activities; and urge continued high priority for research and legislative/regulatory action regarding the dispersal of man-made chemicals in the environment.

GOVERNMENT RESPONSE

No response.

Number: 30

YEAR: July, 1979

SUBJECT: Toxic Disposal

Urge continued high priority for research and legislative/regulatory action regarding the dispersal of man-made chemicals in the environment.

IJC SEVENTH ANNUAL REPORT

The Commission recommends that the replacement of toxic substances in the manufacturing process with less hazardous materials, methods for their destruction after use, and the reduction of wastes through product modification, recycling or closed-loop production systems, all be vigorously pursued by industry and by Governments. As this may not be achieved in the near future, the Commission also recommends that Governments ensure that comprehensive systems of hazardous waste management be developed to ensure the safe storage, transportation and disposal of hazardous wastes.

The Governments ensure that comprehensive systems of waste management be developed and implemented for the safe storage, transportation and disposal of hazardous wastes.

Number: 30 (continued)

Steps be taken to increase public understanding of the need for providing adequate and safe facilities and sites for the handling and disposal of such wastes, including adequate public demonstration that such sites are technically possible and environmentally safe.

GOVERNMENT RESPONSE

No response.

Number: 31 (See number 23)

YEAR: July, 1979

SUBJECT: Hazard Assessment

Urge that efforts for hazard assessment of man-made chemicals in the Great Lakes basin, be carried out in the context of ongoing multi-agency and multi-national efforts as identified in the Board's report.

IJC SEVENTH ANNUAL REPORT

At present, there is no agreement among agencies, either between or in some cases within jurisdictions, concerning the appropriate basis and methodology for a coordinated hazard assessment program for chemicals in the Great Lakes basin.

The Commission recommends the resolution of this problem as a basis for coordinated management of toxic and hazardous substances in the Great Lakes ecosystem, and in fulfilling the commitment of the Great Lakes Water Quality Agreement.

The Commission is concerned about the serious problem of the shortage of adequate laboratory facilities and trained personnel for analyzing toxic and hazardous substances in the Great Lakes Basin Ecosystem. Therefore, the Commission urges the Governments to ensure that sufficient analytical resources are available to meet requirements of a comprehensive program for the control of toxic and hazardous substances.

In its July 1978 Report to the Commission, the Research Advisory Board (now the Science Advisory Board) described its development of a computer data bank designed to identify chemicals manufactured or used in the Great Lakes basin which have the potential to persist or bioaccumulate in the ecosystem, and which are therefore of particular concern in the basin. In January 1979, this data base, the Information System for Hazardous Organics in a Water Environment (ISHOW), became operational at the EPA Environmental Research Laboratory in Duluth, Minnesota.

As one specific measure, the Commission recommends that the ISHOW data base be provided with the necessary information on chemicals in both the United States and Canadian portions of the Great Lakes basin.

Number: 31 (continued)

The Commission again expresses its view that the control of toxic and hazardous substances within the Great Lakes system is a problem of high priority requiring the strict regulation of the manufacture, use, transport and disposal of such substances. The Commission therefore recommends that:

- Governments accelerate their efforts to develop and implement programs for the assessment and control of toxic and hazardous substances in the basin;
- a coordinated hazard assessment methodology for man-made chemicals in the Great Lakes basin be developed as soon as possible;
- high priority be given to research regarding the dispersal and fate of man-made chemicals in the environment and to legislative/regulatory action for their control;
- all jurisdictions assess the adequacy of their capability to identify, measure and analyze toxic and hazardous substances, and take the necessary measures to provide adequate laboratory facilities and skilled personnel to meet the analytical requirements of a comprehensive toxic and hazardous substances control program; and
- the Information System for Hazardous Organics in a Water Environment (ISHOW) data base, developed by the Science Advisory Board (SAB), be provided with all necessary information on the manufacture, use and import of chemicals in both the United States and Canadian portions of the Great Lakes basin.

IJC INTERIM REPORT

Further, since the SAB has strongly recommended centralized and coordinated information systems for toxic and hazardous substances in the Great Lakes basin, the Commission has also requested this Board to provide a more definitive prospectus for such information systems so that the Commission can better assess the adequacy of current Governmental and private systems (with attention to information management policies) and the need for further development on this report.

Pending further assessment the Commission reserves its further advice to the Governments on the questions of ... a centralized information system for hazardous substances.

NOTE: Status of ISHOW will be reported to the Commission via the SAB 1981 Annual Report.

GOVERNMENT RESPONSE

No response.

Number: 32

YEAR: July, 1979

SUBJECT: Annex 10 and 12 of 1978 Water Quality Agreement

Obtain from the Parties an immediate commitment to review the Science Advisory Board's recommended procedure for addressing Annexes 10 and 12 of the 1978 Great Lakes Water Quality Agreement.

IJC SEVENTH ANNUAL REPORT

With respect to Annexes 10 and 12 of the 1978 Agreement, which address "Hazardous Polluting Substances" and "Persistent Toxic Substances," respectively, the Commission endorses the approach (Appendix I) recommended by its Science Advisory Board concerning a procedure regarding the implementation of these Annexes.

It is clear that any plan to effectively control chemicals must:

- consider the toxicity, persistence and quantity produced in the Great Lakes Basin Ecosystem;
- contain a mechanism for selecting those of most probable hazard;
- contain a priority plan for promoting development of needed data that are lacking - from biological effects to control technology; and
- identify locales of most probable occurrence if surveillance needs are to be made realistic.

Accepting these characteristics as important, it is clear that (1) the lists currently in Annex 10 must be revised and (2) a working data base is needed to provide candidate chemicals to the Parties for placement on the lists. These lists are much too rigid and difficult to change to be used as working lists, given the massive lack of information.

The Water Quality Board should establish a mechanism to gather production, transport and discharge data on individual chemicals in the basin. This step is critical to success of the entire program. Both #2 and #3 would require substantial staff support.

The inventory and data base developed by the Science Advisory Board and the EPA Duluth Laboratory should be used as the working mechanism for processing the massive amount of data that will be generated. Further, the Regional Office in Windsor should be assigned the responsibility of maintaining and updating the base at the direction of the Science Advisory Board Committee identified in #2 above.

The Commission should be responsible to see that proper enforcement and surveillance is achieved by the Parties. The Science Advisory Board suggests the following approach towards responding to Annexes 10 and 12:

Number: 32 (continued)

- The Appendices 1 and 2 of Annex 10 should be defined as those chemicals of certain high hazard and suspected high hazard respectively. A task force of the two Boards should be appointed to refine the Appendices based on this definition.
- A Science Advisory Board Committee should establish a mechanism to collect, review and synthesize data on chemicals and their interaction in the Great Lakes Basin Ecosystem and recommend to the Water Quality Board placement on list 1 or 2.

GOVERNMENT RESPONSE

No response.

Number: 33 (See number 20)

YEAR: July, 1979

SUBJECT: Environmental Mapping

Request the Parties to notify United States and Canadian institutions with interests in environmental mapping and to identify agencies with resources which can be allocated to an initial effort. Contingent upon adequate agency support the Commission should establish a task force to coordinate and assure implementation. Topics recommended for consideration are: toxic contaminants, eutrophication and rehabilitation.

IJC SEVENTH ANNUAL REPORT

The Commission has noted a number of initiatives concerning innovative approaches to information gathering and analysis. Examples include the report by the SAB Task Force on Environmental Mapping. In the past, the Commission has supported the concept of an experimental environmental mapping program for part of the Great Lakes basin, and has recommended governmental support. Support for an extensive environmental mapping effort, however, is not unanimous. Concern appears to revolve in part around possible misuse of maps which may contain incomplete or misleading information (e.g., if an area is not marked for fish spawning, it may be assumed that the area is not important in this regard) and around competing priorities for the limited research and operating funds in the agencies concerned.

Noting the activities of the Science Advisory Board's Task Force on Environmental Mapping, and concerns that have been expressed about environmental mapping, the Commission again recommends that:

Governments sponsor an experimental environmental mapping project in order to determine the problems and benefits associated with such an undertaking.

GOVERNMENT RESPONSE

No response.

Number: 34

YEAR: July, 1979

SUBJECT: Land Application of Sewage

Encourage the Parties to identify, within the Basin, land areas generally suitable for land application of municipal wastewater on the basis of soil and groundwater characteristics, agricultural opportunities, climate, as well as present and anticipated land use patterns in an effort to ensure consideration of the use of this technology.

Although not specifically recognized by the IJC in the 7th Annual Report the Commission did endorse the following in the 6th Annual Report.

IJC SIXTH ANNUAL REPORT

In 1976, the United States passed the Resource Conservation and Recovery Act (PL 92-580) amending the Solid Waste Disposal Act. This act encourages the recycling of sludge. United States EPA has proposed criteria for land spreading of solid waste and upon adoption of these criteria, guidelines will be promulgated under the Clean Water Act.

Ontario Regulation #824 under the Environmental Protection Act requires certificates of approval for sludge handling systems and for disposal sites. Guidelines have been developed for use of sludge on agricultural lands. The Ontario Ministry of the Environment encourages the use of sewage sludge on agricultural lands for fertilizing and soil conditioning.

The Commission recommends that Governments place increased emphasis on research and development of techniques for disposal of municipal sludge, including pretreatment of waste entering the municipal systems and alternative technology for disposal or reuse of waste treatment by-products.

GOVERNMENT RESPONSE (to IJC Sixth Annual Report)

CANADA

In June 1979, the Ontario Government adopted the "Guidelines for Sewage Sludge Utilization on Agricultural Lands." The Guidelines will be implemented over a three-year period, and will be jointly administered by the Ontario Ministries of Environment and Agriculture and Food. Fact sheets on the handling of sewage sludge have been produced for use at the farm level. The Guidelines may be used to establish acceptability of a given sludge waste for utilization or disposal. Where sewage sludge quality can be improved, the emphasis will be placed on utilization of the available fertilizer values. The purpose of the Guidelines is to protect foodlands, the quality of food, the health of the consumer, and the environment primarily from the build-up of toxic metals.

UNITED STATES

No response.

1980 SCIENCE ADVISORY BOARD ANNUAL REPORT

Number: 35 (see number 22)

YEAR: November, 1980

SUBJECT: Atmospheric Loadings

The International Joint Commission should urge that jurisdictions institute programs to quantify the atmospheric loadings of hazardous substances to the Great Lakes.

Atmospheric transport to the Great Lakes is an important source for some metals and organic chemicals. Data are inadequate to identify all chemicals for which atmospheric loading is important. In 1977 the Science Advisory Board recommended to the Commission that loading data for each lake be developed and that exchange among air, water, sediment, and biota be determined. In its 1976 Annual Report the Water Quality Board recommended that all jurisdictions establish close coordination between air, water, and solid waste programs to assess the total input of chemicals. The atmospheric inputs are still largely unknown, but such data are essential to meet the goals of the 1978 Great Lakes Water Quality Agreement. Much binational attention is being given to 'acid rain', but insufficient attention is being given to other atmospheric pollutants that may have significant impact. More vigorous pressure from the Commission is needed to accelerate the collection of surveillance data required to identify the most important problems.

IJC INTERIM REPORT

During 1980, the Science Advisory Board attempted to quantify the extent to which the atmosphere is a major pathway of pollutants to the Great Lakes. While not all the data are specific to the Great Lakes Basin Ecosystem, the 1980 Science Advisory Board report and background documents establish that the atmosphere is a major if not the dominant pathway to the waters of the Great Lakes basin for a number of hazardous substances.

The Commission recommends that the Governments review the reports of the Science Advisory Board with a view to overcoming the lack of sufficient monitoring data and to fulfil the need for a well designed, coordinated, efficient sampling network and monitoring study to identify and measure the atmospheric deposition and fluxes of both organic and inorganic substances throughout the Great Lakes basin.

The Commission also recommends that the Parties consult immediately under Article VI(1) of the 1978 Agreement to ensure that adequate provisions are being made to address this problem including the vigorous pursuit of required remedial action, and under the ongoing coordinated research program and bilateral negotiations pursuant to the August, 1980 Memorandum of Intent between the Governments of Canada and the United States Concerning Transboundary Air Pollution.

Number: 35 (continued)

The Commission has asked its Water Quality and Science Advisory Boards to continue to give priority to this area of environmental science and policy concern.

GOVERNMENT RESPONSE

No response.

Number: 36

YEAR: November, 1980

SUBJECT: Recovery of Hazardous Substances

The Commission should urge jurisdictions to recover hazardous substances for reuse and employ treatment technologies that destroy, rather than merely remove, contaminants from waste discharges.

Treatment of water and air discharges does not ensure that substances of concern will not harm the ecosystem, unless they are destroyed during treatment. In many technologies for air and water treatment, the substances being removed are concentrated in sludges which then may be disposed of as solid waste. The Water Quality Board in its 1978 Annual Report advised the Commission that waste treatment techniques which destroy chemicals rather than concentrate them in sludges will substantially reduce solid waste generation. Similarly, treatment technologies which do not produce large volumes of chemical sludge are highly desirable. Some substances such as heavy metals will remain intact and should be reused if possible, but will usually require careful disposal probably as solid waste. Every effort should be made to keep such substances to a minimum in all discharges.

IJC INTERIM REPORT

The Commission also draws attention to the Science Advisory Board's recommendation that jurisdictions recover hazardous substances for reuse and employ treatment technologies that destroy, rather than merely remove, contaminants from waste discharges. Use of wastes as raw materials is crucial to reducing or avoiding the need for more disposal sites. Since many substances can only be containerized, rather than be treated, a permanent reliance on sites is not the final solution to most hazardous waste problems (an exception at the present time may be radioactive materials). The Commission therefore commends its Science Advisory Board's recommendation on recycling and utilization of hazardous wastes to the Governments to encourage new approaches to waste handling.

GOVERNMENT RESPONSE

No response.

Number: 37

YEAR: November, 1980

SUBJECT: Hazardous Substances

The Commission should encourage dischargers to seek ways to reduce the use or loss of hazardous substances that may find their way into air or water effluents.

While the economic benefits of wise chemical use will probably be recognized eventually by the industrial sector, pressure from regulatory agencies could speed such recognition. To the extent that better use can lessen the amount of treatment needed, society will benefit. Although preventing hazardous substances from occurring in waste seems obvious, the past losses of mercury from chlor-alkali facilities illustrate the need for closer scrutiny in all industrial processes.

IJC INTERIM REPORT

The Commission recommended in its Seventh Annual Report on Great Lakes Water Quality that the replacement of toxic and hazardous substances in the manufacturing process with less hazardous materials, and the reduction of wastes be vigorously pursued by industry and Governments. However, where such replacement and reduction may not be achieved in the near future, the Commission has recommended strict measures to bring hazardous waste disposal under control. To this end, the Commission urged Governments in its report, Pollution in the Great Lakes Basin from Land Use Activities to:

- a) prepare a complete inventory of operating and abandoned waste disposal sites in the Basin, including the nature and quantities of waste handled where possible;
- b) determine the adequacy of such sites, and any proposed sites, to properly and safely handle hazardous wastes and implement necessary measures to correct any deficiencies found;
- c) conduct a comprehensive review of all existing legislative and regulatory mechanisms and make alterations where necessary to assure the safe transportation and disposal of hazardous wastes in the Basin;
- d) establish a compatible manifest system for hazardous wastes between all jurisdictions within and beyond the Basin;
- e) because siting of hazardous waste facilities depends in part on public acceptance of such sites, efforts be made to demonstrate clearly that safe disposal sites are technically possible, or that associated risks can be held to a minimum; and
- f) in addition, embark on a long-term effort to reduce or eliminate pollutants at their sources, including increased resource recovery efforts and alterations in the manufacturing process.

Number: 37 (continued)

Further, the Commission again draws attention to its letter of January 31, 1979 to Governments and to its recommendation in the report, Pollution in the Great Lakes Basin from Land Use Activities that Governments provide information on the location and contents of hazardous waste disposal sites. The Commission is aware that Governments have been studying this question and looks forward to receiving information on waste disposal sites and programs required to assess the extent of the problem and the adequacy of corrective, preventive and monitoring measures. In providing for the control of hazardous wastes, Governments should ensure that provision is made in the regulations of the various jurisdictions for coordinated and effective control throughout the Basin.

GOVERNMENT RESPONSE

No response.

Number: 38

YEAR: November, 1980

SUBJECT: Hazardous Substances and Public Awareness

The Commission should urge the jurisdictions to identify and inform populations in the basin which may have higher than average exposure to hazardous substances as a result of their dietary habits or living conditions, and that the jurisdictions expand their efforts to identify any cause and effect human health relationships associated with the consumption of Great Lakes fish and wildlife.

Because various small groups in the Great Lakes population eat quantities of fish in amounts well above average, because residues in sport fish are less well monitored, and because many desired sport fish have high lipid content, the exposure of these populations is above average. Therefore, acceptable residue concentrations based on average consumption may not be sufficiently protective. Residues in sport fish are currently regulated differently in various jurisdictions and usually only by public advisories, which are not mandatory. While the consequences of such increased exposure are not known, these populations should be informed of their high exposure. Monitoring of the residues they consume should be at least as intensive as they are for the average population. The Water Quality Board has recommended that common risk assessment procedures be developed by the jurisdictions. Initial effort concentrated on an identifiable sub-population would be easier than considering the entire population of the Basin because these groups are smaller. Such efforts will be especially significant for protecting high exposure groups.

Not specifically recognized by IJC, however the following appeared in the First Biennial Report

... A primary focus of the 1978 Agreement is on the assessment and management of toxic and hazardous substances in the Great Lakes System. The Parties endorsed an ecosystem perspective as a framework for addressing international

Number: 38 (continued)

water quality problems in that Agreement. The Commission is mindful of, and agrees with, the statement of the Governments made in their Six-Month Review of the Regional Office that ways must be found to maintain public support of the Water Quality Agreement and to keep the problems addressed in the Agreement in front of federal, state and provincial legislators. Unless the attitudes, perceptions and values of government officials and all the citizens of the Great Lakes basin are reasonably consistent with an ecosystem approach, implementation of the General and Specific Objectives of the Agreement will be difficult if not impossible to achieve.

The Commission believes that new initiatives on the part of the Parties are required to give a continuing sense of purpose, direction and commitment to Agreement activities. A clear sense of unity and direction on issues central to the Agreement is required. The sense of drift is nowhere more apparent than with the issue of toxic and hazardous substances.

GOVERNMENT RESPONSE

No response.

Number: 39

YEAR: November, 1980

SUBJECT: Human Health and Risk Assessment

The Commission request that appropriate agencies in Canada and the United States review the human health toxicity information on those hazardous substances which form residues in Great Lakes fish and wildlife, and establish tolerance levels for those substances as they are identified.

Substances that are not food additives or pesticides are not uniformly measured or controlled. Acceptable residue limits for such substances in fish do not currently exist. Through a binational effort and pooling of agency resources, interim levels could be established and used for regulatory actions. These actions would provide a basis to judge the importance of residues found in fish used for food and would aid in establishing estimated risks to residents of the basin. Both the Water Quality Board and the Science Advisory Board in previous reports, have emphasized the need for knowing the significance of chemical residues in human health. Resources to accomplish this goal have not been forthcoming. An alternative is to use existing data and expertise to make best judgements of acceptable intakes. The Commission should urge that a sound regulatory basis be developed that will enable defensible and valid limits to be set for the protection of the Great Lakes basin ecosystem.

Not specifically recognized by IJC

NOTE: A Cancer Registries Workshop was held at the Great Lakes Regional Office on March 19 and 20, 1981. In addition, the Human Health Committee is reviewing methodologies employed in Risk Assessment.

Number: 39 (continued)

GOVERNMENT RESPONSE

No response.

Number: 40

YEAR: November, 1980

SUBJECT: Hazard Assessment

In 1973 the Water Quality Board advised the Commission that there was a need for data on the level and effects of various contaminants, with special emphasis on the environmental significance of PCB levels in the biota, in order to evaluate the human health implications. In addition, both the Science Advisory and Water Quality Boards in previous reports have stressed to the Commission the importance of developing fate and effects information. However, very little additional work has been initiated. The generation of such data is routine work and should not be done by research organizations, which are not efficient in routine data production. They should use their resources to develop better methods for data production and a better knowledge of what data are most needed. Routine data generation is not the responsibility of any agency. This fact may explain why little has been done. Because such data are so important to regulations, funding outside existing research budgets should be requested to develop the required data.

The Commission should strongly urge governments to establish programs to develop routine fate and effects information needed for predictive hazard assessment.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 41

YEAR: November, 1980

SUBJECT: Information Systems

Much of the data needed for the control of hazardous substances, such as toxicity, persistence, and bioconcentration potential must be generated or gathered from diverse sources. Each jurisdiction will need such data as a basis for its control actions. Furthermore, each jurisdiction will be concerned with a number of substances. A single organized assembly of this data at a central location will be far more cost effective than many individual efforts. The Science Advisory Board in its 1978 Annual Report recommended a centralized system. The Water Quality Board has repeatedly stressed the need for information of this nature. Little progress has been made in developing a common data bank accessible to all. The Commission should take a more aggressive role in assisting the jurisdictions to gain access to this data.

Number: 41 (continued)

The Commission should centralize an information system to collect, store, sort, and dispense data needed by the jurisdictions for control of hazardous substances.

IJC INTERIM REPORT

The Commission wishes also to evaluate all data and information systems requirements necessary to fulfill its advisory function with respect to the various Articles and Annexes in the Agreement. These include the adequacy of Regional Office staff and facilities, quality control and the need for centralized information systems. Pending further assessment, the Commission reserves its further advice to the Governments on the questions of inter-jurisdictional data quality assurance programs (Water Quality Board recommendation) and a centralized information system for hazardous substances (Science Advisory Board recommendation).

The Commission has requested the Science Advisory Board to review the GLISP for scientific validity and quality with emphasis on tributary and nearshore monitoring, the adequacy for trend analysis, sampling plans for toxic and hazardous substances, and the compatibility of simultaneous monitoring systems for eutrophication and toxic substances. Further, since the Science Advisory Board has strongly recommended centralized and coordinated information systems for toxic and hazardous substances in the Great Lakes basin, the Commission has also requested this Board to provide a more definitive prospectus for such information systems so that the Commission can better assess the adequacy of current governmental and private systems (with attention to information management policies) and the need for further developments in this regard.

NOTE: The SAB responded to the IJC request to review GLISP by letter dated January 27, 1981 and in its 1981 report to the Commission. The SAB concluded that:

- The information generated by the GLISP could be enhanced and made more valuable to decision makers and other users through more rigorous processing and a more timely review of the data.
- An increased emphasis on integrators and biological indicators coupled with a reduced emphasis on water analysis for contaminants would be beneficial.
- In order to increase the value and usability of the GLISP, the institutions and agencies with responsibility for the Great Lakes system quality should continue cooperative development of surveillance planning, integration, implementation, analysis, interpretation, and presentation.
- Further cooperative development of the GLISP can be accomplished using the existing board and committee structures of the International Joint Commission and the Great Lakes Fishery Commission, but formal endorsement of such a cooperative venture and agreement to participate by environmental protection agency administrators would facilitate progress.

Number: 41 (continued)

GOVERNMENT RESPONSE

No response.

Number: 42 (see numbers 3, 43, 45, 59 and 69)

YEAR: November, 1980

SUBJECT: Net Benefit

Many pollution abatement procedures, such as chemical precipitation of phosphorus and operation of air scrubbers, require the use of chemicals and fossil fuels. The extraction and conversion of fossil fuels produces impacts on various parts of the ecosystem. Likewise, the production of chemicals and the disposal of sludge after treatment can cause adverse impacts. Often these secondary effects occur in locations outside the Great Lakes basin ecosystem. When these impacts exceed the benefit of the abatement steps, the net environmental result is negative and the abatement probably should not be implemented. Careful environmental assessments are needed to identify when this point is reached. The ecosystem approach adopted by the Commission requires that all control programs within the basin result in net environmental benefit. At present there are no methods available to determine net environmental benefit, but they are needed to guide decision making.

The Commission should recommend research for developing methods to determine net benefit as a necessary consideration in future decision making in the Great Lakes Basin Ecosystem.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

1981 SCIENCE ADVISORY BOARD ANNUAL REPORT

Number: 43 (see numbers 3, 42, 45, 59 and 69)

YEAR: November, 1981

SUBJECT: Energy Conservation

While most jurisdictions have energy conservation programs, there is still considerable potential to further reduce demand. In comparison with many other developed countries, the per capita energy consumption in the United States and Canada is still large. It is the Board's view that this consumption can be reduced without a loss in quality of life.

The International Joint Commission should request integrated information from the Parties regarding their programs for making more effective use of energy.

IJC FIRST BIENNIAL REPORT

The Board recommended that the Commission request integrated information from the Parties regarding their programs for effective energy use in the Basin. While the Commission agrees with the general desire to foster energy conservation implicit in this latter recommendation, it does not see a need for direct Commission involvement in such an information exchange program.

GOVERNMENT RESPONSE

No response.

Number: 44

YEAR: November, 1981

SUBJECT: Energy Alternatives – Research

The Board did not find much evidence of activity within jurisdictions responsible for 'energy decisions' affecting the Great Lakes basin, that would encourage the choice of alternatives that could be optimized for greater overall benefit. It appears that decisions are being left to chance and to market conditions, and that such decisions do not reflect the true cost of the choices—we are not in a forced position yet. The Board also believes that there is as much to be gained in improved Great Lakes water quality for the future by proper choice of the modes of energy production and use as there is in applying control technology after the energy technology has been established.

The International Joint Commission should encourage the Parties to direct studies for identifying the energy alternatives best suited to achievement of overall environmental quality and to promote the development and use of alternatives so identified.

Number: 44 (continued)

IJC FIRST BIENNIAL REPORT

(See number 46)

Number: 45 (see numbers 3, 42, 43, 59 and 69)

YEAR: November, 1981

SUBJECT: Energy Alternatives – Planning

Planning, built upon existing knowledge and the studies referred to in Recommendation II, must be coordinated. If it was not evident a decade ago, it is certain now that jurisdictions should not, perhaps even cannot, operate independently. The choice that one jurisdiction makes will affect what another jurisdiction can do. Energy market prices, availability of materials or fuel, the transport and disposal of waste, exposure of populations and their food to contaminants, and a range of other matters are inextricably linked. It is also evident that current knowledge emphasizes the widespread and cumulative nature of the impact of single installations.

The International Joint Commission should encourage the Parties to coordinate the planning and use of energy alternatives in the Great Lakes basin.

IJC FIRST BIENNIAL REPORT

(See number 46)

Number: 46

YEAR: November, 1981

SUBJECT: Hazardous Substances

The Science Advisory Board, in undertaking to review the issue of the environmental impact of alternative energy futures, was able to acquire order-of-magnitude assessments of several alternatives for energy production in the Great Lakes basin. We are able to point to several outstanding features but find a detailed analysis impractical for several reasons, namely:

- (i) there are many options for sites and operational characteristics of energy facilities;
- (ii) the choice of energy options is extensive;
- (iii) not all aspects of certain technologies have been demonstrated; and
- (iv) there is generally inadequate information or data on the impact of the emissions to air and water on the environment and on public health.

This recommendation emphasizes the urgent need for much better information to reduce the speculation and fears associated with concern for the impact of decisions about our energy future as it affects the environment, human health and related societal concerns in the Great Lakes basin. A systematic review and prioritization of this research and surveillance must reflect assessment of potential energy developments.

The International Joint Commission is asked to encourage research into sources and pathways of hazardous substances and monitoring to evaluate which hazardous substances may produce significant adverse environmental or health effects in order to facilitate the identification of the impacts of existing and future energy alternatives.

IJC FIRST BIENNIAL REPORT

Toxic and hazardous substances are another matter. The Great Lakes Basin Ecosystem suffers from widespread contamination and the Lakes are a major sink for such substances. The surrounding population is exposed to toxic and hazardous substances through a variety of pathways. The Commission recognizes that the impact of these contaminants on human and environmental health is not well understood and considers this lack of understanding to be a matter of great concern. The Commission is in full agreement with the Great Lakes Water Quality Board's recommendation that: "Ecosystem studies of the transport, fate and effects of ambient levels of toxic substances in the Great Lakes be encouraged."

This recommendation is also consistent with the Great Lakes Science Advisory Board's Recommendation concerning the hazardous substance implications of energy alternatives (see Energy Considerations section of this Report). Despite current budgetary constraints, the Commission believes that the level of research, monitoring and surveillance directed towards the assessment of the overall problem of toxic and hazardous substances must be maintained. To do otherwise, in the Commission's view, would be both shortsighted and potentially dangerous.

The SAB made three energy recommendations to the Commission of a general anticipatory nature (Numbers 44, 45, 46). These recommendations are supportive of the Commission's conclusions and recommendations made elsewhere in this Report. They are especially consistent with the long term strategies contained in this Report's first recommendation. This is also consistent with the recommendations of the Water Quality Board and indicates a general recognition of the need for research and monitoring related to the sources, transport, fate and effects of toxic substances in the Great Lakes Basin Ecosystem. The Commission supports the implementation of these Science Advisory Board recommendations.

IJC FIRST BIENNIAL REPORT - ADDENDUM

Accordingly, the Commission urges the Parties to, in effect, 'step back' and examine the various requirements of the Agreement in the context of developing an overall management plan or plans for the Basin. It is not clear whether it will be possible to develop a single 'grand' plan or strategy which will adequately address all concerns in the Agreement, or whether a series of management plans directed toward specific concerns (but which recognize and complement other

Number: 46 (continued)

plans where possible) will be most feasible. The present reality, however, is that there is no overall management plan. The development of such a approach, therefore, should receive priority attention from the Parties in order that they may more comprehensively and effectively address the requirements of the Agreement.

GOVERNMENT RESPONSE

No response.

Number: 47 (See numbers 10, 66 and 71)

YEAR: November, 1981

SUBJECT: Water Quality Objectives

The Board has reviewed the scientific documentation prepared by its Aquatic Ecosystem Objectives Committee in support of proposed new or revised water quality objectives for pentachlorophenol, polychlorinated dibenzodioxins, nutrients (phosphorus), lead, chlorine, cyanide, temperature, and selenium. It recommends that the Commission request the Governments of Canada and the United States to incorporate these new objectives in a revision to Annex 1 of the 1978 Great Lakes Water Quality Agreement.

IJC FIRST BIENNIAL REPORT

The Science Advisory Board has recommended new or revised water quality objectives for pentachlorophenol, polychlorinated dibenzodioxins, nutrients (phosphorus), lead, chlorine, cyanide, temperature and selenium in its 1981 Annual Report to the International Joint Commission. Having reviewed these objectives, the Commission believes that the temperature objective, while environmentally desirable, would be difficult to implement throughout the Basin. The Commission does, however, encourage regulatory agencies to take the temperature criteria into consideration regardless of whether or not the specific objective is adopted. With regard to the chlorine objective, the Commission draws the attention of the Governments to the pertinent findings in the 1980 Report of the Commission's Chlorine Objectives Task Force.

With these two caveats, the Commission recommends that the Governments of Canada and the United States incorporate these proposed objectives included in the Great Lakes Science Advisory Board's 1981 Annual Report into Annex 1 of the 1978 Great Lakes Water Quality Agreement.

While the Commission generally endorses the existing and proposed water quality objectives for the Great Lakes Basin Ecosystem, it is clear that these objectives are based primarily on the effects of the single chemical or element being considered. Such an approach, however, does not consider that there can also be cumulative effects resulting from chemicals interacting with one another in the environment. For example, the cumulative impacts on organisms of two or more chemicals simultaneously present in a waterbody could be greater (or less) than the individual impacts of each of the chemicals when considered separately. The

Number: 47 (continued)

waters of the Great Lakes System receive inputs of chemicals from a number of natural and man-made sources, and it is obvious that the impacts of individual chemicals in isolation have limited applicability to what is actually occurring in nature.

Accordingly, the Commission recommends that the Parties reassess the Specific Objectives in Annex 1 of the 1978 Agreement in light of current knowledge on the potential cumulative effects of multiple pollutant inputs and consider their revision, where appropriate, to more realistically reflect their expected impact in the Great Lakes Basin Ecosystem.

U.S. RESPONSE

The United States notes the Commission's recommendations and proposes to consult with the Government of Canada on them. This will be undertaken in conjunction with discussion responding to recommendations five and six of the report.

Current knowledge of the cumulative health or ecological effects of multiple pollutant inputs is very limited, although a substantial amount of research within the EPA and other United States agencies should expand understanding in the future. The need to understand better the effects of multiple pollutant inputs is common to all U.S. pollution control regulatory programs, in all geographic areas.

CANADIAN RESPONSE

The Governments of Canada and the Province of Ontario have initiated a review of the Commission's Recommendation No. 10 concerning the water quality objectives with the exception of the phosphorus objective and will, following consultation with the United States, advise the Commission of their formal response. With respect to phosphorus, the goal statements for each lake contained in Annex 3 are considered to comprise the objectives of the programs and measures to control this nutrient.

With respect to the Commission's Recommendation No. 11 dealing with the cumulative effects of multiple pollutant inputs, Canada and Ontario are hopeful that this approach will assume an ever increasing role in the establishment of water quality objectives for the protection of human health and the environment. While Canada is actively engaged in research of this nature, there is at the present time an insufficient scientific data base to justify any immediate action in this regard.

Number: 48

YEAR: November, 1981

SUBJECT: Phosphorus Alternatives

Prior to any serious consideration of the extensive use of carboxymethyltartronate (CMT) as an alternate builder in laundry detergents, the Board recommends that research be undertaken to fully evaluate its toxicological and ecological properties in order to determine its acceptability.

Number: 48 (continued)

IJC INTERIM REPORT

The Task Force on the Health Effects of Non-NTA Detergent Builders examined seven different types of builders, none of which, on the basis of the information available and expected normal exposure, were found to constitute a human health hazard. These builders were carbonates, carboxymethyloxysuccinate (CMOS), carboxymethyltartronate (CMT), citrates, phosphates, soluble silicates and Type A Zeolite. With respect to the ecological implications, that Task Force (on the same assumptions) found no reason for concern for citrates and CMOS, but could not endorse CMT as a detergent builder at this time because the substance degrades very slowly and under special conditions, and because of the uncertainty of the fate and effects of its impurities.

Because some of the candidate compounds are proprietary, the Board's experts were forced in several cases to rely on studies performed in industrial and commercial laboratories. Without independent verification, the Commission is not certain of the extent to which it should accept some of the findings reported on the candidate builders CMOS and CMT. The Commission commends the efforts of its advisors, and recommends that the Governments further review those non-NTA chemicals for which the only data base is proprietary, prior to any decision which allows the widespread use of these substances.

GOVERNMENT RESPONSE

No response.

Number: 49

YEAR: November, 1981

SUBJECT: Phosphorus Dynamics

It is recommended that the Governments ensure that a sufficiently high level of research is supported to develop accurate methods for determining the relative bioavailability of various forms of phosphorus, and an understanding of the relationship between phosphorus and biological productivity, and the movement of phosphorus through the various parts of large lake ecosystems.

THE IJC FIRST BIENNIAL REPORT

While the Commission has previously expressed its concern in regard to this topic, it reiterates here its concurrence with this Science Advisory Board recommendation.

The term 'biologically available' has been used in the Great Lakes basin to describe those forms of phosphorus which can be used readily by aquatic plants and thereby aggravate the eutrophication problem. It is assumed that the other forms of phosphorus will not stimulate plant growth and, therefore, need not be of immediate concern in developing or implementing phosphorus control programs. There have been efforts to approximate the effects of these two 'categories' of phosphorus in the various models used to derive the proposed target loads in

Number: 49 (continued)

Annex 3 of the Agreement. Nevertheless, the Science Advisory Board's conclusion, that there are no current chemical or biological techniques which can provide a 'meaningful assessment' as to what portion of the total phosphorus load is biologically available on a whole-lake and long term basis, is appropriate.

The commission considers that bioavailability is a research area with implications not only for phosphorus but also for other pollutants as well. Many chemicals do not become a problem in freshwater ecosystems unless they are in a biologically available form. There is currently a limited understanding of the processes controlling bioavailability in waterbodies. Additional research is clearly required.

GOVERNMENT RESPONSE

No response.

Number: 51

YEAR: November, 1981

SUBJECT: Health of Aquatic Communities

The Agreement calls for monitoring and research to identify the effects of persistent toxic substances on the living aquatic system. Currently, most toxic substances research has a regulatory orientation. A great deal of laboratory work, more than the health of the living system. Whilst data on chronic, sublethal, and the biochemical and physiological responses of aquatic organisms to stress, the site specific ecological responses to an array of environmental stresses must be determined. Accordingly, the Board recommends that more research effort be directed towards the study of the potential effects of hazardous substances on the health of aquatic communities.

GOVERNMENT RESPONSE

No response.

Annex 3 of the Agreement. Nevertheless, the Scientific Advisory Board's conclusion that there are no current chemical or biological techniques which can be used to produce a biological agent is based on the current state of knowledge. It is possible that new techniques will be developed in the future which could be used to produce a biological agent. The Board's conclusion is based on the current state of knowledge and is subject to change as new techniques are developed.

GOVERNMENT RESPONSE

The Board's conclusion is based on the current state of knowledge and is subject to change as new techniques are developed. The Board's conclusion is based on the current state of knowledge and is subject to change as new techniques are developed.

GOVERNMENT RESPONSE

No response.

Number 45

YEAR: November, 1951

SUBJECT: Biological Warfare

It is recommended that the Government should take a sufficiently high level of responsibility to ensure that the necessary resources are available for maintaining the relative stability of the biological system, and an understanding of the relationship between biological productivity and the movement of genetic material within the system.

THE UK POSITION

While the Government has no concern in regard to this topic, it reiterates its support for the Science Advisory Board recommendation.

The term 'biological warfare' is used in the Cross-Party Report to describe the use of biological agents as weapons. It is not intended to describe the use of biological agents for peaceful purposes. The other forms of biological warfare, such as the use of biological agents for pest control, are not covered by the term 'biological warfare'. There have been efforts to control the use of biological agents for peaceful purposes, but no specific measures have been taken to control the use of biological agents for peaceful purposes.

1982 SCIENCE ADVISORY BOARD ANNUAL REPORT

Number: 50

YEAR: November, 1982

SUBJECT: Epidemiological Studies

The Board concludes that existing research efforts addressing epidemiological effects of hazardous substances on humans is inadequate to fulfill Agreement requirements. Accordingly, the Board recommends that more effort and funds be devoted to epidemiological research to Great Lakes contaminants.

IJC THIRD BIENNIAL REPORT

The Commission recommends that Governments and implementing agencies develop appropriate mechanisms to encourage innovative, long-term, multidisciplinary research on the control, transport, fate and effects (including human health effects) of toxic substances in the Great Lakes Basin Ecosystem.

GOVERNMENT RESPONSE

No response.

Number: 51

YEAR: November, 1982

SUBJECT: Health of Aquatic Communities

The Agreement calls for monitoring and research to identify the effects of persistent toxic substances on the living aquatic system. Currently, most toxic substances research has a regulatory orientation. Ambient levels are monitored more than the health of the living system. Without data on disease, parasites, and the biochemical and physiological responses of aquatic organisms to stress, the site specific ecological responses to an array of environmental stresses cannot be determined. Accordingly, the Board recommends that more research effort be directed towards the study of the potential effects of hazardous substances on the health of aquatic communities.

IJC THIRD BIENNIAL REPORT

The Commission recommends that Governments and implementing agencies develop appropriate mechanisms to encourage innovative, long-term, multidisciplinary research on the control, transport, fate and effects (including human health effects) of toxic substances in the Great Lakes Basin Ecosystem.

GOVERNMENT RESPONSE

No response.

Number: 52 (see number 63)

YEAR: November, 1982

SUBJECT: Atmospheric Pollution Indicators

One area of research specified in the Agreement is the identification of airborne pollutant sources and their relative contributions of substances with potential significant effects on Great Lakes environmental quality.

Monitoring atmospheric deposition of pollutants in the Great Lakes is difficult and the data are hard to interpret because of the diffuse nature of this source. Consequently, the board recognizes a need to identify and validate the use of a conservative indicator substance, such as the ratio of sulfur isotopes or vanadium to nickel, whose main transport mechanism is the atmosphere. Such indicators may prove to be a useful tool in determining the relative proportion of materials derived from differing sources.

Accordingly, the Board recommends that more research effort be directed toward the identification of conservative indicators of atmospheric inputs of toxic materials into the Great Lakes.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 53 (see number 65)

YEAR: November, 1982

SUBJECT: Polynuclear Aromatic Hydrocarbons and Toxaphene

The Agreement not only calls for research leading to the identification of the sources of airborne pollutants, but it further states that research should be intensified to determine the pathways, fate and effects of toxic substances. Both toxaphene and PAHs are persistent toxic substances and are suspected of entering the Great Lakes system via the atmosphere. Considering Agreement requirements for the identification of atmospheric pollutant sources and the level of current research effort, there is an urgent need for more data on PAHs and toxaphene. Therefore, the Board recommends that more effort be devoted to determining the source, methods of transport, persistence and bioavailability of PAHs and toxaphene, and more emphasis be given to the study of their potential effects on human health and the environment.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 54 (see number 16)

YEAR: November, 1982

SUBJECT: Structure-Activity Correlations

The Agreement calls for the establishment of an early warning system consisting of several elements to anticipate future toxic substances problems. One of these elements is structure-activity correlations. Such correlations may be used as tools to screen the ever increasing number of toxic substances in the Great Lakes ecosystem. Since it is unlikely that the basic data set required to set ambient water quality standards and action levels for fish will ever be developed for every compound, structure-activity correlations are essential.

The Board considers that the current research effort is adequate, but strongly recommends that the present level of support for structure-activity correlations research be maintained.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 55 (see number 65)

YEAR: November, 1982

SUBJECT: Tissue and Sediment Banks

The Board contends that the research effort devoted to the development of tissue and sediment banks is not adequate. The Board therefore recommends that a central, international Great Lakes specimen bank be established and that additional efforts be devoted to the development of advanced methods for the preservation and characterization of samples and for the interpretation of results.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 56 (see numbers 26, 57 and 72)

YEAR: November, 1982

SUBJECT: Computer Modeling and Validation

The development and use of mathematical models to predict the consequences of various loading rates of different chemicals are another component of the early warning system specified within the Agreement. Accordingly, the Board recommends that a task force be established to evaluate efforts for selecting and validating computer simulation models.

Number: 56 (continued)

NOTE: The Board established a Modeling Task Force in the spring of 1983. Their final report was received by Board in February 1986.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 57 (see numbers 26, 56 and 72)

YEAR: November, 1982

SUBJECT: Phosphorus Management

The Board contends that the existing eutrophication model research effort is adequate, and recommends that the current nutrient research effort be maintained, and that the post PLUARG management assessment models be subjected to indepth evaluation and validation.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 58 (see numbers 63 and 67)

YEAR: November, 1982

SUBJECT: Groundwater Contamination

Detailed mapping of the groundwater resources in the Great Lakes basin is required in order to assess the transport mechanism of toxic materials via this route. There is also a need for greater understanding of the technology to remove groundwater pollutants and to limit contamination of groundwater resources.

The Board recommends that groundwater resources of the Great Lakes system be studied to determine potential contamination routes via this source and to establish mitigative measures.

NOTE: The Board established a Groundwater Task Force in 1983. Their report was received in October, 1985.

IJC SECOND BIENNIAL REPORT

The Commission also recommends that serious attention be given by the Parties to development of monitoring strategies for groundwater resources in the Great Lakes region. Concern has been expressed in certain areas of the basin over leachate movement from toxic waste disposal sites to ground waters and

Number: 58 (continued)

eventually to the lakes. Proper management of waste disposal facilities to prevent movement of contaminants requires effective monitoring practices. But development of effective monitoring practices may be inhibited because of the difficulty in sampling groundwater for toxic contaminants. The Commission therefore believes that groundwater research for sampling geochemical and microbiological constituents, and the development of standard protocols for the effective monitoring of the potential leachate movement from toxic waste repository sites, are important, despite the fact that the Agreement does not explicitly address groundwater problems.

GOVERNMENT RESPONSE

UNITED STATES

With regard to the Commission's recommendation concerning development of monitoring strategies for groundwater resources in the Great Lakes region, we note that major groundwater studies are underway in several Great Lakes areas of concern including the Niagara River. As we gain confidence in the technical validity of our methods, these studies will be expanded into other areas.

CANADA

The National Hydrology Research Institute has been developing over the past five years site assessment and remediation methods, including sampling methods and groundwater velocity measurement devices. These activities have direct applications to contaminant migration in the Niagara Region.

The interagency study of the Upper Great Lakes Connecting Channels (UGLCC) includes surveys to identify potential sources of chemical contamination of that part of the drainage system, with the federal and provincial governments conducting, among others, evaluations of deep wells and caverns in the Sarnia Area.

Number: 59 (see numbers 3, 42, 43, 45 and 69)

YEAR: November, 1982

SUBJECT: Socio-Economic Considerations

Water management policies and other developmental decisions undertaken in the Great Lakes basin will have dramatic repercussions on Great Lakes water quality and resources that directly support human activities. Studies of the economic implications of various strategies to implement the Great Lakes Water Quality Agreement have been recognized as necessary. Further, to the extent that other research priorities discussed previously imply management choices, socio-economic analyses are essential complements to the technical studies.

The Board therefore recommends research programs in the Great Lakes encompass socio-economic considerations and that particular emphasis be given to:

Number: 59 (continued)

- (a) assembling currently available socio-economic data relevant to the Great Lakes Water Quality Agreement;
- (b) improving the measurement and documentation of economic and social implications of alternative strategies for meeting the water quality objectives;
- (c) anticipating the water quality impacts of future basin economic activities, including demands for water uses; and
- (d) performing research for (b) and (c) to develop a socio-economic component to be integrated with future policy and management options analysis.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 60 (See number 69)

YEAR: November, 1982

SUBJECT: Areas of Concern

Of particular interest to this Board are the eighteen Class A areas where water quality is significantly degraded and beneficial uses impaired. In this class there are areas which, according to the Water Quality Board's 1982 report, have chronic problems that are not expected to be resolved despite the remedial measures currently in operation and proposed for these locations. The Water Quality Board contends that even though all reasonable remedial measures have been or are being taken, it is doubtful that the environmental problems in these areas will be reasonably resolved.

The Science Advisory Board recommends that adequate efforts and the necessary funds be devoted to the development of research programs designed specifically to address the chronic problems identified in these areas of concern. (The ultimate objective of these programs is to find technically feasible and economically sound solutions to alleviate these problems.)

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 61

YEAR: November, 1982

SUBJECT: Implementation of Recommendations

To complement the formal and informal responses between the IJC, the Jurisdiction and the Board, the Board is proposing to the Commission another mechanism to help circumvent the delay in response to the recommendations to increase cost effective cooperation among the implementing agencies.

The Board therefore recommends that the Commission endorse the formation of a Council of Great Lakes Research Directors to meet semi-annually under the auspices of the SAB to discuss mutual Great Lakes research programs in order to:

- i) provide information exchange;
- ii) coordinate Great Lakes research programs of mutual interest;
- iii) ensure consistency of program elements and optimum resource applications; and
- iv) respond to the evaluations and recommendations of the SAB and the IJC.

Although recommendations on research programs made to the agencies via the Science Advisory Board and the IJC are implemented at the agencies' discretion, it is important that the Science Advisory Board create a position from which it may analyse the response and results of IJC recommendations on Great Lakes research. The system of evaluation used in this report and based on research project descriptions does not allow a full appreciation of the content of the project. To overcome these difficulties and to satisfy the SAB's mandate outlined under Article V 2(a) of the Great Lakes Water Quality Agreement, it is therefore recommended that the SAB in concert with the Council of Great Lakes Research Directors develop a system of research evaluation to assess the degree of implementation and success of agency research, as well as the response to research recommendations of the Commission.

IJC RESPONSE

A terms of reference for the Council of Research Managers (CRM) was approved by the IJC on November 22, 1983. In March, 1986, the IJC approved a SAB request to increase membership on the CRM to 18 members.

Moreover, in the Third Biennial Report the IJC noted that increased cooperation is needed in research funding. For the most part, environmental agency research is performed independently according to uncertain short-term budgetary arrangements and under varying rules of the sponsoring organizations. The Commission suggests that Agreement-related research programs deserve a more unified, consistent and international approach. Independent, long-term joint funding by the Parties should be considered to remove differences in local and national procedures. Such funding could better support broadly-based studies consistent with an ecosystem approach. Therefore, the Commission recommends

GOVERNMENT RESPONSE

that joint funding or at least more coordinated programs specifically supportive of Agreement research, monitoring and surveillance be initiated by the Parties.

UNITED STATES

The United States observes that the Water Quality Act of 1978 specifically recognizes the Great Lakes Water Quality Agreement and requires coordination of research and preparation of an annual research plan, based upon meeting the terms of the Agreement. The United States intends to continue to seek improved coordination with Canadian research. Some joint research is underway now, and more is expected in the future.

CANADA

No response.

1983 SCIENCE ADVISORY BOARD ANNUAL REPORT

Number: 62 (see number 52)

YEAR: November, 1983

SUBJECT: Atmospheric Pollution Indicators

The Atmospheric Pollution Indicators Task Force investigated the feasibility of using atmospheric pollution indicators to determine the sources and loadings of contaminants to the Great Lakes and concluded that the use of variations in isotopic abundance of sulphur and lead may be useful in distinguishing between their anthropogenic (due to man's activities) and natural origins. However, the sole use of isotopic compositions as a method for deducing the relative contribution of airborne pollutants to the Great Lakes is not currently feasible. Therefore, the Board recommends that isotopic ratios of sulphur and lead should be used in conjunction with the data obtained from environmental measurement programs in order to assist in the provision of a better understanding of the proportional contributions of pollutants to the Great Lakes from different sources.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 63 (See numbers 59 and 67)

YEAR: November, 1983

SUBJECT: Groundwater Contamination

The Groundwater Contamination Task Force investigated the significance of groundwater contamination to Great Lakes water quality and concluded that there is no adequate information on the extent of groundwater contamination in the Great Lakes basin. Existing estimates of groundwater flows into the Great Lakes are unreliable, and limited efforts are being made to estimate inflows into the Great Lakes from areas of potential concern where large numbers of known or suspected hazardous waste sites are located. Therefore, the Board recommends that:

- (a) drawing upon the already existing groundwater data and augmenting them where deficient, the jurisdictions should provide detailed mapping and analysis of those areas of potential concern in order to assess the extent of groundwater contamination in the Great Lakes basin;

Number: 63 (continued)

- (b) waste disposal sites should be classified according to hydrologic settings and proximity to streams, lakes, and areas of aquifer infiltration. Sites should be grouped according to tributary basins and to land use for the purpose of developing a monitoring strategy;
- (c) sampling methods and strategy should be developed for the monitoring of groundwater quality in the Great Lakes basin; and
- (d) groundwater research capabilities should be developed and maintained in order to understand the transport mechanism of toxic substances both to the aquifers and the lakes, and to achieve recommendations (a) to (c).

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 64 (See number 54)

YEAR: November, 1983

SUBJECT: PAHs and Toxaphene

The Board recommends that:

- the Commission encourage the Governments to find ways of reducing anthropogenic sources of PAHs and to ensure that the role of these compounds with respect to the health of the living components of the Great Lakes ecosystem is fully investigated;
- the Commission urge the Parties to intensify their research into the sources, pathways, and fate of residual toxaphene in the Great Lakes basin; and
- all laboratories undertaking environmental measurements of toxaphene collaborate, under the auspices of the Governments, to develop a method suitable to identify and quantify this complex residue mixture. Further, once a state-of-the-art method has been described, it should be the adopted procedure for all laboratories making this measurement in support of Great Lakes monitoring and surveillance in order to meet the legislative requirements that regulate this product in both nations.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 65 (see number 55)

YEAR: November, 1983

SUBJECT: Tissue and Sediment Banks

The Board recommends that the Parties study the feasibility and desirability of maintaining a centralized information repository of Great Lakes tissue and sediment samples.

Not specifically recognized by IJC, however in the Third Biennial Report the Commission made the following recommendation:

- The Commission recommends that specimen banking for biological tissue and sediment be implemented as an integral part of the Great Lakes International Surveillance Plan (Annex II).

GOVERNMENT RESPONSE

UNITED STATES

With respect to specimen banking of biological tissue and sediment, the United States supports the concept. The Great Lakes Governors Toxic Substances Control Agreement calls for a study of specimen banking programs and recommendations on how to improve them. The first annual report of progress under the Governors' Agreement reflects that commitment, and the GLNPO will be working cooperatively to pursue that initiative.

CANADA

No response.

Number: 66 (See numbers 10, 47 and 71)

YEAR: November, 1983

SUBJECT: Water Quality Objectives

The Science Advisory Board endorses the recommendations of its Aquatic Ecosystem Objectives Committee regarding the revised water quality objectives for microbiological indicators and diazinon, as well as the new objective for polynuclear aromatic hydrocarbons (PAHs).

Full recommendations for the above parameters are included in the 1983 AEOC's report. The following is only a summary of these recommendations:

- (a) Microbiological Indicators: For the protection of recreational users of nearshore waters from increased gastrointestinal illnesses, the enterococcus geometric mean level in water should not exceed 11/100 mL; similarly the Escherichia coli geometric mean level in water should not exceed 23/100 mL. Mean levels should be monitored by analyzing a minimum of five samples from one location collected over a four-week period.

Number: 66 (continued)

To protect recreational users of nearshore waters from ear infections, no more than 25% of the samples should have levels of Pseudomonas aeruginosa greater than 10/100 mL.

- (b) Diazinon: For the protection of aquatic life, the maximum waterborne concentration of diazinon shall not exceed 0.003 µg/L, except that it may range up to 0.1 µg/L once every 30 or more days for periods not to exceed two days.
- (c) Polynuclear Aromatic Hydrocarbons (PAHS): For the protection of aquatic life, the levels of benzo(a)pyrene (BaP) in the sediments or in organisms serving as a food source for fish should not exceed 1.0 µg/g; levels of BaP in water should be less than 0.01 µg/L.

IJC SECOND BIENNIAL REPORT

There are specific objectives for 38 chemical substances in the Agreement. The Commission has since recommended new or revised water quality objectives for eleven substances. These substances are: pentachlorophenol, polychlorinated dibenzodioxins, nutrients (phosphorus), cyanide, selenium, mirex, chlorine, lead, microbiological indicators, diazinon, polynuclear aromatic hydrocarbons. The limitations of using single water quality parameters for assessing the state of the environment and the adequacy of programs were discussed in the addendum to the Commission's first biennial report. While the Commission believes that additional research is necessary to develop more sophisticated measures, water quality objectives remain a basic part of the environmental monitoring and remedial approach under the current Agreement. The Commission therefore continues to encourage Governments not only to adopt these objectives but to develop more comprehensive measures of ecosystem quality.

IJC THIRD BIENNIAL REPORT

The Commission continues to support the development of new or revised Specific Objectives for incorporation into the Agreement. New objectives, including a new concept of ecosystem objectives, continue to be developed under the auspices of the Science Advisory Board. Eleven new objectives have been recommended since signing of the 1978 Agreement but have not been formally adoptable. The Canadian Government response to the Second Biennial Report notes that the matter will be given attention in the context of the pending Agreement review.

Nevertheless, as new problems become apparent and new objectives are developed or existing ones modified, it is important that they are integrated into ongoing regulatory programs. The 1978 Agreement contains a clause concerning adoption of revised objectives, but it is not clear how they are integrated into ongoing programs. Consequently, the Commission recommends that the Parties, in addition to adopting the previously proposed Specific Objectives, consult on a practical procedure for ensuring the timely consideration and adoption of new or revised Specific Objectives required under the Agreement. The Commission recommends continuing research into the process of developing and improving Specific Objectives.

Number: 66 (continued)

GOVERNMENT RESPONSE

UNITED STATES

The report points out the importance of addressing toxics problems through a comprehensive preventative approach based upon the philosophy of zero discharge of persistent toxic substances. The report also urges the Governments take immediate remedial measures to attain specific water quality objectives for specific problem substances. While programs to achieve the ambient concentrations specified in the objectives do not fully implement the concept of zero discharge or virtual elimination, they are important to the setting of priorities and managing scarce resources to address specific problems.

The United States agrees that the Parties should consult on a practical procedure for ensuring timely consideration and adoption of new and revised specific objectives and observes that amendment of the Agreement to address this may be appropriate.

The United States agrees that research into ways of developing and improving specific objectives is desirable. Considerable progress is being made within the United States in development and promulgation of criteria and standards.

CANADA

The expertise and perseverance of the Commission, and particularly the Aquatic Ecosystem Objectives Subcommittee, in formulating new and revised water quality objectives is appreciated.

It is noted that Section 3 of Article X of the 1978 Agreement calls for a comprehensive review of the operation and effectiveness of the Agreement following the Third Biennial Report of the Commission. In Canada, consideration will be given to the adoption of new or proposed objectives in the context of the review of the Agreement following the Commission's Third Biennial Report.

Water quality objectives are an important element of water pollution control programs in Canada. Recently the Canadian Council of Resource and Environment Ministers established a task force on water quality guidelines. The task force is currently preparing a document to be entitled "Canadian Water Quality Guidelines." This publication will contain a summary of scientific information needed for setting objectives for more than 100 parameters for the protection of all major uses of water. Information in the guidelines will be useful in setting objectives for all interjurisdictional waterways, including the Great Lakes.

In addition, the process of developing these guidelines will lead to identification of research needs. This effort will help focus Canadian research efforts on the important scientific problems that are encountered in the establishment and application of water quality objectives.

GOVERNMENT RESPONSE

UNITED STATES

immediate remedial measures to attain specific water quality objectives for specific pollutants. While progress is being made, the Agency is committed to the concept of comprehensive remedial action for the entire river system. The report also notes the Agency's objective for immediate remedial measures to attain specific water quality objectives for specific pollutants. While progress is being made, the Agency is committed to the concept of comprehensive remedial action for the entire river system. The report also notes the Agency's objective for immediate remedial measures to attain specific water quality objectives for specific pollutants. While progress is being made, the Agency is committed to the concept of comprehensive remedial action for the entire river system.

The United States agrees that the Parties should conduct a periodic review for ensuring timely consideration and adoption of law and revised specific objectives and objectives that are consistent with the Agreement. Further, the review should be conducted in a timely manner to ensure that the Parties are aware of any developments that may affect the implementation of the Agreement.

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1985 SCIENCE ADVISORY BOARD ANNUAL REPORT

Number: 67 (See numbers 58 and 63)

YEAR: June, 1985

SUBJECT: Groundwater

The Board recommends that a study be commissioned to prepare a hydrogeologic inventory of the Great Lakes basin for purposes of assessing the potential for their contamination and be based upon the study design of the Task Force.

IJC THIRD BIENNIAL REPORT

The Commission recommends that the Parties fund and support ground mapping initiatives such as the program proposed by the Great Lakes Science Advisory Board.

The Commission further recommends that the Parties research, develop and implement a program of sampling geochemical and microbiological constituents in groundwater and develop standard protocols for the effective monitoring of leachate movement from toxic waste repository sites.

GOVERNMENT RESPONSE

UNITED STATES

The United States considers that the transport of toxic substances to the Great Lakes through groundwater from hazardous waste sites and other high risk areas is deserving of priority attention. Groundwater initiatives should be focused on such areas and should be expanded beyond such areas only after sufficient resources have been made available to answer the key questions in those areas.

The United States is addressing groundwater transport of contaminants through several programs, most notably those authorized by the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Emergency Response Compensation and Liability Act, known as Superfund. In 1987 Superfund Appropriation and Reauthorization Act (SARA) expanded and strengthened this latter program. Through these programs, discharges to and through groundwater from active and inactive hazardous waste sites are being investigated. Remedial actions are then being taken as provided by law.

With specific reference to the Great Lakes, the USEPA Great Lakes National Program Office (GLNPO) 5-year strategy calls for quantification of groundwater transport of toxic substances as part of a mass balance approach quantifying all loadings to the Great Lakes system. With respect to standard protocols for monitoring leachate movements, the United States uses standard protocols for monitoring of leachate movement as described in "RCRA Groundwater Monitoring Technical Enforcement Guidance Document" and "Practical Guide for Groundwater Sampling."

Number: 67 (continued)

CANADA

No response.

Number: 68

YEAR: June, 1985

SUBJECT: Atmospheric Contaminants

The Board recommends that:

- (a) a standard protocol for measuring organics in atmospheric media (precipitation, airborne particles and vapour phase organics) be developed by the Parties;
- (b) a standard protocol that ensures compatible measurements of metal ions be established (including the identification of a preferred digestion and instrumentation technique); and
- (c) intercomparison studies be initiated to assess the comparability and quality of analytical results from various laboratories involved in atmospheric deposition monitoring networks.

IJC THIRD BIENNIAL REPORT

The Commission recommends that the Parties give priority to the specification and application of required air quality-related activities under the Agreement, including collection and analysis of data on the sources, dynamics and effects of atmospheric pollution inputs into the Great Lakes Basin Ecosystem. These discussions should be coordinated with the ongoing, bilateral discussions that have been convened by the President of the United States and the Prime Minister of Canada.

GOVERNMENT RESPONSE

UNITED STATES

The United States is in the process of upgrading its Great Lakes Air Deposition monitoring network to improve its ability to measure trends and loadings of toxic substances to the Lakes. The United States also supports the IJC's initiatives (i.e. funding of workshops on deposition) to determine the research necessary to better understand the dynamics and effects of atmospheric pollution inputs.

CANADA

No response.

Number: 69 (see numbers 3, 42, 43, 45, 59 and 69)

YEAR: June, 1985

SUBJECT: Sediment Contamination

The Board recommends that:

- (a) the Parties embark on management strategies for the rehabilitation of two Areas of Concern, such as Hamilton Harbour and Grand Calumet, and to observe the biological processes and the rates at which recovery occurs; and
- (b) as adjunct to the preceding recommendation, the Parties should proceed with a social and economic investigation of the costs and benefits associated with the rehabilitation of the Areas of Concern selected in 3a.

IJC THIRD BIENNIAL REPORT

The Commission recommends that the Parties increase efforts to develop and implement comprehensive sediment management programs, and that, in particular, the Parties ensure that the Dredging Guidelines developed under the Great Lakes Water Quality Agreement are applied.

The Commission strongly recommends that the Parties direct increased research priority to the knowledge gaps inhibiting the management of sediments in the Great Lakes system.

GOVERNMENT RESPONSE

UNITED STATES

The United States agrees that contaminated sediments are of major concern within the Great Lakes and that management of in situ pollutants, through dredging or other means, is deserving of high priority. The United States will continue to apply Section 404 (b) (1) guidelines from the Clean Water Act of 1977 to evaluate dredging projects which are consistent with the Great Lakes Dredging Guidelines. It will also accelerate research and demonstration activities, through implementation of the Great Lakes Sediment Demonstration Program authorized under Section 118 of the Clean Water Act, as amended by Section 104 of the Water Quality Act of 1987.

CANADA

No response.

Number: 70

YEAR: June, 1985

SUBJECT: Human Health Concerns

The Board recommends that:

- (a) The jurisdictions should continue to monitor lead concentrations in fish in the St. Lawrence River so that potential human exposure can be assessed reliably.
- (b) The jurisdictions should analyze the edible portions of Great Lakes fish for both organic and inorganic species of lead.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 71 (See numbers 10, 47 and 67)

YEAR: June, 1985

SUBJECT: Water Quality Objectives

The Board recommends that:

- (a) The ammonia objectives be revised to raise the open waters limit for aquatic life from 0.02 to 0.03 mg/L un-ionized ammonia.
- (b) The concentration of total hexachlorocyclohexane (BHC) isomers in water should be revised to not exceed 0.02 ug/L for the protection of aquatic life. The concentration of total BHC isomers in edible portions of fish should not exceed 0.3 mg/kg (wet weight) for the protection of human consumers of fish.
- (c) Work be continued on the further development of indicators of ecosystem health, including the selection of species or communities for mesotrophic and eutrophic systems.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 72 (see numbers 26, 56 and 57)

YEAR: June, 1985

SUBJECT: Modeling

The Board recommends that:

- (a) Because the transfer of scientific information from modelers to managers and policy makers has been insufficient, new approaches involving the use of personal computers, and the development of intelligible, user-friendly software for water quality modeling should be encouraged.
- (b) Integrated and multifaceted Great Lakes model development, like Great Lakes ecosystem research, is a long-term endeavor that will be best served by a continuity of support. The building of new model structures is also encouraged and greater support for refining and integrating existing models is strongly recommended.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response.

Number: 77

Number: 77 (see numbers 76, 78 and 79)

YEAR: June 1985

YEAR: June 1985

SUBJECT: Human Health Concerns

SUBJECT: Modeling

The Board recommends that:

The Board recommends that:

(a) The Board should continue to monitor the progress of the research on the use of personal computers and the development of intelligent, user-friendly software for water quality modeling. The development of such software is strongly recommended.

(b) Integrated and multilevel modeling research is a long-term endeavor that will be best served by a continuity of support. The building of new models and the integration of existing models is strongly recommended.

No response

Not specifically recognized by IJC

Number: 78

GOVERNMENT RESPONSE

YEAR: 1985

No response

SUBJECT: Human Health Concerns

The Board recommends that:

- (a) The ammonia objective should be revised to raise the open water level for ammonia from 0.07 to 0.03 mg/L or 70.0 micrograms/liter.
- (b) The concentration of total hexachlorocyclopentadiene (HCH) in water should be revised to not exceed 0.02 ug/L or 20 micrograms/liter. The concentration of total HCH in sediment should not exceed 0.3 ug/g or 300 micrograms/kg of dry weight of sediment.
- (c) Work be continued on the further development of indicators of ecosystem health, including the selection of species or communities for monitoring and suitable systems.

Not specifically recognized by IJC

GOVERNMENT RESPONSE

No response

REPORTS, WORKSHOPS AND SYMPOSIA

Throughout its existence the Research Advisory Board/Science Advisory Board (RAB/SAB) has relied upon standing committees, task forces and the Regional Office staff for a significant input to formulate their Annual Reports. This input has taken the form of special reports and proceedings from workshops and symposia. An attempt to review the 'process' would be remiss without a brief assessment regarding these information sources and how the RAB/SAB utilized or ignored these sources in discharging its obligations to the IJC. Therefore, a brief description and assessment of all reports to the RAB/SAB follows:

Report:

ASBESTOS IN THE GREAT LAKES BASIN (See number 14)

On the request of the RAB, the Great Lakes Regional Office prepared this report to present state-of-the-art regarding the relationship between asbestos and human health hazards along with sampling technology. Recommendations from this study were reported in the RAB's July, 1975 Annual Report and responded to by the IJC and both governments.

Workshop on:

CLADOPHORA IN THE GREAT LAKES (See numbers 9 and 15)

On a recommendation of the Standing Committee on Eutrophication, the RAB convened this workshop to report on the history, distribution, biomass, production, physical and chemical requirements, and ecology of the alga *Cladophora* in the Great Lakes. The workshop was held in Windsor, Ontario on February 19-21, 1975 and consisted of a single review paper and eight discussion papers and was officially attended by 33 persons. Recommendations were reported in the July, 1975 Annual Report and responded to by the IJC and both governments.

Workshop on:

THE FEASIBILITY OF REMOTE TRACKING OF DROGUES AND OTHER INSTRUMENTS DRIFTING IN COASTAL WATERS (See number 19c)

On a recommendation from the Standing Committee on Lake Dynamics, the RAB convened this workshop to review the state-of-the-art in measuring coastal hydro-dynamics specifically to address the rate of nearshore pollution. Held in Windsor, Ontario on February 25, 1975, the workshop consisted of 12 papers and was officially attended by 21 persons. The recommendations were reported in the July, 1975 Annual Report with no IJC or government response.

Symposium on:

**STRUCTURE-ACTIVITY CORRELATIONS IN STUDIES OF
TOXICITY AND BIOCONCENTRATION WITH AQUATIC ORGANISMS**
(See numbers 16 and 54)

On a recommendation from the Standing Committee on the Scientific Basis for Water Quality Criteria, the RAB convened this symposium to discuss the potential of structure-activity correlations in studies of toxicity and bioconcentration of chemicals with aquatic organisms. Held in Burlington, Ontario, on March 11-13, 1975, the symposium consisted of 13 papers and was officially attended by 62 persons. The recommendations were reported in the July, 1975 Annual Report with IJC, Canadian and United States responses.

Workshop on:

PUBLIC PARTICIPATION (See number 19b)

On a recommendation from the Standing Committee on Social Sciences, Economics and Legal Aspects, the RAB convened this workshop to examine procedures for public involvement in governmental decisions. Held in Ann Arbor, Michigan, on June 23-24, 1975, the workshop consisted of six papers and was officially attended by 94 persons. Conclusions were reported in the July, 1976 Annual Report with selected recommendations appearing in the "1976 Research Needs Report." The IJC in its fifth, sixth and special report alluded to many of the findings and recommendations of this report with a Canadian response to the sixth report.

Workshop on:

TOXICITY TO BIOTA OF METAL FORMS IN NATURAL WATER (See number 19a)

On a recommendation from the Standing Committee on the Scientific Basis for Water Quality Criteria, the RAB convened this workshop to evaluate the current knowledge of metal speciation and research needs to establish objectives based on metal forms rather than total metal concentration. Held in Duluth, Minnesota, on October 7-8, 1975, the workshop consisted of 14 papers and was officially attended by 90 persons. Conclusions were reported in the July, 1976 Annual Report with selected recommendations appearing in the "1976 Research Needs Report" and the July, 1977 Annual Report. The IJC referenced metal toxicity in its fifth and special reports with the Canadian Government responding to the former.

Workshop on:

THE DYNAMICS OF STRATIFICATION AND OF STRATIFIED FLOW (See number 17)

On a recommendation from the Standing Committee on Lake Dynamics, the RAB convened this workshop to review the dynamics of lake stratification as it affects lakewide vertical mixing. Held in Windsor, Ontario, on February 26, 1976, the workshop consisted of 12 papers and was officially attended by 22 persons.

Although reported in the 1976 Annual Report, the RAB chose to list the conclusions of this workshop rather than the recommendations which according to the RAB were considered within the "1976 Research Needs Report." A review of that report failed to reveal any recommendations pertinent to those developed by this workshop.

Workshop on:

**THE FLUVIAL TRANSPORT OF SEDIMENT-ASSOCIATED
NUTRIENTS AND CONTAMINANTS (See number 22)**

On the request from the Reference Group on Pollution from Land Use, the RAB convened this workshop to address the question of lakewide impact of sediment-associated transport of nutrients and contaminants in streams through space and time. Held in Kitchener, Ontario, on October 20-22, 1976, the workshop consisted of 20 papers and was officially attended by 71 persons. Recommendations were reported in the July, 1977 Annual Report and responded to by the IJC and Canadian Government.

Workshop on:

ENVIRONMENTAL MAPPING OF THE GREAT LAKES (See numbers 20 and 33)

On a recommendation from the Standing Committee, the Scientific Basis for Water Quality Criteria, the RAB convened this workshop to address the potential benefit of mapping as an aid to restoring and enhancing water quality of the Great Lakes. Held in Windsor, Ontario, on November 8-10, 1976, the workshop consisted of 31 papers and was officially attended by 71 persons. The recommendations were reported in the July, 1977 Annual Report and received IJC and Canadian responses.

A subsequent report to the RAB in April, 1979, was reported in the July, 1979 Annual Report (Number 33) but has not yet received government recognition.

Workshop on:

ECONOMIC AND LEGAL ENFORCEMENT MECHANISMS

On a request from the Standing Committee on Social Science, Economic and Legal Aspects, the RAB convened this workshop to address the concept of changing pollution patterns through legal-economic policies versus changes through technology. Held in Windsor, Ontario, on February 21-22, 1977, the workshop consisted of 12 papers and was officially attended by 98 persons. The workshop proceedings contained eight recommendations and 33 research topics, none of which specifically appear in the July, 1978 Annual Report. However, a cursory review of the research topics indicates that most are still germane to present day problems and many are in some form of implementation by the jurisdictions/governments/IJC.

Report:

THE ECOSYSTEM APPROACH (See numbers 27, 28 and 29)

As a likely spinoff from the "Environmental Mapping Workshop", the RAB had recommended in its July, 1977 Annual Report (Number 19) that the IJC emphasize a holistic approach in viewing water quality issues. In response, the IJC requested further elaboration as to certain aspects of the 'Ecosystem Approach'. The RAB subsequently charged an ad hoc committee of six members to prepare a report on the 'Ecosystem Approach'. The finished document was reported in the July, 1978 Annual Report (Number 27). The impact of this report or at least the concept carried over into the 1978 Great Lakes Water Quality Agreement and the July, 1979 Annual Report.

Report:

HEALTH IMPLICATIONS OF NTA (See number 21)

Prepared by the Task Force on the Health Implications of NTA, this report re-evaluates existing information on the health implications of NTA as a phosphorus substitute in detergents. Completed in May, 1977, the report was endorsed in the July, 1977 Annual Report and responded to by the IJC and Canadian Government. Additional response by the IJC appeared in its Interim Report of January, 1981.

Report:

**ECOLOGICAL EFFECTS OF NON-PHOSPHATE DETERGENT BUILDERS:
FINAL REPORT ON NTA (See number 21)**

Prepared by the Task Force on Ecological Effects of Non-Phosphate Detergent Builders, this report evaluates the potential ecological effects of NTA as a possible phosphorus substitute in detergents. Completed in December, 1978, the report was documented in the July, 1979 Annual Report without endorsing any of the nine recommendations. However, the IJC in its fifth Annual Report and interim report alluded to this report in its recommendations to the governments.

Workshop on:

ANTICIPATORY PLANNING FOR THE GREAT LAKES

On the request of the Societal Aspects Expert Committee, the SAB convened this workshop to determine how the IJC could be better informed about unmet current or emerging problems affecting the Great Lakes. Held in Windsor, Ontario, on March 5-7, 1979, the workshop consisted of seven work group evaluations and was officially attended by 95 persons. The report was documented in the November, 1980 Annual Report without endorsing the five recommendations. However, the IJC did make the following comment within its seventh Annual Report: "There is considerable value, therefore, in shifting some emphasis towards the future in order to try to anticipate and prevent problems rather than simply react to them. For this reason, the Commission supported a workshop in March, 1979, sponsored by its SAB, on Anticipatory Planning in the Great Lakes basin. The Commission will review the findings of this workshop with respect to possible Commission actions in the future."

Report:

**APPENDIX TO 1980 SCIENCE ADVISORY BOARD ANNUAL REPORT
(See number 36 and 37)**

This report entitled "A Perspective on the Problems of Hazardous Substances in the Great Lakes Basin" contains four background papers, two of which were prepared under contract to the Board.

The first two papers covered the state of science in sampling, fate and pathway, analyses of organic pollutants from the U.S. and Canadian academic viewpoints. The second two papers review that subject from the U.S. and Canadian federal government viewpoint.

Report:

**ECOLOGICAL EFFECTS OF NON-PHOSPHATE DETERGENT BUILDERS
FINAL REPORT ON ORGANIC BUILDERS OTHER THAN NTA
(See number 48)**

Prepared by the Task Force on Ecological Effects on Non-Phosphate Detergent Builders, this report evaluates the potential ecological effects of citrate, CMOS and CMT as possible phosphorus substitutes in detergents. Completed in July, 1980, the report was documented in the November, 1980 Annual Report without endorsing any of the seven recommendations. However, the IJC has, based on this report, recommended. " ... that the governments further review those non-NTA chemicals ... prior to any decision which allows the widespread use of these substances."

Report:

**HEALTH IMPLICATIONS OF NON-NTA DETERGENT BUILDERS
(See number 48)**

Prepared by the Task Force on the Health Effects of Non-NTA Detergent Builders, this report evaluates the health effects of the following potential detergent phosphorus substitutes: carbonates, CMOS, CMT, citrates, silicates, and zeolites. Completed in October, 1980 (revised March, 1981), the report was documented in the November, 1980 Annual Report without endorsing any of the conclusions.

Report:

WATER QUALITY OBJECTIVES (See number 47)

After the 1978 Water Quality Agreement, the Aquatic Ecosystem Objectives Committee (AEOC) replaced the Standing Committee on Scientific Basis for Water Quality Objectives and this represents their premier report. The 1980 report contains nine recommendations that would directly affect Annex I of the 1978 Water Quality Agreement and endorsement by the IJC would be tantamount to a request of the governments to amend that Agreement. The report was documented in the November, 1980 Annual Report without endorsing any of the recommendations. It should also be noted that two of those nine recommendations are under reconsideration by the AEOC with the interim request that they not be transmitted, at this time, to the governments.

Report:

PHOSPHORUS MANAGEMENT FOR THE GREAT LAKES (See number 49)

This 1980 final report from the Phosphorus Management Task Force investigates alternative strategies for managing phosphorus inputs to the Great Lakes and includes a review and evaluation of mathematical models, calculation of loading from tributaries, shoreline erosion, point sources, nonpoint sources and technology to control these inputs.

Report:

**ENVIRONMENTAL IMPLICATIONS OF ALTERNATIVE ENERGY FUTURES
FOR THE GREAT LAKES BASIN (See numbers 43, 44 and 45)**

This represents the supporting documentation for the 1981 Annual Report and focuses on the key physical, biological and socio-economic consequences of possible energy futures.

Report:

WATER QUALITY OBJECTIVES (See number 47)

This 1981 report of the AEOC makes recommendations on revised objectives for selenium and mirex. In addition to listing research needs, an evaluation of the environmental significance of aqueous mixtures of metals and limited use zones are discussed.

Report:

GREAT LAKES RESEARCH REVIEW – APPENDIX

This represents the supporting documentation to the 1982 Annual Report and contains the computer listings and evaluations of the Inventory of Research programs relevant to the Great Lakes basin.

Report:

BIOLOGICAL AVAILABILITY OF PHOSPHORUS (See number 49)

This report was prepared in 1981 by the Engineering and Technological Aspect (ETA) Committee and was based on: a paper by Lee et al. presented at the conference on "Phosphorus Management Strategies for the Great Lakes," a state-of-the-art report prepared by an ETA subcommittee and information presented at a meeting of experts on December 8, 1978 in Chicago.

Report:

WATER QUALITY OBJECTIVES (See number 14)

This 1982 report of the AEOC makes recommendations on a new objective for polychlorinated styrene, and a revised objective for silver and concluded that an objective for asbestos was not scientifically defensible. The report also lists information needs and provides the rationale, history and future of objective making in the context of the 1978 Water Quality Agreement.

Report:

1983 ANNUAL REPORT – APPENDICES (See number 52)

This represents the supporting documentation to the 1983 Annual Report and contains papers reviewing the feasibility of using indicators of atmospheric pollution and groundwater contamination.

Report:

WATER QUALITY OBJECTIVES (See number 66)

This 1983 report of the AEOC makes recommendations on revised objectives for microbiology and diazinon and a new objective for polynuclear aromatic hydrocarbon (PAHs).

Report:

ECOLOGICAL EFFECTS OF NON-PHOSPHATE DETERGENT BUILDER

This 1983 report by the Task Force on Ecological Effects of Non-Phosphate Detergents represents the last in a series which was initiated in 1976 to evaluate the ecological and health effects of alternatives to phosphate detergents. This report evaluates the ecological effects of carbonates, silicates and aluminosilicates (zeolite).

Report:

MULTI-INSTITUTIONAL MANAGEMENT: THE GREEN BAY EXPERIENCE

Prepared under contract to the Social and Economic Considerations Committee, this 1985 report uses Green Bay rehabilitation as an example to explain that consensus management is likely to fail in the ecosystem approach forum because any attempt at comprehensive management must accept existing multi-institutional arrangements and try to implement plans and policies within the existing arrangements, but to accept existing institutional arrangements is to accept a structural distribution of discretion that seems to preclude comprehensive management.

Report:

**AQUATIC ECOSYSTEM OBJECTIVES COMMITTEE - 1985 ANNUAL REPORT
(See number 71)**

This report makes recommendations on new Water Quality Objectives, including general ecosystem and oligotrophic indicators and revised objectives for ammonia, benzenehexachloride and toxaphene. Presents a list of research and data needs.

Report:

**A STUDY PROPOSAL FOR ASSESSING POTENTIAL FOR GREAT LAKES
CONTAMINATION VIA GROUNDWATER (See numbers 58, 63 and 67)**

This 1985 report was prepared by the Groundwater Contamination Task Force and provides a strategy that can be used to determine the potential for Great Lakes contamination through the underground pathway. The study, if completed, would serve as an initial framework around which a comprehensive groundwater-surface water monitoring strategy for the Great Lakes could be developed in keeping with Annex 11 of the GLWQA.

Report:

A CONCEPTUAL APPROACH FOR THE APPLICATION OF BIOLOGICAL INDICATORS FOR THE DETERMINATION OF ECOSYSTEM QUALITY IN THE GREAT LAKES (See number 72)

Prepared by the Work Group on Indicators of Ecosystem Quality at the request of the AEOC, this 1985 report discusses the applicability of the indicator or surrogate concept within the context of the ecosystem approach. The report contains general criteria for the use of indicator species and the specific rationale for using the lake trout as an indicator for the oligotrophic Great Lakes ecosystem.

Report:

USES, ABUSES AND FUTURE OF GREAT LAKES MODELING (See numbers 56 and 72)

Prepared by the Modeling Task Force in 1986 to examine the past, present and future roles of mathematical models applied to research and management of the Great Lakes environment, this report identifies and evaluates limitations of the major models that have been developed for the Great Lakes.

RESEARCH NEEDS

Beginning with the September, 1973 Annual Report, the RAB/SAB has occasionally presented the IJC with separate reports specific to Research Needs in the Great Lakes basin. The initial report in 1974 (Number 4), RESEARCH NEEDS: GREAT LAKES WATER QUALITY listed ten recommendations for priority research relative to water quality where present information necessary to make rational well-informed decisions was inadequate or totally lacking. None of the recommendations or the report were formally endorsed by the IJC.

The next effort by the RAB/SAB to present a separate report on research needs occurred in conjunction with the July, 1976 Annual Report (Number 18). On a request from the Research Needs Committee, the RAB/SAB convened a Research Needs Workshop to identify the priority research needs in three categories: ecological, technological, and social-economic-political. Held in Windsor, Ontario on March 1-3, 1976, the workshop consisted of evaluating, ranking and reviewing responses to a research needs questionnaire and was officially attended by 68 persons. The report entitled "GREAT LAKES WATER QUALITY RESEARCH NEEDS: 1976" recommended 56 basic issues that with sufficient information, would adequately define Great Lakes Water Quality and was the basis for the RAB/SAB recommendation of that year. In addition, the RAB/SAB requested that both governments distribute the document to their research agencies along with advising them that the RAB/SAB intends to conduct a follow-up contact to ascertain the responsiveness of these agencies to research needs efforts by the RAB/SAB. That follow-up resulted in a report entitled "CANADA-UNITED STATES RESEARCH PROGRAM PERTINENT TO THE WATER QUALITY OF THE GREAT LAKES." Issued in July, 1978, the report was briefly noted in the July, 1978 Annual Report. In 1982, the Board again focussed its full attention on research needs with the entire report devoted to an indepth evaluation of ten areas of research.

Ancillary to these reports, were three research directories, published in February, 1975, January, 1976 and November, 1982. These directories were produced in response to a separate questionnaire submitted to researchers in the Great Lakes community in order to catalogue existing research programs. As a baseline data source, the directories were to be used to cross-index a research needs recommendation report. The 1975 Directory of GREAT LAKES RESEARCH ACTIVITIES was noted in the July, 1975 Annual Report, the 1976 Directory of GREAT LAKES RESEARCH AND RELATED ACTIVITIES was noted in the July, 1976 Annual Report, and the 1982 DIRECTORY, as an Appendix to the Annual Report was duly noted.

On November 22, 1983 the IJC approved a terms of reference for a Council of Research Managers (CRM). In March, 1986, the IJC approved a SAB request to increase the CRM membership to 18 members. In May, 1987 the CRM held a research review open forum in conjunction with the annual meeting of the International Association of Great Lakes Research.

JOINT SCIENCE ADVISORY BOARD/WATER QUALITY BOARD
COMMITTEE ON THE ASSESSMENT OF HUMAN HEALTH EFFECTS
OF GREAT LAKES WATER QUALITY (Established February, 1978)

1979 ANNUAL REPORT

The health hazard evaluation process was initiated for the 450 chemicals listed in the Water Quality Board's Appendix E and selected criteria used for toxicity evaluation were defined. Estimates of human exposure from environmental data, interactions in toxicology and transformations of chemicals (e.g. Mirex to Photomirex) were discussed.

Recommended:

1. A study on intervention guidelines for Great Lakes environmental contaminants in fish (FY 1979/80) - \$10,000. The study would clarify cases of disparity among different agencies in standard setting.
2. A workshop on the Interaction of Chemicals of Concern in the Great Lakes Ecosystem (FY 1980/81) - \$15,000. To review the current state of knowledge of predictive models for the toxicity of exposure to mixtures, their data requirements and their application limitations.

1980 ANNUAL REPORT

High priority was given to continuing the health hazard evaluation of the Appendix E chemicals, utilizing the criteria earlier selected. Viruses in the Great Lakes were also discussed, in addition to contaminant levels in Great Lakes fish and the development of compatible cancer registries for the Great Lakes basin.

Recommended:

1. HEALTH HAZARD RANKING OF APPENDIX E CHEMICALS
(See number 39)
 - a. A more detailed examination be made of man's exposure to Great Lakes chemicals known to induce chronic toxicity in humans.
 - b. Additional fish surveillance to monitor decontamination trends in Great Lakes fish.
 - c. Additional toxicological studies be undertaken by the governments of the chemicals to facilitate human health hazard assessment.
2. A PROPOSED WORKSHOP ON THE CAPABILITY OF GREAT LAKES BASIN CANCER REGISTRIES

To implement the Committee's intent to ensure compatible data collection and handling methodologies of Great Lakes Basin Cancer Registries. This would precede the proposed cancer morbidity and mortality survey of the counties bordering on Lake Ontario.

1981 ANNUAL REPORT (See number 46)

The health hazard evaluation of the Appendix E chemicals were completed, utilizing all available toxicological and monitoring data. Exposure and toxicity profiles for 91 of these chemicals were reported. The workshop on the characteristics and compatibility of cancer registries within the Great Lakes basin was conducted and the proceedings published. A review has been initiated of microbiological data collected within the Great Lakes basin in order to determine the impact of improvements in treatment and regulatory measures. Surveillance data procurement for exposure assessment has also been reviewed in addition to areas of future concern to public health.

Recommended:

1. HEALTH HAZARD EVALUATION OF APPENDIX E CHEMICALS

Routine monitoring, inventory and use data development for those Great Lakes chemicals which may impact on human health when present in high concentrations. The Parties to develop toxicity information to supplement the inadequate data base for many of the Great Lakes chemicals and should update the list of chemicals, providing quantification, location of sampling, frequency of identification and ecosystem compartment. Identification is necessary also of industrial by-products discharged or stored within the basin.

2. ENVIRONMENTAL ASSESSMENT NECESSARY TO SUPPORT HUMAN HEALTH ASPECTS

Great Lakes surveillance and monitoring should address human health aspects.

3. WORKSHOP ON THE COMPATIBILITY OF GREAT LAKES BASIN CANCER REGISTRIES

The Great Lakes jurisdictions should adopt the recommendations of the workshop when developing cancer registry and health programs; and

4. POTENTIAL HUMAN HEALTH IMPACT OF MICROBIOLOGICAL CONTAMINATION OF THE GREAT LAKES

Microbiological monitoring of Great Lakes waters should be continued to reveal water quality trends due to changing water treatment and industrial technology. Testing methodology development should identify more closely with infection risks posed by pathogens and the reporting of waterborne diseases in the Great Lakes basin should be improved.

1982 ANNUAL REPORT (See number 50)

The Committee reviewed the information available on Great Lakes drinking water quality and the potential for adverse health effects. Various aspects of the water

quality were discussed, including newly-developed, short-term, mutagenicity tests and microbiological contamination of drinking water and recreational waters. Watershed protection policies to safeguard public health were also discussed and newly-developed methodology for assessing the potential of chemicals to affect the mammalian immune system was evaluated. A roundtable on the Surveillance and Monitoring Requirements for Assessing Human Health Hazards Posed by Contaminants in the Great Lakes Basin Ecosystem was held and the proceedings published, a summary being provided in the Committee's report. Updating of the hazard assessment of Appendix E chemicals from the (1981) report was also presented.

Recommended:

1. DRINKING WATER AND PUBLIC HEALTH CONCERNS

Chemical: Increasing surveillance of drinking water supplies for new organic contaminants; the Parties should augment existing toxicology programs to include the toxicity for Great Lakes contaminants; and more emphasis on toxicity/mutagenicity of non-chlorinated organics.

Microbiological: Drinking water treatment plant operational changes must be based on sound microbiological quality impact studies in addition to efficacious contaminant removal; caution is advisable in reliance on point-of-use water treatment units; the significance of particulate/matter turbidity in contributing to waterborne illness (especially in recreational waters) should be studied; and the jurisdictions should recognize the need to assess chronic health problems through low exposure to microbiological contaminants.

Recreational Water Quality: Additional research into public health protection is required.

Immunotoxicity: Testing methodology development on the effects of low level, chronic, exposure to chemicals on the immune system is required.

Roundtable on the Data Requirements for Health Protection from Surveillance and Monitoring Programs:

- a. General: The jurisdictions recognize the need to assess the chronic health implications and impact on reproduction of low-level exposures of humans in the Great Lakes basin to environmental contaminants; interagency communications regarding sampling, analysis, quality assurance and reporting to the IJC, are advocated as recommended in the proceedings of the Roundtable.
- b. Fish and wildlife surveillance for those Great Lakes chemicals identified in the Committee's (1982) report as 'impacting human health but not currently monitored', should be undertaken; data on fish-consumption patterns and contaminant exposure for Great Lakes residents are necessary for health risk estimates; and resolve the 'edible' portion issue among the jurisdictions.
- c. Microbiology: The jurisdiction should improve their reporting of waterborne disease outbreaks and the related monitoring; and investigate recreational water quality at bathing beaches regarding the potential for disease.

Update of Great Lakes Chemicals published in the (1981) Annual Report of the Committee.

1983 ANNUAL REPORT

This report explained the relative roles of toxicology and epidemiology in identifying environmental hazards, an activity leading to the setting of objectives, guidelines and standards and the issuance of Health Advisories by the Jurisdictions. The extrapolation of toxicology data has allowed the setting of conservative standards for the protection of human health from contaminants in water, air and food, whereas epidemiological studies address the presence or absence of health effects in populations. Use of both approaches can delineate the grey area where maximum permissible levels of contamination are set. The protection of drinking water sources in the basin was again discussed. Following its health hazard evaluation process of Great Lakes chemicals listed in Appendix E, the Committee determined whether Acceptable Daily Intake values had been assigned by various agencies to some of the chemicals for which toxicity data were lacking.

Recommendations:

1. DRINKING WATER CONCERNS

- a. **Epidemiology:** Development by the Contractor of a strategy for epidemiological studies on the human health effects of Great Lakes water contaminants (\$20,000).
- b. **Water Treatment:** The operation of water and waste treatment plants under their design criteria should be enforced; and research into the removal of unconventional contaminants and the high-efficiency removal of particulate matter, should be encouraged.
- c. **Groundwater and Sampling Protocols:** The Science Advisory Board, in its review of groundwater contamination of the Great Lakes, should include those sources utilized for drinking water.

2. TOXICOLOGICAL CONTAMINATION

Accurate reporting of scientific information is advocated.

3. FURTHER EVALUATION OF CHEMICALS RECOMMENDED BY THE COMMITTEE FOR MONITORING AND SURVEILLANCE

The jurisdictions are requested to determine contaminant sources and verify information and data to facilitate the assessment of human exposure to chemicals of concern in the Great Lakes.

4. PEER REVIEW OF UNSOLICITED APPLICATIONS FOR RESEARCH SUPPORT - INTERNATIONAL ISSUES

That the jurisdictions develop or improve administrative mechanisms for the review and funding of Great Lakes joint research projects.

1985 ANNUAL REPORT (See number 70)

Minimum allowable exposures to certain of the chemicals of concern listed in Appendix E and evaluated by the Committee for health hazards were reported, with recommendations for further action by the jurisdictions. Toxicity information has been evaluated also for additional chemicals listed in the (1983) Inventory of Great Lakes Chemical Contaminants compiled by the Commission. Alkyl lead contamination of the International Section of the St. Lawrence River was discussed, the affected jurisdictions having responded positively. The development of exposure levels for protecting human health from a wide range of environmental and industrial chemicals depends on high quality toxicology data. The Committee continued to examine the potential for the use of epidemiologic approaches to determine disease occurrences in Great Lakes basin residents by considering the concerns which exist and the relevant data bases which are available. Research on tumours found in Great Lakes fish has been reviewed, particularly concerning their potential as indicators of contamination with chemicals which act as complete carcinogens, initiators or promoters.

Recommended:

1. EVALUATION OF GREAT LAKES CHEMICALS RECOMMENDED BY THE COMMITTEE FOR MONITORING AND SURVEILLANCE

Review by the jurisdictions of the impact of chemicals identified at levels of concern for human health in areas of the basin should be initiated, coupled with adequate monitoring and surveillance.

2. LEAD IN EDIBLE PORTIONS OF GREAT LAKES FISH

The jurisdictions should continue monitoring lead concentrations in the St. Lawrence River for human exposure assessment and fish analysis results for both inorganic and organic lead, age and species should be provided.

3. HEALTH RELATED SURVEILLANCE AND MONITORING PROGRAMS OF WATER AND EFFLUENTS IN THE GREAT LAKES BASIN

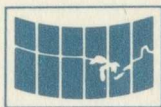
The jurisdictions should provide the best available data for use in human health risk assessment and coordinate monitoring programs with the contiguous jurisdictions, basing them on the recommendations from the (1982) report.

4. REVIEW OF THE GREAT LAKES INTERNATIONAL SURVEILLANCE PLAN FOR 1985

The Committee's identified chemicals of concern should be included in the Great Lakes Surveillance Plan by the individual lake task forces.

5. FISH TUMOURS AND THEIR POSSIBLE RELATIONSHIP TO HUMAN CANCER

Better documentation is required of the distribution of fish cancers in the Great Lakes and additional pathologic studies are advocated. Dose-and-effect relationships for environmental carcinogens in fish need to be determined relative to established animal models, especially the rat, leading to an assessment of the potential for utilizing fish in monitoring waterborne carcinogens.



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