1985-01-01

Great Lakes International Surveillance Plan (GLISP). Volume 1: Overview: 1985 Edition

Great Lakes Water Quality Board. Surveillance Work Group

GREAT LAKES INTERNATIONAL SURVEILLANCE PLAN (GLISP)

VOLUME I. OVERVIEW

BY

THE SURVEILLANCE WORK GROUP

OF THE

GREAT LAKES WATER QUALITY BOARD

INTERNATIONAL JOINT COMMISSION

WINDSOR, ONTARIO

1985 Edition

PREFACE

Annex 11 of the 1978 Great Lakes Water Quality Agreement states that a joint monitoring and surveillance program shall be developed and implemented among the Parties and the State and Provincial Governments in order to ensure the attainment of the letter and intent of the Agreement. The Great Lakes International Surveillance Plan (GLISP) contained in the Water Quality Board Report of 1975 and, as subsequently revised, was declared as the model for development of the joint monitoring and surveillance program.

This document represents the first of three volumes in the current effort to update GLISP. Volume I of GLISP, the overview document, contains an historical briefing on the development of GLISP, culminating in the current updating process. It includes concise statements about the major environmental issues and those specific monitoring and surveillance activities which have been developed to address them. Linkages between the planning, implementation and reporting phases of GLISP are identified. Moreover, a concise listing of monitoring and surveillance activities (i.e., what is going to be done, by whom, when, and sampling and reporting schedules) for the current calendar year are given. This document should be of interest to those individuals requiring information on the overall scope and intent of the Great Lakes monitoring and surveillance program and activities for the current year.

Volume II of GLISP contains the operational details of the monitoring and surveillance plans. It is intended for surveillance program managers and anyone interested in the activities planned for a specific lake or connecting channel. The Plans are presented by geographic area and, when completed, will consist of seven chapters, one for each Great Lakes, one for the upper connecting channels (the St. Marys, Detroit and St. Clair Rivers and Lake St. Clair) and another on the lower connecting channels (the Niagara and St. Lawrence Rivers). Each chapter contains background and rationale, linkages between issues and monitoring surveillance activities, sampling location and

frequency, and other details of operational components that are specific to a particular lake or connecting channel.

Volume III of GLISP is known as the Surveillance Handbook. It will consist of methods details for each operational component applicable to all lakes and connecting channels. Whereas Volume II focuses on the "what, when, and where" of Great Lakes monitoring and surveillance, Volume III concentrates on the "how". The intended audience of Volume III is field and laboratory scientists involved in monitoring and surveillance activities and others interested in methodological details.

GLISP is intended to have consistency and constancy to track water quality trends through time. In addition, it will be dynamic and able to address new and emerging issues as well as responsive to changing emphasis in environmental issues and concerns.

TABLE OF CONTENTS

LIST OF TABLES

GREAT LAKES INTERNATIONAL SURVEILLANCE PLAN (GLISP)
VOLUME 1. OVERVIEW

INTRODUCTION

Numerous agencies in both Canada and the United States are responsible for surveillance and monitoring activities designed to determine the effectiveness of pollution abatement programs implemented by the Parties and jurisdictions in meeting the objectives of the Canada-United States Great Lakes Water Quality Agreement. The Great Lakes International Surveillance Plan (GLISP) presented by the Great Lakes Water Quality Board in its annual report to the Commission in 1980, provided the framework for coordinating these responsibilities in a bilaterally comprehensive and cost-effective manner. It also provided a strategy to ensure that returns from such expensive remedial measures and other related management practices were not jeopardized. The primary output of GLISP was to be information to assist managers and policy makers in arriving at rational and effective decisions in the overall management of Great Lakes water quality. Specifically, the fundamental purposes of surveillance and monitoring as outlined in Annex 11 of the 1978 Agreement are:

- to assess compliance with jurisdictional control requirements;
- to assess the degree to which the general and specific objectives of the Agreement are being achieved;
- to evaluate local and whole lake water quality trends; and,
- to identify emerging problems.

The original GLISP design called for specific components of surveillance and monitoring programs to be carried out annually on each lake and the connecting channels, plus periodic intensive lake studies which would focus on

an individual lake or the connecting channels (IJC 1980)*. The annual program components were designed to address one or more of the above objectives while the intensive lake studies were designed to provide a more comprehensive assessment. The intensive lake studies under GLISP were to be conducted on a nine-year rotational cycle. The intensive survey conducted on Lake Superior in 1983-84 represented completion of the first cycle.

It was intended that the GLISP be dynamic and flexible to respond to changing needs and priorities. Explicit in this Plan was the need for periodic review and updating. Since the development of the GLISP, the review of accumulated data as well as consideration of a number of additional factors have suggested the need to modify the surveillance strategies to more effectively address current Great Lakes water quality issues and problems. The time for such a review is particularly appropriate given that the first full rotational cycle has been completed.

The Need for Review and Update

A number of factors dictated the need for review and update of the GLISP. Some of the more important of these are summarized briefly below.

While the introduction to the original GLISP states that it was designed to meet the requirements of the 1978 Great Lakes Water Quality Agreement it must be remembered that the GLISP was being developed almost concurrently with the Agreement. Indeed the intensive surveys on Lake Michigan (1976) and Lake Erie (1978 and 1979) were completed before the Agreement was signed. In this regard the design of the GLISP was anticipatory of the 1978 Agreement requirements. In particular, the 1978 Agreement provided two major shifts in focus from the 1972 Agreement. Specifically, there was a shift in emphasis from eutrophication and phosphorus to toxic substances and a transition from a purely water quality viewpoint to an ecosystem approach. Both of these

---

* International Joint Commission (IJC). 1980. Great Lakes International Surveillance Plan, IJC Regional Office, Windsor, Ontario.

required changes in the existing GLISP. In this regard, in an overview assessment requested by the Commission, the Science Advisory Board concluded that while the GLISP adequately addressed the compliance assessment requirements of the Agreement, it did not sufficiently address the detection and identification of emerging problems in the Great Lakes Basin Ecosystem. Furthermore, the Board recommended that "an increased emphasis on integrators and biological indicators coupled with a reduced emphasis on water analysis for contaminants would be beneficial". More recent criticisms identified the lack of habitat and community structure considerations within the GLISP.

A recent review by the Surveillance Work Group identified several deficiencies in coordinated annual program planning, implementation and data reporting of the original GLISP. Data quality and data interpretation were noted as particular problems. The latter was also identified by the Science Advisory Board in its overall assessment. In particular, the Board stated that the GLISP generated enormous amounts of data, but insufficient attention had been given to the analysis, interpretation and review of these data. This fact, along with the lack of definitive annual planning has made it extremely difficult to provide comprehensive reports on lake status. The delayed reports on the intensive studies further exemplify this problem.

Finally, review of the data base showed some deficiences in data collections (e.g., Areas of Concern) and that some changes may be occurring quicker than anticipated (e.g., the decrease in mercury concentrations in Lake St. Clair). These suggest the need for review and modification of present sampling programs.

In light of these facts, the Surveillance Work Group initiated an intensive re-evaluation of surveillance and monitoring requirements to meet the needs of the 1978 Great Lakes Water Quality Agreement.

The Re-evaluation Process

In the Spring of 1983, the Water Quality Board established seven Lake and Connecting Channels Task Forces (one for each of the five Great Lakes and one

for each of the upper and lower connecting channels) under the Surveillance Work Group and charged them to design a scientifically defensible surveillance plan which, in their professional judgement, was necessary and sufficient to meet the requirements of the 1978 Canada-United States Great Lakes Water Quality Agreement.

The seven Task Forces were also charged with developing and reviewing, on an annual basis, design details of an international surveillance plan for their respective portion of the Great Lakes. Members were selected by the Surveillance Work Group to serve because of their professional expertise and experience. They were specifically challenged to develop scientifically defensible plans unencumbered by present programs, agency affiliation, or financial considerations. Although the Surveillance Work Group provided a communication link among the task forces, it did not structure their activities or directions; instead, free and creative input to the plans was encouraged.

Draft copies of the individual plans were sent out for external peer review to ensure their scientific integrity as well as their ability to meet the surveillance and monitoring requirements under the 1978 Great Lakes Water Quality Agreement.

HIGHLIGHTS OF THE PLANS

A major objective has been to make these surveillance plans more effective in an ecosystem sense. The International Joint Commission, the Great Lakes Fishery Commission, and the twelve associated federal, provincial and state jurisdictions are committed to the ecosystem approach espoused in the 1978 Great Lakes Water Quality Agreement for the resolution of water quality and associated Great Lakes issues. The transition to the ecosystem approach required a shift in focus for some of the components within the original GLISP. In addition to consideration of the physical and chemical aspects, the 1978 Agreement also specifies the need to consider the biological integrity of the waters of the Great Lakes Basin Ecosystem. Therefore, more emphasis has been placed on biology in these plans compared to the original GLISP.

The ideal product from implementation of these plans is expected to be a coherent annual "snapshot" which will be an accurate gauge of the health of the system. To continue the analogy, the photo album then becomes a record of the changes and trends in the system over time.

At the outset, these plans represent an attempt to integrate the necessary components, with the aim of achieving greatly improved data quality and comparability. The first requirement to complete this process of integration is to link the water quality program components through the various levels of the food chain. The second requirement is to phase over to an ecosystem perspective with minimal loss of comparability with past data. The third requirement is to develop an evaluation process which will measure progress towards the ideal program. The fourth requirement is some assurance of program continuity.

Specifically, coordination is required at the planning, implementation, and reporting levels in order to link appropriate surveillance components. This linking entails selection of common sampling sites, sampling schedules, and data collection targets, and also includes compatible data recording and storage. The summarization process also requires use of common due dates, standard terms to link water quality, and the status of the ecosystem. The plans contain the following highlights which are departures from or improvements upon the original GLISP:

- shift to an ecosystem approach (i.e., a more integrative and holistic design including a better balance of physical, chemical and biological considerations);

- development of compatible methodologies for generic (common) operational components (e.g., atmospheric monitoring which is applicable to the entire Basin);

- development of specific operational components where required (e.g., habitat monitoring, biological community structure monitoring, etc.) to address specific concerns in certain lakes or connecting channels;

- consideration of the need for more detailed and specific programs for identified "Areas of Concern";
- annual planning and implementation instead of periodic intensive surveys;
- more detailed planning;
- more emphasis on quality assurance;
- more emphasis on compatible data management;
- more emphasis on the need for improved coordination, accountability and timely data interpretation and reporting.

The latter three items were specifically recognized by the Surveillance Work Group as major shortcomings which reduced the effectiveness of the original GLISP. Specific actions were recommended to the Water Quality Board to correct this situation. Because of their paramount importance to ensuring the effectiveness of these new Plans, these are discussed in more detail below.

Quality Assurance

Great Lakes surveillance and monitoring requires planning, coordination, and implementation. The Surveillance Work Group and its Task Forces believe that conscientious consideration of planning and coordinating issues are indeed within their mandates. Coordination goes beyond planning toward implementation, and the Agreement is quite clear that implementation is a Party responsibility. However, under Article VII 1(e) and Annex 11 of the Agreement, the Commission is given some coordination responsibility. If the output from monitoring and surveillance programs conducted by the Parties (and the jurisdictions) in accordance with the requirements of Annex 11 are not coordinated, thereby resulting in the production of non-compatible data, then it is exceedingly difficult for the Commission to obtain the information (Article IX) it requires for its reports, reviews, and recommendations.

Therefore, the Water Quality Board, with supporting documentation from its committees, has an obligation to advise on both relevant planning and coordination issues to the Commission which, in turn, can tender advice and recommendations to the Parties and the Great Lakes' jurisdictions.

The original GLISP provided no mechanism to bridge the gap between planning and implementation, especially in regard to the quality assurance issue. The Surveillance Work Group considers quality assurance from a broad perspective, encompassing field, laboratory, and data storage activities. The IJC-coordinated round robins on analytical laboratory performance have been mechanisms for assessing quality assurance, but other aspects need addressing as well. Moreover, the Surveillance Work Group and its Task Forces recognize that, to improve surveillance and monitoring activities commensurate with the letter and spirit of the Agreement, the mechanism for coordination and oversight of quality assurance must be in place before the surveillance plans are implemented.

The primary responsibility for quality assurance lies, of course, with the various agencies. However, to ensure that the level of quality assurance recommended by the Task Forces is maintained, the creation of a new position, the Quality Assurance Coordinator, was recommended to and accepted by the Water Quality Board. The new position will be funded by the Parties, thereby keeping implementation as a Party function and maintaining the Commission's objectivity and independence. The position also will improve the quality of information provided to the Commission, with the coordination links necessary for its binational oversight function. The Quality Assurance Coordinator will be stationed at or near the IJC Great Lakes Regional Office in Windsor to facilitate communication with the IJC, cooperating agencies, and jurisdictions responsible for Great Lakes monitoring and surveillance activities.

Data Accessibility and Manipulation

A crucial factor in the successful development and conduct of the surveillance plans is the proper management of the data and information which result from the surveillance activities. The data and information will be used to prepare periodic reports on the status of each lake and connecting

channel and an overview on the status of the Great Lakes (i.e., the synopsis on surveillance to the Water Quality Board Report - Appendix B).

To ensure that the reports address the identified issues in the most forthright manner, the right data must be available at the right time and in the right format. These requirements dictate a particular end product of the data handling exercise, which means that consideration must be given to the models, graphs, tables, and other particulars regarding the presentation of the information. These requirements, in turn, dictate how data must be entered into the data management system.

Article VIII of the Agreement states that the IJC Regional Office will provide administrative support and technical assistance to the Boards in the conduct of their activities. One significant aspect of this assistance is data analysis and evaluation for the purpose of interpreting data and developing advice. Data analysis and evaluation, as construed, is viewed as a coordination function and, under Article VII and Annex 11, the IJC has coordination responsibility. If the data are not available, compatible, or usable, then it becomes exceedingly difficult for the Boards (and the IJC) to develop the information (Article IX) they require for reports, reviews, and recommendations.

Data analysis and evaluation is a legitimate role for the Regional Office, because the IJC is the only entity whose mandate encompasses the entire Great Lakes Basin. However, this function does not include data management (i.e., the establishment and operation of data bases) which is clearly the responsibility of the Parties and jurisdictions generating the data. The proper role for the Regional Office is accessing and manipulating data to improve the depth and breadth of data interpretation and critical review. Data accessibility refers to the ability to obtain data from various external sources. Data manipulation refers to the ability to utilize that data, once obtained. The former falls under the heading of telecommunications and the latter, computer capability. The Surveillance Work Group is recommending improvements in both data accessing and manipulative capabilities at the Regional Office to be coordinated by a Data Analyst, a line position at the Regional Office that needs to be filled as soon as practical.

Data Interpretation and Report Writing

Describing the enhancement and restoration of water quality within the Great Lakes Basin Ecosystem, as defined under Article I (Great Lakes Water Quality Agreement, 1978), requires the synthesis of many separate reports and data bases provided by the participating agencies in the course of meeting their individual mandates. The summation of these separate information sources initiates the process of producing synoptic reports which are sought by the Water Quality Board for reporting purposes. It is the process of melding project completion reports and data summaries into intralake synoptic reports that allows interlake and global comparisons to be made. The ability to do these comparative analyses puts our collective problems and efforts to resolve them into perspective.

The synoptic process requires specialists adept in viewing a broader picture. While this expertise may exist at the agency level, there is seldom time or manpower available to exercise it without a specific terms of reference (e.g., PLUARG, ULRG, IFYGL, Project Hypo*). Subsequently, the Regional Office staff has been frequently called upon to produce these synoptic reports, often in association with a selected agency staff member, but often without such help. Invariably, the individuals involved have had other concurrent work assignments and the time to generate reports has been inordinately long.

As the demand for reporting in the framework of the ecosystem perspective increases, as it already has, the demand for Regional Office staff has likewise increased. Thus far the demand has been partially met, but not without sacrifices. If the Water Quality Board is to continue to improve the scope and quality of its reports to the International Joint Commission, then the mechanisms for the production of these reports must be expanded to meet

---

* PLUARG - Pollution From Land Use Activities Reference Group; ULRG - Upper Lakes Reference Group; IFYGL - International Field Year on the Great Lakes; Project Hypo - a study of hypolimnetic oxygen depletion in the central basin of Lake Erie.

the need. There are several ways to meet this need, which include expanding data accessing/manipulating ability within the Regional Office with personnel and equipment capable of supporting the ecosystem approach (outlined above), and relying on agency secondments (temporary reassignments) to the Regional Office.

To improve the quality of reports in a timely fashion, a Report Writing Team is necessary to produce the output (e.g., synoptic lake reports and the Appendix B surveillance synthesis) from Great Lakes monitoring and surveillance activities for the Water Quality Board. A Report Writing Team will consist of IJC staff, including secretariats and the Data Analyst, as well as the Quality Assurance Coordinator and special, short-term secondments of pertinent agency personnel to the IJC Great Lakes Regional Office.

In the 12-year history of the IJC Great Lakes Regional Office, secondments and other short-term assignments to the office have been rare. It is recommended that these mechanisms be more earnestly utilized. Professionals will be encouraged to take secondment to the office for the purpose of completing writing assignments away from normal work pressures and to effect better communication with the other members of the Report Writing Team. Yet it must be realized this will take man hours from the agency and possibly reduce the agency output further. Therefore, it would seem logical that additional total man hours should be devoted to the area of data interpretation and reporting.

THE PLANS - GENERAL OVERVIEW

The fundamental objective of the GLISP is to determine the impact of man's activities on the quality of the Great Lakes Basin Ecosystem, particularly the effect of these activities on the desired uses of the lakes. Information from the program is primarily directed at assisting managers of remedial programs in defining the need for specific programs as well as in evaluating their effectiveness.

A variety of substances are continuously being introduced into the Great Lakes through man's activities, or in some cases by naturally occurring

phenomena. The amount and impact of such substances on ecosystem quality in the Great Lakes are primary concerns. In many cases, these substances present hazards to aquatic life, wildlife and human health. Nuisance or aesthetic concerns related to water quality can also interfere with resource use. In addition to material inputs, other activities such as shoreline development, destruction of wetlands, etc., can have a detrimental impact on aquatic ecosystem quality.

These concerns can be translated into several issues which seem to be common to all the lakes and the connecting channels. Their severity, however, may vary from lake to lake and even within a particular lake or connecting channel.

Common Issues

This update of the GLISP is centered around two general concerns:

- human health and well being; and
- aquatic ecosystem status.

In varying degrees, these two general concerns are pertinent to the following common issues:

- Chemical Contaminants;
- Eutrophication;
- Microbial Contaminants;
- Radionuclide Contaminants; and
- Biological Community and Habitat Status.

Chemical contaminants and eutrophication are addressed in the plans from both human and ecosystem health viewpoints, whereas microbial and radionuclide contaminants are considered as human health issues. Biological community and habitat are, of course, approached from the perspective of ecosystem status.

Chemical Contaminants

The chemical contaminants issue, especially persistent toxic substances, is the major focus of the 1978 Great Lakes Water Quality Agreement and the

monitoring and surveillance plans. The effects of toxic substances on the health of the Great Lakes ecosystem, including man, are not well understood. However, some obvious problems including closed fisheries, fish morphological abnormalities, fish kills, and impairment of reproduction and deformities in aquatic birds have been well documented. Present levels of certain substances are adversely affecting growth and reproduction in some Great Lakes biota, and contaminant levels in many top predator fish still exceed the guidelines for human consumption set by public health agencies in Canada and the United States. To understand where and how these substances interact in the lakes and connecting channels, both biotic and abiotic components of the system must be measured. Focus will be on those chemicals that are known to biomagnify or bioaccumulate and those which are suspected oncogens, including the list of 11 critical pollutants identified by the Water Quality Board. While it is important to know the quantities and distribution of chemical contaminants, it is also important to identify the sources and fates of contaminants in the lakes and connecting channels. Selected monitoring of suspected and known sources is therefore necessary.

Eutrophication

The changes caused by nutrient enrichment (eutrophication) were the primary motivation behind the initiation of the 1972 Great Lakes Water Quality Agreement. Since 1972, the United States and Canada have spent or committed more than $7 billion to construct and upgrade municipal wastewater treatment plants in the Great Lakes Basin. A large portion of the budget was allocated for phosphorus control, in efforts to meet the effluent limit of 1.0 mg/L total phosphorus called for in the 1972 Agreement. Implementation of phosphorus controls is now sufficiently complete, and positive effects are becoming evident in many areas of the Basin. Lake Ontario has shown the most substantial response on a whole lake scale as measured by spring total phosphorus concentrations. In Lake Huron, there is strong evidence that nutrient reduction programs in the Saginaw Bay watershed have resulted in measurable improvements in the water quality of the Bay. The effects of phosphorus control on Lake Erie, however, have not yet become readily observable since the loading objective for municipal wastewater treatment plants has only been met for the last three years.

As with chemical contaminants, the sources and quantities of nutrients entering the lakes must be monitored on an ongoing basis to document trends, to assess the effectiveness of nutrient control programs and to determine the need for further controls at point and non-point (diffuse) sources.

Microbial Contaminants

Current water treatment practices coupled with basic biological treatment and disinfection of sanitary wastes have essentially removed the threat of bacterial disease transmission via drinking water. However, the recreational user is still exposed to pathogenic bacteria on an occasional basis at locations close to urban centers. Beach closures due to bacterial contamination do occur regularly in the Great Lakes and, therefore, microbiological indicators of human health diseases require monitoring at selected nearshore locations.

Radionuclide Contaminants

No radiological objectives are being exceeded at any of the nuclear power generating facilities around the Great Lakes. Likewise, objectives are not being exceeded from periodic releases into municipal (hospitals, etc.) and industrial wastewater. Nevertheless, this issue should continue to be addressed to maintain the long term trend assessment of the radiological variables in the Basin, including monitoring in the vicinity of existing and planned low and high level nuclear waste disposal sites.

Biological Community and Habitat Status

The physical habitat as well as water quality determine the composition of flora and fauna present in the biotic community. Quality of habitat is particularly significant for successful fish spawning and for determining the quantity of food available at all levels in the food chain. Description and quantification of habitat conditions provide a baseline to forecast changes in the biotic community when perturbations occur in the habitat.

Monitoring will focus on nearshore and riparian habitats (estuaries, harbours, bays, littoral zones, and rocky shoals and submerged bedrock outcrops) where problems can result from shoreline development, dredging activities, water level changes, flow changes, chemical loadings, etc. However, habitat assessment can include the open lake, especially deep water zones (except shallow Lake St. Clair and the western basin of Lake Erie), since their vast cold and well oxygenated hypolimnia (except the central basin of Lake Erie) represent one of the most unique attributes of the Great Lakes.

Of all the common issues, habitat assessment is the one representing the newest departure from the original GLISP. It embraces the ecosystem approach as outlined in the 1978 Water Quality Agreement. Not all Task Force plans are currently addressing habitat assessment nor should this issue only fall under the purview of the Great Lakes Water Quality Agreement. Cooperation between the IJC and the Great Lakes Fishery Commission is essential to address habitat issues within the Great Lakes Basin. The habitat issue should be considered as evolving and requiring further development in future revisions of the Plans.

Common Requirements

As stated previously, while the Surveillance Work Group provided a communication link among the seven individual Task Forces developing the plans, it did not structure their activities or directions; instead free and creative input to the plans was encouraged within the boundaries of their terms of reference. As a result, each of the plans tended to develop in slightly different formats with considerable variation in scope and amount of detail. Despite these differences, there is a basic similarity in the fundamental underlying requirements of each of the plans.

Since surveillance and monitoring activities ultimately relate back to management decisions on the need for remedial programs, the starting point is the fact that pollution abatement programs have as their objective the control of the loadings of nutrients (which relate to eutrophication), toxic substances, and suspended and other dissolved materials to the Great Lakes.

Therefore, the first requirement of monitoring and surveillance is to measure directly the loadings from sources affected by remedial programs.

A second requirement of the surveillance program is directed towards measurement of conditions in the receiving waters in order to assess the frequency and intensity of violations of water quality objectives in both localized areas and in the open lakes where changes and trends in problem conditions are to be established.

A third requirement of the surveillance program is to provide sufficient data to permit valid interpretation of water quality conditions - this to distinguish the impact of remedial programs from natural changes, both near to and remote from sources. This requirement entails documentation of the loadings not under control by present remedial programs as well as monitoring ambient water quality or impacted biota and other indicators of aquatic habitat in the system in order to distinguish the impact of controlled loadings from the impact of other causes.

Implicit in these three requirements is the need to examine the data to establish whether new problems may be developing.

Common Operational Components

Operational components common to each of the Plans must be integrated to properly address these issues. Specifically, the operational components include:

INPUTS - measuring loadings from:
- Tributaries
- Point Sources (municipal and industrial)
- Non-point Sources (urban and agricultural)
- Atmosphere
- (Connecting Channels)[1]

IMPACTS - determining effects on:

Open Lake

Nearshore (including Areas of Concern, beaches and water intakes)[2]

Habitat (flora and fauna)

(Connecting Channels)[1]

Because these are generally common to all Plans, it is appropriate to provide a brief description of the rationale for each in this overview discussion.

Inputs

The quality of the inputs to the Great Lakes are the key to future conditions and uses of the lakes. Tributaries, point sources and non-point sources can have a direct impact on localized areas of nearshore waters of the Great Lakes. However, combined influence from these inputs can also be seen over the whole lake. Atmospheric inputs affect the whole lake but are probably of relatively minor significance to nearshore areas, connecting channels, and Areas of Concern. Connecting channels are affected by tributaries and point source discharges, thereby impacting the downstream lakes. Surveillance of inputs can be used to determine the effect remedial programs have on the quality of the water. A change in the ecosystem quality of the lakes cannot necessarily be seen immediately from changes in inputs to the lakes, but loading trends provide the background for an estimation of future variations in quality. Knowledge of the inputs from all these sources are required before any type of mass balance can be attempted.

i) Tributaries

The purpose of tributary monitoring for the Great Lakes is to provide estimates of an important component of loadings to the system. Changes in

---

[1]Specific plans have been developed for each of the Connecting Channels (see discussion in the text).

[2]These have been identified as separate operational components in some plans.

loadings to the lakes are not necessarily reflected in immediate changes in water quality. Trends in loadings may provide the basis for estimating future changes in lake quality. The ideal program would encompass flow measurements and sampling of all tributaries to the Great Lakes. However, the small gain in accuracy would not be worth the large increase in costs. The significant tributaries have been identified by the jurisdictions and account for up to 80 percent of the pollution load from tributaries (for some substances) into the Great Lakes.

Tributary monitoring also plays an important role in point source monitoring. For example, in monitoring industrial outfalls for contaminants, sampling at each site is very expensive. A step-wise program is more cost-effective. Tributaries, as integrators, can be monitored and, if sufficiently high levels are seen, this can be pursued upstream to the source(s).

ii) Point Sources

This category of inputs includes all municipal and industrial outfalls that discharge directly into the Great Lakes, connecting channels or tributaries downstream of the tributary sampling site. Once again the major purpose is to determine loadings. Monitoring at the source is important to determine contributions from individual dischargers eliminating the masking effects of dilution and natural variations which may occur once these substances have entered the system, and to focus remedial programs where they will effect the most water quality improvements.

iii) Nonpoint Sources

Nonpoint sources (including agricultural and urban runoff, groundwater seepage, and leakage from landfills) are diffuse in origin, but may have a significant cumulative impact on the lakes. Because of their diffuse nature, nonpoint sources are more difficult to measure but, nevertheless, are important for determining loadings. In many cases, nonpoint sources are included in the integration afforded by tributary monitoring. In other instances, special monitoring is required, particularly in hydrologically active regions, and in areas of operating and abandoned hazardous waste

disposal sites. Nonpoint source monitoring, in general, is not routinely incorporated into monitoring and surveillance programs. Instead, they are currently demonstration and research projects. Therefore, they are included under special studies in the surveillance plans.

iv) Atmosphere

The purpose of this operational component is also to contribute to the determination of the material loadings to the Great Lakes via direct atmospheric deposition and to determine trends with time in the chemical composition of atmospheric contributions to the Great Lakes and the effect of this on loadings to the lakes. Previous studies have shown that the atmosphere can be a significant source of nutrients, metals, and toxic substances to the lakes. It is important, therefore, to determine the magnitude of this contribution to the overall materials budget.

v) Connecting Channels

The connecting channels are important water resources in themselves because of their intensive use, proximity to major urban and industrial complexes, and as links in the Great Lakes chain. The type and amount of materials transported from lake to lake is an important aspect of the total data base needed to evaluate long range lake responses to loading changes. Surveillance of connecting channels is necessary to determine trends in the water quality, to provide information needed to assess remedial programs, and to calculate material balances at the head and mouth of each connecting channel. Estimates can be made on the annual mass output of nutrients, etc., coming from the upper lake and going into the lower lake.

Over time, changes in the overall conditions of a connecting channel should parallel significant changes in loadings from upstream lakes and direct or indirect discharges. The important parameters are nutrients and persistent suspended/dissolved materials. The rates of output and input of a lake are critical factors in determining mass balances, projecting trends and evaluating the influence of pollution control programs on background loadings.

Impacts

The levels and trends in the physicochemical and biological parameters in the Great Lakes need to be determined and related to the impacts of man's activities. The nearshore areas are those that assimulate nearly all the inputs and in turn are the most readily used by man for water supply, biological production, fishing, and recreation. Understanding changes in nearshore quality and their interactions with the open lake is critical to the development of remedial programs and determining their effectiveness. Changes in open lake quality are much slower, but represent a better indication of the progressive and longer-term changes that might be obscured by the often degraded and rapidly variable water quality found in the nearshore. Monitoring programs for toxic substances (e.g., pesticides, industrial organics, metals) are severely hampered because most chemicals of concern are below routine analytical detection limits in water, particularly in the open lake. Fish and other wildlife are convenient integrators and bioaccumalators of these substances and frequently accumulate them to levels which may be of concern either to human health or to the aquatic organisms themselves.

i) Open Lake

Open lake surveillance is particularly important to understanding the overall, long range response of the lakes to remedial programs and recognizing the introduction of new sources or types of contaminants. Changes in the water quality, biota or sediments are generally very slow and subtle, and, depending on the lake, may or may not be able to be accurately assessed on an annual basis. The masking effect of weather may further complicate interpretation of the data. However, there is a need to determine as accurately as possible the concentration of the physicochemical and biological constituents in the open waters and their relation to abatement and restoration efforts.

ii) Nearshore

As the recipient of all tributary, point source and non-point source loadings, the nearshore areas, both temporally and spatially have variable

water quality. This situation has the potential to impact the water not only in its use for recreational and drinking water purposes but its usefulness as spawning and rearing habitat for fish and wildlife. Nearshore surveillance provides an indication of the efficacy of remedial programs on a more immediate time frame than measurements in the open lake since areas close to the sources are expected to respond more rapidly. Nearshore monitoring also provides data to identify the possible sources of problems resulting from inputs to the lakes.

Some of the plans have identified additional specific operational components, such as Areas of Concern, water intakes and beaches, which could be considered within the overall context of a nearshore component.

Areas of Concern. Localized areas in each of the Great Lakes and all of the Connecting Channels have been identified by the Water Quality Board. In general these are the most polluted areas of the Great Lakes where the specific objectives of the Agreement are not met and beneficial uses are impaired. The Water Quality Board is presently reconsidering the classification scheme for these Areas of Concern. The causitive factors may range from specific point source inputs to residual problems, for example, as a result of in-place polluted sediments. Because of the varying nature of the problems as well as the geographic nature of the locations (e.g., harbours and embayments versus tributaries and connecting channels) each will have to be dealt with in the individual plans on a case-by-case basis.

Water Intakes. Water intake monitoring can be a cost-effective way to obtain water quality data during all seasons. In many cases, water intake monitoring has provided the best historical data for detecting trends in water quality (e.g., phosphorus, nitrogen, chlorides) because of the opportunity for year-round sampling, frequency of sampling, and the constancy of sampling location.

Beaches. Recreational areas where swimming and other activities involving bodily contact with the water require specific monitoring for human pathogenic organisms.

iii) Biota

There is an obvious connection between water quality and the aquatic life forms dependent on the quality of the aquatic environment. This is now recognized in the purpose of the 1978 Water Quality Agreement which calls for restoration and maintenance of the "chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem". The interrelationships within the biological community and between the biological community and its surrounding environment are often quite subtle and complex. Without sampling and analyses that cover the spectrum of the biological community, it is unlikely that definitive cause-effect relationships can be established. Unfortunately, this is one aspect that has been almost completely neglected in the previous GLISP. In recognition of this, many of the lake plans now call for specific measurements of various biological components including benthos, phytoplankton, zooplankton and other biological "indices". All plans include fisheries and wildlife as common operational components. These are outlined briefly below.

Fisheries and other aquatic life. During the past 100 years, the fisheries of the Great Lakes have exhibited dramatic changes in structure and abundance. Exploitation, predation by sea lamprey, introduction of exotic species, eutrophication, and direct pollution stresses have all been cited as contributing to the observed changes and declines. Basic to the understanding of these relationships are knowledge of the status of fish stocks and the degree of exploitation (sport and commercial), predation by lamprey, and competition from exotic species. This information is gathered on a continuing basis by fish and wildlife agencies of the appropriate jurisdictions with coordination by the Great Lakes Fishery Commission.

Some contaminants entering the Great Lakes are found in lake biota at concentrations greater than in the water itself. The biota have value as natural monitors of water quality because they integrate all stresses placed on an aquatic ecosystem (including ambient physical and chemical parameters of water quality) and reflect the combined effect of such stresses. Some biota (e.g., clams and young-of-the-year fish) are especially valuable as biomonitors in detecting local areas of contamination. Others (e.g., algae,

zooplankton and benthos) are useful in documenting levels of contaminants concentrated at different levels of the food chain. The higher trophic levels the predatory fish have elevated concentrations which are more amenable to accurate measurement, and thus represent a convenient point of focus for impact surveillance.

The surveillance program will monitor the level of these contaminants in various biota, including fish, to aid in the evaluation of potential harm to the fishery resources, the risk to human and animal consumers of the fish, the status of Great Lakes water quality, and the effectiveness of remedial programs.

Of increasing impact and concern in recent years is the problem of contamination of the fishery resources by toxic substances that affect not only the utilization of these resources as food for man and animals, but possibly also the growth, reproduction, survival, and long-term potential of the fish and fisheries. These impacts have yet to be fully defined.

There are other matters in which fisheries and water quality interrelate. Water quality may have some more direct impact upon spawning areas (e.g., silting), fish food and feeding locations, and impair the preferred habitats of desirable fish species. For example, eutrophication can give rise to low dissolved oxygen levels in the colder waters of the hypolimnion, thus eliminating the preferred habitat of some species. Waste heat provides a new habitat that can give rise to predominance of different species in that area.

Thus there exists the potential for a surveillance program to serve both fisheries and water quality concerns. A surveillance program consisting of assessment of physicochemical parameters of water quality, supported by relevant biological assessment, will provide a more accurate and continuous record of water quality.

Wildlife. Wildlife that use the Great Lakes for their water or food supply are exposed to the contaminants present in the water and aquatic food web. The objective for wildlife surveillance is to document the impact of low

level concentrations of contaminants found in fish and the viability, productivity and tissue residue concentrations in wildlife. The main focus of the wildlife component is on herring gulls, a Great Lakes resident population of fish-eating birds. Herring gulls have among the highest concentrations of numerous organochlorine contaminants of any wild bird population in the Great Lakes.

The biological significance of these toxic contaminants can be studied through monitoring both tissue residue levels and productivity, since research to date suggests a clear inverse association between contaminant levels and productivity. The occurrence of high contaminant levels also presents the opportunity to examine the data and samples (in specimen archives) for as yet unidentified compounds that may be significant in detecting emerging problems.

Links Between Issues and Components

The issues have been selected because of their obvious importance to the human health and well being and to the health of the aquatic ecosystem in the Great Lakes. Operational components of monitoring and surveillance have been designed to address each of the major issues. Evaluation of the issues can be expressed in numerical terms based on data accrued in the operational components.

The monitoring and surveillance Plans, built on a framework of linkages between issues and components, has built-in flexibility (i.e., ability to respond to new issues) which enables response to the dynamic nature inherent in the ecosystem approach. To be an effective management tool, however, the Plans need more than flexibility. The Plans must also have an institutionally derived portion (i.e., operational components) that is fixed so that the practical considerations of program planning and resource commitments can be made. For this reason, the details of the Plans are presented on a component by component basis.

The framework of linkages between the flexible and rigid portions of the Plans is summarized in Tables 1-5. Each table is a summary of operational components needed to provide an information base on which an annual assessment for each issue can be obtained. A table for the Areas of Concern issue is not

included as they are both an issue (i.e., the most polluted areas in the Great Lakes exhibiting impairment of uses) and a specific, multifaceted operational component. As stated earlier, operational programs in Areas of Concern must be individually defined for the specific problems and inherent physiographic and limnological features of these regions.

TABLE 1

CHEMICAL CONTAMINANTS

Operational Component	Superior*	Michigan	Huron	Erie	Ontario	St. Marys River	Detroit St. Clair Rivers	Lake St. Clair	Niagara River	St. Lawrence River
Atmospheric		X	X		X					
Tributaries		X	X	X	X	X	X	X	X	X
Point Sources					X					
Combined Sewer Overflows					X					
Open Lake		X	X	X	X					
Nearshore		X	X	X	X					
Water Intakes			X		X					
Areas of Concern			X		X					
Fish		X	X	X	X	X	X	X	X	X
Wildlife		X	X	X	X					
Acute Toxicity					X					
Sublethal Effects					X					

* The Lake Superior Plan has not been developed and is pending completion of the Intensive Survey Report.

TABLE 2

EUTROPHICATION

Operational Component	Superior *	Michigan	Huron	Erie	Ontario	St. Marys River	Detroit St. Clair Rivers	Lake St. Clair	Niagara River	St. Lawrence River
Atmosphere		X	X		X					
Tributaries		X	X	X	X	X	X	X	X	X
Open Lake - Water		X	X	X	X	X	X	X	X	X
Open Lake - Sediments		X	X	X	X	X	X	X	X	X
Open Lake - Biota		X	X	X	X					
Nearshore - Cladophora			X	X	X					
Beaches - Aesthetics			X		X					
Water Intakes		X	X	X	X					
Point Sources		X		X	X	X	X	X	X	X
Combined Sewer Overflows					X	X	X	X	X	X
Nonpoint Sources						X	X	X		

* The Lake Superior Plan has not been developed and is pending completion of the Intensive Survey Report.

TABLE 3

MICROBIAL CONTAMINANTS

Operational Component	Superior *	Michigan	Huron	Erie	Ontario	St. Marys River	Detroit St. Clair Rivers	Lake St. Clair	Niagara River	St. Lawrence River
Nearshore			X		X					
Beaches		X	X	X	X	X	X	X	X	X
Areas of Concern			X							

* The Lake Superior Plan has not been developed and is pending completion of the Intensive Survey Report.

TABLE 4

RADIONUCLIDE CONTAMINANTS

Operational Component	Superior*	Michigan	Huron	Erie	Ontario	St. Marys River	Detroit St. Clair Rivers	Lake St. Clair	Niagara River	St. Lawrence River
Tributaries		X	X		X	X	X	X	X	X
Open Lake		X	X	X	X					
Nearshore		X		X	X					
Water Intakes		X		X	X	X	X	X	X	X

* The Lake Superior Plan has not been developed and is pending completion of the Intensive Survey Report.

TABLE 5

BIOLOGICAL COMMUNITY AND HABITAT STATUS

Operational Component	Superior*	Michigan	Huron	Erie	Ontario	St. Marys River	Detroit St. Clair Rivers	Lake St. Clair	Niagara River	St. Lawrence River
Aquatic - Planktonic					X					
Aquatic - Nektonic**					X	X	X	X		X
Aquatic - Benthic***					X	X	X	X		X
Terrestrial - Shoreline/wetlands					X	X	X	X		X

* The Lake Superior Plan has not been developed and is pending completion of the Intensive Survey Report.

** Includes fish composition and nursery and spawning habitat.

*** Includes bottom sediments, zoobenthos and macrophytes.

LINKS BETWEEN PLANNING, IMPLEMENTATION, AND REPORTING

As noted previously, the IJC is involved in the planning process for monitoring and surveillance programs but implementation is clearly the responsibility of the Parties and jurisdictions. Yet there must be some follow through from planning to implementation to achieve a higher degree of: 1) data compatibility and quality; 2) availability of reduced and interpretated data for use in synthesis reports; and 3) accountability by agencies responsible for specific components.

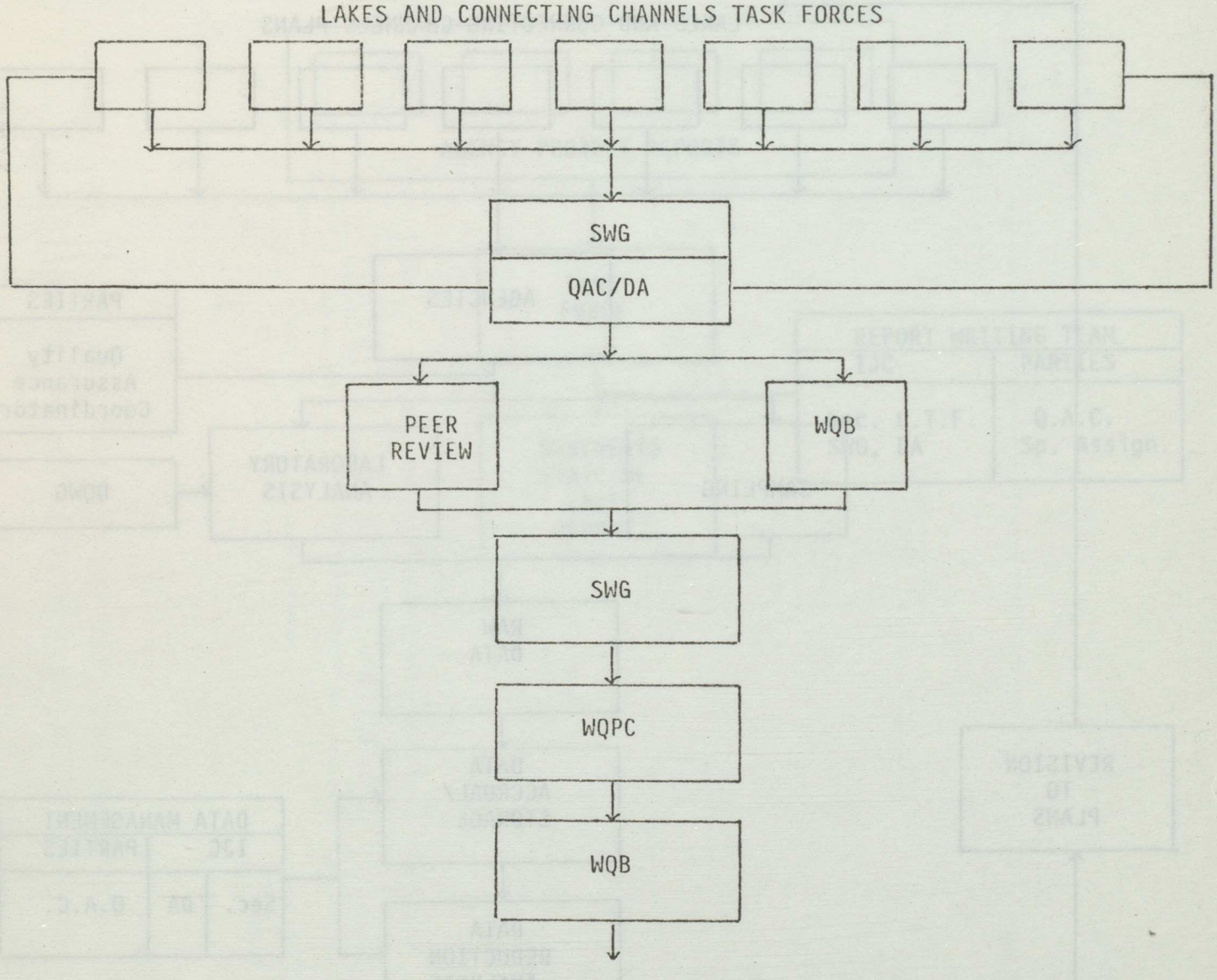
The linkage between planning, implementation, and reporting for Great Lakes monitoring and surveillance programs is outlined in a series of flow diagrams (Tables 6-10). The diagrams illustrate the flow of information and responsibilities at each step of the planning, implementation, and reporting phases of the monitoring and surveillance programs.

The leadership in planning the programs has been the responsibility of the seven lake and connecting channel task forces. Reviews of the draft plans were coordinated by the Surveillance Work Group with the assistance of reviews solicted from experts internal to and external of the Water Quality Board. Acceptance of the plans by the Water Quality Board triggers implementation by the Parties and jurisdictions (Table 6).

To improve the implementation process, the updated GLISP contains more operational details and quality assurance considerations than previously attempted. Quality assurance, formerly directed primarily to analytical laboratory performance, is now broadly viewed to encompass field and laboratory aspects. New positions, the Quality Assurance Coordinator and the Data Management Specialist, were initiated to improve the links between planning and implementation with regards to quality assurance and data management (i.e., data accessing and manipulation for reduction and analysis). Involvement of the Quality Assurance Coordinator (position approved by the Water Quality Board) and the Data Management Specialist (position recommended by the Water Quality Board to be filled by the

TABLE 6

PLANNING PROCESS



LEGEND

SWG = Surveillance Work Group
QAC = Quality Assurance Coordinator
DA = Data Analyst
DQWG = Data Quality Work Group
WQPC = Water Quality Programs Committee
WQB = Water Quality Board
SEC - IJC Secretariat
L.T.F. = Lake and Connecting Channel Task Forces

TABLE 7

IMPLEMENTATION PROCESS

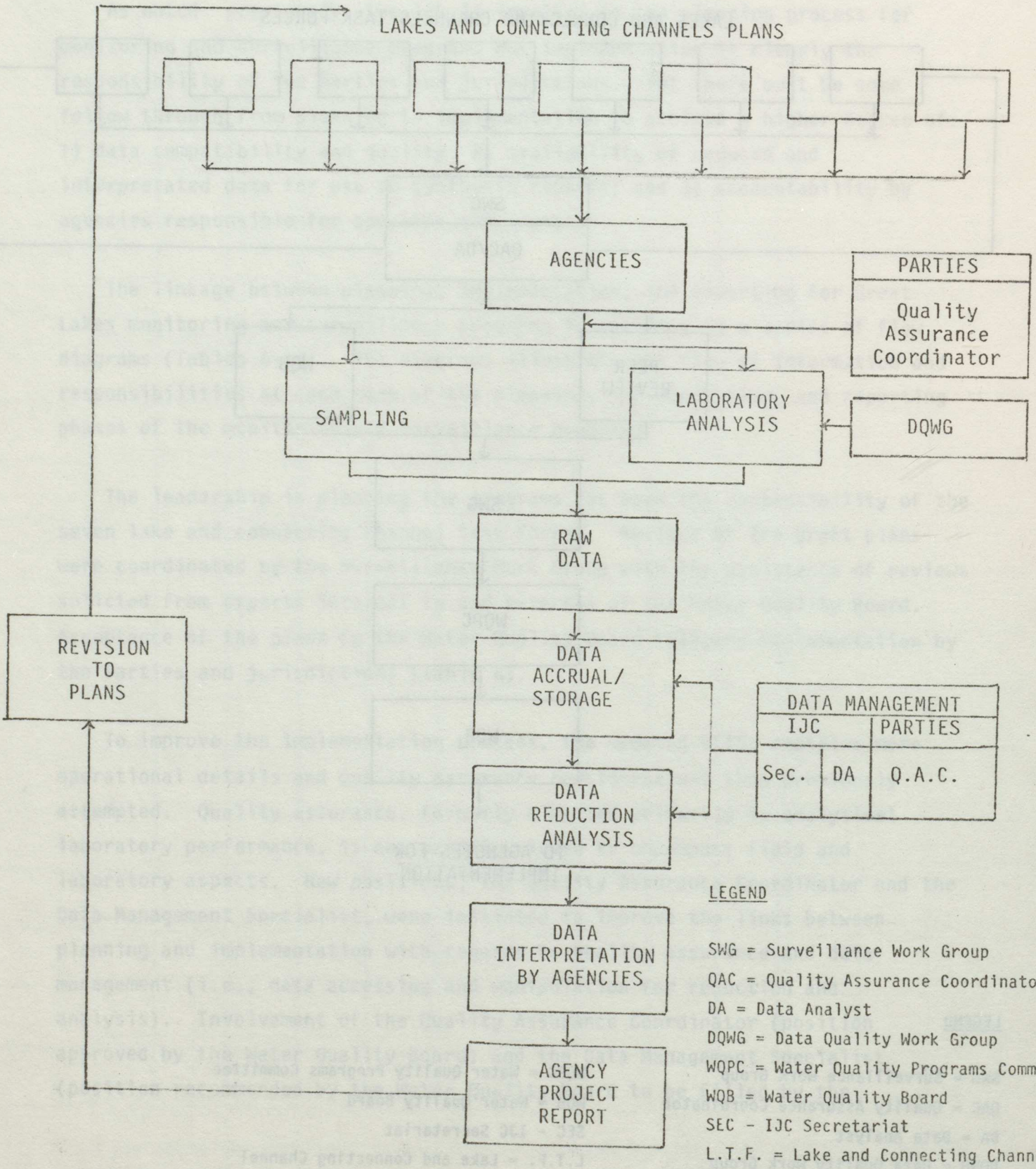
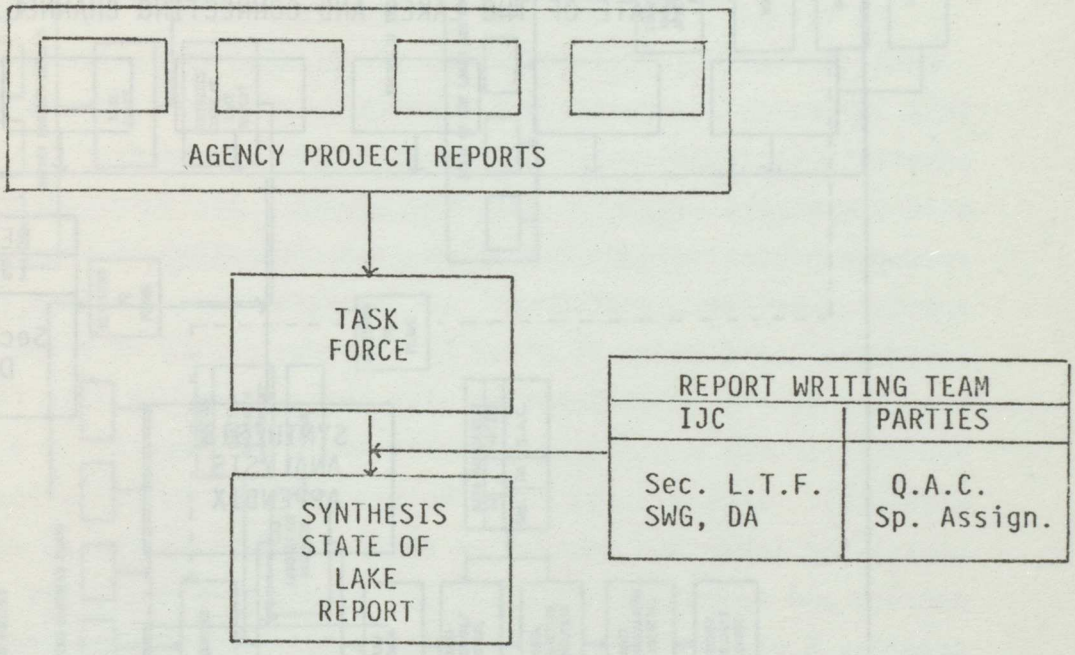


TABLE 8

LAKE AND CONNECTING CHANNEL REPORTS

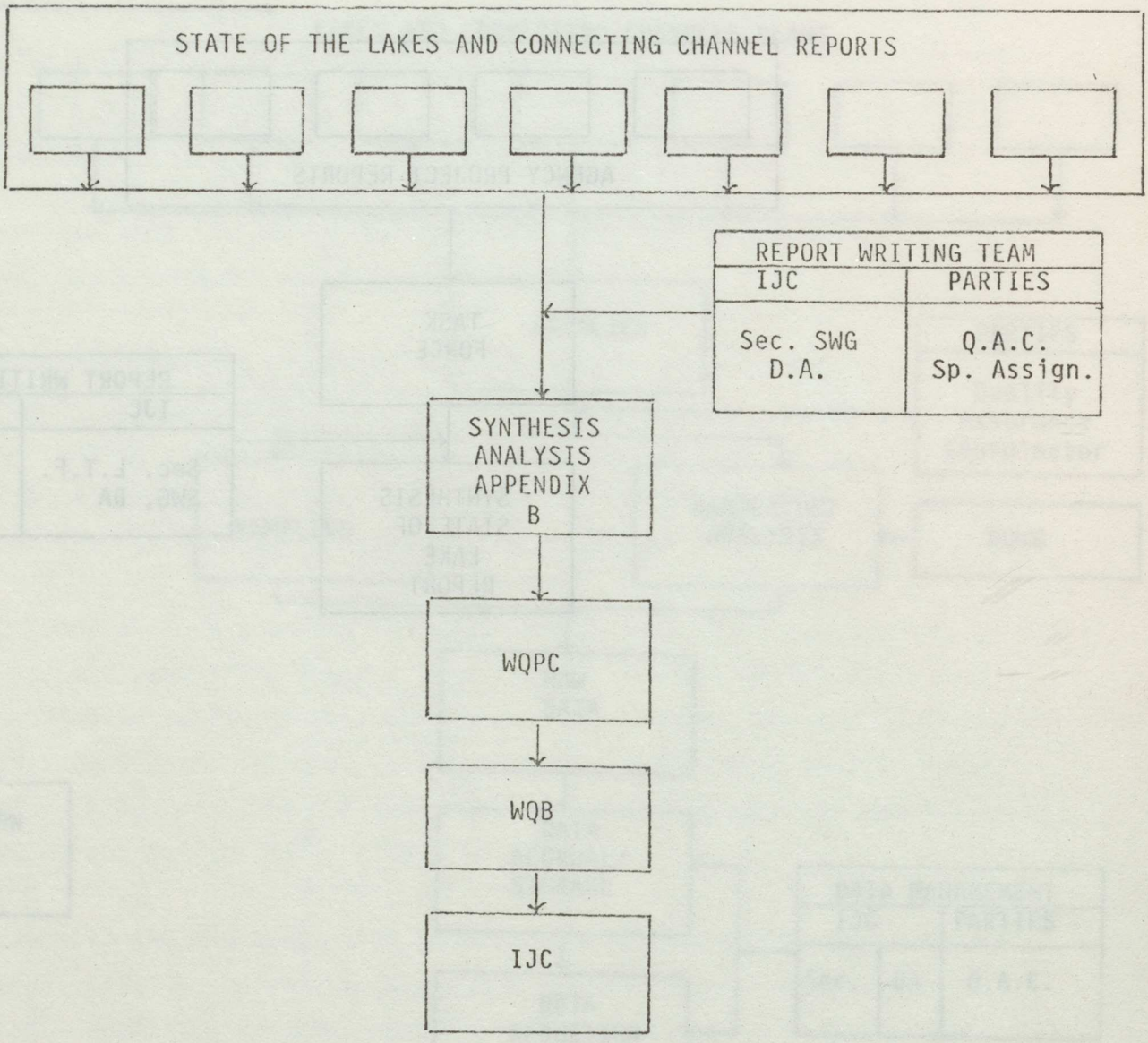


LEGEND

SWG = Surveillance Work Group
QAC = Quality Assurance Coordinator
DA = Data Analyst
DQWG = Data Quality Work Group
WQPC = Water Quality Programs Committee
WQB = Water Quality Board
SEC - IJC Secretariat
L.T.F. = Lake and Connecting Channel Task Forces

TABLE 9

STATUS OF THE GREAT LAKES REPORT

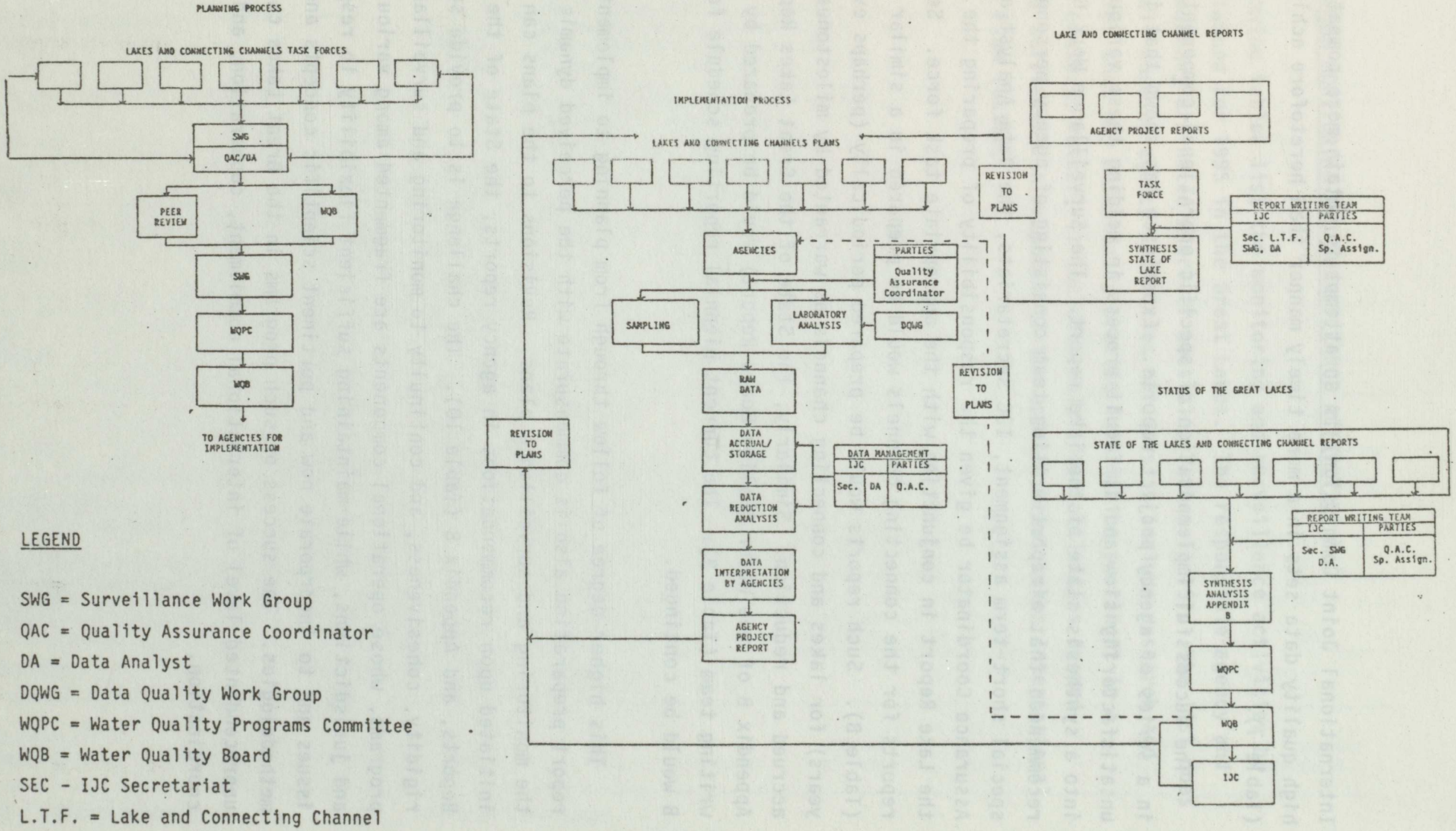


LEGEND

SWG = Surveillance Work Group
QAC = Quality Assurance Coordinator
DA = Data Analyst
DQWG = Data Quality Work Group
WQPC = Water Quality Programs Committee
WQB = Water Quality Board
SEC - IJC Secretariat
L.T.F. = Lake and Connecting Channel Task Forces

TABLE 10

LINKAGES BETWEEN THE PLANNING, IMPLEMENTATION AND
REPORTING PHASES OF THE GREAT LAKES INTERNATIONAL SURVEILLANCE PLAN (GLISP)



LEGEND

SWG = Surveillance Work Group
QAC = Quality Assurance Coordinator
DA = Data Analyst
DQWG = Data Quality Work Group
WQPC = Water Quality Programs Committee
WQB = Water Quality Board
SEC - IJC Secretariat
L.T.F. = Lake and Connecting Channel
Task Forces

International Joint Commission) is an attempt to obtain more compatible and high quality data sets in a more timely manner than heretofore achieved (Table 7).

The successful implementation of specific operational components results in a series of agency project reports. Experience has shown that it is an unsatisfactorily slow and difficult process in melding these various reports into a synthesis state of the lake report. The Surveillance Work Group has recommended that a report writing team consisting of agency personnel on special short-term assignment, IJC secretariats, the Data Analyst and Quality Assurance Coordinator be given the responsibility of preparing the State of the Lake Report in conjunction with the appropriate task force. Separate reports for the connecting channels would be prepared in a similar manner (Table 8). Such reports would be prepared periodically (perhaps every 3 years) for lakes and connecting channels as warranted by milestones in data accrued and reduction. Similarly, the State of the Great Lakes Report (i.e., Appendix B of the Water Quality Board Report) would be prepared by a report writing team (Table 9). The current biennial reporting schedule for Appendix B would be continued.

This higher degree of follow through from planning to implementation to report preparation also is commensurate with the perceived dynamic nature of the monitoring and surveillance plans. Revisions to the plans can be initiated upon recommendations in agency reports, the State of the Lakes Reports, and Appendix B (Table 10). The challenge is to provide sufficient rigidity, cohesiveness, and continuity to monitoring and surveillance programs, whose operational components are fragmented among various agencies and jurisdictions, while maintaining sufficient flexibility to respond to new issues and to incorporate new and pertinent scientific concepts and methodologies. The success of such programs in the Great Lakes calls for an unprecendented level of international commitment, cooperation, and coordination.

1985 GREAT LAKES MONITORING AND SURVEILLANCE ACTIVITIES

The following tables list the monitoring and surveillance activities by each issue planned for 1985 in the Great Lakes. The responsible agency and reporting frequency are noted wherever possible (Tables 11-15). The list does not include all ongoing agency activities nor does it include research and special studies that may potentially provide information pertinent in a surveillance context; rather, it includes only those activities deemed necessary and sufficient in response to the updated Great Lakes International Surveillance Plan (GLISP).

TABLE 11

ISSUE: CHEMICAL CONTAMINANTS CALENDAR YEAR: 1985

OPERATIONAL COMPONENT		SUPERIOR*	MICHIGAN	HURON	ERIE	ONTARIO	ST. MARYS RIVER**	DETROIT & ST. CLAIR RIVERS**	LAKE ST. CLAIR**	NIAGARA & ST. LAWRENCE
ATMOSPHERIC	1		EPA	EPA,DOE	DOE,EPA	DOE,EPA				DOE,EPA
	2		Annually	Annually	Annually	Annually				Annually
TRIBUTARIES	1		EPA,MI,WI,IN CHICAGO MSD	DNR,MOE	MOE,OH,MI DEC,PA,EPA	DEC, MOE				DEC, MOE
	2		Annually	Annually	Annually	Annually				Annually
POINT SOURCES, including CSOs	1		EPA,MI,WI, IN,IL, Chicago MSD			DEC,MOE,DOE EPA				DEC,MOE,DOE EPA
	2					Annually				Annually
OPEN LAKE	1		FWS/EPA	FWS/EPA, U.Mich,DOE DFO	FWS/EPA DFO,CWS	DOE,FWS/EPA, MOE,MNR,DFO, DEC				DOE,FWS/EPA, MOE,MNR,DFO,DEC
	2		Annually	Annually	Annually	Annually				Annually
NEARSHORE	1		EPA,MI,WI IN,IL, Milwaukee	DNR,MOE	FWS,MOE,EPA	DEC,DOH,MOE, MNR,MOH				DEC,DOH,MOE, MNR,MOH
	2		Annually	Annually	Annually	Annually				Annually
AREAS OF CONCERN	1		EPA,MI,WI IN,IL, Milwaukee	EPA,DNR,MOE		MOE,DEC				MOE,DEC
	2		Annually	Variable		Annually				Annually
SPECIAL STUDIES	1		EPA,FWS, FDA,WI,MI,IN IL			DOE,DFO,FWS EPA,DEC,DOH MNR,MOE,MOH				DOE,DFO,FWS EPA,DEC,DOH MNR,MOE,MOH
	2		Annually			Annually/ Variable				Annually/ Variable

1. Responsible Agency
2. Reporting Frequency

* Information pending completion of Intensive Study Report.
** Information pending completion of Upper Connecting Channels Study.

LEGEND:

CWS = Canadian Wildlife Service
DEC = Dept. of Environmental Conservation
DFO = Canada Dept. of Fisheries & Oceans
DOE = Canada Dept. of Environment
DOH = Department of Health
DNR = Department of Natural Resources
EPA = U.S. Environmental Protection Agency
FDA = U.S. Food & Drug Administration
FWS = U.S. Fish & Wildlife Service
IL = Illinois
IN = Indiana
MI = Michigan
MOE - Ontario Ministry of the Environment
MOH - Ontario Ministry of Health
MNR - Ontario Ministry of Natural Resources
MSD = Metropolitan Sanitary District
NY = New York
OH = Ohio
PA = Pennsylvania
WI = Wisconsin

TABLE 12

ISSUE: EUTROPHICATION CALENDAR YEAR: 1985

OPERATIONAL COMPONENT		SUPERIOR*	MICHIGAN	HURON	ERIE	ONTARIO	ST. MARYS RIVER**	DETROIT & ST. CLAIR RIVERS**	LAKE ST. CLAIR**	NIAGARA & ST. LAWRENCE
ATMOSPHERIC	1			EPA,DOE	DOE,EPA	DOE,EPA				DOE,EPA
	2			Annually	Annually	Annually				Annually
TRIBUTARIES	1			DNR,MOE	MOE,OH,MI DEC,PA,EPA	DEC,MOE				DEC,MOE
	2			Annually	Annually	Annually				Annually
POINT SOURCES, including CSOs	1				MI,OH,PA NY,MOE	DEC,EPA, MOE,DOE				DEC,EPA, MOE,DOE
	2				Annually	Annually				Annually
OPEN LAKE	1		EPA	EPA,U.Mich DOE,DFO	EPA	DOE				DOE
	2		Annually	Annually	Annually	Annually				Annually
NEARSHORE	1			DNR,MOE		DEC,MOE,EPA DOE,DOH				DEC,MOE,EPA DOE,DOH
	2			Annually		Annually				Annually
AREAS OF CONCERN	1			EPA,DNR,MOE		MOE,DEC				
	2			Variable		Annually				
SPECIAL STUDIES	1		EPA Chicago Milwaukee							
	2		Annually							

1. Responsible Agency
2. Reporting Frequency

* Information pending completion of Intensive Study Report.
** Information pending completion of Upper Connecting Channels Study.

LEGEND:

CWS = Canadian Wildlife Service
DEC = Dept. of Environmental Conservation
DFO = Canada Dept. of Fisheries & Oceans
DOE = Canada Dept. of Environment
DOH = Department of Health
DNR = Department of Natural Resources
EPA = U.S. Environmental Protection Agency
FDA = U.S. Food & Drug Administration
FWS = U.S. Fish & Wildlife Service
IL = Illinois
IN = Indiana
MI = Michigan
MOE - Ontario Ministry of the Environment
MOH - Ontario Ministry of Health
MNR - Ontario Ministry of Natural Resources
MSD = Metropolitan Sanitary District
NY = New York
OH = Ohio
PA = Pennsylvania
WI = Wisconsin

TABLE 13

ISSUE: MICROBIAL CONTAMINANTS CALENDAR YEAR: 1985

OPERATIONAL COMPONENT		SUPERIOR*	MICHIGAN	HURON	ERIE	ONTARIO	ST. MARYS RIVER**	DETROIT & ST. CLAIR RIVERS**	LAKE ST. CLAIR**	NIAGARA & ST. LAWRENCE
ATMOSPHERIC	1			DNR,MOE						
	2			Annually						
TRIBUTARIES	1									
	2									
POINT SOURCES, including CSOs	1									
	2									
OPEN LAKE	1		EPA							
	2		Annually							
NEARSHORE	1				IJC	DEC,DOH, MOE,MOH				DEC,DOH MOE,MOH
	2				Variable	Annually				Annually
AREAS OF CONCERN	1			EPA,DNR,MOE		Included				Included
	2			Variable		in above				in above
SPECIAL STUDIES	1		WI,MI,IL,IN Municipalities							
	2		Annually							

1. Responsible Agency
2. Reporting Frequency

* Information pending completion of Intensive Study Report.
** Information pending completion of Upper Connecting Channels Study.

LEGEND:

CWS = Canadian Wildlife Service
DEC = Dept. of Environmental Conservation
DFO = Canada Dept. of Fisheries & Oceans
DOE = Canada Dept. of Environment
DOH = Department of Health
DNR = Department of Natural Resources
EPA = U.S. Environmental Protection Agency
FDA = U.S. Food & Drug Administration
FWS = U.S. Fish & Wildlife Service
IL = Illinois
IN = Indiana
MI = Michigan
MOE - Ontario Ministry of the Environment
MOH - Ontario Ministry of Health
MNR - Ontario Ministry of Natural Resources
MSD = Metropolitan Sanitary District
NY = New York
OH = Ohio
PA = Pennsylvania
WI = Wisconsin

TABLE 14

ISSUE: RADIONUCLIDE CONTAMINANTS CALENDAR YEAR: 1985

OPERATIONAL COMPONENT		SUPERIOR*	MICHIGAN	HURON	ERIE	ONTARIO	ST. MARYS RIVER**	DETROIT & ST. CLAIR RIVERS**	LAKE ST. CLAIR**	NIAGARA & ST. LAWRENCE
ATMOSPHERIC	1									
	2									
TRIBUTARIES	1					MOE,DEC				
	2					Variable				
POINT SOURCES, including CSOs	1									
	2									
OPEN LAKE	1		NOAA	DOE		DOE				DOE
	2		Annually			5 yrs.				5 yrs.
NEARSHORE	1					MOE,DEC				
	2					Variable				
AREAS OF CONCERN	1									
	2									
SPECIAL STUDIES	1									
	2									

1. Responsible Agency
2. Reporting Frequency

* Information pending completion of Intensive Study Report.
** Information pending completion of Upper Connecting Channels Study.

LEGEND:

CWS = Canadian Wildlife Service
DEC = Dept. of Environmental Conservation
DFO = Canada Dept. of Fisheries & Oceans
DOE = Canada Dept. of Environment
DOH = Department of Health
DNR = Department of Natural Resources
EPA = U.S. Environmental Protection Agency
FDA = U.S. Food & Drug Administration
FWS = U.S. Fish & Wildlife Service
IL = Illinois
IN = Indiana
MI = Michigan
MOE - Ontario Ministry of the Environment
MOH - Ontario Ministry of Health
MNR - Ontario Ministry of Natural Resources
MSD = Metropolitan Sanitary District
NY = New York
OH = Ohio
PA = Pennsylvania
WI = Wisconsin

TABLE 15

ISSUE: BIOLOGICAL COMMUNITY AND HABITAT STATUS CALENDAR YEAR: 1985

OPERATIONAL COMPONENT		SUPERIOR*	MICHIGAN	HURON	ERIE	ONTARIO	ST. MARYS RIVER**	DETROIT & ST. CLAIR RIVERS**	LAKE ST. CLAIR**	NIAGARA & ST. LAWRENCE
ATMOSPHERIC	1									
	2									
TRIBUTARIES	1									
	2									
POINT SOURCES, including CSOs	1									
	2									
OPEN LAKE	1		EPA,FWS		EPA,CWS	FWS,DEC,MNR DFO				
	2		Annually			Annually				
NEARSHORE	1				EPA,MOE	DEC,FWS,MNR MOE				
	2				Annual	Annually				
AREAS OF CONCERN	1									
	2									
SPECIAL STUDIES	1		EPA,FWS			FWS,DEC,MNR DFO,MOE,DOE				FWS,DEC,MNR DFO,MOE,DOE
	2		Annually			Variable				Annually

1. Responsible Agency
2. Reporting Frequency

* Information pending completion of Intensive Study Report.
** Information pending completion of Upper Connecting Channels Study.

LEGEND:

CWS = Canadian Wildlife Service
DEC = Dept. of Environmental Conservation
DFO = Canada Dept. of Fisheries & Oceans
DOE = Canada Dept. of Environment
DOH = Department of Health
DNR = Department of Natural Resources
EPA = U.S. Environmental Protection Agency
FDA = U.S. Food & Drug Administration
FWS = U.S. Fish & Wildlife Service
IL = Illinois
IN = Indiana
MI = Michigan
MOE - Ontario Ministry of the Environment
MOH - Ontario Ministry of Health
MNR - Ontario Ministry of Natural Resources
MSD = Metropolitan Sanitary District
NY = New York
OH = Ohio
PA = Pennsylvania
WI = Wisconsin