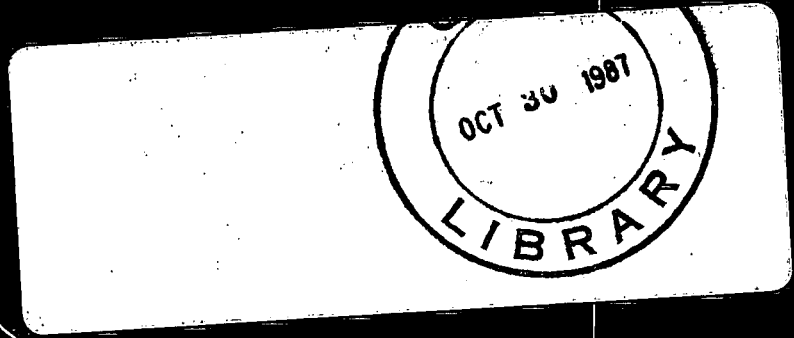




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# ANNUAL REPORT 1984 INLAND WATERS DIRECTORATE ONTARIO REGION



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Inland Waters Directorate  
Ontario Region

ANNUAL REPORT  
1984

DEPARTMENT OF THE ENVIRONMENT

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## Summary

This report describes the activities and accomplishments of Inland Waters Directorate (IWD), Ontario Region during 1984. IWD, Ontario Region is a component of the federal Department of the Environment. As the lead federal agency for water management in the Ontario Region, IWD plans and participates in national and international water management programs to achieve economic and social benefits, while giving full consideration to environmental concerns. During the year, significant events in Great Lakes matters involving IWD included the release of the final report of the Niagara River Toxics Committee, the presentation of the final report of the International Great Lakes Technical Information Network Board and the completion of the first annual spring surveillance cruise on Lake Huron. The first permanent water quality monitoring station was installed on the Ottawa River in 1984.

The Ministers for Environment Canada and Ontario Natural Resources were requested to amend the current Canada-Ontario Flood Damage Reduction Agreement. The new provincial policy for floodplain management was released permitting the resumption of work towards final designations for a number of floodplain projects. All three phases of the Muskoka River Water Management Study were completed and public meetings were held to obtain public input to the final study report.

April 1, 1984 marked the beginning of the tenth year of the Canada-Ontario Cost Share Agreement on Water Quantity surveys. Under this agreement IWD through its Water Resources Branch cooperates with provincial agencies in collecting and publishing streamflow, water level, and sediment data on a cost share basis. As of April 1, 1984, the Water Survey of Canada Division of the Branch operated a network of 373 hydrometric stations in the province. The newly formed Hydrology Division began a review of the hydrometric network in order to increase the effectiveness of the data collection network. The Branch also installed a new computer system to make the data processing and dissemination process more efficient.

The major public information activities of IWD in 1984 consisted of participation in the organization and staging of Environment Week activities in Burlington in June, the presentation of a public information display in North Bay during Environment Week, participation in the organization and manning of a major departmental display at the Canadian National Exhibition in Toronto in August, and participation in the Regional Public Consultation Conference held in Hamilton in November.

In 1984 IWD, Ontario Region administered and managed resources amounting to 6.6 million dollars and 88.5 person-years. The resources included operational funding under international and federal-provincial agreements as well as grants and contributions under similar agreements. Significant federal-provincial cost-shared funding administered in 1984 included Canada-Ontario Flood Damage Reduction Agreement funding (\$400,000 for 1984-85) and Canada-Ontario Great Lakes Water Quality Agreement funding (\$1,200,000 for 1984-85). Approximately \$750,000 is expected to be cost recovered from the Province in 1984/85 under the Canada-Ontario Cost Share Agreement on Water Quantity Surveys.

A list of 1984 publications and presentations by staff of IWD, Ontario Region is included in this report.

A French translation of the Annual Report is available on request.

## Résumé

Le présent rapport décrit les activités et les réalisations de la Direction générale des eaux intérieures (DGEI), région de l'Ontario, en 1984. La DGEI, région de l'Ontario, relève du ministère fédéral de l'Environnement. La DGEI, principal organisme fédérale en matière de gestion des eaux dans la région de l'Ontario, collabore à des programmes nationaux et internationaux de gestion des eaux destinés à procurer des avantages économiques et sociaux, tout en accordant une grande importance aux questions environnementales. Durant l'année, la DGEI a participé à des événements importants touchant les Grands Lacs, notamment la publication du rapport final rédigé par la Comité d'étude sur les substances toxiques dans la rivière Niagara, la présentation du rapport final du Conseil international d'étude du réseau technique et la réalisation de la première croisière printanière annuelle de surveillance sur le lac Huron. La première station permanente de contrôle de la qualité de l'eau a été installée sur la rivière des Outaouais.

Le ministre de l'Environnement Canada et celui des Richesses naturelles de l'Ontario ont amendés l'Accord Canada-Ontario sur la réduction des dommages causés par les inondations. La nouvelle politique provinciale en matière de gestions des zones inondables a été communiquée permettant ainsi la reprise des travaux pour un certain nombre de projets. Les trois phases de l'étude sur la gestion des eaux de la rivière Muskoka ont été complétées et des réunions publiques ont été tenues afin d'obtenir les commentaires du public pour le rapport d'étude final.

Le 1<sup>er</sup> avril 1984 a marqué le début du dixième anniversaire de l'Accord Canada-Ontario à frais partagés sur les relevés hydrométriques. En vertu de cet accord, la DGEI, par l'entremise de sa Direction des ressources en eau, collabore avec des organismes provinciaux à frais partagés, de données sur les débits, les niveaux d'eau et les sédiments. La 1<sup>er</sup> avril 1984, la Division des relevés hydrologiques du Canada (partie intégrante de la Direction) exploitait un réseau de 373 stations hydrométriques dans la province. La Division hydrolique, récemment créée, a commencé une révision du réseau hydrométrique dans le but d'augmenter l'efficacité du réseau de collecte des données. La Direction a de plus procédé à l'installation d'un nouveau système d'ordinateur de façon à optimiser les processus de traitement et de propagation des données.

En 1984, les principales activités de la DGEI en matière d'information publique ont été d'abord sa participation simultanées à Burlington et à North Bay, en juin à la Semaine de l'Environnement, ensuite sa participation à l'organisation et la réalisation d'une présentation importante sur le ministère à l'Exposition nationale canadienne de Toronto en août et finalement sa participation à une Conférence de consultation publique régionale tenue à Hamilton en novembre.

En 1984, la DGEI, région de l'Ontario, a administré et géré des ressources de l'ordre de 6.6 millions de dollars et de 88.5 années-personnes. Ces ressources comprennent des fonds d'exploitation versées en vertu d'accords internationaux et fédéraux-provinciaux, ainsi que des subventions et des contributions attribuées dans le cadre d'accords semblables. Les frais partagés fédéraux-provinciaux administrés en 1984 comportent une subvention de 400 000 \$ versée pour 1984-85 dans le cadre de l'Accord Canada-Ontario de réduction des dommages causés par les inondations et une subvention de 1 200 000 \$ versée pour 1984-85 dans le cadre de l'Accord Canada-Ontario sur la qualité de l'eau dans les Grands Lacs. Un montant d'environ 750 000 \$ devrait être versé par la Province en 1984-85 conformément à l'Accord Canada-Ontario à frais partagée sur les relevés hydrométriques.

Le présent rapport comporte également une liste des publications et des présentations faites par les personnel de la DGEI, région de l'Ontario, en 1984.

La version française du rapport annuel est disponible sur demande.

## 1.0 Introduction

Inland Waters Directorate (IWD), Ontario Region, is a component of the federal Department of the Environment (DOE). As the lead federal agency for water management in the Ontario Region, IWD plans and participates in national and international water management programs to achieve economic and social benefits, while giving full consideration to environmental concerns.

The primary role of IWD, Ontario Region is related to the gathering and dissemination of water related information and to the explaining and predicting of the behaviour of the quantity and quality of the waters in Ontario with particular emphasis on the Great Lakes and their interconnecting channels. IWD plays a major role in water use planning and management investigations including flood damage reduction programs in cooperation with the province, and in addressing international water management problems along the Canada-United States boundary.

The Directorate consists of three Branches: Water Planning and Management Branch, Water Resources Branch and Water Quality Branch.

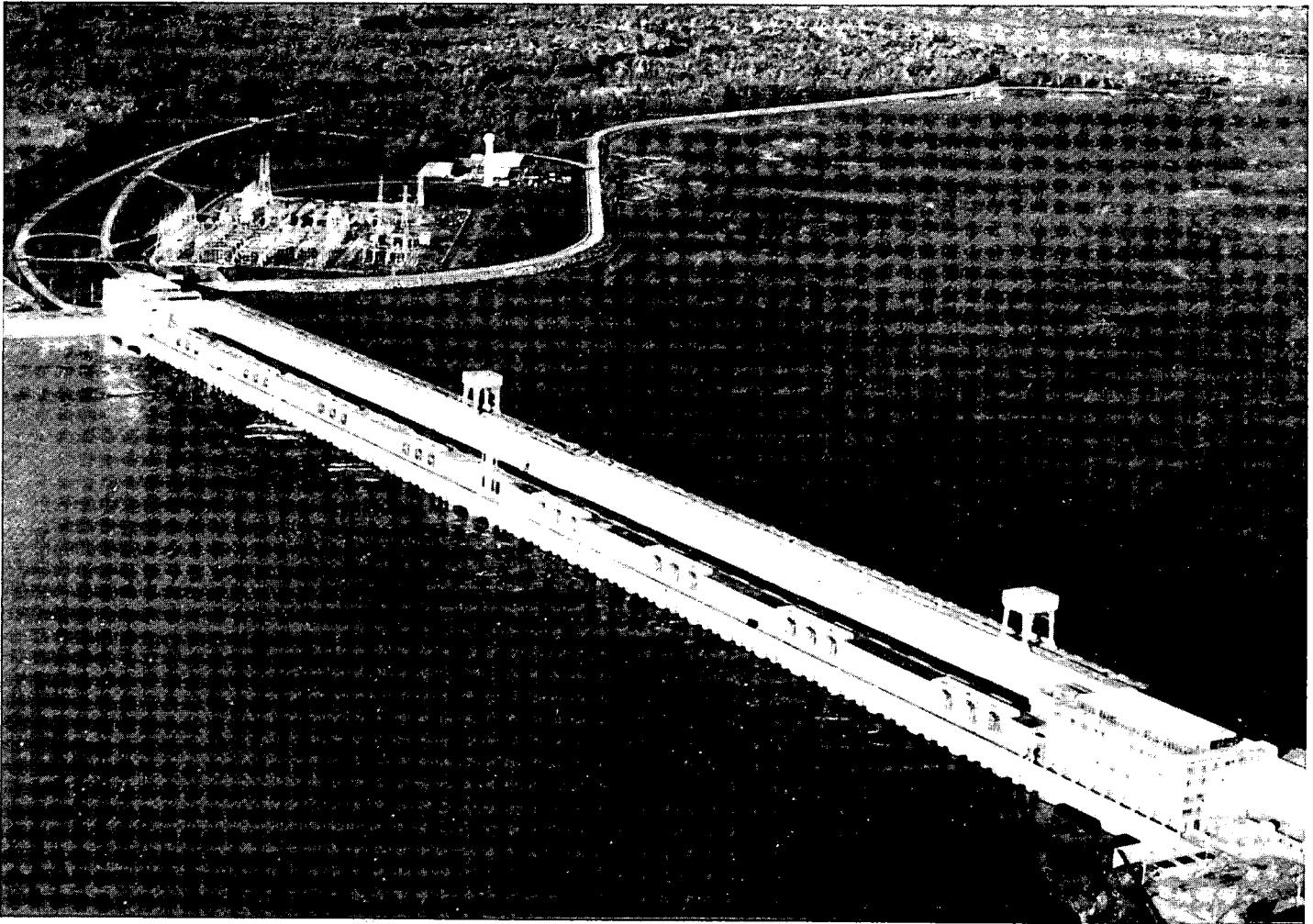
The Water Planning and Management Branch (WP&MB) administers and implements federal, federal-provincial, and international water management projects. The Branch provides technical support to all the International Joint Commission's (IJC) Great Lakes Boards of Control in the regulation of the water levels and outflows of Lakes Superior and Ontario and water levels at Niagara Falls. In addition, the Branch carries out special studies for IJC Study Boards, such as the recently completed International Great Lakes Technical Information Network Board, and other studies aimed at further improvements in Great Lakes regulation. WP&MB also implements federal-provincial water management projects under the Canada Water Act (CWA) relating to flood damage reduction, flood control, and shoreland management. WP&MB reviews federally-initiated and federally-funded projects for environmental impact under the Environmental Assessment and Review Process. The Branch also gathers and evaluates social and institutional information and investigates the socio-economic implications of resource policies and programs.

The Water Resources Branch (WRB) operates and maintains a network of streamflow, water level, and sediment stations throughout Ontario and the Great Lakes system jointly funded with the Province. The Branch publishes annual summaries of the data collected and provides more detailed surface water and sediment information and technical advice for specific projects and programs in the region such as special requests from various IJC Boards of Control, baseline studies and environmental assessments. The Branch also complements its data collection activities with network evaluation and planning activities, as well as data interpretation studies.

The Water Quality Branch (WQB) collects, interprets and disseminates information about the quality of the surface waters of federal interest in Ontario including the Great Lakes-St. Lawrence River System, the Ottawa River, major rivers tributary to Hudson Bay and the Rainy and Winnipeg Rivers. The Branch provides technical advice and support to the Water Quality Board of the International Joint Commission and carries out special studies for other international bodies such as the Niagara River Toxics Committee. In addition, water quality studies are carried out in support of the National Water Quality Assessment Program, the Toxic Chemicals Program, and Environmental Assessment and Baseline Studies Program.

The following is a description of the major program activities and achievements of the Directorate during 1984.

## 2.0 Great Lakes and St. Lawrence River Basin Water Level Control Program



*The Moses-Saunders power plants on the St. Lawrence River at Cornwall, Ontario.*

Human activities and the ecosystem in the Great Lakes-St. Lawrence basin are affected significantly by water level fluctuations in the lakes and their interconnecting channels. The fluctuations of these levels and channel flows have been recognized by the Governments of Canada and the United States as an important boundary water issue, affecting shore erosion, hydro-electric power generation, navigation, recreation, water supply for domestic and industrial purposes and the environment. The International Joint Commission was established in 1909 by the two governments to seek common solutions in their joint interest and in accordance with the agreed rules or principles set out in the Boundary Waters Treaty. This has since led to several international agreements relating to the levels and flows in the Great Lakes-St. Lawrence River System.

Inland Waters Directorate, Ontario Region, provides assistance and advice to the IJC and other bilateral entities in carrying out the terms of the various agreements between the two countries.

### 2.1 Great Lakes Boards of Control

The Water Planning and Management Branch (WP&MB) continued to support the IJC's International Lake Superior Board of Control and International St. Lawrence River Board of Control in regulating the outflows of Lake Superior and Lake Ontario. The Branch also supported the IJC's International Niagara Board of Control in water management activities in the Lake Erie-Niagara River area. The significance of IWD's involvement is demonstrated by the fact that IWD provides the chairmen to two of these IJC Boards and two of the Boards' Working Committees. Other support includes secretarial duties and technical studies and operations.

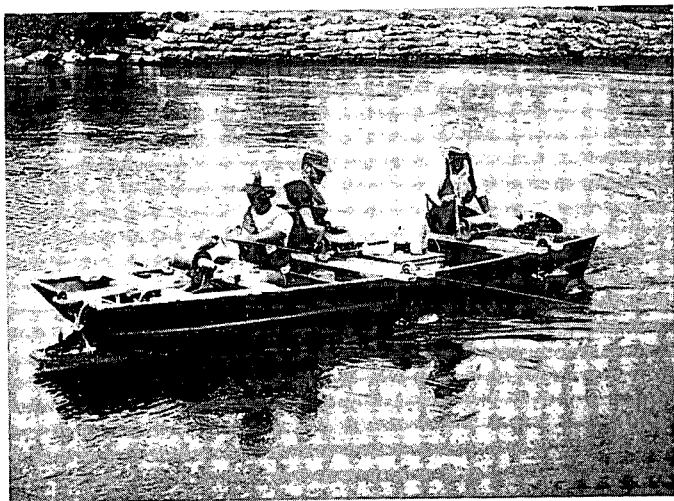
Throughout the year the Branch reviewed the various hydrologic factors, including ice conditions in the rivers, which influence the regulation of Lake Superior and Lake Ontario and provide advice in their regulation. High water supplies kept the water levels of Lake Superior slightly above

normal throughout 1984; and Lakes Michigan, Huron, Erie and St. Clair about one-half metre above their normal values. Lake Ontario was generally 0.2 metres above normal in the first half of 1984 and near normal by year end.

The 16-gate Lake Superior Compensating Works on the St. Marys River was constructed more than sixty years ago and is a main component in the facilities used to regulate the outflow of Lake Superior. In early 1982 the Superior Board completed a report on the structural stability of the Compensating Works. In response to the findings of this report, repairs to the Compensating Works have been undertaken and are being monitored.

The average Canadian power diversion at the St. Marys River in 1984 was 32,000 cubic feet per second. The increased power diversion capabilities at Sault Ste. Marie has resulted in reductions of flows in the St. Marys Rapids. Throughout the year, gates at the Compensating Works were set, as directed by the IJC, to provide no less protection for the Rapids fisheries than that prior to the Canadian power re-development. On September 12, WR&MB staff briefed the IJC on the activities of the Superior Board, and provided the Commissioners with a tour of the regulatory facilities at Sault Ste. Marie.

In January the WRB submitted the report "Discharge Measurements at Francis H. Clergue Generating Station, August-October 1983" to the Lake Superior Board of Control. The report presents the results of eleven discharge measurements taken in the power canal of the generating station during August-October and compares the results with the corresponding discharges measured by the flowmeters (one flowmeter for each of the three turbines) installed in the plant. Great Lake Power Ltd. uses the flowmeters to determine total flow through the station and reports the data to the Lake Superior Board of Control. The report confirms that the flowmeters are sufficiently accurate over the range of flows measured (between 2/3 and full capacity of tur-



*Discharge measurement at the Welland Canal.*

bines). The Branch also completed the report "Leakage Measurements at Sault Lock on the St. Marys River at Sault Ste Marie, Ontario". The leakage measurements were carried out in 1983 for Parks Canada, operator on the canal.

The International Niagara Board of Control was established in 1953 by the IJC following the signing of the 1950 Niagara Treaty between Canada and the United States. This treaty established flow requirements for Niagara Falls in order to preserve their scenic beauty as well as regulations regarding the diversion of water for power purposes. During 1984, WP&MB monitored the regulation of water levels in the Chippawa-Grass Island Pool which is located upstream of the Falls, as well as flows over Niagara Falls for compliance with the Niagara Treaty.

The Niagara Board continued to advise the IJC on the operation of the Lake Erie-Niagara River Ice Boom. The boom is installed by Ontario Hydro and the New York Power Authority each winter at the head of the Niagara River to protect their power intakes from ice. Local residents have in the past opposed the use of the boom, alleging that its presence prolongs the ice season in the area. Following the completion of a study of the boom and its effects by the United States National Academy of Science, the IJC issued a new order in early 1984 governing the operation of the boom, and directed the Niagara Board to monitor the operation. WP&MB staff carried out periodic reconnaissance flights over Lake Erie and the Niagara River to survey ice conditions, and coordinate with the power entities the timing of the boom's removal.

In the fall of 1984, IWD completed a series of levelling and surveys in the upper Niagara River. The survey results confirmed the correct and common datum used at all water level gauges and their controlling benchmarks on both sides of the river. The survey also confirmed the difference in water surface elevations across the river in the vicinity of the Peace Bridge. Any subsequent modelling of this reach of the river would have to consider those flow characteristics. By year end, re-calibration of the Niagara River backwater model commenced and should be completed in early 1986. This model is being used by WP&MB to determine the effect of landfills in the Niagara River on the water level and outflow of Lake Erie.

WP&MB participated in a study of the proposed Bird Island Pier remedial works on the U.S. side of the river. The works are intended to provide a safer environment for fishermen who fish off the pier. In 1984, WP&MB also initiated a study of the recession rate of the Horseshoe Falls. Air photos taken by the U.S. Army Corps of Engineers in late 1984 show that, with the exception of some minor erosion, the current crestline has not changed much since last surveyed in 1969.

The WRB and U.S. Army Corps of Engineers took a series of 22 discharge measurements at the American Falls during October-November. The results showed that the



rating curve of the American Falls gauge is sufficiently accurate for its purpose. The WRB, WP&MB, and U.S. Army Corps of Engineers also took a series of 10 discharge measurements at the Welland Canal supply weir in August to verify the weir rating. Flows through the supply weir are a significant portion of the total flow diverting from Lake Erie and are reported by the St. Lawrence Seaway Authority on a regular basis to the International Niagara Committee. Results of the measurement program suggested some recent shifting of the weir rating may have taken place. Additional measurements will be taken in 1985 to define the rating curve more accurately.

WP&MB assisted the International Niagara Committee, established by the Governments of Canada and the United States pursuant to the Niagara Treaty of 1950, in determining the amounts of water available and the amounts used for the various purposes of the Treaty. Weekly power inspections were carried out at the Niagara power plants to ensure accuracy in the reporting of power diversions by the power entities.

WP&MB also monitored the existing water transfer arrangements at Niagara between Ontario Hydro and the New York Power Authority (NYPA). During 1984, some 35 million cfs-hours of Canada's share of the Niagara River water were directed to the U.S. power plant to maximize energy production. The Branch provided advice on this subject to officials of IWD-Ottawa and External Affairs. Since 1982 when NYPA announced a plan to expand its power installation at Niagara Falls, WP&MB has been monitoring the proposal closely and provided advice to the Niagara Board and the International Niagara Committee. Since two of the power plants in Canada are not as efficient as the U.S. plants, the U.S. power expansion could further increase the water transfer. In the summer of 1984, WP&MB staff toured the New York State Barge Canal and assisted the Niagara Working Committee in preparing a background paper on its diversion. WP&MB also reviewed a proposal by a U.S. company to re-develop the Burt Dam that would divert, for power purposes, water from the New York State Barge Canal and ultimately from the Niagara River. Advice on the Burt Dam proposal was provided to the IJC.

In late 1984 when the lift bridge at Valleyfield, Quebec, became inoperable, thus stopping all Seaway traffic, WP&MB intensified its ice forecast surveys in the upper St. Lawrence River. Assistance was provided to the International St. Lawrence River Board in Lake Ontario regulation, as well as to the Seaway Authority in determining the Seaway closing date.

IWD supported the Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data, by undertaking chairman, secretarial and technical duties. WP&MB representatives coordinated data with United States officials pertaining to the Great Lakes water levels, outflows and supplies in a manner prescribed by the Coordinating Commit-

tee. Following the completion of all field surveys in 1983, the Committee commenced developing techniques and procedures to re-calculate elevations for the benchmarks in the Great Lakes-St. Lawrence River system on the International Great Lakes datum. The datum defines a reference plane for the water levels of the Great Lakes relative to sea level. This datum was last established for the year 1955, but requires updating because of the continuous, but uneven movement of the Earth's crust. New elevations for the Great Lakes benchmarks, based on the IGLD (1980), will be computed by 1986.

The draft report "Procedures for Discharge Measurements in the Great Lakes Connecting Channels and the St. Lawrence River" was prepared by WRB for the River Flows Sub-Committee of The Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data. The report outlines the accepted procedures for discharge measurements in the interconnecting channels (St. Marys, St. Clair, Detroit, Niagara, and St. Lawrence Rivers) and describes the various methods used to measure discharge. WRB provided technical input to the report "Hydraulic Discharge Measurements and Regime Changes in the Great Lakes Connecting Channels and the St. Lawrence River, 1900-1978" for the River Flows Sub-Committee. The report is being reviewed by the U.S. Army Corps of Engineers and describes the various measurement programs and water resources developments which have taken place on the interconnecting channels and St. Lawrence River.

Ongoing Great Lakes level studies and operations include: hydrologic modelling of the Great Lakes, and the use of airborne gamma radiation survey to measure snowpack water equivalence in the Lake Superior basin. To provide ground reference data for this latter project, the WRB collected a total of 643 soil samples and analyzed the samples for moisture content. These projects were carried out in cooperation with other Canadian and United States agencies to determine the feasibility of using real-time data and hydrologic models to forecast basin water supplies and thus, improve the regulation of the Great Lakes.

In mid 1984, IWD joined in a study led by the Atmospheric Environment Service on the effects of doubling of carbon dioxide in the earth's atmosphere on Ontario's climate and economy. Initial IWD contributions include analysis of the hydrologic impacts on Great Lakes levels and outflows. Efforts in 1985 will be expanded to include the socio-economic and environmental aspects, hydrologic effects on rivers and streams, and water quality impacts.

## 2.2 Investigative and Engineering Boards

In 1979, the IJC established the International Great Lakes Technical Information Network Board to examine and provide advice and recommendations on unmet hydraulic, hydrologic and meteorological data needs in order to im-

prove the data collection network in the Great Lakes region. The Canadian Chairman of the Board and its two committees are from WP&MB. The Board submitted its final report to the IJC in late 1984, and the Committees' joint report is scheduled to be printed in early 1985. The report recommends improvement in the transmitting of data to users as well as automation of the data collecting stations. New hydrometeorological stations were recommended in the northern remote area where station densities are low. The Board also urged the IJC and its Board of Control to keep pace with the rapid advancement in data collection technology, and stressed closer coordination between the data users and the suppliers. Finally, the Study Board urged the IJC to promote research in weather forecasting and Great Lakes hydrologic modelling.

### 3.0 Great Lakes Basin Water Pollution Program

The Great Lakes represent 80 percent of North America's supply of surface freshwater. They sustain life, commerce, industry, and recreation for an estimated 7 million Canadians and 30 million Americans. One out of every three Canadians live in the basin and one-half of all manufactured goods of the country are generated there. The major urban centres in the basin rely on the Great Lakes for a ready source of water for domestic and industrial use and as assimilators of their wastes. The Great Lakes are thus a priceless resource of vital importance to all facets of life and activity in the Great Lakes Basin. The quality of their waters is a basic concern to Canada in general and the Ontario Region in particular.

On April 15, 1972, the Canadian and U.S. governments signed the Great Lakes Water Quality Agreement to prevent further deterioration of the Great Lakes and to provide a basis for improving existing water quality. A new agreement was signed on November 22, 1978. Whereas the 1972 Agreement placed its emphasis on the control of phosphorus, the new Great Lakes Water Quality Agreement emphasizes control of pollution from toxic substances and the control and prevention of pollution from industrial and municipal sources. Numerical water quality objectives for some 40 substances have been specified in the new Agreement. The IJC has been given the responsibility to overview the progress of the two governments in the implementation of the Agreement. Inland Waters Directorate, Ontario Region provides extensive membership and scientific support to the Boards and Committees assisting the IJC in its responsibilities under the Agreement. It also is a major participant in the federal response to the requirements of the Agreement. Inland Waters Directorate activities related to the Agreement include:

(a) monitoring and surveillance of pollution loadings to the lakes, conditions in the lakes, and lake-related activities to ensure the water quality objectives are being met and to determine the effectiveness of remedial measures;

(b) providing advice on the effectiveness of control policies and measures;

(c) defining and continual refining of water quality objectives; and

(d) identifying new and emerging pollution problems.

The Governments of Canada and Ontario signed the Canada-Ontario Agreement on Great Lakes Quality (COA) in 1971 which was extended in 1976 for a further five years. That Agreement provided the instrument for the cooperation of the two jurisdictions in clean-up efforts in the Great Lakes and for Ontario's coordination and cooperation with government agencies in the United States. The Canada-Ontario Agreement also provided for the cost-sharing of provincial surveillance activities on a 50-50 basis. In the 1984-85 fiscal year Canada's share of surveillance costs under the Canada-Ontario Agreement amounted to \$1,200,000. The Director of IWD, Ontario Region is a member of the Review Board which is responsible for overseeing the implementation of the COA.

In recognition of the added responsibilities for Canada under the 1978 Canada-U.S. Agreement, Canada and Ontario initiated the renegotiation of the Canada-Ontario Agreement in 1979. The revised Canada-Ontario Agreement was signed in July 12, 1982 and is effective to March, 1985. The new agreement continues cost-shared programs up to a maximum contribution of \$1,200,000. In addition, \$65,000,000 of federal funds have been made available to the province for the period 1982-85 to assist in the completion of municipal sewage facilities construction to meet the requirements of the 1978 Canada-U.S. Agreement.

#### 3.1 IJC Water Quality Board

Inland Waters Directorate continued to provide extensive support to the IJC Water Quality Board and its committees. Staff of IWD, Ontario Region serve on the Board, the Board's Water Quality Programs Committee and Surveillance Work Group. IWD, Ontario Region personnel were also extensively involved in the preparation of the Water Quality Board's Progress Report for 1984 which was presented to the IJC at its November, 1984 meeting with the Board in Winnipeg, Manitoba. The 1984 Progress Report focused on four major issues — Toxic substances and management strategies for their control; surveillance and monitoring; areas of concern; and, the status of phosphorus control programs.

The Board reported on progress in the development of surveillance and monitoring plans for each of the Great Lakes and interconnecting channels and presented the rationale for the plans. A review of progress for the 21 Class "B" Areas of Concern identified in 1983 was presented. Progress on the 18 Class "A" Areas of Concern had been reported in 1983 to the IJC. An up-date on the phosphorus

load reduction plans of the parties to the Agreement was provided.

During 1984 IWD, Ontario Region personnel participated extensively on a number of Lake Task Forces responsible for preparing Surveillance Plans for each of the Great Lakes. These individual lake plans, parts of which were being implemented in 1984, will be put together by the Surveillance Work Group in the form of a revised Great Lakes International Surveillance Plan (GLISP). The current version of the GLISP was first published in 1980. It is anticipated that the revised GLISP will be finalized in 1985 and presented to the Water Quality Board.

### 3.2 *Canada-U.S. Open Lake Surveillance and Analysis*

#### *Lake Ontario*

Two water quality surveillance cruises were completed in the spring of 1984 by the Canadian research ship CSS Limnos. The National Water Quality Laboratory provided shipboard analytical support and carried out shore laboratory analyses for both cruises.

Comprehensive analysis of water quality data for the years 1974 to 1984 continued, with findings to be reported in 1985. In addition, work began on the Lake Ontario Intensive Report, for submission to the Surveillance Work Group, IJC in 1985.

A predictive model of Lake Ontario water quality, developed by NWRI, was used to evaluate water quality responses to various phosphorus loading scenarios. This report was submitted to the IJC Task III Working Group to assist in developing target phosphorus loads to Lake Ontario.

#### *Lake Huron*

A report describing the water quality conditions of Lake Huron, Georgian Bay and the North Channel in 1980 was completed. In addition, a paper describing the nutrient chemistry of Georgian Bay and the North Channel was presented at the International Association for Great Lakes Research (IAGLR) Conference held in St. Catherines, Ontario during May.

One Spring water quality surveillance cruise was carried out on Lake Huron to substantiate results of the 1980 surveys, as per the recommendations of the Lake Huron Intensive Report. Contaminants were sampled at 28 stations as part of this surveillance cruise.

#### *Lake Superior*

A report describing the water quality conditions in Lake Superior during 1983 was completed for the Lake Superior

Task Force. This report detailed the changes in water quality conditions since the last intensive surveys in 1973 and recommended a strategy for future surveillance activities.

### 3.3 *Niagara River Toxic Contaminants*

The Niagara River Toxics Project, a joint Canada/United States investigation of toxic chemicals in the Niagara River was initiated in 1981. The Toxics Project had three objectives:

1. To identify sources of toxic pollutants entering the Niagara River.
2. To recommend control programs where necessary.
3. To recommend long term water quality monitoring programs for the Niagara River that will allow evaluations of the effectiveness of control programs.

A Canada/United States Niagara River Toxics Committee (NRTC) was formed to oversee and coordinate the project.

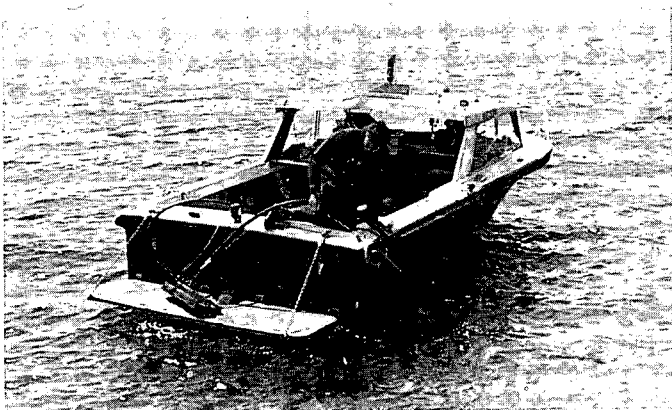
IWD, Ontario Region has been extensively involved in the work of the NRTC and its sub-committees. The Director, IWD, Ontario Region is Canadian Co-Chairman of the NRTC while other IWD, Ontario Region staff chair or participate on the various NRTC sub-committees. The final report of the NRTC was completed in 1984 with the formal release of the report on November 27. The release took place in Niagara Falls, New York. The report received wide coverage in local and national newspapers, as well as on television and radio.

The final report contained 24 recommendations pertaining to control programs, as well as a detailed long-term water quality monitoring program, which included a quality assurance component. Twenty-two of the 24 recommendations were jointly supported by the Canadian and U.S. members of the NRTC. The recommendations ranged over a wide variety of areas relating to the Niagara River toxics issue and were grouped into five sections; point source, non-point source, ambient, chemicals of concern, and general. The Niagara Falls Waste Water Treatment Plant was identified as the most significant contributor of organic priority pollutants and phenols to the River and it was recommended that its repair be completed as quickly as possible. There were five recommendations relating to the identification, investigation and remediation of toxic chemical leakage from waste disposal sites along the River. Other recommendations called for further investigation of contaminants in the River system. The two recommendations that were not jointly supported were general recommendations supported only by the Canadian members of the NRTC. These latter recommendations pertained to the development of a toxic loading allocation plan and the up-dating and expansion of Annex 1 of the Great Lakes Water Quality Agreement.

The Long-Term Monitoring Program recommended by the NRTC has three objectives; the assessment of the degree of compliance with jurisdictional control requirements; the assessment of trends to determine response to control measures, the effectiveness of those measures and emerging problems; and the identification of sources of toxic substances inputs to the Niagara River.

### 3.4 Interconnecting Channels Water Quality

Water quality monitoring continued in the Niagara and St. Lawrence Rivers. Automatic water samplers at Niagara-on-the-Lake, Fort Erie and Wolfe Island collected daily samples for nutrients and weekly samples for organics (monthly at Wolfe Island), major ions, trace metals and radioactivity to determine chemical loadings from Lake Erie to Lake Ontario and into and out of Lake Ontario. Results of the analysis are provided annually to the IJC for inclusion in its Great Lakes Water Quality Report.



*Installing the intake at the Wolfe Island sampling station.*

A report, "Toxic Contaminants in the Niagara River, 1975-82" was published in the IWD report series. This report summarized the WQB toxic contaminants work which has been carried out in the Niagara River during the 1975-82 period. This report formed the basis of the WQB input to the Niagara River Toxics Committee final report. Another report entitled, "Evidence of Contaminant Loading to Lake Ontario from the Niagara River" was completed in July 1984 and also was used as input to the NRTC final report. A report on the "S"-Area investigations was presented at IAGLR in May. Contributions were also made to the St. Lawrence and Niagara River Task Force Surveillance Plans.

### 3.5 Atmospheric Loadings

WQB continued to operate a network of 16 precipitation chemistry stations as part of the IJC Great Lakes International Surveillance Plan to measure and report on atmospheric loadings. Atmospheric loading estimates for 1983 have been reported to the IJC Lake Superior Task Force.

A small network consisting of four stations, one in each lake basin at Sibley Park, Turkey Lake, Pelee Island and Wolfe Island has been established to sample wet precipitation for levels of trace organic contaminants in the Great Lakes Basin. The first information from these studies will be available in 1985.

### 3.6 Phosphorus Management

Annex 3 of the 1978 Great Lakes Water Quality Agreement specifies total phosphorus target loads for each of the Great Lakes. These loads were confirmed by the signing in October 1983 of the Phosphorus Load Reduction Supplement to the Annex. The supplement forms the basis for the establishment of load allocations and compliance schedule for the two countries. A federal/provincial task force was established in January to develop a "Canadian" phosphorus load reduction plan for the Great Lakes in accordance with the supplement.

IWD-Ontario Region was represented on the task force and provided its support by organizing/participating at various workshops and meetings. For example, information was compiled and presentations were made on tributary loading estimates to the Great Lakes (WP&MB), phosphorus allocation for Lake Ontario (Director's office) and non-point source contributing area definition (WP&MB). In addition, IWD, Ontario Region took part in various work groups and provided technical assistance in the preparation of the phosphorus management plans.

In order for Canada to meet the established target loads in the most efficient and effective manner, it is very important to monitor progress in the control of phosphorus inputs as reduction efforts are implemented and to use this information for planning any further reductions. WP&MB staff undertook a study of the Thames River Basin to investigate the feasibility of utilizing historical water quality and quantity data for planning phosphorus loading reductions. By integrating the historical information available, the temporal and spatial variability of phosphorus loads along the river system were defined and various management alternatives were assessed. For the Thames River Basin, the analysis revealed that point sources account for only a small portion of the total phosphorus load (12%). The major source of phosphorus to the basin is runoff from agricultural land. Implementation of point source phosphorus controls, while significantly decreasing the in-

stream loadings of phosphorus downstream of urban areas, had no significant effect on loadings at the river mouth. The most cost-effective phosphorus management strategy for the basin is implementation of sound soil and nutrient management practices. The findings were summarized in the report "Utilization of Historical Water Quality and Quantity Data for Planning Phosphorus Loading Reductions in the Thames River Basin" and were presented at the 27th IAGLR conference in St. Catharines in May.

The management of soil erosion and the associated delivery of sediment (and related contaminants) to a watercourse requires a tool which will assist in the efficient and effective application of remedial measures. The verification and calibration of a screening model, developed by the Lands Directorate of Environment Canada to identify priority management areas for the control of non-point sources was undertaken by WP&MB during 1984, which was the third year of a three year program. Spring melt and fall storm runoff was intensively monitored in twelve watersheds for both sediment and phosphorus loadings. The essential data base will be used to evaluate and calibrate several types of sediment yield models currently being developed for non-point source management. A final report is expected early in 1985.

The phosphorus load reductions specified in Annex 3 are based on total phosphorus. Not all of the phosphorus in surface waters, however, is biologically available for algae production. During 1984, WP&MB completed a study which investigated the transmission and transformation of phosphorus in a river ecosystem. The study was part of a larger Water Quality Management project conducted by the province (the Stratford-Avon River Environmental Management Project). Suspended sediment samples were collected and analyzed for biologically available phosphorus during high and low flow events from several sites on the Avon River. The study contributed to a better understanding of phosphorus dynamics in rivers, which is essential in order to devise effective strategies for the reduction of phosphorus loadings to the lower Great Lakes. The results were summarized in the report "Phosphorus Bioavailability of the Avon River".

WP&MB was also involved in a joint research project with NWRI-Aquatic Ecology Division which examined the effect of tributary inputs of phosphorus on the growth of *CLADOPHORA* (a nuisance algae) in the nearshore zone. The relative importance of tributary loadings versus the "whole lake load" was evaluated. A final report is due early in 1985.

### 3.7 International and Interprovincial Rivers

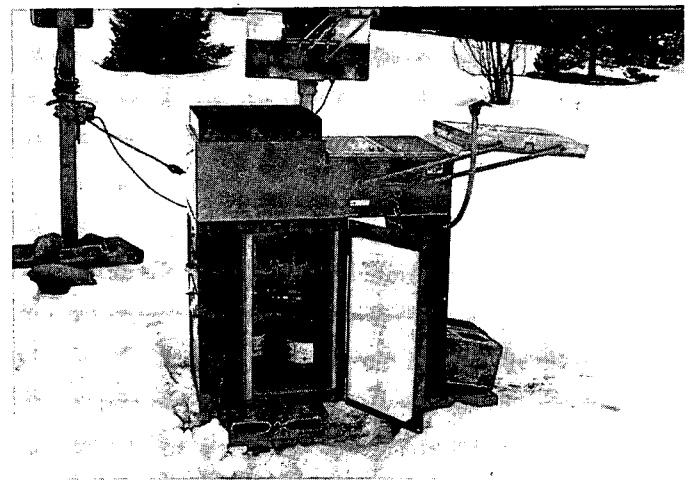
The Water Quality Branch continued to sample at four stations in Northwestern Ontario as part of its commitment to monitor international and interprovincial waters. Two stations are located on the Rainy River, one on the Winnipeg River and one on the English River. Water samples were collected every two weeks from these locations and analyzed for physical parameters, major ions, nutrients and metals. Samples were collected on a monthly basis for the analysis of organochlorine pesticides and PCBs.

The Branch continued to provide advice to the International Rainy River Pollution Control Board on matters pertaining to an inter-agency monitoring plan for the river and proposed water quality objectives.

Six water quality surveys were carried out between May and October on the Ottawa River in the National Capital Region. Water samples were collected for physical parameters, major ions, nutrients, trace metals and bacteriological parameters. Results from these surveys will be compared to previous work conducted by the Water Quality Branch to assess changing water quality conditions in the Ottawa area.

The Water Quality Branch continued to provide input and advice to the Ottawa River Coordinating Committee. The committee is charged with coordinating the activities of Ontario, Quebec and Environment Canada, as well as finalizing an aquatic monitoring strategy for the river.

The Branch provides input for the annual report of the Ottawa River Coordinating Committee that is prepared for the Ministers.



Rain/snow sampler for organic contaminants.

#### 4.0 Flood Damage Reduction Program

The federal government is committed to alleviating human suffering and minimizing damage caused by floods through strategies such as identifying high flood-risk areas, discouraging new investments in these areas, and participating in traditional flood damage reduction measures where these offer the best solution.

The Inland Waters Directorate, through its Water Planning and Management Branch, is involved with the Province of Ontario in a program to reduce flood damages. The Department, on behalf of the federal government, signed an Agreement with the Province of Ontario on March 31, 1978, to provide funding for flood-risk areas and other flood damage reduction measures. The Agreement was revised on November 5, 1982 to accommodate the provincial floodplain management policies, by allowing a two-zone floodway-fringe concept and recognizing special policy areas, where under certain conditions a lower level of flood protection could be allowed. The term of the current Agreement runs to March 31, 1985 for flood-risk mapping and to March 31, 1990 for other measures. Costs are shared equally with a total cost for the program of \$9.2 million.

During the year, a proposal was made to the Ministers for Environment Canada and Ontario Natural Resources to amend the current Agreement. The Amending Agreement No.1 proposed that the mapping component receive additional finances of \$7.4 million and other flood damage reduction measures additional funding of \$1.0 million. Extension in time of five years for the mapping and policies component and the seven years for other measures was also requested. Ministerial approval of this amendment was pending at year end, but was expected in 1985.

The total expenditure under the Program as of March 31, 1984 was \$7,005,596.85. The flood risk mapping component accounted for \$6,471,992.32 and the other measures component for \$533,604.53. Projected expenditure for the fiscal year 1984-85 is \$400,000.

##### 4.1 Flood-Risk Mapping

The mapping of the flood-risk areas is the primary function of the Program. The majority of mapping studies are implemented through the local Conservation Authorities and municipalities. In 1984, projects were in progress in 19 Conservative Authorities, as well as several municipalities where no organized Conservation Authority exists.

Upon completion of flood-risk mapping, the Ministers of Environment Canada and Ontario Natural Resources may agree to designate the identified flood-risk areas. The policies of the Agreement come into effect upon designation. These policies put limitations on:

1. placing federal or provincial government buildings or structures in the flood-risk areas;

2. funding from government sources for new buildings or structures placed in the flood-risk area and subject to flood damage risk;

3. eligibility for flood disaster assistance of buildings or structures placed in the flood-risk area after designation and which are vulnerable to flood damage.

As well, the two governments will encourage local municipalities to adopt Official Plan Policies and zoning restrictions on development in the flood-risk area.

Following the release of the new provincial policy for floodplain management, work commenced on the final designations of the projects held up from the previous year. Preparation of the public information flood-risk maps was continued for Atikokan River at Atikokan, Thessalon River at Thessalon, Spanish River and Darkie Creek at Espanola, Ottawa River at Petawawa and McNab, Montreal River at Elk Lake and Jackfish River at Hornepayne. Designations will likely occur for these areas as well as the Essex Region Conservation Authority and Lower Trent River Conservation Authority in fiscal year 1985/86. Basin wide public information map preparation was commenced for South Lake Simcoe Conservation Authority and Nickel District Conservation Authority.



*Flooded road at Beaver Creek, spring of 1984.*

During the year, WP&MB completed the hydrologic/hydraulic analysis for the Black and Beaver Creek watershed. The study incorporated state-of-the-art hydrodynamic modelling to predict realistic design flows. This exercise helped allay a number of concerns regarding the accuracy of flood lines in this area.

A project to delineate the flood and erosion hazard zones along the Lake Huron shoreline under the jurisdiction of the Maitland Valley Conservation Authority was completed. Fisheries and Oceans Canada and the Ontario Ministry of Natural Resources cooperated with IWD in identifying the hazard areas.

An important part of the Flood Damage Reduction Agreement is the provision of information to the public and other government departments on the nature of the Program, the extent of flood-risk areas, and government policies that apply to designated areas. During the year, the Steering Committee and Technical Subcommittee explained the Program to a number of Conservation Authorities. A display was set up at the Annual Meeting of the Appraisers Institute of Canada. Participation is planned for the Ontario Real Estate Association conference in February 1985. An information flyer was developed for distribution at conferences and public meetings. Work commenced on developing the agenda and contents for an Information Meeting with federal departments and provincial ministries to explain the implementation of the program in Ontario. Extensive use was made of information brochures, public information display panels and audio-visual presentations.

#### 4.2 Other Flood Damage Reduction Measures

All three phases of the Muskoka River Water Management Study were completed. Phase I provided an inventory of water level control operations, a physical and socio-economic description of the basin and identified water management concerns; Phase II investigated improvement in reservoir and lake operations within the existing system; and, Phase III concentrated on evaluating various structural and non-structural alternatives to improved water management by satisfying various competing water and land uses. Public meetings were held in 1984 in Huntsville, Dorset and Port Carling to provide information on alternatives considered and incorporate public input. The study will be released in the Spring of 1985 following formal comment from the Muskoka District Planning Council.

In 1984, the Steering Committee initiated a comprehensive study to develop a set of curves that will relate the depth of flooding to the damages sustained by houses. These curves will be useful in the evaluation of benefits that could result from flood damage mitigation initiatives. During the year, the study objectives and methodology were formulated, terms of reference were prepared and a consultant selected to conduct the study. By year-end, the consultant had completed the data collection phase of the study, and the study should be completed by June 1985.

A major component of the Regional Flood Frequency Analysis Study for Ontario was completed. This comprehensive study is being carried out by WP&MB under the Program. The intent of this study is to develop design flows for watersheds where little or no streamflow data exists. The study is scheduled for completion in the Spring of 1985.

## 5.0 Water Management Data Program

The ever increasing demand for water and the multiplicity of its uses have produced a growing need for better and more efficient management of this most precious resource. The systematic collection and compilation of water resources data is essential for the wise management of Ontario water resources. It is vital to activities such as the regulation of individual and industrial consumption, irrigation, hydro-electric power generation, recreation, flood-risk mapping and flood forecasting, engineering studies, pollution control and environmental assessments. The objective of the Water Management Data Program is to provide the basic water quantity data on a timely, accurate and comprehensive basis to meet Canada's responsibilities under Federal-Provincial Agreements and to serve the national interest. Inland Waters Directorate is extensively involved in meeting this objective and ensuring that the data user's needs are met.

The fluctuation of the water levels of the Great Lakes affect many users. An important activity in Water Management Data Program is the preparation of a six month forecast of Great Lake water levels on a monthly basis for distribution to the public. Forecasts of ice formation on the St. Lawrence River are also made during the early winter of each year. Throughout 1984, IWD responded to numerous requests from the public and other government agencies for information related to water levels and flows in the Great Lakes System.

### 5.1 Hydrometric and Sediment Surveys

The Water Survey of Canada Division of the WRB continued to operate a network of hydrometric and sediment stations under the terms of the Canada-Ontario Cost Share Agreement on Water Quantity Surveys. Provincial participants in the Agreement are the Ontario Ministry of Environment (OMOE), the Ontario Ministry of Natural Resources (OMNR), and Ontario Hydro. The terms of the Agreement ensure a coordinated approach to data collection by the four agencies and that national standards are met for measurement and computation procedures, and for equipment and instrumentation. The terms of the Agreement require that all hydrometric and sediment stations be classified on the basis of national guidelines and that the station costs be shared between parties according to the classifications. The terms of the Agreement are implemented by appointed Administrators and by a Canada-Ontario Coordinating Committee which has representatives from the four agencies.

April 1, 1984 marked the beginning of the tenth year of the operation of the hydrometric network under the Canada-Ontario Cost Share Agreement. As of April 1, the Water Resources Branch of IWD, Ontario Region operated a total

of 373 hydrometric stations in Ontario. In addition there are 70 hydrometric stations in the extreme northwest part of the province which are operated by the Water Resources Branch of IWD, Western and Northern Region. These stations are operated by the Western and Northern Region because of their close proximity to its Winnipeg District office.

During the year, the WRB took approximately 2460 discharge measurements at hydrometric stations. The Branch processed the data from all stations which it operated and also processed data from 62 stations operated by other agencies.

Of the 373 hydrometric stations operated by the WRB, 151 were classified as Federal stations, 32 as Federal-Provincial stations and 190 as Provincial stations. As per the terms of the Cost Share Agreement, construction and operating costs for Federal stations are funded entirely by Canada, Federal-Provincial stations are cost shared 50/50, and Provincial stations are funded by the Province. As of April 1, 1984, new national guidelines for the classification of hydrometric stations were approved by the Administrators of the Canada-Provincial Agreements and were implemented. The classification system includes the Federal, Federal-Provincial, and Provincial groups as well as several sub-groups. For all stations, Canada, as the operating party in Ontario, is responsible for providing and paying the total cost of the primary water level recording equipment while the requesting agency pays for the purchase, installation, and operation of specialized equipment. For the fiscal year ending March 31, 1984, the shareable cost for construction, maintenance and operation of the hydrometric and sediment networks in Ontario was \$1,655,300 of which \$744,200 was paid by the province.

The WRB operated a network of 12 continuous and 2 seasonal sediment stations. Six northern and two southern stations were sampled on a miscellaneous basis.

A fully operational sediment laboratory in Guelph supported the sediment data collection activities. A total of 1200 suspended sediment samples, 112 bed material samples, 373 dissolved solids samples and 27 evaporation analyses was completed. In addition, samples were analyzed for the Glaciology Division (National Hydrology Research Institute) study on the MacKenzie River delta. Two automatic sediment samplers were installed for testing in a joint program with Sediment Survey Section WRB-Headquarters.

New sediment stations, both seasonal and miscellaneous, were selected for the coming year as well. Four stations which had been sampled on a continuous basis were discontinued. This resulted from the recommendations presented in the Ontario Region Miscellaneous Sediment Station Network Proposal and the Ontario Region Sediment Network Review completed in late 1983.

During 1984, the WRB installed seven data collection platforms (DCP) at remote hydrometric stations for the

retransmission of data via satellite. These DCPs are included in a program to install 35 DCPs at remote sites in Ontario over a five year period which is part of a national federal program. WRB also operated 11 other DCPs on behalf of Ontario Ministry of Natural Resources.

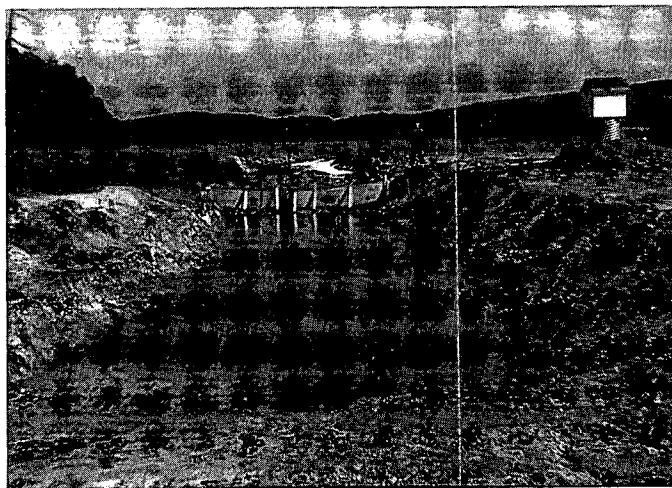
WRB carried out discharge measurements for rating of small scale hydro turbines at Elora and Brantford. The WRB also tested and evaluated specialized data collection equipment such as data telemetry equipment. Safety and training seminars were also held which included a chain saw safety course and defensive driver training.

## 5.2 Runoff Conditions and Events

Early in the year, most areas of Ontario experienced some record low temperatures. A sharp increase in temperature occurred in mid-February. Melting snow combined with heavy precipitation resulted in severe flooding in some areas of Southern Ontario. During the spring, summer and fall months, localized storm events caused water levels to increase for short durations with some minor flooding reported in various parts of Ontario. At the end of the year, above normal temperatures left most of Ontario with little snow cover and very little ice cover on surface waters. The year once again provided very challenging weather and streamflow conditions for field data collection activities.

## 5.3 Construction and Maintenance

The WRB construction program included six new installations, six major upgradings and a number of minor maintenance projects.



*Installing a concrete weir in the Elliot Lake area.*



A number of field and site investigations were conducted for new hydrometric stations, relocation of hydrometric stations, and major repairs and renovations. Minor repairs and maintenance such as upgrading and repairing electrical services, installing thermostats to regulate gauge house heating systems, repairing weirs and controls damaged during spring freshet, and repairing cableways, intakes, and damaged shelters were also carried out.

#### 5.4 Data Control, Publication and Distribution

During 1984, the WRB answered 484 requests for technical data, advice, and information related to the hydrometric and sediment station network. Some 2,823 station years of record were distributed, comprising 164 requests for historical record, 237 requests for current record, and 83 requests for other related information. Streamflow data from two hydrometric stations (Saugeen River near Port Elgin and Missinaibi River at Mattice) were reported on a monthly basis to the United States Geological Survey (USGS). The USGS incorporates these data in their regional hydrologic analyses and publishes the results in the "National Water Conditions Bulletin". WRB completed the processing for 1983 hydrometric data by May 1, 1984.

The annual publications "Surface Water Data — Ontario, 1983" and "Sediment Data — Canadian Rivers, 1982" and "Historical Streamflow Summary — Ontario — to 1982" were published and distributed.

A major study of the hydrometric network and data from the Severn River in the Washago area was completed and a report prepared. A review of contributed data for stations in the Lake St Joseph area in northern Ontario was also begun.

The WRB Guelph office installed a new computer system in 1984. The major components of the new system are a Digital Equipment Corporation PDP 11/44 mini-computer, a Gentian Electronics Digitizer, Calcomp 1012 plotter, several terminals and printer. The system makes the computation of hydrometric and sediment data more efficient. It also expands the Branch's capability in data handling and analysis.

#### 5.5 Network Planning and Hydrologic Studies

The WRB was restructured to include a Hydrology Division in order to strength the analytical and interpretive capabilities of the Branch in data and information synthesis, and to strengthen the network evaluation and planning capabilities of the Branch. Staffing of most positions in the Hydrology Division was completed by August 1984.

Several hydrometric stations were reviewed in order to determine the need for each particular station. The reviews

included stations in the Sydenham (Southwestern Ontario), Albany, Kwataboahagan, and Wilmot river basins.

Other studies included estimation of peak flows at selected sites, and monthly runoff modelling. Several watersheds are being modelled to assess the impact of future climate changes on runoff in Ontario. The Branch also worked closely with WRB-Headquarters on a contract for the transfer of hydrologic computer programs and techniques from Solomon and Associates consulting firm to WRB-HQ.

All hydrometric stations operated by the Branch are classified by funding and purpose into 9 categories as described in the National Guidelines for station designations of Canada-Provincial Cost Share Agreements. The classification for all stations operated by WRB Ontario Region were reviewed in a preliminary hydrometric network review. Recommendations for station classification changes were prepared for discussion by the Canada-Ontario Cost Share Committee early in 1985.

#### 5.6 Tides and Water Levels Network

In addition to the regular hydrometric stations operated under the Canada-Ontario Cost Share Agreement, WRB continued to operate 34 water level gauges on the Great Lakes and St. Lawrence River System on behalf of the Canadian Hydrographic Services (CHS) of the Department of Fisheries and Oceans (DFO). These gauges are part of the DFO network of tides and water level gauges which provide data for navigation and water management purposes. Under the terms of a memorandum of understanding with DFO, IWD operates and maintains these gauges and publishes the data from them in its surface water data publications. DFO retains ownership of the gauges, operates and maintains specialized equipment for navigational applications, processes the data, and publishes weekly and monthly reports and bulletins on water levels.

### 6.0 Toxic Chemicals Program

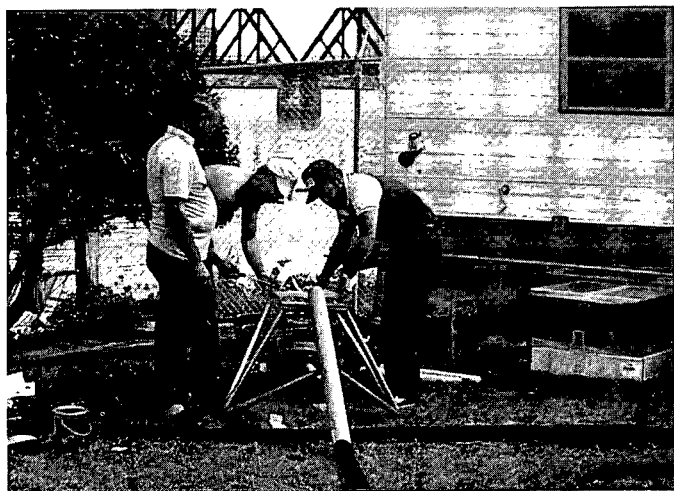
The deleterious effects of toxic materials such as mercury, lead and PCBs on the environment are of major concern considering the ultimate impacts on the welfare and health of society. The presence of these substances in the environment may seriously affect plant and animal life, including humans. Contaminated water is limited in its use unless costly pretreatment is employed. Contaminated fish, birds, and other animals may become unfit for human consumption resulting in unemployment and loss of revenue for some industries. There may also be serious adverse effects on recreational activities and industries, including sport fishing, swimming and hunting.

The federal government has recognized the very serious problem toxic substances pose. As a result it enacted the Environmental Contaminants Act in December, 1975. The Act represented a major step forward in dealing with toxic chemicals nation-wide.

### *Ottawa River*

A water quality monitoring station was set-up at Lemieux Island in September 1984, to collect water and suspended sediment from the Ottawa River. A triple-line intake system with independent submersible pumps was installed, in the midstream channel, to minimize loss of samples and costly emergency repairs. A continuous flow centrifuge equipped with a vibration sensor and related pump control circuitry (designed by the Water Quality Branch) was installed to collect suspended sediment and provide a supply of clarified water.

Water samples for nutrient analyses were collected on a daily basis. Organochlorine pesticides, chlorobenzenes, PCBs, and trace metals in clarified water and suspended sediment were sampled on a weekly basis. All sampling was conducted with the assistance of the laboratory staff of the Ottawa-Carleton Water Filtration Plant.



*Preparing the intake structure at Lemieux Island on the Ottawa River.*

## **7.0 Long Range Transport of Airborne Pollutants Program**

The problem of long range transport of airborne pollutants (LRTAP) is an issue of concern to both Canada and the United States. Reports of studies conducted by two IJC

reference groups, the Upper Lakes Reference Group and Pollution from Land Use Activities Reference Group (PLUARG); have indicated that the issue of long range transport of airborne pollutants with its transboundary pollution implications was of great concern requiring immediate attention. Recognizing the problems LRTAP could bring to the Great Lakes Basin ecosystem, Article VI of the 1978 Canada-U.S. Great Lakes Water Quality Agreement specified the need to increase monitoring activities.

The long range transport of airborne pollutants such as acid rain is having serious adverse effects of both the aquatic and terrestrial ecosystems in eastern North America. Acid precipitation has its greatest effect on the waters and soils of the Precambrian Shield region which have only limited capacity for neutralizing the acid in the rain. Soil impoverishment through leaching of important nutrient elements by acid precipitation has the potential of reducing the yield from forests in this region. Several lakes in the Haliburton-Muskoka area of south-central Ontario have lost up to 75% of their buffering (neutralizing) capacity in the last 10 years. It has been estimated that there are about 48,000 lakes in Ontario that could be adversely affected if acid loadings remain constant or increase over the next 10 to 20 years. This trend in aquatic environmental degradation poses serious threats to the social and economic well-being of Canadians.

The Water Resources Branch collected hydrometric data from six hydrometric stations in the Turkey Lakes area in support of the National Water Research Institute and the Turkey Lakes Watershed Program. The objective of this latter study is to determine how an acid sensitive lake system responds to acid precipitation.

The Water Planning and Management Branch provided advisory and analytical services for this program in cooperation with other government agencies. Assistance was provided during the year in the review and assessment of benefits and costs associated with long range transport of airborne pollutants. Extensive information was assembled and organized on: effects/damages/resources at risk; abatement/technology options and costs; financing options; economic impacts; evaluation methodologies; and other general aspects of LRTAP. The development of new theories and concepts, and related methodologies and data for the evaluation of the LRTAP problem continued. A paper/poster proposal based on this research was submitted for presentation at the Muskoka '85' Conference on Acidic Precipitation. Supplementary funding for LRTAP was used to finance a consultant's report entitled, "A Review of Socio-Economic Impacts of Long Range Transportation of Atmospheric Pollution/Acid Rain".

## 8.0 Environmental Assessment and Baseline Studies

Under this integrated program, IWD, Ontario Region provides direct support to the Federal Environmental Assessment and Review Process (EARP) in ensuring that environmental effects, particularly effects of water resources, are taken into account early in the planning of projects involving federal interests and funding and that appropriate measures are taken to minimize environmental impacts of the projects. IWD usually assumes lead agency responsibilities for evaluation of predominantly water-related development projects and provides advice on water concerns to other lead services on other projects. IWD has membership on the Regional Screening and Coordinating Committee (RSCC) which provides the focus for EARP-related activities in Ontario Region.

The baseline studies component of the program endeavours to provide the information or knowledge base required for evaluating the effects of various activities on environmental resources of specific geographic areas or the effects of particular development cycles, such as the nuclear fuel cycle. IWD, Ontario Region, participates together with other DOE services in baseline studies identified as priority areas by the Regional Director General/Ontario Region, as these arise.

### 8.1 Environmental Assessment

During 1984, a number of activities were continued from the previous year and either were completed or entered yet another stage of the environmental assessment process. The Keating Channel (dredging and flood control) is one such project that continued into 1984. Previously, the environmental assessment report for this project, which is going through the Provincial Environmental Assessment Act route, was reviewed and a DOE, Ontario Region position prepared. Towards the end of the year, however, an addendum to the environmental assessment report (dredging material disposal and maintenance) necessitated additional evaluation and no decision had been reached regarding the project's progress towards public hearings.

A DOE discussion paper on winter navigation season extension on the Great Lakes, undertaken at the request of the RSCC by WP&MB, was completed. The report entitled, "Winter Navigation Season Extension on the Great Lakes — St. Lawrence Seaway System — Background Considerations and Environmental Issues Relevant to Canadian Concerns", addressed primarily the sensitivities of the Canadian environmental resources of the Great Lakes to winter navigation impacts and information/data gaps regarding the assessment of potential impacts. The report saw extensive internal review within RSCC services and the Ontario Committee of Regional Directors and is, at present, slated to be

used as a basis for discussion with the Province. During the year, the winter navigation initiative in the U.S. was defeated in the U.S. Congress, however, pressure still persists in some quarters in the U.S. to establish it on the Great Lakes.

Activities associated with the Eastern Ontario Subsidiary Agreement (EOSA) and the South Nation River Basin Development Subcommittee, on which IWD had membership, wound down. The water management study, which was underway for four years, was completed with published reports and recommendations. The interim flood control channelization work on the South Nation was also completed and officially opened in 1984. Already resolutions calling for the implementation of further flood control and drainage projects (by the South Nation River Conservation Authority, for example), either through extensions to the EOSA or new cost-shared agreements, necessitated review and clarification of the federal position. Input into the review of drainage projects in Eastern Ontario, such as the Glen Elbe Drain, was provided.

WRB participated in a bathymetric and bed material survey as part of the Goderich Harbour expansion project, using the Hydac system developed by the Sediment Survey Section at HQ's. The survey was carried out for Department of Public Works as part of the monitoring program for the project.

Substantial effort by WP&MB was devoted to the Marentette Dyke Protection project in Mersea Township. Funds for the project were committed by the Department of Agriculture (with additional funding from the Province under the Drainage Act) to protect the eastern flank of existing dykes and unprotected cottages from erosion by Lake Erie waters. Several design options were reviewed with the primary concern over potential acceleration of erosion processes affecting Point Pelee National Park. Input was also provided to the preparation of an environmental assessment by an outside consultant.

Among other projects reviewed during the year were: Port Granby Low-Level Radioactive Waste Site Decommissioning (shoreline stability monitoring and response plan); Goderich Harbour Development (flooding/sedimentation impacts); Ontario MNR proposal for remedial measures in the St. Marys Rapids to enhance fish spawning and habitat; Toronto Harbour Commission's (THC) plans for a new Toronto Outer Harbour (and term of reference for an Initial Environmental Evaluation (IEE) report); and also the THC annual operation plan for dredged material disposal and containment.

Input was provided as well to Atomic Energy Control Board's guidelines on waste management at uranium mining facilities and the Urban Drainage Policy Implementation Committee's guidelines on urban drainage design. Proposals for remedial measures at hazardous waste sites and ecocommunity demonstration projects were also evaluated for possible funding. A ministerial response was prepared

to answer concerns expressed over a project to rehabilitate Hillman Marsh by the Essex Region Conservation Authority and Ducks Unlimited.

IWD acted as lead agency in coordinating departmental comments on the Association of Conservation Authorities of Ontario — Class Environmental Assessment for Water Management Structures. Comments from Canadian Wildlife Service, Parks Canada, and Environmental Protection Service, as well as Inland Waters Directorate, were forwarded to the Ontario Ministry of Environment.

In terms of the EAR Process, a review of DOE's role in EARP was initiated, as was a review of the Environmental Conservation Service Environmental Screening Guidelines. To meet the request of the RSCC to ensure that services had their own guidelines in place to screen their activities and programs, IWD Environmental Screening Guidelines were prepared for Ontario Region and adopted for implementation by the IWD, Ontario Region Management Committee. Federal Environmental Assessment and Review Office guidelines for environmental screening and initial assessment were given initial draft review at the close of the year.

## 8.2 Baseline Studies

The baseline study dealing with wetlands conservation in Southern Ontario, initiated in 1983, continued in 1984 to review federal programs and policies and their possible role in contributing to the decline of wetlands. A report is due in early 1985. A related Lands Directorate report on the EOSA drainage program and its land impacts was reviewed with some additional input for the study undertaken by



*Environmental minstrels perform during Environment Week.*

WP&MB. WRB continued to collect baseline information and provide technical advice on field surveys associated with the Oshawa Second Marsh Study.

A paper on groundwater issues in Ontario Region was prepared to provide a regional perspective to the development of IWD HQ's policy on groundwater.

Following previous work directed at assessing the effects of dredging on flow distributions around Sugar Island in the St. Marys River, discussions were conducted between WP&MB and WRB to review needs and initiate a data collection program. It is likely that the long-term measurements of water levels, flows, and sedimentation patterns will commence in 1985 and eventually provide a basis to ascertain effects on flow distributions, sedimentation and water quality. The data collected would also be useful in determining effects associated with winter navigation.

## *Hudson Bay Lowlands*

Five major rivers of the Hudson Bay Lowlands were sampled every two weeks for ionic constituents, nutrients, heavy metals, organochlorine pesticides and PCBs. Sampling sites were located on the Moose, Albany, Attawapiskat, Severn and Winisk Rivers adjacent to the Indian Reserves.

## 9.0 Management and Administration

In 1984, the Directorate administered and managed resources amounting to 6.6 million dollars and 88.5 person years. The resources included operational funding under international and federal-provincial agreements as well as grants and contributions under similar agreements. Significant federal-provincial cost-shared funding administered in 1984 included the Canada-Ontario Great Lakes Water Quality funding (\$1,200,000) and the Canada-Ontario Flood Damage Reduction Agreement funding (\$400,000 for 1984-85). Approximately \$750,000 is expected to be cost recovered from the Province in 1984/85 under the Canada-Ontario Cost Share Agreement on Water Quantity Surveys.

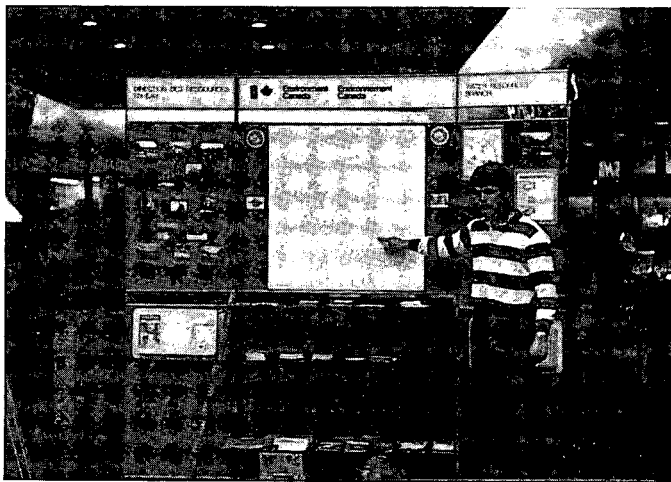
IWD, Ontario Region staff helped organize and stage several successful events held in the Burlington area to celebrate Canadian Environment Week, June 3-10, 1984. Supported by the Canada Centre for Inland Waters (CCIW) Executive Committee, and assisted by a number of volunteers, the Environment Week Committee sent "Johnny Biosphere" (Dr. Jack Vallentyne of DFO) to area schools in advance of Environment Week and a two-man team of Environmental Minstrels to more schools during the actual week. In addition: A three-day public information display, featuring Professor Trout Jr. (a talking fish), an exhibit on Great Lakes Water Quality and environmental videos, was

set up at the Burlington Mall; a lake research display and demonstration was presented at the Crawford Lake Conservation area during a mass hike-a-thon organized by the Halton Jay-cees and the Halton Region Conservation Authority; and an in-house festival on World Environment Day was held at CCIW where the 10th anniversary of CCIW's designation as the World Health Organization Collaborating Centre on Surface and Ground Water Quality was observed. The series of events was successful, reaching a large audience directly and a much wider one through extensive news media coverage.

IWD, Ontario Region, hosted a public information display at a shopping mall in North Bay during Environment Week. The display was very successful, receiving considerable television, radio, and newspaper coverage. The display included equipment used in hydrometric and sediment surveys along with reports, brochures, and posters describing water quality monitoring, the flood damage reduction program, and other IWD activities. Discussions concerning IWD activities were held with several interested people. Many brochures and reports were given out during the display.

IWD, Ontario Region also helped organize and man a major departmental display on water at the Canadian National Exhibition, August 15-September 3. The exhibit consisted of information pods on major water issues, hands-on computer games, a Great Lakes feature area and enclosed video theatre. It was successful and reached a large audience.

IWD, Ontario Region staff took part in the Regional Public Consultation Conference sponsored by Environment Canada. The conference was held November 23-24, 1984 in Hamilton, Ontario. Those attending the conference included representatives from all levels of government, universities, industry and public interest groups as well as the general public.



*Environment Week display at North Bay, Ontario.*

## 10.0 Publications and Presentations

### *Water Planning and Management Branch*

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2. Bien, W., "Winter Navigation Season Extension on the Great Lakes-St Lawrence Seaway System — Background Considerations and Environmental Issues Related to Canadian Concerns". RSCC/DOE-Ontario Region Discussion Paper, Burlington, December, 1984.
3. Burton, D.T., "Water Conservation Practices and Possibilities". Unpublished Report, Burlington, September, 1984.
4. Clarke, T.C., "A Philosophical Look at Some Natural Resource and Environmental Problems". Submitted to Forestry Chronicle, December, 1984.
5. Kalinauskas, R.A., "Utilization of Historical Water Quality and Quantity Data for Planning Phosphorus Loading Reductions in the Thames River Basin". Paper presented at the 27th conference on Great Lakes Research, St. Catharines, Ontario, May 30-June 3, 1984.
6. Kalinauskas, R.A. and R. Gruchella, "Utilization of Historical Water Quality and Quantity Data for Planning Phosphorus Loading Reductions in the Thames River Basin". Unpublished Report, Burlington, September, 1984.
7. Lee, B. and D. Powell, "The Ecosystem Approach as a Framework for Interagency Problem Solving". Submitted to Inland Water Directorate in fulfillment of Contract No. OSE 84-00078, August, 1984.
8. McCulloch, V., "Energy, Economics, Ecology and Ontario Hydro: Toward a New World View". Unpublished Report, Burlington, September, 1984.
9. Moin, S.M.A. and M. Shaw, "Black and Beaver Creeks Flood Plain Mapping Study — Using Dynamic Modelling Techniques". Report prepared for the Canada-Ontario Flood Damage Reduction Program, Burlington, April, 1984.
10. Petticrew, E. and D. Gregor, "Phosphorus Bioavailability of the Avon River". Technical Report S-12, Stratford-Avon River Environmental Management Project, Burlington, February, 1984.

11. Upper Thames River Conservation Authority, "Progress Report — Sediment Delivery Monitoring for Model Calibration". Submitted to Water Planning and Management Branch, Ontario Region, in partial fulfillment of Contract No. 02SE-KW405-0098, September, 1984.

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2. El-Shaarawi, A.H., S.R. Esterby, N.D. Warry and K.W. Kuntz, "Evidence of Contaminant Loading to Lake Ontario from Niagara River". In Press. Submitted to Canadian Journal of Fisheries and Aquatic Sciences, September, 1984.
3. Hallett, D.J., N.D. Warry, K.W. Kuntz, R.C. McCrea and L. Kurdydyk, "An Investigation of Localized Toxic Chemical Contamination of the Niagara River Opposite the "S" Area Landfill". Presented at the 27th Conference of Great Lakes Research, St. Catharines, Ontario, May 1984.
4. Kuntz, K.W., "Toxic Contaminants in the Niagara River, 1975-82". Technical Bulletin No. 134. Inland Waters Directorate, Ottawa, 1984.
5. McCrea, R.C., J.D. Fischer and K.W. Kuntz, "Distribution of Organochlorine Pesticides and PCB's between Aqueous and Suspended Sediment Phases in the Lower Great Lakes Region". In Press. Submitted to Water Pollution Journal of Canada, November, 1984.
6. McCrea, R.C., R.E. Kwiatkowski, D.E. Campbell, P.P. McCarthy and T.A. Norris, "An Investigation of Contaminants and Benthic Communities in the Major Rivers of the Hudson Bay Lowland, Ontario". Technical Bulletin No. 131. Inland Waters Directorate, Ottawa, 1984.
7. Merriman, J.C. and R.C. McCrea, "Trace Organic Contaminants in the Ottawa River, National Capital Region". In press — IWD Technical Report Series.
8. Neilson, M.A.T. and A.H. El-Shaarawi, "Changes in Nutrient Levels of Lake Water Stored at 4°C". Can. Journ. of Fisheries and Aquatic Sciences. 41(6): 985-988, 1984.
9. Neilson, M.A.T. and A.H. El-Shaarawi, "Shipboard Analysis of Soluble Nutrients in Lake Water Versus Analysis after Storage". Technical Bulletin No. 133. Inland Waters Directorate, Ottawa, 1984.
10. Neilson, M.A.T. and R.J.J. Stevens, "Report on Status of Open Waters of Lake Ontario, 1984". Unpublished report, Burlington, 1984.
11. Neilson, M.A.T., R.J.J. Stevens and J. Hodson, "Documentation of the Averaging Lake Data by Regions (ALDAR) Program". Technical Bulletin No. 130. Inland Waters Directorate, Ottawa, 1984.
12. Shertzer, W.M. and R.J.J. Stevens, "Comparison of Actual and Simulated Water Quality Responses to Phosphorus Loading Scenarios in Lake Ontario and Lake Erie". Unpublished report, Burlington, September, 1984.
13. Stevens, R.J.J., "Nutrient Chemistry of Georgian Bay and the North Channel, 1980". Presented at the 27th Conference, International Association for Great Lakes Research, St. Catharines, Ontario, May, 1984.
14. Stevens, R.J.J., M.A.T. Neilson and N.D. Warry, "Water Quality of the Lake Huron — Georgian Bay System". Interpretive Report No. 143. Inland Waters Directorate, Ottawa, 1984.
15. Sylvestre, A., "Material Output from Lake Ontario to the St. Lawrence River, 1982". Unpublished report, Burlington, 1984.
16. Sylvestre, A., "Material Output from Lake Ontario to the St. Lawrence River, 1983". Unpublished report, Burlington, 1984.

*Water Resources Branch*

1. Canada-Ontario Coordinating Committee "Annual Report, 1983/84, Canada-Ontario Cost Sharing Agreement for Water Quantity Surveys, August 1984".
2. Goertz, H., "Review of Albany River below Achapi Lake Hydrometric Station", Internal Report, Water Resources Branch, Guelph, Ontario, 1984.
3. McCurry, P.J., "Summary Report: The Study of Published Flow Data for the Severn River — Washago Area, 1963-1982". Internal Report, Water Resources Branch, Guelph, Ontario, 1984.

4. Poyser, B., Phinney, R., "Discharge Measurements at Francis H. Clergue Generating Station, August-October, 1983", Water Resources Branch, Guelph, Ontario, 1984.
5. Poyser, B., "Procedures for Discharge Measurements in the Great Lakes Connecting Channels and the St. Lawrence River", Draft Report, Water Resources Branch, Guelph, Ontario, 1984.
6. Poyster, B., "Leakage Measurements at Sault Lock on the St. Mary's River at Sault Ste. Marie, Ontario", Water Resources Branch, Guelph, Ontario, 1984.
7. Water Resources Branch, "Historical Streamflow Summary — Ontario to 1982", Ottawa, 1984.
8. Water Resources Branch, "Surface Water Data, Ontario, 1983", Ottawa, 1984.
5. "Great Lakes Hydrometeorologic and Hydraulic Data Needs". A report to the International Joint Commission by the International Great Lakes Technical Information Network Board, 1984.
6. "Report of the Niagara River Toxics Committee". Niagara River Toxics Committee, November, 1984.
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8. "Report on the Diversions of Water from the Niagara River into the New York State Barge Canal". International Niagara Working Committee, 1984.
9. Semi-Annual Progress Report to the International Joint Commission by the International Niagara Board of Control, 1984.

#### *Director's Office*

1. Wagner, E.T., "Water Quality and Use". Presented at the 1984 Ontario Region Public Consultation Conference, Hamilton, November, 1984.
2. Williams, D.J., "Lake Ontario Water Quality". Presented at the Ontario Public Health Association Conference, Toronto, May, 1984.
3. Williams, D.J., "Toxic Substances in the Great Lakes". Environ, Health Rev. 28(3): 66-70, 1984.
10. Semi-Annual Progress Report to the International Joint Commission by the International St. Lawrence River Board of Control, 1984.
11. Semi-Annual Report to the International St. Lawrence River Board of Control by the Committee on River Gauging, 1984.
12. "Submissions to the Inquiry on Federal Water Policy — Environment Canada, Ontario Region", Toronto, September, 1984.

#### *Publications with IWD Contributions*

1. "1983 Annual Report of the International Niagara Committee". 1983.
2. "1983-84 Operation of the Lake Erie-Niagara River Ice Boom". International Niagara Working Committee, 1984.
3. "Annual Report to Ministers". Steering Committee, Canada/Ontario Flood Damage Reduction Program, August, 1984.
4. Annual Report to the International Joint Commission by the International Lake Superior Board of Control 1984.

# 11.0 Organization Chart

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Water Quality Branch  
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 Chief

Sec/Admin Clerk

Special Advisor for  
 IJC Obligations  
 and Research

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Regional Engineer,  
 Water Survey of  
 Canada

Head, Engineering  
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Surveillance Program  
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