

PROTECTION OF THE WATERS OF THE GREAT LAKES
THREE YEAR REVIEW

Report Prepared
for
The International Joint Commission
by
The International Water Uses Review Task Force

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EXECUTIVE SUMMARY

The International Water Uses Review Task Force was appointed in July of 2002 to assist the International Joint Commission in its three year review of activities related to its report on Protection of the Waters of the Great Lakes, which was released in February of 2000. The Task Force was specifically requested to provide status reports on legislative, policy, information gathering and other management programs concerning removals of Great Lakes waters or major new or increased consumptive uses. This report summarizes the outcome of the Task Force's research, consultations and deliberations over the past four months. The eight chapters in this report cover eight key topics, namely: decision making considerations; legal and policy considerations; and six chapters dealing with related technical considerations.

DECISION MAKING CONSIDERATIONS

Since February of 2000, both federal governments have taken legislative initiatives to clarify the situation regarding diversions and/or other removals. Aside from these federal actions, the primary policy initiatives have related to Annex 2001 to the Great Lakes Charter, under the leadership of Great Lakes Governors and Premiers, with the support of a senior officials-level Water Management Working Group. The Annex calls for, inter alia, a single resource improvement standard for dealing with both removals of water from the basin and new or expanded uses within the basin. The primary technical initiatives have focussed on efforts to develop a decision support system, led by state and provincial officials, along with the Great Lakes Commission.

Even though the Government of Canada expressed reservations about certain aspects of Annex 2001, governments at all levels in both countries have always cooperated fully on activities related to the Great Lakes Charter, and are continuing to work closely together to seek out common solutions that will benefit both countries. This is indicative of the strong and very constructive relationship that exists between our two countries. Regardless of the outcome of these deliberations, one immediate benefit of the quest for an improved decision making regime is that it is stimulating discussion among water managers in the basin, as well as encouraging a considerable amount of highly relevant research.

The Annex 2001 timetable does not call for binding agreement before 2004, and the discussions on the complex issues that need to be resolved to create the management regime called for by this document are still in preliminary stages. As a result, we have not attempted to pass judgement on the merits of the proposals as currently crafted. Instead, in the chapter on decision making we have pointed out, by way of questions, both the kind of fundamental conceptual concerns that are arising, and the very significant technical challenges that would be involved in developing implementation methodology and a management regime that will be both scientifically sound and legally defensible. Potential legal difficulties are discussed more fully in the chapter on legal and policy considerations. Our assessment, based on extensive consultations and the nature of questions arising from those consultations is that either a) full implementation may have to await

major scientific advances, advances which are not on the immediate horizon, and the assembly of much more information than is currently available, or b) ways will have to be found to significantly simplify the approach before any regime is likely to be supported by all governors and premiers in binding agreements that are then actually implemented by all.

Our assessment of the data suggests that the region does not need to rush to create binding agreements because of an overuse of water. As is indicated in the chapter on water use, we are now relatively certain that the consumptive use “problem” has been consistently and significantly overstated for the past three decades. While there are gaps in the data that make it difficult to do trend analyses and future projections, water use in the basin is relatively stable, and policy makers do not need to rush to create a new management system to solve an immediate problem. Nevertheless, because of the large number of remaining uncertainties, and because conservation is justifiable on its own merits, it would be advisable to continue, and to the extent practicable, accelerate water conservation measures.

Our technical consideration of the potential for long-distance, large-scale removals also indicates that such activity is highly improbable, at least for the near- to mid-term. This suggests to us that the region can take the time to answer the significant conceptual, technical, and legal questions surrounding a standard and management regime that seeks to combine conservation, no significant adverse impact at both an individual and a cumulative level, and resource improvement, without worrying in the near-to mid-term either about projects to move water from the Great Lakes to southern or western North America or about a loss of water because of developments in international trade.

Regarding out-of-basin removals, the approach used for the Akron diversion, “(essentially) no net loss of water”, would be simple, measurable, and, we believe, quite effective. It, along with accompanying conservation and environmental safeguards, could provide both adequate protection of the waters of the Great Lakes, and reasonable access to communities straddling or outside the basin, but close to the basin divide. Another simple, readily available approach to diversions that could be effective and legally defensible is that contained in the Commission’s 2000 report: limit any loss from an out-of-basin diversion to the average loss of water due to in-basin consumptive use, which is under 5%.

LEGAL AND POLICY CONSIDERATIONS

The major legal development in the United States since the release of the IJC’s report in February of 2000 was the enactment of federal legislation which confirms that the federal government has delegated the primary decision making authority to the states because federal and state interests on this issue are congruent. The Water Resources Development Act of 2000 (WRDA 2000), Section 504 directs the states, in cooperation with the two basin Canadian provinces, “to develop and implement a mechanism that provides a common conservation standard embodying the principles of water conservation and resource improvement for making decisions concerning the withdrawal and use of water from the Great Lakes Basin.” WRDA 2000 helped shaped the form

of Annex 2001. It also reinforced the conclusion, one that had been challenged by part of the legal community, that Congress in fact intended the WRDA legislation as a waiver of the Dormant Commerce Clause. As such, decisions made by the governors under WRDA should not violate the U.S. Constitution.

In Canada, the Canadian Parliament passed amendments to the International Boundary Waters Treaty Act. The amendments have yet to be proclaimed, but that is a practical matter that will have to await the adoption of the regulations. Section 13 provides that “...no person shall use or divert boundary waters by removing water from the boundary waters and taking it outside the water basin in which the boundary waters are located.” The prohibition does not apply to “...the removal of boundary waters other than the removal of boundary waters in bulk”; nor to “the removal of boundary waters used in a conveyance, including a vessel, aircraft or train, (a) as ballast; (b) for the operation of the conveyance; or (c) for people, animals or goods on or in the conveyance” nor to “boundary waters used in a non-commercial project on a short term basis for firefighting or humanitarian purposes.”

In the United States, water law in the Great Lakes region is moving slowly from common law of riparian rights to regulated riparianism. Under regulated riparianism, water is seen as a public resource and the state attempts to manage waters pro-actively, creating a planning and permitting system that seeks to anticipate and resolve problems rather than have the legal system deal with them post hoc. Within the region, the move to regulated riparianism is occurring at various rates of speed. Should the Annex 2001 process eventually produce a management system that includes a common decision making standard and binding agreement(s), states will need to incorporate this common regime into the individual regimes that are already developing. In general, water managers seek to make decisions as close to the point of withdrawal or use as possible, and the level of interstate and state-provincial cooperation envisioned under the Annex 2001 process is almost unprecedented. States and provinces never fully implemented the provisions of the Great Lakes Charter that called for information gathering and permitting, and Annex 2001 is calling for a more complex standard and management regime. Should the states succeed in negotiating an interstate compact (which might include the two basin provinces) and having it blessed by the federal government, it would be the first major regulatory compact in the water area. Most interstate compacts divide an interstate resource into state shares, but none of them contain a post-division management regime.

Aside from expressing certain concerns about concepts in the Annex, the Government of Canada also suggested a number of possible concerns about potential non-compatibility between the Annex and both the Boundary Waters Treaty and the Great Lakes Water Quality Agreement. Additionally, it suggested that the binding international agreement between provinces and U.S. states contemplated in the Annex raises concerns regarding Canadian constitutional law. It has been a longstanding position of the Canadian federal government that, notwithstanding the silence of the Constitution Act on the matter, the power to enter into such agreements is exclusive to the federal Crown. This does not mean that it is impossible for Canadian provinces to enter into agreements that may have binding international effect; but, as is the case in the

United States, this would require the facilitation of the federal government.

Presently, the states and provinces are committed to an open-ended, inclusive process that listens to a wide range of stakeholder and expert opinions. They have not yet adopted a decision standard. They have not yet agreed upon the form of the binding agreement. Nor have they resolved other important legal, policy and technical issues. For example, Annex 2001 does not speak of the threshold levels that will trigger review and application of the proposed standards, of the geographical scale which should be used to review small projects, of how to measure improvements to the Great Lakes system, and of the quality and quantity of information that will be necessary to support the proposed standards and decision process. Resolving all the issues in ways that are scientifically sound and legally defensible will take a considerable amount of time. The new State administrations that are the result of the November 2002 elections in the United States will undoubtedly want to play a key role in developing a regime consistent with Annex 2001. With the discussion of any regime far from complete, they will have ample opportunity to shape the resolution of these important issues.

TECHNICAL CONSIDERATIONS

a) Water Use and Related Information

The Great Lakes Commission has estimated 1998 consumptive uses in the basin at 2168 mgd, or 18 % less than their 1993 estimate of 2639 mgd. Earlier IJC-sponsored estimates included 1485 mgd in 1965, 3230 mgd in 1975, and between 1940 mgd and 3890 mgd in 1980. Several binational forecasts prepared between 1973 and 1985 projected year 2000 uses at between 3780 mgd and 6400 mgd. Based on these numbers, we can now say with a relatively high degree of confidence that the consumptive use “problem” has been consistently and significantly overstated for the past three decades.

While the latest data is more complete than earlier attempts, there remain difficult challenges with respect to its accuracy. The effort now being coordinated by the Great Lakes Commission will result in a substantial expansion of the current knowledge base on water use and supply. It will be important for states and provinces to sustain that effort, to intensify and improve measurement, to refine estimates, to validate consumption coefficients, and to begin to identify concrete reasons for any changes over time.

b) Diversions and Other Removals

The possibility of marine tanker export from the Great Lakes has essentially become a dead issue, partly because of public and governmental reactions to the earlier proposal, but also because, based on studies elsewhere, it is now relatively clear that the concept is economically infeasible. Although there will always be concerns in some quarters about large, long-distance diversions, we believe, based on economic and other considerations, that it is highly unlikely that there will be any official interest in such diversions, either into or out of the basin in the

foreseeable future.

No new diversions or new diversion proposals have come to our attention. Nevertheless, in the Great Lakes states, where population is more heavily concentrated than in Canada, some interbasin diversion possibilities are likely to attract communities just outside or straddling the basin divide. This likelihood may be increased by a trend towards consolidation of water utilities over larger geographical areas, including both sides of the basin divide.

c) Cumulative Impact

Since February of 2000, a series of workshops and literature reviews have provided important insights into the nature of the problem. It is now quite clear that any attempt to use the cumulative impact concept in a regulatory or quasi-regulatory way in the Great Lakes water levels context will face serious conceptual problems, as well as very difficult scientific challenges. It is not expected that these hurdles will be overcome for some considerable time.

Regardless of whether cumulative impact can be developed into a quasi-regulatory tool, or continue to be used for informational purposes, it is important that the relevant science proceed as quickly as possible, because all factors (except water conservation) likely to impact on water levels in the future are likely to cumulatively lower water levels. In that regard, the Great Lakes Protection fund is currently supporting two highly relevant modelling projects, and modest scientific progress is also likely to come out of ongoing Lake Ontario regulation studies in about two years time.

d) Climate Change

Although there have been at least two new developments with respect to climate modelling in the Great Lakes Region, the level of uncertainty remains essentially the same as it was three years ago. There is still a wide variation in model results. Climate change could result in large decreases in water levels, small increases, or anything in between. The undetermined but potentially decisive impact of climate change on the Great Lakes ecosystem ought to be a powerful incentive for the region to intensify its collaboration on research, to remain cautious in the way it uses water, and to seek to develop a variety of resilient water management tools that can respond to change.

e) Groundwater

Groundwater research continues to be largely directed at solving quite local problems. There has been only modest progress related to a few of the IJC recommendations on groundwater. Over the longer term, one key to improving the way groundwater is considered in any decision making regime will be our ability to map the groundwater divide. Unlike the surface water divide, groundwater divides shift as water enters or leaves an aquifer, a fact that will always make mapping at least somewhat imprecise. In any event, the mapping of groundwater throughout the

Great Lakes basin is likely to be a very long, arduous process.

A very promising initiative currently being funded by the Great Lakes Protection Fund will better define how groundwater relates to surface water, including flows into the Great Lakes, and develop protocols and data reporting procedures that can be used in both Canada and the United States in routine hydrologic analyses.

f) Conservation

There are a number of reasons why we have consistently overprojected water uses over the past three decades. These include inadequate data and forecasting tools, demographic shifts, and stricter pollution control measures. But we also believe that some of the overprojection is a product of a failure to appreciate that conservation in this water-rich region has been occurring. Unfortunately, there is little measurement of conservation in the region, and we cannot say how much conservation alone has contributed to the quicker than expected levelling off of consumptive uses.

There are a number of important conservation initiatives underway on both sides of the boundary. These efforts are expected to be enhanced in the future by improved coordination, for example through the work on a conservation tool kit that is currently being funded by the Great Lakes Protection Fund. In the long run, virtually all successful water conservation programs have at their core comprehensive metering (if you don't measure, you won't improve), and the setting of prices in such a way that the amount of water used by any activity is a function of its price. We believe there continues to be considerable potential for additional water savings, and that those water savings will not only result in basin-wide benefits, but will also yield significant infrastructure and energy cost savings, as well as contributing to the resolution of many local scale water management problems.

INTRODUCTION

In February 2000, the International Joint Commission submitted its report on Protection of the Waters of the Great Lakes to the governments of the United States and Canada in response to a February 1999 reference. In that report, the Commission recommended that it be given a standing reference to review its recommendations in three years and thereafter at 10-year intervals unless conditions dictate more frequent review. By letters dated September 28, 2000 and November 2, 2000, the governments of the United States and Canada approved this further assignment.

To assist it in its three year review, the International Joint Commission appointed the International Water Uses Review Task Force in July of 2002. The Task Force was asked to review and provide a status report on legislative and policy efforts of the governments of Canada and the United States, and the Great Lakes States and Ontario and Quebec concerning removals or major new or increased consumptive uses. In addition, it was asked to report on the status of information gathering and other management programs that affect Great Lakes water uses. The Directive from the Commission called for a final report by November 8, 2002.

The full Task Force met twice, in Chicago on July 23 and in Ottawa on October 8. In addition, the Co-Chairmen met on August 7 and again on August 20-21 in Ann Arbor, Michigan, and extensive consultations have taken with a variety of experts working on this issue. On October 8, the Task Force presented its preliminary findings to IJC Commissioners at their semi-annual meeting in Ottawa. This final report summarizes the outcome of the Task Force's research, consultations and deliberations.

Since February of 2000, both federal governments have taken legislative initiatives to clarify the situation regarding diversions and/or other removals. Aside from those federal actions, the primary policy initiative has been work towards a multi-jurisdictional regime for decision making led by the Council of Great Lakes Governors and Premiers, while much of the supporting technical activity has been focussed on efforts to develop a decision support system, led by state and provincial officials along with the Great Lakes Commission. Chapter 1 of this report concentrates on the two key state-provincial activities and their status. Chapter 2 provides an analysis of legal and policy issues, while chapters 3 through 8 provide status reports on six related technical subjects. The technical topics include water use data and related information, diversions and other removals, cumulative impact, climate change, groundwater, and water conservation.

In completing its assignment, Task Force members have made every effort to ensure the accuracy of the information provided, including having reviews conducted by selected experts. While much of the information is straightforward facts, in some instances Task Force members have had to go beyond the simple facts and have provided some additional interpretation in order to provide the reader with a reasonably comprehensive picture. In those cases, the interpretations are those of Task Force members alone based on their own personal and professional judgement, and do not necessarily represent the views of the International Joint Commission or its staff.

DECISION MAKING REGARDING CONSUMPTIVE USES AND REMOVALS

1. Situation as of February 2000

This section will briefly attempt to outline selected water management regimes that are now in place in the Basin and some of the changes that are being considered to them. In its 2000 report, the Commission recognized that “water management in the Great Lakes is governed by a network of legal regimes, including international instruments and customs, federal laws and regulations in both Canada and the United States, the laws of the eight Great Lakes states and Ontario and Quebec, and the rights of Aboriginal Peoples and Indian tribes under Canadian and U.S. law,” and a similar caveat applies here: since it is impossible to offer a full description of existing management regimes, most of which exist at the sub-state/sub-provincial level, this section will focus on select items.

The Commission’s 2000 report devotes considerable attention to the 1985 Great Lakes Charter, a non-binding arrangement among the Great Lakes states and provinces that focuses attention on a number of resource issues in an effort to promote cooperation. The report notes that:

“The Charter provides that the planning and management of the water resources of the Great Lakes Basin should be founded upon the integrity of the natural resources and ecosystem of the Great Lakes Basin. Moreover, the Charter stipulates that the water resources of the Basin should be treated as a single hydrologic system that transcends political boundaries in the Basin. New or increased major diversions and consumptive use of the water resources of the Great Lakes are said to be matters of serious concern, and the Charter states that ‘[it] is the intent of the signatory states and provinces that diversions of Basin water resources will not be allowed if individually or cumulatively they would have any significant adverse impacts on lake levels, in-basin uses and the Great Lakes Ecosystem.’

The Charter provides that no state or province will approve or permit any major new or increased diversion or consumptive use of the water resources of the Great Lakes Basin without notifying and consulting with and seeking the consent and concurrence of all affected Great Lakes states and provinces. The trigger point for notification and for seeking the consent and concurrence of other Great Lakes states and provinces is an average use of 5 million gallons (19 million liters) per day in any 30-day period. In order to participate in this notice and consultation process, jurisdictions must be in a position to provide accurate and comparable information on water withdrawals in excess of 100,000 gallons (380,000 liters) per day in any 30-day period and must have authority to manage and regulate water withdrawals involving a total diversion or consumptive use of Great Lakes Basin water resources in excess of 2 million gallons (7.6 million liters) per day average in any 30-day period.

The Great Lakes Charter also records a commitment by the signatory states and provinces to pursue the development and maintenance of a common base of data and information regarding the use and management of Basin water resources, the establishment of systematic arrangements

for the exchange of water data and information, the creation of a Water Resources Management Committee, the development of a Great Lakes Basin Water Resources Management Program, and additional coordinated research efforts to provide improved information for future water planning and management decisions. Although not fully implemented, these commitments point toward the kind of cooperation and coordination that is required in the future.

On October 15, 1999, the Great Lakes governors issued a statement renewing their commitment to the principles contained in the Great Lakes Charter and pledged to develop a new agreement, based on those principles, that would bind the states and provinces more closely to collectively planning, managing, and making decisions regarding the protection of the waters of the Great Lakes. The governors also pledged to develop a new common standard, based on the protection of the integrity of the Great Lakes ecosystem, against which water projects would be reviewed.

The 2000 Report also covers the Great Lakes Basin Compact, a congressionally approved arrangement that created the Great Lakes Commission and “provides, among other things, for joint or cooperative action to promote the orderly, integrated, and comprehensive development of the water resources of the Great Lakes Basin and to plan for the welfare and development of these water resources.”

In addition, the 2000 Report says that “the Water Resources Development Act of 1986 (WRDA) is a federal law that prohibits any further diversion of water from any U.S. portion of the Great Lakes or their tributaries for use outside the Basin unless such diversion is approved by the governors of all Great Lakes states. It also prohibits federal studies of diversions without the concurrence of the governors. The impetus for the Charter and for WRDA was the concern in the U.S. portion of the Great Lakes Basin, in the early 1980s, that there would be major demands for Great Lakes Basin water from the agricultural and energy sectors of the western and southern United States.”

The 2000 Report acknowledges that several proposals for diversion have been considered by the Governors and Premiers since the signing of the Great Lakes Charter and the passage of WRDA but points out that there has been just one proposal for a new consumptive use large enough to trigger the Charter levels and recognizes that, “consequently, the Charter has not yet provided the impetus for an ongoing conversation among the jurisdictions on the subject of consumptive uses.”

The Commission’s observation on the Charter trigger level led the Commission to a formal conclusion that: “The Great Lakes Charter’s trigger amount for consideration of significant proposed new diversions and consumptive use is too high to encourage the degree of consultation regarding the use of Great Lakes water that is needed to assure the sustainable use of these resources.”

In its conclusions on the Charter, the Commission continued on to say that “the Charter does not require the consent of all Great Lakes states and provinces before allowing a new diversion or

consumptive use to proceed, it does not establish standards for when such consent should be given or withheld, and it does not provide for public involvement during the consultation process.”

The Commission’s 2000 report clearly affirmed the importance of using existing institutions to manage shared waters. Recommendation V says:

“To help ensure the effective, cooperative, and timely implementation of programs for the sustainable use of the water resources of the Great Lakes Basin, governments should use and build on existing institutions to implement the recommendations of this report. In this regard, the governments of the states and the provinces should take action, with respect to the implementation of the Great Lakes Charter, to:

- a. develop and implement, on an urgent basis, the Basin Water Resources Management Program,
- b. develop a broader range of consultation procedures than are currently called for in the Charter to assure that significant effects of proposed uses of water resources in the Great Lakes Basin are assessed, and
- c. ensure that the notice and consultation process under the Charter is open and transparent and that there is adequate consultation with the public.”

With regard to the way existing institutions should manage removals and major new or increased consumptive uses, the Commission offered two major recommendations:

“Recommendation I. Removals

Without prejudice to the authority of the federal governments of the United States and Canada, the Governments of the Great Lakes states and Ontario and Quebec should not permit any proposal for removal of water from the Great Lakes Basin to proceed unless the proponent can demonstrate that the removal would not endanger the integrity of the ecosystem of the Great Lakes Basin and that:

- a. there are no practical alternatives for obtaining the water,
- b. full consideration has been given to the potential cumulative impacts of the proposed removal, taking into account the possibility of similar proposals in the foreseeable future,
- c. effective conservation practices would be implemented in the place to which the water would be sent,
- d. sound planning practices will be applied with respect to the proposed removal, and
- e. there is no net loss to the area from which the water is taken and, in any event, there is no greater than a 5 percent loss, (the average loss of all consumptive uses within the Great Lakes Basin); the water is returned in a condition that, using the best available technology, protects the quality of and prevents the introduction of alien invasive

species into the waters of the Great Lakes.

In reviewing proposals for removals of water from the Great Lakes to near-basin communities, consideration should be given to the possible interrelationships between aquifers and ecosystems in the requesting communities and aquifers and ecosystems in the Great Lakes Basin.

In implementation of this recommendation, States and Provinces shall ensure that the quality of all water returned meets the objectives of the Great Lakes Water Quality Agreement.

At this time, removal from the Basin of water that is used for ballast or that is in containers of 20 liters or less should be considered, *prima facie*, not to endanger the integrity of the ecosystem of the Great Lakes. However, caution should be taken to properly assess the possible significant local impacts of removals in containers.

Removal of water for short-term humanitarian purposes should be exempt from the above restrictions.

The governments of Canada and the United States and the governments of the Great Lakes states and provinces should notify each other of any proposals for the removal of water from the Great Lakes Basin, except for those classes of removals referred to in paragraph 4.

Consultations regarding proposed removals should continue in accordance with the procedures and processes that are evolving throughout the Great Lakes Basin and should be coupled with additional opportunities for public involvement.

Any transboundary disagreements concerning any of the above matters that the affected governments are not able to resolve may, as appropriate, be referred by the governments of Canada or the United States to the International Joint Commission pursuant to Article IX of the Boundary Waters Treaty.

Nothing in this recommendation alters rights or obligations under the Boundary Waters Treaty.

Recommendation II. Major New or Increased Consumptive Uses

To avoid endangering the integrity of the ecosystem of the Great Lakes Basin, and without prejudice to the authority of the federal governments of the United States and Canada, the governments of the Great Lakes states and Ontario and Quebec should not permit any proposal for major new or increased consumptive use of water from the Great Lakes Basin to proceed unless:

- a. full consideration has been given to the potential cumulative impacts of the proposed new or increases major consumptive use, taking into account the possibility of similar proposals in the foreseeable future,

- b. effective conservation practices would be implemented in the requesting area, and
- c. sound planning practices will be applied with respect to the proposed consumptive use.

In implementation of this recommendation, States and Provinces shall ensure that the quality of all water returned meets the objectives of the Great Lakes Water Quality Agreement.

The governments of Canada and the United States and the governments of the Great Lakes states and provinces should notify each other of any proposals for major new or increased consumptive uses of water from the Great Lakes Basin.

Consultations regarding proposed major new or increased consumptive uses should continue in accordance with the procedures and processes that are evolving throughout the Great Lakes Basin and should be coupled with additional opportunities for public involvement.

Any transboundary disagreements concerning the above that the affected governments are not able to resolve may, as appropriate, be referred by the governments of Canada or the United States to the International Joint Commission pursuant to Article IX of the Boundary Waters Treaty.

Nothing in this recommendation alters rights or obligations under the Boundary Waters Treaty.”

In addition, the Commission recommended that States and Provinces develop standards and procedures to implement the above two recommendations and that there be a moratorium on major new projects to allow time to develop such standards and procedures. Specifically, the Commission said:

“Recommendation IV. Great Lakes Charter Standards

Without prejudice to the authority of the federal governments of the United States and Canada, the Great Lakes States and Ontario and Quebec, in carrying out their responsibilities under the Great Lakes Charter, should develop, within 24 months, with full public involvement and in an open process, the standards and the procedures, including the standards and procedures in Recommendations I and II, that would be used to make decisions concerning removals or major new or increased consumptive uses. Federal, state and provincial governments should not authorize or permit any new removals and should exercise caution with respect to major new or increased consumptive use until such standards have been promulgated or until 24 months have passed, whichever comes first.”

2. Recent Developments

The Government of Canada responded positively to the IJC’s recommendations, but has formally

expressed reservations about some subsequent developments. We will return to that topic later, but for now, we would like to stress that governments at all levels in both countries have always cooperated fully on activities related to the Great Lakes Charter, and continue to seek out common solutions that will benefit both countries despite the reservations expressed by the Government of Canada. That is indicative of the strong and very constructive relationship that exists between our two countries.

Now that three years have passed since publication of the IJC's report, and we have the benefit of considerable additional data and study, it might be helpful to take a retrospective look at the Commission's recommendations. As indicated in the chapter on water use and related information, we are now relatively certain that the consumptive use "problem" has been consistently and significantly overestimated and overstated for the past three decades. While there are gaps in data that make it difficult to do trend analysis and future projections, water use in the Basin is relatively stable, and policy makers do not need to rush to create a new water management system to solve an immediate problem. Nevertheless, because of the large number of remaining uncertainties, and because conservation is justifiable on its own merits, it would be advisable to continue, and to the extent practicable, accelerate water conservation measures. (see the chapter on conservation for more detail)

Regarding the regime proposed for removals, the approach used for the Akron diversion, "(essentially) no net loss of water," is simple, measurable, and could, we believe, be very effective. It, along with its accompanying environmental safeguards, could provide both adequate protection to the waters of the Great Lakes, and reasonable access to communities straddling or outside the basin but close to the basin divide. Pending further advances in measurement and understanding, incorporating broader concepts into a new decision making standard may be impractical. Although concepts like ecosystem integrity and cumulative impact are extremely important, and will become increasingly important in the future, we believe that there are significant technical issues involving measurement that will need to be resolved before it will be possible to establish a regulatory or quasi-regulatory regime that will be both scientifically sound and legally defensible. Predicting the length of time that will be needed to resolve these issues is beyond our competence, but we would not be surprised were it to take a decade or more. (See the chapter on cumulative impact for more detail).

In 2000, the Great Lakes Protection Fund issued a grant to the Great Lakes Commission.¹ The grant asked the GLC to lead a project team to: (1) inventory existing information sources on Great Lakes water resources and begin initial collection of new information, (2) assess the status of water resources and update the Commission's existing database to include information on water withdrawal and use; and (3) collect and present preliminary information on the ecological effects of inventoried water uses. The project management team includes representatives from each of the Great Lakes states and provinces, the Great Lakes Commission, the Council of Great Lakes Governors, USGS, NOAA, the Army Corps of Engineers and Environment Canada.

¹www.glpf.org/00awards

During the course of subsequent work on the project, the project management team incorporated into the scope of its work items relevant to issues outlined in Annex 2001.

In June 2001, the Great Lakes premiers and governors issued a supplementary agreement to the Great Lakes Charter.² In this document, the governors and premiers recognized that “the Waters and Water-Dependent Natural Resources of the Basin remain at risk of damage from pollution, environmental disruptions, and unsustainable water resource management practices which may individually and cumulatively alter the hydrology of the Great Lakes ecosystem.” To respond to this risk, the premiers and governors agreed to develop “an enhanced water management system that is simple, durable, efficient, retains and respects authority within the Basin, and, most importantly, protects, conserves, restores and improves the Waters and Water-Dependent Natural Resources of the Great Lakes Basin.”

In the six directives to the Annex, the premiers and governors agreed, among other things, to develop a new set of binding agreements within three years to “protect, conserve, restore, improve and manage use of the Waters and Water-Dependent Natural Resources” of the Basin, to use a process that allows for ongoing public input, to design an information gathering system that will assess available information and existing systems, completely update data on existing water uses, identify needs, provide a better understanding of groundwater, and plan for the implementation of an ongoing support system.

Following the issuance of Annex 2001, the Council of Great Lakes Governors established a Water Management Working Group (WMWG) with a goal of developing a sound water management system. The WMWG then developed a work plan designed to:

- produce recommendations to the Governors and Premiers on a decisionmaking standard;
- draft binding agreements between the States and comparable commitments for the Provinces;
- create cross-border agreements for the States and Provinces and, as appropriate, the two federal governments;
- develop a sound dispute resolution process; and
- ensure the new structure is flexible enough to handle current and future challenges.

The WMWG consists of two representatives from each jurisdiction. It is supplemented by an advisory committee of about 20 regional stakeholder organizations and a resource group of governmental and quasi-governmental groups with technical expertise related to Great Lakes water management. In addition, the WMWG established a number of sub-committees:

²The entire Annex is available in English and French at:
[www.cglc.org/projects/water/Annex 2001](http://www.cglc.org/projects/water/Annex%2001) and [www.cglc.org/projects/water/Annex2001 fra](http://www.cglc.org/projects/water/Annex2001fra).

- The Decision Making Sub-committee is investigating issues surrounding an appropriate standard for the Great Lakes Basin.
- The Compact Structure Sub-committee is charged with addressing issues surrounding what will or will not be written into the actual compact; who will have implementing authority and what authorities they will have.
- The Inter-provincial/International Agreement(s) Sub-committee has been charged to harmonize water withdrawal standards and establish a structure to resolve cross-border disputes.

In 2002, the WMWG also established:

- a Legal Team to serve as a resource on legal questions, including those related to compacts, constitutional law, and environmental regulations, and
- a Tribal/First Nations Team to serve as a resource on how to involve the Tribes and First Nations in the development of the agreement(s).

The CGLG structure for Annex 2001 is complex and its work is in the initial phases. Many of the technical issues that the WMWG must eventually resolve have been identified in the WRMDSS project. Several key issues underlying Annex 2001 are brought together in Directive #3, which calls for the establishment of a new decision making standard. The full text of this directive is:

“The new set of binding agreement(s) will establish a decision making standard that the States and Provinces will utilize to review new proposals to withdraw water from the Great Lakes Basin as well as proposals to increase existing water withdrawals or existing water withdrawal capacity.

The new standard shall be based upon the following principles:

- Preventing or minimizing Basin water loss through return flow and implementation of environmentally sound and economically feasible water conservation measures; and
- No significant adverse individual or cumulative impacts to the quantity or quality of the Waters and Water-Dependent Natural Resources of the Great Lakes Basin; and
- An improvement to the Waters and Water-Dependent Natural Resources of the Great Lakes Basin; and
- Compliance with the applicable state, provincial, federal, and international laws and treaties.”

As indicated earlier, the Government of Canada has formally expressed serious concerns about certain aspects of the Annex. Regarding consumptive uses, it stated: “Recognizing that improved conservation measures for consumption within the Great Lakes are a high priority, Canada considers that an environmental approach that treats in-basin and out-of basin uses differently is

the most effective way of protecting the Great Lakes.” It elaborated on this distinction by noting that “Bulk removals outside the basin represent a permanent loss to the basin and is not a sustainable use of water. When water is withdrawn within the basin, most of it usually returns to the boundary waters by a natural route - on average, there is essentially no or little loss to the system. Consumptive losses within the basin should not be equated to removals out of the basin.” Regarding removals, the Government of Canada expressed a concern that the proposal could open the door to long-distance, large-scale removals out of the basin.

3. Remaining Issues

Clearly, both the IJC recommendations and the Annex proposals are responding to the same threats, and both have common objectives. Despite differences of opinion on how to meet those common objectives, we are confident that, as work towards an appropriate water use regime proceeds, agencies at all levels in both countries will continue to cooperate fully, and that in the end a regime will be established to the satisfaction of all concerned.

As indicated earlier, the Great Lakes Commission has modified its task to take account of Annex 2001. In particular, the GLC project was expanded to begin a discussion of the issues involved in creating a decision making standard along the lines of Directive #3. Since the Annex 2001 timetable does not call for agreement until 2004, any discussion of the standard must necessarily be limited to the proposals in the Annex, which could conceivably change before they are implemented. For that reason, we will not attempt to pass judgement on the merits of the Annex as currently crafted, but will instead point out, by way of questions, both the kind of fundamental policy concerns that are likely to arise and will have to be answered along the way, and the very significant challenges that will be encountered in devising implementation methodology.

3.1 Policy Questions

- Is there a legal requirement to adopt a single standard for both in-basin and out-of-basin uses? We have heard and read widely varying opinions on that topic. If not, and based on what we know now, are there compelling reasons to impose a multi-jurisdictional, quasi-regulatory regime within the basin. Without sufficient justification, would it be wise to curtail the freedom of choice of local decision-makers? Would a multi-jurisdictional regime create a huge and perhaps counter-productive bureaucratic apparatus? Over the longer run, would individual jurisdictions tolerate external jurisdictions passing judgement on their internal decisions, such as those dealing with local land use and environmental management?
- Is it possible to achieve a “resource improvement” without, in one way or another, simply taking credit for meeting the responsibilities of some other resource abuser (i.e., some entity that has failed to meet at least a moral obligation to either mitigate some environmental harm that it has caused, or has failed to implement appropriate resource conservation measures)? Viewed in that light, does the resource improvement concept

represent good environmental policy? In the case of removals, how could one quantify the negative effects of bulk removals, in the sense of being able to cope with future, unpredictable stresses such as climate change, in order that they could be offset by equal or greater resource improvements?

- If the constraints in the proposed standard (e.g. no significant detrimental individual or cumulative impact plus and a resource improvement) were rigorously enforced, taking into account all the other potential pressures on water levels, would there be any feasible policy space remaining within which any new or expanded use could take place, either inside or outside of the basin? If the constraints were loosely interpreted, would they, as the Government of Canada suggested, open the door to large-scale, long-distance removals of water from the basin? Are there legal mechanisms available at the state-provincial level to make the constraints legally binding? If so, in the event of a legal challenge, would the courts interpret the constraints rigorously or loosely?
- Would the states and provinces actually enshrine any standard in legislation and regulation? In the 1985 Great Lakes Charter, states and provinces agreed to “seek (where necessary) and to implement legislation establishing programs to manage and regulate the diversion and consumptive use of Basin water resources.”³ Yet, as the GLC’s recent survey of water use permitting, registration, and reporting programs in states and provinces indicate, there are huge differences in the level of permitting, registration, and reporting throughout the Basin.⁴ Jurisdictions with more rigorous water management programs may well be reluctant to agree to a new decision making standard with partners that have not yet completely implemented the legislative/regulative commitments imbedded in the 1985 Charter.

3.2 Questions Related to Implementation

- Broadly speaking, would it be possible to achieve the objectives sought by the proposed standard in a simple, durable and efficient manner as called for in the Annex? For example, all the case studies considered to date would seem to require extremely complex accounting practices, based on parameters that are difficult and in some circumstances even impossible to measure. Could the harm associated with a water withdrawal be meaningfully equated to an improvement in some other resource, for example wildlife?
- What is the meaning of the term “significant,” as used in Directive #3? Presumably a

³Principle III, Great Lakes Charter, 1985.

⁴Dan Blake, Report on State and Provincial Water Use and Conservation Programs in the Great Lakes - St. Lawrence Basin, Great Lakes Commission, July 2002. Found at: www.glc.org/waterquantity/wrmdss/PE3/WaterUseProgramsReportFINAL.

project could have an insignificant impact when considered individually, but significant when looked at cumulatively? Certainly, the importance assigned to the question of cumulative impacts appears to be a recognition that a series of “insignificant” minor projects can result in a significant “cumulative” harm, but it is hard to see how one could identify the “straw that breaks the camel’s back.” And even if one could, would it be possible to allow proposals to proceed until some threshold level of harm is reached, and then suddenly prohibit any additional water-dependent development in the Region? Should cumulative impact assessments take into account only similar types of development, or should they also take account of other factors affecting or likely to affect water levels?

- Similar questions of measurement apply to the term “improvement,” as used in Directive #3. What will be meant by improvement? How does one measure an improvement? What is the appropriate scale for the improvement, i.e., should it occur near the withdrawal? Or, for a withdrawal from a stream, in the same basin, Or, for a withdrawal from a lake, in the same lake? Or can an improvement occur anywhere in the Great Lakes/St. Lawrence system? How long should the improvement last? Five years? Ten? Fifty? Indefinitely? If an improvement were made indefinite, how would the improvement be sustained in the face of other changes to the system?

A number of these technical questions, along with many others were identified by participants at a workshop linked to the GLC’s work, but it is clear that finding satisfactory answers to many of them will take a good deal of time and effort. The Great Lakes Protection Fund is continuing to support projects that are designed to contribute to the effort to develop a standard. In 2002, GLPF agreed to fund projects designed, among other things, to build case studies of how small communities near the edge of the Great Lakes drainage basin can meet their water needs under the management system contemplated by Annex 2001; to build case studies for new or increased use within the Basin under the envisioned management system; to prepare a water conservation toolkit; to develop metrics and models to quantify the resource impacts of various types of water withdrawals; to build a modeling framework that couples existing models in ways that allow for predictions of effects on a scale of a basin river system (i.e., not simply local modeling); and to produce a tool that simulates the impact of groundwater withdrawal on flows into the Great Lakes and develop protocols that can be shared by U.S. and Canadian agencies that track groundwater.⁵

As cooperative efforts move forward, one can anticipate the identification of further issues requiring research and evaluation in order to build a workable regime for dealing with both in-basin and out-of basin uses. In fact, one immediate benefit of the quest for an improved regime is the fact that it is stimulating discussion and research among water resource managers and researchers in the Basin. Simply knowing more about the resource is a significant benefit to any management scheme that may result from the ongoing effort.

⁵ www.glpf.org/02awards

Annex 2001 indicates that the governors and premiers see the creation of a unified and credible decision making standard as key to the water management system they envision for the Basin, although it is quite possible states and provinces will find it necessary to make distinctions between in- and out-of-basin uses in the application of a unified standard. The Government of Canada has expressed a preference for an approach more like that recommended by the International Joint Commission. The initial work on the resource improvement standard would suggest that either a) implementation may have to await major scientific advances, and those advances are not on the immediate horizon or b) ways will have to be found to significantly simplify the approach before any regime is likely to be supported by all governors and premiers in legally binding agreements.

LEGAL AND POLICY CONSIDERATIONS

1. Situation as of February 2000

In its 2000 Report,⁶ the Commission noted that the Great Lakes Basin was subject to a network of legal regimes, both domestic and international. The report did not provide a detailed discussion of all the possible legal issues that could arise in the context of water management in the Basin; it did however identify those “aspects of the legal regime that bear most directly on the issues raised in [the] report.”⁷ Specifically, the section in the report on legal and policy considerations focused on both the international legal context and the domestic legal context, with a separate short section on Aboriginal Peoples and Indian tribes.

1.1 International Legal Context

The discussion of the international legal context in the 2000 Report had three primary prongs: the legal regime created by the Boundary Waters Treaty of 1909, the arrangements instituted in the Great Lakes Charter of 1985, and international trade law.

1.1.1 *Boundary Waters Treaty*

The Commission noted the effectiveness of the Boundary Waters Treaty of 1909, for a period of over ninety years “in assisting Canada and the United States to avoid and resolve disputes over freshwater.”⁸ It also observed, however, that the treaty regime does not treat all Basin waters in the same way. For example, while the treaty requires Commission approval in cases where the “use, diversion, or obstruction” of boundary waters will affect water levels or flows on the other side of the boundary (Article III), in the case of tributaries to boundary waters or of transboundary rivers, each nation reserves “exclusive jurisdiction and control over [their] use and diversion”. (Article II). The Commission also noted that groundwater was not referred to explicitly in the treaty. Finally, it remarked on the extensive use of the Commission by the two governments as a means of investigating and making recommendations on both water quantity and water quality issues over the years.

⁶International Joint Commission, *Protection of the Waters of the Great Lakes*, Final Report to the Governments of Canada and the United States (February 22, 2000) [hereinafter “2000 Report”].

⁷*Id.*, at 31.

⁸*Id.*

In summary, the Commission concluded (Conclusion 17) that the Boundary Waters Treaty “continues to provide effective protection for both countries from abuses to the waters of the Great Lakes Basin ecosystem [and] represents a proven regime for avoiding and resolving disputes that arise between Canada and the United States over boundary waters and transboundary rivers”.⁹ In this respect, the Commission also stressed the importance of the Great Lakes Water Quality Agreement in buttressing the protection afforded by the Boundary Waters Treaty. More specifically, the Commission refers to its own role in the implementation of its recommendations regarding “Major New or Increased Consumptive Uses” (Recommendation II of the 2000 Report), where it states that in the implementation of Recommendation II (which the Commission anticipates will occur in the context of “the procedures and processes that are evolving throughout the Great Lakes Basin”), “[a]ny transboundary disagreements ... that the affected governments are not able to resolve may, as appropriate, be referred by the governments of Canada or the United States to the International Joint Commission pursuant to Article IX of the Boundary Waters Treaty.”¹⁰

1.1.2 Great Lakes Charter

The Commission’s 2000 report noted the significance of the Great Lakes Charter of 1985¹¹ in the management of the waters of the Basin. The Charter was initiated in reaction to proposals to divert Lake Superior water as a means of coping with the depletion of the Ogallala aquifer in the U.S. southwest. Although the Charter signatories include all the Great Lakes states and the two Canadian provinces¹², it was developed initially in the context of concerns originating in the United States, and the only litigation touching on the status of the Charter has been in U.S. courts. These developments are discussed below in the context of U.S. domestic developments.

Briefly, the Charter requires (Principle IV) that any signatory notify, consult and seek the consent of the other states or provinces for any new or increased diversion or consumptive use “of the

⁹*Id.*, at 44.

¹⁰*Id.*, at 48.

¹¹Council of Great Lakes Governors, *The Great Lakes Charter*, Principles for the Management of Great Lakes Water Resources (February 11, 1985). The Charter can be found on the Council’s website at www.cglg.org.

¹²Specifically Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin, and Ontario and Quebec.

water resources of the Great Lakes Basin.”¹³ If the permitting state or province follows the Charter Consultation Procedures, it has the discretion to approve or disapprove the diversion subject only to the duty to notify other affected states and provinces. The Charter is a non-binding agreement and is at most “soft law”. In the first litigation to consider it, a federal district court described it as “a kind of gentlemen’s agreement between the Governors of the Great Lakes States and the Provinces of Ontario and Quebec that the parties to the charter should not make any new diversion of Great Lakes waters averaging more than 5 million gallons per day over a 30-day period without the notification, consultation and approval of all the parties to the charter.”¹⁴ As the Commission noted in its 2000 Report: “Although not fully implemented, [the Charter] commitments point toward the kind of cooperation and coordination that is required in the future.”¹⁵

Shortly before the Commission issued its 2000 Report, the governors of the Great Lakes issued a statement that both re-committed them to the principles in the Charter and to the development of a new agreement to improve the collective management of the waters of the Great Lakes and the development of a common standard for reviewing water projects.¹⁶

1.1.3 *International Trade Law*

Finally, international trade law was an issue on which the Commission received numerous submissions, and this is reflected in a separate section in the 2000 Report’s chapter on legal and policy considerations. In addition to a number of submissions made by interested parties in the course of the Commission’s public hearings, the Commission received representations from both the Deputy United States Trade Representative and the Canadian Department of Foreign Affairs and International Trade; the Commission found that both these representations “generally are consistent with the Commission’s views regarding the effect of international trade law on the ability of the two countries to protect the water resources of the Great Lakes Basin.”¹⁷

¹³Principle IV is triggered by any diversion in excess of 5,000,000 gallons (19 million litres) per day over a 30-day average.

¹⁴*Little Traverse Bay Bands of Odawa Indians v. Great Springs Waters of America, Inc.*, Case No. 1:02-CV-127 (Western District of Michigan May 28, 2002).

¹⁵*2000 Report*, at 32.

¹⁶Council of Great Lakes Governors, “A Statement on Protecting the Great Lakes: Managing Diversions and Bulk Water Exports” (October 15, 1999), Chicago. The statement can be found at <http://www.cglg.org/projects/water/press101599.html>.

¹⁷*2000 Report*, at 33.

Additionally, the Commission heard from several experts on international trade law as to the implications of trade law for water management. The general tenor of these opinions was “similar to the views expressed by the Canadian and U.S. governments.”¹⁸

The central conclusion of the Commission (Conclusion 23) with respect to international trade law obligations was that

International trade law obligations ... do not prevent Canada and the United States from taking measures to protect their water resources and preserve the integrity of the Great Lakes Basin ecosystem. Such measures are not prohibited so long as there is no discrimination by decision makers against persons from other countries in their application, and so long as water management policies are clearly articulated and consistently implemented so that undue expectations are not created.¹⁹

The Commission further concluded that neither nation could be “compelled by trade laws to endanger the waters of the Great Lakes ecosystem”; nevertheless, the Commission recognized that the public “remains deeply concerned that international trade law could affect the protection of these waters.”²⁰ This latter finding is reflected in the Commission’s recommendation with respect to trade law (Recommendation IX) – namely, that the two governments “should direct more effort to allaying the public’s concern that international trade obligations could prevent Canada and the United States from taking measures to protect waters in the boundary region, and

¹⁸*Id.*

¹⁹*2000 Report*, at 45. Strictly speaking, the Commission dealt with more than just international trade obligations under the rubric of International Trade Law. It also dealt with *investment* obligations, albeit those existing under a trade agreement – specifically, under Chapter 11 of NAFTA. These investment obligations were also a source of comment in the Commission’s public hearings, and, in this respect, the Commission noted (at 34) that

Actions with respect to water diversions or sales that nationalize or expropriate an investment of a foreigner may lead to a claim under Chapter 11 of NAFTA, which gives private investors of one country the right to commence proceedings against another country for injuries to the rights accorded private investors under the agreement.

The concerns with respect to the implications of Chapter 11 for water management have continued to be expressed, especially by non-governmental organizations, to the present day.

²⁰*Id.*

... to direct more effort to bringing greater clarity and consensus to the issue.”²¹

1.2 Domestic Legal Context

1.2.1 Canada

In its 2000 Report, the Commission reviewed the constitutional underpinnings of Canadian water in the Constitution Act. Water does not constitute a separate head of power under the Act and federal and provincial authority with respect to water must therefore be found under a number of constitutional headings. In the case of the federal government, the Commission noted that it “exercises jurisdiction over water management primarily through its legislative [as opposed to proprietary] authority” and that “[h]istorically, the primary interest of the federal government has been focused on its constitutional responsibilities for fisheries ... navigation ... and international relations, although it has in recent years taken a role in water quality, particularly with respect to toxic substances.”²² Two more general sources of federal power – the power to implement “Empire” treaties (notably the Boundary Waters Treaty) and the peace, order and good government power – have also been relevant for water management in an international context. With respect to international water relations, the Commission noted the existence of the International Rivers Improvements Act, which may have implications for some water withdrawals having international aspects. However, the Act is limited in important ways (including its non-application to boundary waters), and the Commission observed that, “as with other federal legislation, the act is not designed to provide a general mechanism for dealing with water removals...”²³

The Commission noted that the federal government, in November 1999, had introduced into Parliament “proposed amendments to the International Boundary Waters Treaty Act that, if enacted, will impose a prohibition [for which there may be exceptions established by regulations] on removals of boundary waters from their water basins ... Moreover, the amendments will [subject to certain exceptions] require persons to obtain a license from the Minister of Foreign Affairs for the use, obstruction, or diversion of boundary waters in a manner that in any way affects, or is likely to affect, the natural level or flow of boundary waters on the other side of the international boundary.”²⁴ This legislation was described as one part of the Canadian federal

²¹*Id.*, at 50.

²²*Id.*, at 35.

²³*Id.*

²⁴*Id.*, at 34-35.

government's "three-part strategy, announced on February 10, 1999, to prohibit the removal of water (including removals for the purposes of export) out of Canadian water basins" The other two prongs of the strategy included the joint Canada-U.S. reference to the Commission which led to the 2000 Report and "an effort by the Canadian Minister of the Environment to seek the endorsement by provinces and territories of a Canada-wide accord prohibiting bulk water removals to ensure that all of Canada's watersheds are protected."²⁵

Provinces also have both significant legislative and proprietary powers under the Constitution; of particular significance is provincial ownership of public lands and resources, including water. As the Commission noted, these proprietary powers are buttressed by grants of legislative authority over such matters as management and sale of public lands, local works and undertakings, property and civil rights in the province and matters of a local or private nature. All provinces have significant legislation governing the use of water. In the case of the two Basin provinces, Quebec and Ontario, at the time of the Commission's 2000 Report both these provinces had recently adopted new legal provisions with respect to water withdrawals. Ontario had adopted in 1999 a regulation prohibiting (subject to certain exceptions) the transfer of water from the Great Lakes Basin.²⁶ In the same year Quebec adopted a Water Resources Preservation Act prohibiting (subject to specified exceptions) the transfer of surface or ground water out of the province. Although this was adopted as an interim measure pending the completion of a then-ongoing provincial inquiry with respect to water management, the legislation was subsequently extended.²⁷

1.2.2 *United States*

The key domestic developments in U.S. domestic law relating to water management in the Great Lakes Basin leading up to the release of the Commission's 2000 Report arose out of the Great Lakes Charter, discussed above. The Charter was implemented by the adoption of state laws that

²⁵*Id.*, at 35.

²⁶O. Reg. 285/99 (filed April 30, 1999, gazetted May 15, 1999).

²⁷*Water Resources Preservation Act*, S.Q. 1999, c. 63 (in force November 26, 1999). The Act was originally conceived as an interim measure pending the report of the Commission sur la gestion de l'eau au Québec. That report, which was issued in May 2000 (and which may be found on the website of the Bureau d'audiences publiques sur l'environnement – BAPE – at www.bape.gouv.qc.ca/eau) "categorically opposed" any large-scale transfer of freshwater resources from Quebec, and recommended that the *Water Resources Preservation Act* be made permanent. The latter recommendation was effectively accepted in December 2001 with the passage of *An Act to Amend the Water Resources Preservation Act*, S.Q. 2001, c. 48 (in force 18 December 2001).

prohibited out of basin diversions.²⁸ The Charter and the anti-diversion laws apply both to interstate and intrastate diversions.²⁹

The Charter, and state laws implementing it, raised serious federal constitutional issues. Any state law which subjects interstate diversions to a higher standard than intrastate diversions, or which imposes a flat prohibition on them, is suspect under federal constitutional law. Laws which *per se* discriminate against interstate commerce will almost certainly be held in violation of the judge-made Dormant Commerce Clause as a result of the 1982 decision in *Sporhase v. Nebraska*³⁰. In contrast, the power to subject intrastate diversions to different standards does not raise as serious Dormant Commerce Clause problems: there is no discrimination against interstate commerce and states have long successfully asserted the power to protect areas of origin from trans- watershed diversions.

The power of states to protect their water resources as a result of carefully crafted conservation regimes has never been tested, but state power is not as constricted as many assume. For example, an out of state user challenged a cross-border permit denial under Nebraska's post-*Sporhase* law, but the court upheld the denial.³¹ The court admitted that the statute applied only to interstate uses but concluded that "when compared with the regulation of intrastate uses of groundwater, the overall regulation relevant to this litigation is evenhanded."³²

Congress endorsed the Great Lakes Charter in 1986. The Omnibus Water Resources Development Act of 1986 [WRDA] prohibited all diversions from the Great Lakes or any United States tributary for use outside the basin.³³ Congress may waive the Dormant Commerce Clause, since it is judge-made law and Congress can decide which state actions threaten to undermine, and its power to waive the doctrine has never been seriously limited by the Supreme Court. WDRA was intended as an express waiver of the Dormant Commerce Clause.

²⁸For example, Michigan Comp. Laws 324.32703.

²⁹Michigan is an exception in this respect, because it is the only Great Lake state or province whose territory lies wholly within the basin.

³⁰458 U.S. 941 (1982).

³¹*Ponderosa Ridge LLC v. Banner County*, 554 N.W.2d 151 (Neb. 1996)

³²554 N.W.2d at 165. See generally Richard S. Harnsberger et al., *Interstate Transfers of Water After Sporhase*, 70 Neb. L. Rev. 754 (1991).

³³42 U.S.C. 1962d-20(d).

After its passage, WRDA was applied in several relatively small diversion proposals. These precedents have influenced state thinking about the process and standards for small diversions that raise long risks because of their cumulative impacts by shaping the on-going dialogue about standards.³⁴ The scope of both the Charter and WRDA was raised in the Crandon Mine proposal in Northern Wisconsin. The company planned to divert groundwater from the Great Lakes to the Mississippi River drainage, and NGOs argued that this triggered WRDA and the Charter notification process. However, the U.S. Army Corps of Engineers ruled that the groundwater did not fall within WRDA.³⁵

WRDA and the Great Lakes Charter preserved the status quo on the Great Lakes but WRDA's ability to provide Dormant Commerce Clause immunity was questioned in a 1999 legal memorandum prepared for the Council of Great Lakes governors. It also suggested that the WRDA violated the non-delegation doctrine because it did not provide a sufficient standard in reviewing diversions and was not a sufficiently clear waiver of the Dormant Commerce Clause.³⁶

1.3 Aboriginal Peoples and Indian Tribes

The Commission received many submissions in the course of its public hearings under the Water Uses Reference with respect to the interests of the Aboriginal Peoples and Indian tribes in the waters of the Great Lakes Basin. The Commission also had some work undertaken on this issue, and commented briefly on it in the 2000 Report. Specifically, it noted with respect to Canada that the nature of Aboriginal Peoples interests in water was not yet clearly settled, while in the United States, although “the right of Indian tribes to the use of the waters of the Great Lakes Basin has continued without significant challenge since the reservations were established (late 1700s to mid-1800s)”, and although there has been some litigation as to tribal fishing rights in the Great

³⁴For example, a Wisconsin diversion was approved in 1989; in 1992 Michigan vetoed a plant to augment the supply of a small Indiana community just outside the basin. Canada strenuously objected to an Illinois request that the U.S. Army Corps of Engineers increase the Chicago diversion to relieve barges stranded along the Illinois River in the drought summer of 1988, and the request was in fact denied.

³⁵See James P. Hill, *The New Politics of Great Lakes Water Diversion: A Canada-Michigan Interface*, 2 *The Toledo J. of Great Lakes, Law, Science & Policy* 75 (1999).

³⁶The non-delegation doctrine is a United States Supreme Court doctrine designed to reconcile the rise of the administrative state with the federal constitution, which makes no provision for administrative agencies. A strict reading of the principle of separation of powers would prohibit the delegation of functions from one branch to another, but the Court has held that legislative functions can be delegated to the executive so long as the legislation contains an intelligible principle or standard to cabin the exercise of discretion.

Lakes, “there does not appear to have been any dispute over tribal use of water from the Great Lakes or its tributaries flowing through or adjacent to the reservations.”³⁷

Whatever the ambiguities in the legal interests of Aboriginal Peoples and Indian tribes, the Commission found a consistent position in their “uniformly expressed opposition to exports or diversions from the Great Lakes Basin [in which they] strongly urged the need to ensure opportunities for the participation of Aboriginal Peoples and Indian tribes in decisions concerning the waters of the Great Lakes Basin ecosystem.”³⁸ Finally, the Commission in its 2000 Report declined to address the issue of the relationship between international trade agreements and treaties with Aboriginal Peoples and Indian tribes, which in its hearings it had been requested to clarify, on the basis that it was not the appropriate forum for addressing the issue.

2. Recent Developments

2.1 United States

The major U.S. development is the enactment of federal legislation which reconfirms that the federal government has delegated the primary decision-making authority to the states because the federal and state interests on this issue are congruent. Subsequent to the IJC’s 2000 Report, and in light of the concerns raised earlier with respect to the effectiveness of the Great Lakes Charter, the Basin states succeeded in obtaining new federal legislation. Section 504 of the Water Resources Development Act of 2000 [WRDA 2000] Section 504 directs the states, in cooperation with the two basin Canadian provinces, “to develop and implement a mechanism that provides a common conservation standard embodying the principles of water conservation

³⁷*2000 Report*, at 38. Indian Tribes exist in the Great Lakes states of Michigan, Minnesota, New York and Wisconsin. Some reservations border or are near the lakes and the Saint Lawrence, but all reservations potentially use surface and ground waters that are part of the Great Lakes system. United States law recognizes two types of Indian rights which can arise as a result of a treaty or the creation of a reservation. *Winters v. United States*, 207 U.S. 564 (1908). The tribe may reserve or be granted hunting and fishing rights, and the tribe may reserve or be granted federal Indian water rights. These rights have historically been granted to support irrigated agriculture the reservations in the Western United States, but the emerging view is that the rights are intended to fulfill the purposes of the reservation and these can include fishery maintenance and perhaps ecosystem protection. Because, there is no Indian irrigation around the Great Lakes, any Indian water rights remain inchoate. Reservations may have groundwater waters as an incident of land ownership.

³⁸*Report 2000*, at 38.

and resource improvement for making decisions concerning the withdrawal and use of water from the Great Lakes Basin.”³⁹ WRDA 2000 corrects the delegation objection and reinforces the conclusion that Congress intended the legislation as a waiver of the Dormant Commerce Clause.

The basin states were involved in a continuing standards development process that was underway before the reference, and the process has continued after the 2000 final report. States took the first step to implement WRDA 2000 by adopting Annex 2001. Annex 2001 was the result of an open two-year process that began in October, 1999. Annex 2001 is best seen as an interim step in the process of drafting a binding agreement. A preliminary draft was released on December 14, 2001. It committed the states to prepare binding agreements between the states and provinces within five years, guidelines for the development of a new withdrawal standard, modification provisions and a commitment to develop an information sharing system. In response to both industry and environment comments, an express commitment to on-going public participation was also added.⁴⁰

The final version, signed on June 18, 2001, provides in part:

The Governors and Premiers agree to immediately prepare a Basin-wide binding agreement(s), such as an interstate compact and such other agreements, protocols or other arrangements between the States and Provinces as may be necessary to create the binding agreement(s) within three years of the effective date of the Annex. The purpose of the agreement(s) will be to further the Governors’ and Premiers’ objective to protect, conserve, restore, improve, and manage use of the Waters and Water-Dependent Natural Resources of the Great Lakes Basin. The agreement(s) will retain authority over the management of the Waters of the Great Lakes Basin and enhance and build upon the existing structure and collective management efforts of the various governmental organization within the Great Lakes Basin.

The new set of binding agreement(s) will establish a decision making standard that the States and Provinces will utilize to review new proposals to withdraw water from the

³⁹WRDA standards reflect in part the position of Governor Engler of Michigan. In his 1992 veto of the proposed Lowell, Indiana diversion, Governor Engler suggested that diversions might be allowed if no imminent adverse health, safety and welfare risks were demonstrated, there was meaningful conservation and clean water was returned to the lakes after use.

⁴⁰It also contained an interim exemption for *de minimis* withdrawals which were defined as those of 1 million gallons per day or less. The preliminary annex was modified in response to objections from the environmental community and Great Lakes industries. Environmental NGOs objected to the exemption and this was dropped from the final version.

Great Lakes Basin as well as proposals to increase existing water withdrawals or existing water withdrawal capacity.

The new standard shall be based upon the following principles:

- Preventing or minimizing Basin water loss through return flow and implementation of environmentally sound and economically feasible water conservation measures; and
- No significant adverse individual or cumulative impacts to the quantity or quality of the Waters and Water-Dependent Natural Resources of the Great Lakes Basin; and
- An Improvement to the Waters and Water-Dependent Natural Resources of the Great Lakes Basin; and
- Compliance with the applicable state, provincial, federal, and international laws and treaties.

The standard guidelines partially reflect the experience with the two Ohio and Wisconsin diversions which were conditioned on the promise that they cause no net loss to the lakes. Annex 2001 commits the Great Lakes states to an ambitious effort to develop a two-track approach to the future use of Great Lakes waters: first, they have agreed to develop a use standard which can be applied on a case by case basis by each state through its own state water management law; and, second, they have moved towards the development of a cooperative mechanism among themselves and the two basin provinces for both large and small scale in-basin use and out-of-basin diversions.

As to the first track, the attainment of a common use standard will be difficult because, while the Great Lakes States are slowly moving from the common law of riparian rights to regulated riparianism, the rate of change varies considerably among the states. Regulated riparianism seeks to move states from a tort to a property model of water allocation. The tort model resolves conflict post hoc and the property model seeks to create firm entitlements that will avoid inter-user conflicts. Regulated riparianism also injects the idea that water resources are public resources in which individual rights to use can be obtained subject to the state's power to supervise and regulate these uses.⁴¹ Regulated riparianism has three primary components:

1. State water planning;

⁴¹See 2 R. Beck, WATERS AND WATER RIGHTS § 9 (1991).

2. An integrated permit system for ground and surface water use; and
3. The establishment of base or environmental flows and lake levels.

The move towards regulated riparianism by the Great Lakes Basin states poses two significant difficulties. First, the level of water management varies considerably among the basin states. Second, the states have committed themselves to regulate both large and small out-of-basin diversions and in-basin use; the regulation of small-scale projects like this raises both problems of information assembly and the challenge of unprecedented interstate and state-provincial cooperation.

With respect to the first of these difficulties, each state follows the common law of riparian rights with some statutory modifications. In many states, the common law remains the primary allocation mechanism. For example, Illinois relies on the common law of riparian rights to resolve most lake and stream conflicts except for the Lake Michigan diversion.⁴² The Department of Transportation has special authority to administer the United States Supreme Court decree in *Wisconsin v. Illinois*.⁴³ By statute, Illinois has also adopted the “reasonable use” as opposed to the common law “absolute ownership rule” rule for groundwater allocation. Michigan continues to rely on the common law as does Indiana, New York, and Ohio. Pennsylvania is somewhat similar to Illinois. It relies on the common law, but it has a permit system for the uses of two of its major rivers, the Delaware and Susquehanna, which are allocated by interstate compacts and cover about two-thirds of the state.

The second difficulty noted above flows from the fact that the states have committed themselves to a complex standard for in- and out-of-basin projects and to a binding agreement to regulate these projects. Future additional water use must both have “no significant adverse individual or cumulative impacts to the quantity or quality of the Waters and Water-Dependent Natural Resources of the Great Lakes Basin; and constitute “an improvement to the Waters and Water-Dependent Natural Resources of the Great Lakes Basin.” The former standard is the NEPA cumulative impacts standard and the latter appears to have come from the Clean Water Act’s section 404 wetlands mitigation program.⁴⁴

⁴² See 6 WATERS AND WATER RIGHTS 335- 344.

⁴³ 615 ILCS 50.

⁴⁴ Under Section 404, a developer can obtain a permit to drain natural wetlands on the condition that they construct new, artificial ones.

The dual standard in turn presents two major difficulties. First, as discussed elsewhere, to apply it effectively to projects, especially small ones, a great deal of water use and environmental impact data must be assembled and synthesized. Second, the implementation of the standard will require unprecedented levels of cooperation. Should the states negotiate an interstate compact (which might include the two basin provinces), it would be the first major regulatory compact in the water area. Most interstate compacts divide an interstate resource into state shares but do not contain a post-division management regime.⁴⁵

The second track that the states are following in addition to the development of a common use standard is the development of a cooperative mechanism among themselves and the provinces for both large and small scale water-use projects. The Great Lakes Charter, WRDA, Annex 21 and parallel Canadian federal and provincial legislation are already sufficient legal barriers to any large-scale diversion. The Charter and WRDA are non-binding, but at a minimum they chill any plan to take large amounts of Great Lakes water to non-basin states. To succeed the plan would have to have the approval of all states and provinces, as well as the two federal governments. Annex 2001 commits the states to develop a binding management scheme for all new projects, regardless of whether the project is an in-basin use or an out-of-basin diversion. Two factors, one legal, and the other hydrologic, seem to drive this process.

First, the Great Lakes Governors are following the advice of international trade law experts and the conclusions of the IJC Report. These experts, along with others, counsel that the best defense to a NAFTA or GATT challenge to a ban on the trans-national export of water is the existence of strong water conservation regulatory regime.⁴⁶ A strong region-wide conservation regime would also make it easier to defend the policy of keeping water within the Great Lakes basin or the

⁴⁵Two compacts in the eastern United States, the Delaware and Susquehanna, provide a permanent compact commission but these commissions have dealt primarily with flood control and pollution project evaluation, construction and short-term drought management. They have not displaced state water allocation to the extent that a binding agreement to evaluate and permit all withdrawals from the lakes might.

⁴⁶The influence of international trade on state allocation decisions can be seen in a recent filing in the Michigan state court litigation challenging Perrier's extraction of ground water. The challenges allege that if Perrier is given the right to extract ground water and sell it for profit "nothing will stand in the way of private exploitation or privatization of Michigan's water resources by others" because the United States Dormant Commerce Clause, the GATT and Chapter 11 of NAFTA "will chill or deprive the State . . . of any public control, subjecting the state to exorbitant losses." Motion for Brief in Support of Motion for Summary Disposition, *Sapp v. Great Springs Waters, Inc.*, Mecosta C'ty Cir. Ct, Case No. 01-14563-CE (filed 2001). A Michigan trial judge has ruled that the withdrawal and sale of Michigan groundwater is lawful but reserved judgment on whether the proposed withdrawal would injure other land owners. For a discussion of a related federal court challenge to the extraction see text to note 44 , *infra*.

Great Lakes states against a challenge under the Dormant Commerce Clause. At present, these regimes do not exist in any Great Lakes state. As described above, the level of regulation varies considerably from state to state.

Second, the Annex 2001 Working Group of the Council of Great Lakes Governors has accepted the position that the basin may be equally harmed by the cumulative impact of small in-basin projects as well as small out-of-basin diversions.

The commitment to negotiate a binding mechanism to regulate Great Lakes diversions which applies to both the Great Lakes states and Canadian provinces will be a great political as well as legal challenge. The states can be bound in two basic ways. First, the federal government can preempt control over the Great Lakes; thus any decision would be binding on all states under the Supremacy Clause. The Great Lakes are international, navigable waters and thus the federal government could assert full plenary power them. However, the federal government has chosen to share its authority with the states. This allows states to cooperate among themselves subject to federal approval. A second means by which states may be bound is an interstate compact. Article I, Section 10, Clause 3 of the U.S. Constitution provides “No state shall, without the Consent of Congress . . . enter into any Agreement of compact without another state, or with a foreign power . . .” The “Compact Clause” has been interpreted to allow states to enter into binding agreements to define or share their quasi- sovereign powers. In the twentieth century, a number of states entered into compacts to define their inchoate equitable shares of interstate rivers. An interstate compact is a federally approved binding agreement among the states. Once approved the Compact becomes federal law and federal common law applies.

The language of the Compact Clause also permits compacts with foreign powers. Article I, Section 10, Clause 1 draws a distinction between Compacts and Treaties. The latter are reserved exclusively to the federal government. As a general matter, the subordinate or member units of federal systems, the United States states and Canadian provinces, may have the competence to enter into formal relations with other nations of subordinate units of those nations. No general international rule exists to prohibit the exercise of such competence,⁴⁷ but the scope of state power remains undefined. Some commentators have argued that the Compact Clause is limited to agreements among the federal United States states. However, Professor Lawrence Tribe argues that the Clause encompasses other agreements.⁴⁸ He suggests two limitations. Any state-provincial agreement could not trench of the President’s exclusive foreign affairs power or be inconsistent with existing treaties. It is unlikely that Congress would consent to a state-provincial compact that was inconsistent with either Canada’s or the United States’ interpretation of the Boundary Waters Treaty of 1909.

⁴⁷ 2 ENCYCLOPEDIA OF PUBLIC INTERNATIONAL LAW, Federal States, 362, 366 (1995).

⁴⁸1 L. Tribe, American Constitutional Law, p. 630, f. 37 (3d ed. 2000).

A final development in the United States with respect to issues raised in the 2000 Report concerns the rights of Indian tribes in the Great Lakes Basin. The first assertion of Indian rights occurred in a challenge by three Michigan Indian bands (a lesser organizational status than a tribe) to the location of Perrier bottled water plant in Michigan. Perrier planned to pump 400 gallons per minute from a spring that fed into a Lake which flows into a stream which eventually reaches two tributaries of Lake Michigan, and the bands argued that the proposed diversion would interfere with their Treaty fishing rights. The Michigan Department of Environmental Quality had issued a license, but the governor had not invoked the Charter process. The tribes claimed that the extraction violated the anti-export prohibition in WRDA 2000. However, after tracing the history of Great Lakes diversion controversies from the Chicago diversion to Annex 2001, the court dismissed the complaint on procedural grounds.⁴⁹ United States Supreme Court jurisprudence requires that persons claimed implied rights under federal statutes designed to advance a general public interest demonstrate that they fall within a specially benefitted class, that Congress intended implicitly or explicitly to create the right, that the right is consistent with the statutory scheme and that a federal interest is at stake. Riparians were not found to be a specially benefitted class because any rights extend to the public generally, there was no indication of Congressional intent to create a right, the right would be inconsistent with the statutory scheme which contemplates gubernatorial decision-making, and “tribal rights are fairly peripheral to the statute.

2.2 Canada

In Canada, the proposed amendments to the *International Boundary Waters Treaty Act*⁵⁰ and the public concerns discussed earlier in this chapter with respect to international trade, although logically separable, became conjoined as the amending legislation (reintroduced after the federal election as Bill C-6 in February 2001) proceeded through extensive committee hearings in both the House of Commons (in the Standing Committee on Foreign Affairs and International Trade) and the Senate (in the Standing Senate Committee on Foreign Affairs).⁵¹

⁴⁹*Little Traverse Bay Bands, supra*, note 9.

⁵⁰*An Act to amend the International Boundary Waters Treaty Act*, S.C. 2001, c. 40.

⁵¹Although this was the primary context in which the implications of international trade law were discussed subsequent to the 2000 Report, the Canadian government also noted, in response to the Report’s Recommendation IX (that the two governments “should direct more effort to allaying the public’s concern that international trade obligations could prevent Canada and the United States from taking measures to protect waters in the boundary region”), that it agreed with this suggestion and in this respect had issued, in February 2001, an update of a November 1999 position paper from the Department of Foreign Affairs and International Trade on *Bulk Water Removals and International Trade Considerations* (attached as Appendix II to the February 2002 response by the Government of Canada, *infra*, note 48).

The amendments added a number of sections to the existing act implementing the Boundary Waters Treaty. The key provisions are found in sections 11 and 12 (licences) and section 13 (prohibitions). The provisions on licences were relatively non-controversial and were generally regarded as a “housekeeping” measure to facilitate Canada’s compliance as necessary with its existing obligations under the Boundary Waters Treaty. Section 11 addresses boundary waters and requires a licence from the Minister of Foreign Affairs for a person to “use, obstruct or divert boundary waters, either temporarily or permanently, in a manner that affects, or is likely to affect, in any way the natural level or flow of the boundary waters on the other side of the international boundary.”(s. 11(1)) However, exceptions are made for “the ordinary use of waters for domestic or sanitary purposes, or the exceptions specified in the regulations.” (s. 11(2)) Section 11 clearly reflects the obligations on Canada under Article III of the Boundary Waters Treaty. Section 12 similarly reflects Canada’s treaty obligations under Article IV in requiring a licence to “construct, maintain, either temporarily or permanently, any remedial or protective work of dam or other obstruction in waters flowing from boundary waters, or in downstream waters of rivers flowing across the international boundary, the effect of which is or is likely to raise in any way the natural level of waters on the other side of the international boundary.” Again, exceptions may be provided for by regulation.

The section that attracted more comment in the course of the parliamentary committee hearings was section 13, which provides that, notwithstanding section 11, “no person shall use or divert boundary waters by removing water from the boundary waters and taking it outside the water basin in which the boundary waters are located.” (s. 13(1)) Moreover section 13 also includes a “deeming” provision (s.13(2)) in which any such removal “is deemed, given the cumulative effect of removals ... to affect the natural level or flow of the boundary waters on the other side of the international boundary.” However, section 13 applies only to water basins as described in the regulations (s, 13(3)) and is subject to exceptions as provided for in the regulations (s. 13(4)).

There was extensive debate with respect to s. 13 in the course of committee hearings, including discussion as to the possible implications of international trade law, the potential advantages and disadvantages of an outright export ban (as opposed to a prohibition on removal from basins), and the extent to which the Act or its regulations should address certain issues (especially related to the particular basins to be covered and the exceptions that would be created for ss. 11, 12 and 13).⁵² These discussions, especially with respect to the issue of international trade law, covered many matters that were the subject of comment in the course of the Commission’s hearings held pursuant to the Water Uses Reference.

It was recognized in the committee hearings that the regulations adopted under the Act would be crucial in determining the precise nature of the regulatory regime. Indeed, this was a cause of concern on the part of some of those who spoke at the committee hearings (as well as some

⁵² The committees also had before them draft regulations under the proposed Act.

members of the committees). The major reason given by government representative for dealing with some of the key issues in regulations as opposed to addressing them directly in the Act was the flexibility that regulations afforded. Although the committees had before them draft regulations, the proposed regulations under the Act were not officially published for comment until June 2002, with a deadline for reception of representations of September 26, 2002.

The regulations as proposed in June 2002 address a number of technical issues relating to such matters as the required content for licence applications. However, the key issues that affect the substance of the regulatory regime as set out in the Act can be summarized briefly. These include first, a definition of the term “removal of boundary waters in bulk”; second, a listing of the water basins which are subject to the prohibition on water removal in subsection 13(1) of the Act; and third, a specification of the exceptions to subsection 13(1).

As to the first issue, “removal of boundary waters in bulk” is defined in subsection 2(1) of the proposed regulations as:

“The removal of water from boundary waters and taking the water, whether it has been treated or not, outside the water basin in which the boundary waters are located

(a) by any means of diversion, including by pipeline, canal, aqueduct or channel; or

(b) by any other means by which more than 50,000 L of boundary waters are taken outside the water basin per day.”

Section 2 of the regulations also provides the following important exceptions (s. 2(2)):

“The removal of boundary waters in bulk does not include taking a manufactured product that contains water, including water and other beverages in bottles or packages, outside a water basin.”

With respect to the issue of which basins are covered by the legislation, pursuant to section 5 of the regulations as proposed, subsection 13(1) of the Act applies only to the Canadian portion of the Great Lakes - St. Lawrence Basin, the Hudson Bay Basin and the Saint John - St. Croix Basin.

Finally, regarding the exceptions to subsection 13(1), which was a matter of intense interest in the committee hearings, three types of exception are created in section 6 of the proposed regulations: subsection 13(1) of the Act “does not apply to the removal of boundary waters other than the removal of boundary waters in bulk” [as defined in section 2 of the regulations] (s. 6(1)); nor to “the removal of boundary waters used in a conveyance, including a vessel, aircraft or train, (a) as ballast; (b) for the operation of the conveyance; or (c) for people, animals or goods on or in the conveyance (s. 6(2)); nor to “boundary waters used in a non-commercial project on a short

term basis for firefighting or humanitarian purposes.”

One other aspect of the amendments to the *International Boundary Waters Treaty Act* that also are relevant to the 2000 Report relate to the interests of Aboriginal Peoples and Indian tribes in the waters of the Basin. In the course of the consideration of Bill C-6, the issue of Aboriginal and Treaty Rights was raised and a new section was added to the legislation as finally passed (s. 21.1), providing:

“For greater certainty, nothing in this Act shall be construed so as to abrogate or derogate from the protection provided for existing aboriginal or treaty rights of the aboriginal peoples of Canada by the recognition and affirmation of these rights in section 35 of the *Constitution Act, 1982*.”

The Canadian federal government has also followed, and responded to, the developments that have taken place in the context of the Great Lakes Charter – and specifically to the Annex 2001 process, discussed above in the section on U.S. domestic developments. In its comments to the Council of Great Lakes Governors on Annex 2001⁵³, while the Canadian government expressed its appreciation for “the key role played by members of the Great Lakes Charter ... in the management and protection of the Great Lakes”, it also admitted to having “serious concerns about the proposed standard in the Annex...” It identified three concerns in particular:

- first, that “the standard proposed is too permissive, and could compromise the ecological integrity of the Great Lakes Basin by the cumulative impacts of diversions below the *de minimis* threshold⁵⁴, as well as opening the door to long-distance, large-scale removals out of the basin”;
- second, that “there are a number of unanswered legal and jurisdictional questions, not the least of which is the possibility of conflict between the Annex and the *Boundary Waters Treaty*, thereby diminishing the importance of the protections the latter offers to the Great

⁵³“Comments from the Government of Canada on Annex 2001 to the Council of Great Lakes Governors”, February 28, 2001. The Comments may be found as Appendix 1 to the “Government of Canada Response to the International Joint Commission Final Report THE PROTECTION OF THE WATERS OF THE GREAT LAKES (February 8, 2002). The comments were with respect to the proposed Annex 2001. While there are some differences between the proposed and final version of the Annex, the comments on the proposed version are germane to the final version as adopted, which in general retains the features of the proposed version that caused the Canadian government concern.

⁵⁴The reference to a *de minimis* threshold was deleted in the final draft of Annex 2001.

Lakes”; and

- third, that there is a the lack of “clarity on a number of important aspects related to implementation...”

As to the first of these issues – the permissiveness of the proposed standard – one of the key objections that was raised by Canada, apart from the appropriate level for the *de minimis* threshold, was the treatment of in-basin and out-of-basin uses. In this respect, there is a key difference of opinion insofar as “Canada considers that an environmental approach which treats in-basin and out-of-basin uses differently is the most effective way of protecting the Great Lakes.” The Canadian rationale for this asymmetric treatment is based both on the desirability of preventing the introduction of invasive species, pathogens and pollutants, and on the view that as a practical matter, while “[b]ulk removal outside the basin represents a permanent loss to the basin and is not a sustainable use of water ... [w]hen water is withdrawn within the water basin, most of it usually returns to the boundary waters by a natural route [so that] there is essentially no or little loss to the system.”

With respect to the legal and jurisdictional issues raised in the Canadian government’s response, Canada has suggested a number of possible concerns involving potential non-compatibility between the Annex and both the Boundary Waters Treaty and the Great Lakes Water Quality Agreement. Additionally, the response notes that to the extent that the Annex contemplates a binding international agreement between provinces and U.S. states, it raises certain problems as a matter of international and Canadian constitutional law. This problem has been discussed above in the context of the ability of states within the United States to engage in binding international agreements.⁵⁵ In Canada, it has been a longstanding position of the federal government that, notwithstanding the silence of the Constitution Act on the matter, the power to enter into such agreements is exclusive to the federal Crown.⁵⁶ This does not mean that it is impossible for Canadian provinces to enter into arrangements that may have binding international effect, but this would require the facilitation of the federal government. There have been a number of techniques

⁵⁵The term “binding international agreements” here refers to those agreements with foreign governments that are governed by international law (as opposed, for example, to contracts that provinces may enter into across international borders with various entities, and which would typically be governed by domestic law). In Canada and in most other countries, these would be referred to generically as treaties, although the term treaty is not used here since it has a special meaning in U.S. constitutional law.

⁵⁶The Constitution is silent in this respect since at the time of Confederation Canada did not have such a power, which was exercised on its behalf by the Imperial Government in London.

that have been used in this respect⁵⁷ – including the use of indemnity agreements⁵⁸, *ad hoc*⁵⁹ covering agreements, and framework agreements (or *accords cadres*)⁶⁰. All these techniques, however, require the participation of the federal government, and under all of them it would be Canada as a whole that would bear responsibility at international law for any breach of obligations

3. Remaining Issues

Since the publication of the Commission's 2000 Report, the basin states along with Ontario and Quebec have been engaged in an on-going process that is intended to implement the report's primary conclusions, principles and recommendations. The states and provinces are committed to an open-ended, inclusive process that listens to a wide range of stakeholder and expert opinions. The bodies have not yet adopted a decision standard and they have not yet agreed upon the form

⁵⁷See generally: Canada, Department of External Affairs, FEDERALISM AND INTERNATIONAL RELATIONS (1968).

⁵⁸Where the federal government enters directly into an agreement with a foreign state for the benefit of a province or provinces, and, typically also, where the obligations are to be carried out at the provincial level. Since Canada is legally liable at international law for any breach of the agreement, the federal government also enters into a separate agreement with the province(s) in question, providing for indemnification in the event that a failure by the latter to comply with international obligations gives rise to a financial claim on Canada. This technique was employed in the Columbia River Treaty and Protocol.

⁵⁹Where an exchange of notes between the federal government and a foreign state provides the necessary assent to an international arrangement that has been agreed to between a province and a foreign state. It is important to note in this respect that “[t]he exchange of notes gives international legal effect to the arrangements between the province and the foreign entity, *but does not involve the province itself acquiring international rights or accepting international obligations*. Only the Canadian Government is bound internationally by the agreement, but the province participates fully in treaty-making through co-operation with the federal authorities.” FEDERALISM AND INTERNATIONAL RELATIONS, *supra*, note 52 (emphasis added). This technique was employed in the Quebec-France education entente of 1965.

⁶⁰A technique that “is similar to the *ad hoc* approach ... except that it is not intended to be restricted in its application to a specific agreement between a province and a foreign entity, but rather to allow for future agreements in a given field by any province which may be interested. *As in the case of the ad hoc procedure, the Federal Government remains responsible in international law for such arrangements.*” FEDERALISM AND INTERNATIONAL RELATIONS, *supra*, note 52. This technique was used in the 1965 Canada-France agreement on cultural collaboration.

of the binding agreement nor have they resolved other important issues.⁶¹ For example, the states and provinces are still considering whether it is legally and otherwise feasible to have different standards for in-basin use and out-of-basin diversions, the threshold in-basin use/out-of-basin diversion levels that will trigger review and application of the proposed standards, the geographic scale which should be used to review small in-basin use/out-of-basin diversions, how to measure improvements to the Great Lakes system, and the availability of the information necessary to support the proposed standards and decision process.

As of this writing, the Canadian federal legislation amending the *International Boundary Waters Treaty Act* has yet to be proclaimed. As a practical matter, this will have to await the adoption of the regulations. As noted earlier, the proposed regulatory text was issued for representations on June, 2002 for a period of 75 days (that is, until September 26). The final shape of the regulatory regime will therefore depend upon any changes that follow on the comments received by the Department of Foreign Affairs and International Trade. It is not currently expected that there will be any major substantive changes in the regime as described earlier in this chapter.

⁶¹These issues are discussed in more detail in the chapter on Decision Making Regarding Consumptive Uses and Removals.

WATER USE DATA AND RELATED INFORMATION

1. Situation as of February 2000

In its description of water use in the Great Lakes basin provided to governments in its 2000 final report, the Commission drew upon data sets provided by the Great Lakes Commission (GLC), the U.S. Geological Service (USGS) and Environment Canada (EC). Because the data spanned several years (1978-1998) and the methods of data collection varied from jurisdiction to jurisdiction, the Commission recognized that trend analysis and jurisdictional comparisons were difficult and so focused on overall aggregate Basin figures for withdrawals and consumptive use. For the year 1993, the data indicated that withdrawals from the Great Lakes Basin amounted to an estimated 2,493 cms (88,060 cfs), with consumptive use estimated to be 121 cms (4,270 cfs). Looking forward, the Commission acknowledged that withdrawal demand would undoubtedly increase, but that “it is impossible to say with confidence just how much the increase will be.” For consumptive use, however, the Commission noted that there was no similar agreement on the most likely future increase: one prediction had consumptive use rising 2 percent by 2040; another had use falling 2-3 percent by 2020; a third had use rising 25 percent by 2020; and a “conservation scenario” predicted a rise in use of 3 percent by 2020.

Following its conclusion that “existing water data, much of which is out of date, do not provide a reliable basis from which to predict future demand,” the Commission⁶² proceeded to make the following recommendation on data and research:

Recommendation V. Data and Research

Federal, state and provincial governments should move quickly to remedy water use data deficiencies by:

- c. allocating sufficient staff and financial resources to upgrade the timeliness, precision, and accuracy of water use data,
- d. working much closer together to ensure consistency in water use monitoring, estimation techniques, and reporting,
- e. emphasizing and supporting the development and maintenance of a common base of data and information regarding the use and management of the water resources of the Great Lakes Basin, establishing systematic arrangements for the exchange

⁶² International Joint Commission, Report on Protection of the Waters of the Great Lakes, February, 2000.

of water data and information, and undertaking coordinated research efforts to provide improved information for future water planning and management decisions.

Furthermore, governments should immediately take steps to ensure that, on a binational basis, research is coordinated on individual and cumulative impacts of water withdrawals on the integrity of the Great Lakes Basin ecosystem. In support of their decision-making, governments should implement long-term monitoring programs capable of detecting threats (including cumulative threats) to ecosystem integrity. Such monitoring programs should be comprehensive, particularly in their approaches to detecting threats to ecosystem integrity at a spectrum of space and time scales.

As part of an anticipatory policy for identifying emerging issues, governments should, on a binational basis, undertake more active science and research, and in particular, should implement appropriate long-term monitoring programs for key indicators of ecosystem change.”

2. Recent Developments

In its response to the Commission’s 2000 report, the Government of Canada said that plans were “evolving to modernize the Government of Canada’s water monitoring network in order to enhance Canada’s ability in addressing emerging trends across the country in the Great Lakes basin. The Government of Canada will continue working with provinces and territories as well as academia, the private sector, and other partners to address problems associated with data collection, management and accessibility, and to explore innovative ways of monitoring the aquatic environment.” Environment Canada and Ontario have initiated a joint federal/provincial water use and supply project, scheduled for completion in 2005, to gain baseline information on water supply, use and demand at a sub-basin level, identify the ecological sensitivities of the system to water resources and make projections for the future including the potential impacts of climate change.⁶³

The primary U.S. response to the Commission’s 2000 report has been at the state level. At the federal level, the USGS National Water-Use Information Program (NWUIP) is responsible for compiling and disseminating the nation’s water-use data. USGS works in cooperation with local, state, and federal agencies that collect water-use information at a site-specific level and compiles the data from hundreds of thousands of these sites to produce water-use information aggregated up to the county, state, and national levels. Every five years, USGS compiles data and publishes a national water-use data report. In the Commission’s 2000 report, the Commission drew upon the data in the USGS five-year report for 1995. The task force has learned that USGS is scaling

⁶³ Environment Canada website

back its 2000 report, in part because its program is underfunded and in part because of concerns that certain features of the report, in particular estimates of consumption, lack a sufficient basis in fact to warrant publication. The USGS 2000 report, when issued, will not include consumption estimates; nor will it include data aggregated by basin. The data for the USGS 2000 are still being compiled and reviewed.

At the federal level in Canada, Environment Canada and Statistics Canada have been conducting national water use surveys and publishing related reports on a five year cycle. However there are now early indications that those surveys may be scaled back or perhaps even discontinued in the near future due to budgetary constraints. Cutting back on data collection and analysis may not be damaging in the short term, but good collection and analysis of water use will remain valuable. Governments should recognize that it need not be an all or nothing situation. Taking into account what we already know about water use, it would likely be possible to design very low cost sampling programs that could provide adequate information.⁶⁴

In the Great Lakes Basin, the states and provinces, with support from US and Canadian federal agencies, have set in motion a robust effort to respond to the Commission's recommendations on water use data. In Directive #5 of Annex 2001,⁶⁵ the Great Lakes Governors and Premiers "call for the design of an information gathering system to be developed by the States and Provinces, with support from appropriate federal government agencies, to implement the Charter, this Annex, and any new agreement(s). This design will include an assessment of available information and existing systems, a complete update of data on existing water uses, an identification of needs, provisions for a better understanding of groundwater, and a plan to implement the ongoing support system."

The state-provincial effort to implement the data recommendations in the Commission's report and in Annex 2001 is centered at the Great Lakes Commission. The Great Lakes Protection Fund is providing financial support to the GLC to develop a framework for a comprehensive decision support system to provide the data, information, and process required to ensure timely and well informed public policy decisions concerning the use and management of surface and groundwater in the Great Lakes system. Items that are part of the overall effort include literature reviews on various data and measurement issues, workshops, and papers on topics pertinent to the needs of any decision support system that may be developed. The GLC's annual report on water use is a key element of this effort.

⁶⁴ Personal communications with Don Tate, Canadian consultant.

⁶⁵ Council of Great Lakes Governors, Great Lakes Charter Annex, June, 2001.

2.1 Annual Report of the Great Lakes Region Water Use Database Repository (1998)

Much of the description of water use in the Commission's 2000 report is based on information collected by the GLC for its 1993 annual report. Due to a lack of sufficient current information from the states and provinces, GLC did not produce annual reports for the years 1994-1997. It has recently completed its 1998 report,⁶⁶ is working on reports for 1999 and 2000, and hopes to fill in the gaps from 1994 to 1997. The task force was only able to compare the data set in the 1998 report with the (1993) data set used by the Commission in its 2000 report.

The 1998 to 1993 comparison of GLC's data shows that water withdrawals (all categories but hydroelectric) from the Great Lakes appear to have fallen by 17% from 56,920 mgd to 47,230 mgd. Consumption, which is calculated by using coefficients that did not change between 1993 and 1998, is reported to have decreased by 18% from 2639 mgd to 2168 mgd over the five year period. The following table provides a jurisdiction-by-jurisdiction comparison of withdrawals and consumption changes between 1993 and 1998:

	Withdrawals 1993	Withdrawals 1998	Consumption 1993	Consumptio 1998
Illinois	4194/15876	2327/8809	37294	37256
Indiana	2956/11190	3020/11432	181/685	196/742
Michigan	11166/42268	8812/33357	589/2230	548/2074
Minnesota	430/1628	558/2112	62/235	88/331
New York	534420299	4754/17996	169/640	306/1158
Ohio	3361/1273	3093/11708	160/606	166/628
Ontario	20572/77873	16570/62724	760/2877	478/1809
Pennsylvania	86/326	89/337	13/49	14/53
Quebec	1372/5194	1372/5194	158/598	158/598
Wisconsin	7439/28160	6633/25222	544/2059	213/806
Total	56920/215466	47228/178777	2638/9986	2167/8203

Unit: mgd/mld

Organizing the withdrawal data by category of use produces the following chart for the years

⁶⁶ Annual Report of the Great Lakes Regional Water Use Database Repository - Representing 1998 Water Use Data in Gallons, Great Lakes Commission, July, 2002.

1993 and 1998:

	1993	1998
Public Supply	6650/25173	6712/25408
Irrigation	1014/3838	434/1643
Industrial	6883/26055	4934/18677
Nuclear Power Plants	23672/89608	14133/53499
Fossil Fuel Plants	16114/60998	19791/74917
Self-supplied Domestic	828/3134	453/1715
Livestock Watering	107/405	131/496
Other	1654/6261	639/2419
Total	56922/215473	47227/178774

Unit: mgd/mld

Some changes from 1993 to 1998 are relatively easy to identify. For example, the large drop in withdrawals in Illinois is largely due to the fact that a nuclear-power plant was taken off line between 1993 and 1998, reducing water withdrawals by over 1700 mgd; and one can be fairly certain that the changes in the nuclear and fossil fuel power plants categories stem from plants coming on or going off line.

Most items, however, are more difficult to explain. Did withdrawals in Michigan, for example, actually drop between 1993 and 1998 or were the estimates used in 1993 high? Why do the data show a drop in Ontario in both consumption and withdrawal from 1993 to 1998? Is there an explanation for the drop in irrigation and industrial withdrawal from 1993 to 1998? Water managers need to be able to answer questions like this, and the states and provinces need to work more closely with GLC to ensure that they can answer these and similar questions in the future.

Currently, the states and provinces submit their water use data to the GLC database. GLC then prepares jurisdictional summaries from the data that are submitted and asks state water officials to review their individual summaries for accuracy. The GLC's annual report would be improved if this exchange produced more explanation of the differences that crop up from year to year. As data is improved over time and differences are explained, it ought to be possible for GLC, states and provinces to identify trends. For example, water officials have already identified a link between the drop in water use in the industrial category to the fact that the U.S. Safe Drinking Water Act is pushing some industries to move onto public water supplies and forego self-supply.

The drops in the irrigation and self-supplied domestic use are more difficult to explain. Did more rain in 1998 produce less irrigation than in 1993? Did less rain lead to drought restrictions

and produce the drop in irrigation? Or is the drop in the irrigation data due to a change in the way the data was collected and estimated? Michigan, for example, improved its data submission effort for the 1998 report, making more extensive use of a model to estimate its agricultural use. Did self-supply domestic use drop because more homes were linked to the public supply? What is the effect of conservation in all categories? What is the effect of changes in state/provincial reporting techniques? To repeat, states and provinces could assist in the analysis by working with GLC to explain changes and to attempt to identify trends in the data they submit. As the Commission's 2000 report indicated, there are significant differences in future demand predictions. Better trend analysis might make it possible to narrow these differences.

2.2 The Problem of Estimates and Coefficients

Most states and provinces estimate at least a portion of the water that they report as withdrawn from the basin and use coefficients to calculate the percentage of withdrawn water that is "consumed" and so not returned to the basin.⁶⁷ Illinois, which takes water under rules subject to a consent decree monitored by the US Supreme Court, measures all its withdrawals from all sites. Minnesota also reported its data for the GLC 1998 report as 100% measured and 100% site-specific.

There is more estimation among the other jurisdictions. For example, Ontario, which reported more withdrawal than any other jurisdiction in the 1998 report, reported 99.9% of its data as partially measured, 99.5% as site-specific. Michigan, the second largest withdrawer, turned in data that was 89% measured, 8% partially measured, 3% estimated, and 100% site-specific. Data from Wisconsin were 100% calculated or estimated and 100% aggregated (i.e., not site-specific). Indiana measured 4% of its data, partially measured another 50%, and calculated or estimated the remaining 46%, with 99% of the data site-specific. Data from New York were reported to be 100% partially measured, with all the data site-specific.

Since the region has an abundance of water, water managers do not need data that is 100% accurate to make good decisions. If states and provinces can continue to submit withdrawal data that would allow the GLC to resume its production of annual reports, water managers would be in a far better position to make informed decisions in the future about their collective and individual use of water, particularly if the states and provinces provide more trend analysis and explanation of changes when they submit their data.

While it is difficult to measure water withdrawals, developing good data for withdrawals is far easier than figuring out how much water is actually consumed. According to a briefing paper on

⁶⁷The information that follows was taken from the individual state analyses found in the Great Lakes Commissions's report.

consumptive use prepared by the GLC,⁶⁸ USGS adopted water use coefficients to support the National Water-Use Information Program (NWUIP) in an effort “to provide a consistent means for estimating how much water is lost through consumptive use where the information was insufficient for calculating consumptive use by subtracting return flows (and conveyance losses) from withdrawals.” In practice, rarely can water consumption be measured by simply subtracting return from withdrawal. In its 1980 report on national water use, the first five-year report since establishment of the NWUIP, USGS did not refer to coefficients when reporting consumptive figures. It did report the use of coefficients in its 1985, 1990, and 1995 reports, modifying the coefficients uses slightly from one report to the next.⁶⁹ In the run-up to its 2000 report and an internal review of the NWUIP, USGS became concerned that the coefficients being used lacked any real scientific basis and has decided not to include consumption estimates when it issues its 2000 report.

The uncertainty at USGS will undoubtedly spill over into the states and provinces. Pebbles’ examination of the use of coefficients at the state/provincial level indicates that “Great Lakes states and provinces generally are unable to find documentation, either published or unpublished to validate the coefficients that have been adopted. . . . Notwithstanding the lack of documentation or scientific basis for the use of consumptive use coefficients used by Great Lakes jurisdictions, state and provincial officials generally believe that such coefficients are worthwhile for having some sense of consumptive use losses to various water users. . . . Officials also generally agreed that having consistent coefficients among all Great Lakes jurisdictions was important for making Great Lakes water resource policy decisions.”

Having identified the problem, it will be important for national, state, and provincial jurisdictions to fix it. Water managers need to be able to estimate consumption and states and provinces ought to be able to develop coefficients that have documented basis in fact for common use. The effort underway at the GLC to develop better estimation and monitoring techniques should improve the quality of data over time and provide the USGS with the defensible coefficients.

2.3 Demand Forecasting

The Great Lakes Commission reports sporadic forecasting efforts in some states.⁷⁰ For example, Illinois prepares forecasts every 8 - 10 years for a 20 - 40 year period, Minnesota has done some

⁶⁸ Victoria Pebbles, *Consumptive Use of Great Lakes Waters*, July, 2002.

⁶⁹In the Great Lakes Commission’s reports, the coefficients did not change from 1993 to 1998.

⁷⁰ Dan Blake, *Report on State and Provincial Water Use and Conservation Programs in the Great Lakes - St. Lawrence River Basin*, great Lakes Commission, May, 2002.

forecasting in the Twin Cities Metro area, Ohio prepares forecasts periodically, most recently in 1996 and 1998, and Pennsylvania forecasts demands on public supply systems on a 5 - 10 year basin. As part of the Canada-Ontario program, forecasts have been developed at a sub-basin level in Ontario. However, there does not appear to be any ongoing or cooperative demand forecasting activity for the Great Lakes Basin as a whole.

A brief review of past efforts to estimate basin-wide consumption and forecast future demands is not encouraging. All units in the following chronology are in cubic feet per second (cfs) to facilitate comparisons with early studies.

- In 1973, the International Great Lakes Levels Board⁷¹ estimated consumptive use in 1965 at about 2300 cfs (1485 mgd), and projected uses in the year 2000 at about 6000 cfs (3780 mgd).
- In 1981, the International Great Lakes Diversions and Consumptive Uses Study Board⁷² placed consumption at about 5000 cfs (3230 mgd) in 1975, and projected growth to about 9900 cfs (6400 mgd) by the year 2000.
- In 1985, the IJC's Great Lakes Diversions and Consumptive Uses Report⁷³ estimated 1980 uses at between 3000 cfs (1940 mgd) and 6000cfs 3890 mgd), and projected increases to between about 6000 cfs (3890 mgd)and 8000 cfs (5170 mgd) by the year 2000.
- In 2000, the IJC's Report on Protection of the Waters of the Great Lakes reported a 1993 estimate by the Great Lakes Commission of about 4270 cfs (2760 mgd).
- The most recent estimate of 1998 uses by the Great Lakes Commission places them at about 3350 cfs (2168 mgd).

⁷¹ International Great Lakes Levels Board, Regulation of the Great Lakes, Appendix B, December, 1973.

⁷² International Great Lakes Diversions and Consumptive Uses Study Board, Great Lakes Diversions and Consumptive Uses, Annex G, September, 1981.

⁷³ International Joint Commission, Great Lakes Diversions and Consumptive Uses, January, 1985.

Clearly, all attempts to define the magnitude of the consumptive use “problem” over the past several decades have overestimated and overstated its urgency. While very important at a local level, it is now becoming clear that on a basin-wide scale, current consumptive uses probably represent only about 1 % - 2 % of the renewable supplies, and that it is quite possible that they may have already leveled off as conservation efforts begin to take effect. This preliminary conclusion, if verified, could have extremely important policy implications.

2.4 Water Balance

As part of its effort to facilitate the construction of a water resources management system for the Great Lakes, GLC is also preparing a paper on the water balance of the lakes.⁷⁴ Attempting to quantify the amount of water entering and leaving the lakes is a complex process. It is impossible to measure the flow in every stream, and the measurements from those streams that are gauged include a margin of error. Nor can one measure the exact amount of precipitation falling in the Basin or the evaporation leaving the Basin. Water enters and leaves the basin at different rates, depending on the time of year, and estimates must be used for almost all categories. The water balance paper, when completed, should clarify a variety of issues surrounding the measurement and estimation of water entering and leaving the Basin through a variety of paths and suggest ways the states and provinces might improve data collection. For example, the discussion of streamflow and precipitation gauging might lead to more standardization among the jurisdictions. At a minimum the water balance paper will provide water managers with a tool that will facilitate their discussion of key data issues involved in creating and maintaining a water resources management system. It is important to note that, even though some individual components of the water balance have large errors, the impact of specific man-made changes on water levels can be very accurately estimated. That is because changes in net basin supply are routed rather than the components of net basin supply, and net basin supply can be calculated from direct measurements of water levels and flows.

3. Remaining Issues

The most critical remaining issue is an urgent need for all governments to promptly come to a collective conclusion about the real magnitude of the consumptive use “problem”. As was noted in the section on demand forecasting, based on what we now know, it is now believed that the “problem” has been consistently and significantly overstated for the last several decades. Before rushing to judgement on an appropriate solution, governments should as a matter of the highest priority take a step back and reassess the situation.

⁷⁴ Brian Neff, Roger Gauthier, Chuck Southam, The Great Lakes Water Balance: Errors White Paper, 2002 (draft).

States and provinces, with the assistance of Canadian and US federal agencies and various stakeholders, have launched a major effort to develop a decision support system for the management of the Great Lakes. When complete, water managers will have an array of information – analytical papers on, e.g., water resources, consumptive use, modeling; literature reviews and bibliographies on, e.g., water balance, consumptive use and ecological impacts; and summaries of workshops on diversions and flow accounting, scenario evaluation and resource improvement standard – that has been prepared by staff and reviewed by technical committees, a project management team of state/provincial water officials and stakeholders. GLC will make final products available to the public on the internet. The target date for a report on early efforts is October of 2002.

The effort now underway at GLC will result in a substantial expansion of the current knowledge base on water supply and use. It will be important for states and provinces to sustain the effort. In this regard, the GLC's annual report on water use and consumption serves as a kind of "canary in the mine" as evidence of the commitment in the states and provinces to proper water management. If GLC is able to resume the production of its annual reports, can begin to identify concrete reasons for yearly changes in data, and can work with the states and provinces to identify trends, it might indicate that public officials have significantly stepped up their level of commitment to protect the waters of the Great Lakes. For the annual report to become an effective tool, states and provinces must not only regularly collect and submit data, they must also intensify and improve measurement, refine estimates, and validate consumption coefficients. Something along the lines of the structure created for the current effort – staff/contractor, technical committees, project management team, stakeholder advisory council – might be a useful long-term tool to help ensure that the commitment we see now lasts.

As indicated, the joint project between Environment Canada and Ontario, which is scheduled to run until 2005, should provide valuable information about water use in Ontario. Information from this effort is already being fed into the state/provincial effort underway at GLC. Changing the USGS's National Water-Use Information Program, while not directly a response to the Commission's 2000 report, is a positive step if the changes lead to greater accuracy for data collected in the Basin, but NWUIP could cease to be effective because of lack of interest and support at both the federal and the state levels. The program provides valuable information to water managers and deserves support. A similar comment could be made about national water use surveys in Canada.

From its examination of the GLC's 1998 data on withdrawals and consumption, the Task Force was unable to identify any significant new developments that would necessitate significant changes to the description of water use in the IJC's 2000 report. Demand forecasting, while interesting, will remain of limited use unless states and provinces improve measurement and data collection, and begin to identify real trends in their historical data.

DIVERSIONS AND OTHER REMOVALS

1. Situation as of February 2000

1.1 Technical Situation

In its 2000 Report,⁷⁵ the IJC defined a removal as water conveyed outside its basin of origin by any means. It went on to define bulk removal as including diversions or other means such as tanker ships or trucks which carry water in large volumes, but excluded water used as ballast in ships or incorporated into products or otherwise bottled for retail sale. It did not include water withdrawn for use within the basin. At the time of the February 2000 report, there were eight significant interbasin and six significant intrabasin diversions as follows:

Table 1

Existing Diversions in the Great Lakes Basin	Operational Date (original project)	Average Annual Flow	
		(cms)	(cfs)

1. Interbasin

Long Lac (into Lake Superior basin)	1939	45	1,490
Ogoki (into Lake Superior basin)	1943	113	3,990
Chicago (out of Lake Michigan basin)	(1848)1900	91	3,200
Forestport (out of Lake Ontario basin)	1825	1.4	50
Portage Canal (into Lake Michigan basin)	1860	1	40
Ohio & Erie Canal (into Lake Erie basin)	1847	0.3	12
Pleasant Prairie (out of Lake Michigan basin)	1990	0.1	5
Akron (out of and into Lake Erie basin)	1998	0.01	0.5

⁷⁵ International Joint Commission, report on Protection of the Waters of the Great Lakes, February, 2000.

2. Intrabasin

Welland Canal	(1829)1932	260	9,200
NY State Barge Canal (Erie Canal)	(1825)1918	20	700
Detroit	1975	4	145
London	1967	3	110
Raisin River	1968	0.7	25
Haldimand	1997	0.1	2

These diversions along with consumptive uses in the basin and channel modifications were reported to have the following impacts on lake levels and flows in the connecting channels:

Table 2

On Lake Levels in Centimeters

	Superior	Michigan-Huron	St. Clair	Erie	Ontario
	Mean	Mean	Mean	Mean	Mean
Recorded Levels 1918-1997 (meters)	183.43	176.49	175.02	174.15	74.75
Long Lac-Ogoki (160 cms) (inflows)	6	11	N/A	8	7
Chicago (90 cms) (outflows)	-2	-6	N/A	-4	-3
Welland Canal (260 cms)	-2	-6	N/A	-13	0
Detroit/St. Clair modifications	0	-40	N/A	0	0
Niagara River outlet	0	3	N/A	12	
Existing consumptive uses (1993)	-1	-5	N/A	-4	-6
Impacts (cm):	1	-43	N/A	-1	-2

On Flows in Connecting Channels (in cubic meters per second)

	St. Mary's R.	St. Clair R.	Detroit R.	Niagara R.	St. Lawrence R.
	Mean	Mean	Mean	Mean	Mean
Recorded flows 1918-1997 (cms)	2150	5200	5350	5940	6980
Long Lac-Ogoki (160 cms) (inflows)	160	160	160	160	160
Chicago (90 cms) (outflows)	0	-90	-90	-90	-90
Welland Canal (260 cms)	0	0	0	-260	0
Existing consumptive uses (1993)	-10	-50	-50	-90	-110
Total impacts (cms)	150	20	20	-280	-40

Notes: N/A is Not Available

St. Lawrence River flows measured at Cornwall

1.2 Outcome of IJC Deliberation

Following its general discussion of diversions and other removals, the Commission went on to present four conclusions and one recommendation. The conclusions are quoted below. The recommendation is covered in a separate chapter on decision-making.

“Conclusion 10: Diversions and Other Removals. Over the longer term, a number of factors may affect the demand for water diversions and other bulk removals. Global population growth or climate changes could result in requests for shipments of Great Lakes water to meet short-term humanitarian needs. Geography and distance may reduce such demands as there are more logical and more economical water sources closer to most areas of potential drought. The United Nations advocates that the solution to future water crises rests with nations learning to use water more efficiently, not in shipping freshwater around the world.

“Conclusion 11: Potential Diversions. There are no active proposals for major diversion projects either into or out of the Basin at the present time. There is little reason to believe that such projects will become economically, environmentally, and socially feasible in the foreseeable future. Although the Commission has not identified any planning for or consideration of major diversions in areas outside the Basin, such diversions cannot be entirely discounted. There are no active proposals for any smaller diversions into or out of the Great Lakes Basin at this time, although growth trends would indicate that such requests are likely from communities on or near the Great Lakes Basin divide.

“Conclusion 12: Interruptions of Supply. Apart from the many engineering, economic, environmental, and social obstacles to construction of large-scale diversions, and given the variations in water levels and flows in the Great Lakes, it would be impossible for the Great Lakes jurisdictions to guarantee an uninterruptible supply to any mega-removal. Some interests in the Great Lakes Basin, such as riparian homeowners, might welcome a means of removing water from the Basin during periods of extremely high levels. Most interests, including in-stream interests, commercial navigation and recreational boating, would be adamantly opposed to such removals in periods of low levels. Diversions during droughts would be difficult to interrupt because of the dependency that diversions create among recipients. The Commission recognizes that once a diversion to a water-poor area is permitted, it would be very difficult to shut it off at some time in the future.

“Conclusion 13: Current Bulk Removals. There are not, at present, significant removals of water from the Great Lakes Basin by truck. There is no trade in water from the Great Lakes by marine tanker, although the Nova Group in 1998 did seek a permit to ship 600 million liters (159 million gallons) of water annually from Lake Superior to Asia. Moreover, despite the increase that has occurred in the market for bottled water, the volume of water leaving the Great Lakes

Basin in bottles is not significant (the amount of bottled water presently imported into the Basin exceeds the amount leaving by a factor of 14). The amount of ballast water currently leaving the Basin is not sufficient to cause damage to the Basin ecosystem. There is nevertheless a need to monitor these activities and keep them under review.”

2. Recent Developments

There have been a few new developments since the release of the February 2000 report. The earlier reference was initiated mainly in response to a public outcry about a proposal to ship water out of the Basin by marine tanker. Even at that time, it was generally believed by those closest to the issue that this would be highly impractical from an economic perspective. This belief has since been more conclusively substantiated, most recently in a study conducted for the Government of Newfoundland and Labrador.⁷⁶

Newfoundland, being an island, is optimally situated to export water by marine tanker. Tanker export from the Great Lakes would be substantially more expensive by comparison because of the additional travel time and related shipping costs. Even considering its optimal east coast location, that study concluded that “the most important cost associated with export of water from this province is the delivery cost. Because of that factor, provincial water is not competitive with conventional supplies in the United States or elsewhere. Water from Newfoundland and Labrador is potentially competitive in those places that rely on desalinated water. Desalinization is expensive, energy-intensive and waste-generating. Due to transport costs, the areas of any promise in this regard are limited to the U.S. southwest, particularly Florida and Texas, and the Caribbean. However, improving desalination technology casts doubt on even this opportunity. Provincial water might also be competitive when shipped in bulk to countries other than the United States for bottling there.”

Regarding diversions, consultations with the Great Lakes Commission (GLC), which acts as a repository for state and provincial data on water use and diversions, indicates that there have been no new diversions either implemented or proposed since publication of the Commission’s report. GLC staff cautioned, nevertheless, that the lack of new information does not preclude the possibility that one or more very small unauthorized diversions may have taken place in communities close to or straddling the Basin boundary.⁷⁷

⁷⁶ Government of Newfoundland and Labrador, Report of the Ministerial Committee Examining the Export of Bulk Water, October, 2001.

⁷⁷ Personal communications with Tom Crane, Great Lakes Commission

A number of earlier studies have indicated the impracticality of long distance diversions. These included: the U.S. Corps of Engineers High Plains Study (1976-82)⁷⁸ which placed the cost of diverted Great Lakes water well above what even farmers would pay for irrigation water; a 1984 study by DeCooke et al⁷⁹ which concluded diversions from either Lakes Superior or Michigan-Huron would be impractical; and a cost-benefit study of the GRAND Canal scheme by Muller⁸⁰ which placed its benefit: cost ratio between 0.14 and 0.19. No more recent studies of this type have come to the attention of the Task Force. Since the earlier studies, additional environmental costs would make the economics of long-distance water transfer even more unattractive.

The following quotes from an article in the Canadian Water Resources Journal⁸¹ sums up the current international situation very well. “The era of big dams and diversions ended in the United States with the Central Arizona Project in the 1970s, and in Canada with the LaGrande Project (James Bay) in Quebec in the early 1990s. The break-up of the Soviet Union effectively ended construction of the Siberian south-north water diversion. More recently, the World Bank has imposed a moratorium on funding major dam construction anywhere pending the findings of an appointed commission of inquiry. The costs have become too high and the adverse impacts too many.” That paper went on to observe that China is the one exception to the established trend “for reasons which no longer apply to other major powers: the need to provide relief from devastating floods and droughts; and, at the same time feed its huge population while giving priority to industrial expansion.”

There are two other recent reports that provide some interesting additional information regarding Great Lakes diversions. The first is entitled :The Great Lakes Water Balance: Data Availability and Annotated Bibliography of Selected References,”⁸² and the second “The Great Lakes Water

⁷⁸ High Plains Study Council, A Summary of Results of the Ogallala Aquifer Regional Study, with Recommendations to the Secretary of Commerce and Congress, 1982.

⁷⁹ DeCooke, B.G., J.W. Bulkley and S.J. Wright, Great Lakes Diversions: Preliminary Assessments of Economic Impacts, Canadian Water Resources Journal, V.9, N.1.

⁸⁰ Andrew Muller, Some Economics of the GRAND Canal, Canadian Public Policy, XIV 2.

⁸¹ Frank Quinn and Jeff Edstrom, Great Lakes Diversions and other Removals, Canadian water Resources Journal, Summer 2000.

⁸² U.S. Geological Survey, The Great Lakes Water Balance, Data Availability and Annotated Bibliography of Selected references, report prepared in Cooperation with the Great Lakes Commission, 2002.

Balance: Errors White Paper.”⁸³ Both were prepared in cooperation with the Great Lakes Commission. The errors paper provides some ideas that may be helpful in improving the accuracy of diversions data. The Task Force is not aware of any new statistics on bottled, trucked or ballast water that would affect the IJC’s earlier conclusions regarding smaller removals.

3. Remaining Issues

The possibility of marine tanker export has effectively become a non-issue and most other types of removal, except diversions, although having important local impacts, are now recognized as having little or no measurable impact on the overall water balance. The real interjurisdictional removals issue is the potential for additional or increased diversions out of the Basin.

There will always be concerns in some quarters about the possibility of large, long-distance diversions. Nevertheless, based on considerations discussed earlier, we believe it is highly unlikely that there will be any official interest in large, long-distance diversions either into or out of the Great Lakes Basin in the foreseeable future.

In the Great Lakes states, where population is more heavily concentrated than in Canada, some interbasin diversion possibilities are likely to attract communities just outside or straddling the Great Lakes Basin divide. This likelihood may be increased by a trend towards consolidation of water utilities over larger geographical areas, including both sides of the basin divide.⁸⁴

The paper in the Canadian Water Resources Journal mentioned earlier summarizes the most likely scenario in the Canadian portion of the basin as follows: “In southern Ontario, intrabasin diversions by pipeline have been postponed to some degree by conservation, higher consumer prices and other measures, particularly in the Waterloo area. A number of inland communities, however, are still pursuing pipelines with the aim of returning waste waters to the same source (e.g. Allison to and from Georgian Bay, York Region to and from Lake Ontario).”

⁸³ Brian Neff, Roger Gauthier, Chuck Southam, Jim Nicholas, The Great Lakes Water Balance: Errors White Paper, 2002 (draft).

⁸⁴ In particular, because surface water and groundwater boundaries differ, it is quite possible for a community near a surface water boundary to draw groundwater from an aquifer associated with a basin that is not the community’s surface basin.

CUMULATIVE IMPACT

1. Situation as of February 2000

The final report⁸⁵ from the previous Reference summarized the combined impacts of existing diversions, consumptive use, and outlet channel modifications on water levels as indicated in table 1 below. It is interesting to note that the combined effect of diversions and consumptive uses to date (ignoring the very significant impact of channel changes) has been virtually nil. This was the result of an historic coincidence, not good planning. From now on, apart from conservation, all pressures are likely to be in a downward direction.

Table 1

Impact on Lake Levels in Centimeters

	Superior	Michigan-Huron	St. Clair	Erie	Ontario
	Mean	Mean	Mean	Mean	Mean
Recorded Levels 1918-1997 (meters)	183.43	176.49	175.02	174.15	74.75
Long Lac-Ogoki (160 cms) (inflows)	6	11	N/A	8	7
Chicago (90 cms) (outflows)	-2	-6	N/A	-4	-3
Welland Canal (260 cms)	-2	-6	N/A	-13	0
Detroit/St. Clair modifications	0	-40	N/A	0	0
Niagara River outlet	0	3	N/A	12	
Existing consumptive uses (1993)	-1	-5	N/A	-4	-6
Impacts (cm):	1	-43	N/A	-1	-2

⁸⁵ International Joint Commission, Protection of the Waters of the Great Lakes, February, 2000.

There were two primary activities related to cumulative impacts during the earlier IJC Reference. In the first, a Working Group defined a number of possible future scenarios, and had 33 experts qualitatively evaluate the ecological impacts of one of those scenarios.⁸⁶ In the second, a cursory literature review was conducted, followed by an experts workshop.⁸⁷ In the first activity, the particular scenario chosen had significant water level impacts, mainly because of the dominant influence of the climate change assumption. The experts were able to identify many significant detrimental ecological and socio-economic impacts. In the second activity, no specific scenario or scenarios were considered, and the experts concluded that, although many important impacts are likely, “it is difficult to quantify with any precision the ecological impacts of most water withdrawals, consumptive uses, and removals.”

It should be noted that cumulative impact assessments are normally used for informational purposes, for example in environmental assessment processes. To date, it is highly unusual, at least in a riparian law environment,⁸⁸ to attempt to use them for quasi-regulatory purposes, as is being attempted in the Great Lakes water uses and diversions situation. While it is intuitively clear that repeatedly increasing the use of a resource will eventually deplete that resource (death by a thousand cuts), it is far less clear that it will be possible to develop a standard that takes account of cumulative effects across a Basin as large as the Great Lakes.⁸⁹ The results of the above-mentioned Working Group and literature review/experts’ workshop demonstrate the difficulty of using the notion in any more than an informational context. At one extreme, it was relatively easy to agree that any water use would bring about a significant cumulative impact, if considered along with all other possible influences on water levels. At the other extreme, the

⁸⁶ Task # 5 Working Paper, Cumulative Impacts/Risk Assessment, IJC Reference on Consumption, Diversions and Removals of Great Lakes Water, August, 1999.

⁸⁷ International Joint Commission, Cumulative Impacts in the Great Lakes - St. Lawrence River Ecosystem, Summary of a Workshop held in Windsor, Ontario, September, 1999.

⁸⁸ In Western states, where the doctrine of prior appropriation applies, the cumulative effects of stream use can sometimes result in the disappearance of a stream for part of the year. Application of public trust doctrine in this situation is leading in some cases to a restoration of stream flow in order to establish at least a minimum flow throughout the year to preserve the ecosystem as much as possible. The Great Lakes community, by attempting to account for cumulative impacts, has a chance to work out ways to protect their ecosystem before shortages become critical.

⁸⁹ The emphasis here is on impacts that may have significant implications, either individually or collectively, in an interjurisdictional context. It is recognized that, on a very local scale, the task of defining cumulative impacts may be more feasible.

experts agreed that it remains virtually impossible to quantify the ecological impact of any specific use, if other related influences were either ignored or narrowly defined.

1.1. Outcome of IJC Deliberations

The Commission concluded that “it is unlikely that cumulative assessment tools will ever be able to deal comprehensively with all the uncontrollable and unknown factors and all the uncertainties, surprises, and complex, nonlinear interrelationships that are inherent in a vast ecosystem. Nevertheless, efforts to conduct such assessments must continue.” In its Recommendation I on Removals, the Commission mentioned cumulative impact as one factor to consider when ensuring that “the removal would not endanger the integrity of the ecosystem of the Great Lakes Basin.” Cumulative impact was not a consideration in the Commission’s recommendations on in-basin water uses.

In part of its Recommendation VI on Data and Research, it suggested that “governments should immediately take steps to ensure that, on a binational basis, research is coordinated on individual and cumulative impacts of water withdrawals on the integrity of the Great Lakes Basin ecosystem. In support of their decision-making, governments should implement long-term monitoring programs capable of detecting threats (including cumulative threats to ecosystem integrity). Such monitoring programs should be comprehensive, particularly in their approaches to detecting threats to ecosystem integrity at a spectrum of space and time scales.”

2. Recent Developments

Most of the relevant activity since February 2000 has focussed on Annex 2001, a policy proposal by the Council of Great Lakes Governors,⁹⁰ and on related technical efforts by State and Provincial officials in concert with the Great Lakes Commission. The key technical activities are summarized in chronological order below:

- a) **Indicators Workshop:** In April 2001, thirty-eight people participated in an Ecological Requirements -Indicators Workshop in Burlington, Ontario.⁹¹ The purpose of the Workshop was to develop indicators that could be used to assess the sensitivities of changes in water resources. The Workshop was in support of the Canada/Ontario Water

⁹⁰ Council of Great Lakes Governors, The Great Lakes Charter Annex, a Supplementary Agreement to the Great Lakes Charter, June, 2001.

⁹¹ Environment Canada, Summary of Indicators’ Workshop held in Burlington, Ontario, April, 2001.

Use and Supply Project, which is in turn linked to the broader State - Provincial work on a Water Resources Decision Support System. One immediate output was a ranking of a large number of potential indicators. Ultimately the goal “is to have baseline data that gives us the ability to assess and identify sensitivities” under various scenarios, for example those related to water takings, diversions, drought and climate change, on a fourth level watershed basis.

- b) **Literature Review:** Michel Slivitzky, the same author who did the earlier literature review for the IJC, completed a more detailed “Literature Review on Cumulative Ecological Impacts of Water Use and Changes in Levels and Flows” for the Great Lakes Commission.⁹² The search produced a list of some 200 references. Particular attention was paid to literature that assesses ecological thresholds with respect to water supply, and which presents indicators that have been used to assess the cumulative ecological impacts of water use. It concluded, as is the case with other reviews both previously and more recently that “linking specific changes in levels and flows to specific changes in biota will require much better data and models.” The author went on to suggest that the next steps should involve “acquiring all pertinent data and knowledge especially on species habitat linkages and development of mathematical models.”
- c) **Experts Workshop on Ecological Impacts:** In November 2001, following completion of the literature review, an experts workshop⁹³ was convened in Ann Arbor, Michigan, by the Great Lakes Commission, with financial support from the Great Lakes Protection Fund. The primary objectives of the Workshop were to identify the types of “essential questions” that should be asked to evaluate the potential for ecological impacts for any given water withdrawal proposal, to begin to develop an inventory of information on ecological impacts, and to provide an opportunity for participants to raise issues and concerns related to the topic. It was not the intent of the Workshop to reach consensus or draw conclusions. Rather its intent was to provide participants with an opportunity for “public airing” of issues. Nevertheless, the Workshop Proceedings includes a list of essential questions that must be asked to assess impacts, as refined by participants, and a listing of other scientific and policy issues that were raised.
- d) **Scenario Evaluation Workshop:** In May 2002, a Workshop was convened in Ann Arbor, Michigan, to evaluate the data and information needs for the Annex 2001

⁹² Michel Slivitzky, A Literature Review on Cumulative Impacts of Water Use and Changes in Levels and Flows, Great Lakes Commission, October, 2001.

⁹³ Great Lakes Commission, Ecological Impacts of Water Withdrawals in the Great Lakes - St. Lawrence System, Summary of an Experts Workshop held in Ann Arbor, Michigan, November, 2001.

implementation process.⁹⁴ Three diversion scenarios were evaluated using an information assessment form and the “list of essential questions” developed through the Experts Workshop on Ecological Impacts. Much of the discussion touched on the cumulative impact question, with some questioning whether the data and science is available to assess ecological and cumulative impacts, and whether it is even possible within realistic time and financial constraints. One of the main “lessons learned” was that the issue of cumulative impacts needs to be a major consideration in the development of the Decision Support System.

- e) **Inventory of Data and Models:** As part of the Decision Support System Process, a private firm⁹⁵ prepared an inventory of data and models relevant to the ecological impacts issue. Their main conclusions regarding data was that there is a lot available, but that much of it is descriptive, and that data collection would have to become a lot more comprehensive and site specific before we could begin to understand relationships between hydrologic variables and ecological impacts. Regarding models, there are a lot of models available describing one or more pieces of the puzzle (hydrodynamic/hydraulic, surface water quality, hydrology/watershed, ecological effects, groundwater), but nothing sufficiently comprehensive or linked to quantify the range of potential ecological impacts of a particular scenario.

3. Remaining Issues

A lot of effort has gone into defining the nature of the problem since February 2000, but there has been little relevant scientific progress specific to quantifying ecological or cumulative impacts related to the water uses or diversions.

Any attempt to use the cumulative impact concept in a regulatory or quasi-regulatory way in the Great Lakes water levels context will pose serious conceptual problems, as well as difficult scientific challenges. It is not expected that these hurdles will be overcome for some considerable time.

⁹⁴ Great Lakes Commission, Great Lakes Water Withdrawal and Use Scenario Evaluation, Summary of a Workshop held in Ann Arbor, Michigan, May, 2002.

⁹⁵ Limno-Tech Inc., Presentation to a Joint Meeting of the Project Management Team and Stakeholders Advisory Committee, Water Resources Management Decision Support System, Ann Arbor, Michigan, August, 2002.

Regardless of whether cumulative impact can be developed into a quasi-regulatory tool or will continue to be used in the more normal sense as an informational tool, it is important that the relevant science proceed as quickly as possible, because all factors likely to impact on water levels in the future are likely to cumulatively lower water levels.

As the science advances, it will be important to recognize that water level and flow changes are not the only stressors on wetland, near-shore and in-stream communities. Others include dredging, filling, diking, toxic substances and other forms of pollution, and invasion by exotic species. In that context, it will remain extremely difficult to make a realistic cumulative effect assessment of just changes in water levels of flows.

In 2002 the Great Lakes Protection Fund issued a grant to Enterprising Environmental Solutions to develop metrics and models to quantify the resource impacts of various types of water withdrawals and another grant to Limno-Tech to build a modeling framework that couples existing computer models to predict the ecological consequences of new or increased water withdrawals and test it on a river basin system.⁹⁶

Modest scientific progress is also likely to come out of ongoing Lake Ontario regulation studies in about two years time.⁹⁷ In those studies, significant resources are being devoted not only to defining the issue, but also to data collection, model development and advancing scientific understanding.

⁹⁶ www.glpf.org/02awards

⁹⁷ Personal communications with Doug Cuthbert, Canadian Co-Chairman of the Lake Ontario Regulation Study.

CLIMATE CHANGE

1. Situation as of February 2000

1.1 Scientific Considerations

Most climate change studies link changes in concentrations of greenhouse gases to emissions from human activity. The most significant of these sources are the burning of fossil fuels (transportation, heating, cooling, and various industrial activities) as well as some forestry and agricultural practices. Various scenarios of plausible future emissions of greenhouse gases have been developed. These scenarios suggest that atmospheric concentrations of greenhouse gases equivalent to a doubling of CO₂ are almost certain by the latter half of this century. Tripling or more is a distinct possibility.

Historically, climate impact assessments for the Great Lakes used climate change scenarios based on equilibrium 2xCO₂ general circulation model (GCM) runs in which the atmospheric concentration of CO₂ was instantaneously doubled. Once linked with hydrologic models, a decrease in annual runoff for all of the Great Lakes was projected. Similarly, mean annual outflows and mean annual water levels decline under 2xCO₂ scenarios. In more recent years, the atmospheric model has been coupled with a fully three-dimensional ocean model, thus allowing time dependent (“transient”) runs. It has also begun to take more account of the effects of sulphate aerosols, which scatter and absorb solar and infrared radiation in the atmosphere and alter the formation and precipitation efficiency of liquid-water, ice and mixed-phase clouds, thereby causing an indirect radiative forcing associated with these changes in cloud properties.⁹⁸ Overall, the effect of including sulphate aerosols in the model generally results in regional cooling. Greenhouse gases are normally assumed to increase by historical levels to the present and then by 1% per year to the year 2100.

By February 2000, the International Joint Commission had two primary sources of scientific information at its disposal. The first was a working paper prepared for the Commission and

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www.grida.no/climate/ipcc_tar/wg1/164

dated July 1999,⁹⁹ which included contributions from a number of highly respected scientists from both the United States and Canada.

Those results were subsequently refined with an emphasis on hydrology and jointly published in the Canadian Water Resources Association (CWRA) Journal by seven scientists from the two countries in June of 2000.¹⁰⁰ The second source of scientific information was draft material prepared by U.S. scientists for the U.S. Global Change Research Program. That material was subsequently published in October 2000 in a report entitled “Preparing for a Changing Climate - Great Lakes Overview” by the Great Lakes Regional Assessment Group.¹⁰¹ Scientific results from the two sources of information were qualitatively the same, and can be represented by the following table, taken from the bi-nationally prepared paper in the CWRA Journal.

⁹⁹ IJC Study Team on Great Lakes Consumption, Diversions and Removals, Working Paper entitled Climate Change Impacts on Hydrology, Water Resources Management and the Peoples of the Great Lakes - St. Lawrence System: a Technical Survey, compiled by Linda Mortsh with support from Murray Lister, Brent Lofgren, Frank Quinn and Lisa Wenger, July, 1999.

¹⁰⁰ Linda Mortsh, Henry Hengeveld, Murray Lister, Brent Lofgren, Frank Quinn, Michel Slivitzky and Lisa Wenger, Climate Change Impacts on the Hydrology of the Great Lakes - St. Lawrence System, Canadian Water Resources Journal, Summer 2000.

¹⁰¹ Great Lakes Regional Assessment Group, Preparing for a Changing Climate, Great Lakes Overview, a contribution to the U.S. Global Change Research Program, October, 2000.

Table 1 - Impacts on the Great Lakes by GCM Scenarios

	Equilibrium 2xCO ₂ ,GCM Scenarios				Transient GCM Scenarios			
Lake/River	CCC CM1	GFDL	GISS	OSU	CCCma2030	CCCma2050	Hadley 2030	Hadley 2050

Change in mean annual runoff (%)

Superior	-12	-26	- 2	- 8 - 5	- 8	-4	0
Michigan	-38	-27	-24	-14 -12	-15	+3	+4
Huron	-36	-19	-29	- 9 - 7	-10	+1	+3
Erie	-54	-22	-41	-19 -23	-28	+3	+4
Ontario	-34	-28	-33	- 7 -10	-15	+5	+4

Mean annual outflow changes (%) from base case

Superior	-13	-	- 2	-19 -11	-17	+1	0
Michigan-Huron	-33	-	-25	-20 -16	-22	+3	+3
Erie	-40	-	-32	-23 -19	-25	+3	+3
Ontario	-39	-	-	- -18	-25	+3	+2
St. Lawrence at Montreal	-40	-	-	- -	-	-	-

Mean annual water level changes (m) from base case

Superior	-0.23	-	-0.46	-0.47 -0.22	-0.31	-0.01	-0.01
Michigan-Huron	-1.62	-2.48	-1.31	-0.99 -0.72	-1.01	+0.05	+0.03
Erie	-1.36	-1.91	-1.16	-0.87 -0.60	-0.83	+0.05	+0.04
Ontario	-1.30	-	-	- -0.35	-0.53	+0.02	+0.04
St. Lawrence at Montreal	-1.30	-	-	-	-	-	-

(Sources: Quinn and Lofgren, 2000; Mortsch and Quinn, 1996; Croley, 1990, 1992; Hartmann, 1990.)

CCC - Canadian Climate Centre - **Equilibrium 2xCO₂ run**. Boer *et al.*, 1992; McFarlane *et al.*, 1992.

CCCma - Canadian Centre for Climate Modelling and Analysis - **Transient Run**. A coupled atmosphere -ocean model (CGCM1) is run in transient mode where greenhouse gases increase by historical levels and then by 1% per year to 2100. Regional cooling effects of aerosols incorporated. Ensemble average of three transient GCM runs used to develop scenarios. The transient run period 1961-1990 was used as the

'current' or base climate; 2030 is represented by 2021-2040 and 2050 by an average of 2041-2060. Scenarios of climate elements developed by computing ratios or differences between the base climate and the 2030 or 2050 climate. Boer *et al.*, 2000a,b; Flato *et al.*, 2000

GFDL - Geophysical Fluid Dynamics Lab - **Equilibrium 2xCO₂ run** - Manabe and Wetherald, 1987

GISS - Goddard Institute for Space Studies - **Equilibrium 2xCO₂ run** - Hansen *et al.*, 1983, 1984

Hadley - Hadley Centre - **Transient run** - HadCM2 - Johns *et al.*, 1997; Mitchell and Johns, 1997; Mitchell *et al.*, 1995

OSU - Oregon State University - **Equilibrium 2xCO₂ run** - Schlesinger and Zhao, 1988.

In discussing the 2xCO₂ equilibrium model results, the U.S. National Assessment noted that with all models of this type “increases in atmospheric greenhouse gas concentrations produce a warming effect that enhances evaporation in the Great Lakes drainage basin and over the Lakes themselves. Although the general circulation models have produced varying results in terms of change in precipitation (both wetter and drier futures), they have agreed in showing an increase in lake surface temperature, a decrease in basin runoff, and a consequent increase in lake evaporation resulting in reduced interlake channel flow and water levels on all of the Great Lakes.”

As indicated in table 1, at the end of the last Reference, the two transient models yielded quite different results. The Canadian model (CGCM1) projected reduced runoff, increased lake surface evaporation, reduced net basin supplies and significant lake levels reductions. On the other hand, Hadley version 2 (HadCM2) projected either little change or a small increase in net basin supplies and water levels during each of the time periods investigated. The U.S. National Assessment pointed out the following difference between the two models which may have accounted for some, but not all, of the discrepancy in the results:

“One difference of the HadCM2 from the CGCM1 model and previously studies models is that it includes the presence of the Great Lakes as a water surface with significant thermal inertia. It is doubtful that this is a full explanation of the increased precipitation and lesser increase in temperature, as differences of a similar magnitude have been noted on portions of North America remote from the Great Lakes.”

1.2 Outcome of IJC Deliberations

In the general discussions of this topic in its February 2000 report,¹⁰² the Commission summarized the technical findings regarding water level changes and speculated on a few of the most obvious implications for water users. Commissioners then went on to formulate one conclusion, one principle and one recommendation that specifically referred to climate change:

¹⁰² International Joint Commission, Protection of the Waters of the Great Lakes, February, 2000.

Conclusion 8: Climate Change

“Mounting evidence of the potential for climate change adds uncertainty to the nature of future supplies to the Great Lakes and how the levels and flows of the lakes will be affected. All climate models to date agree that there will be some increase in temperature in North America. Although most models suggest that global warming would lower Great Lakes levels and outflows, there is some limited new information that suggests the possibility of a slight rise in water levels. There is information to suggest that there could be more frequent and severe local weather events. Climate change also has the potential to increase the demand for water, both inside and outside the Great Lakes Basin.”

Principle 2: The Precautionary Principle

“Because there is uncertainty about the availability of Great Lakes water in the future - in the light of previous variations in climate conditions as well as potential climate change, uncertainty about the demands that may be placed on that water, uncertainty about the reliability of existing data, and uncertainty about the extent to which removals and consumptive use harm, perhaps irreparably, the integrity of the Basin ecosystem - caution should be used in managing water to protect the resource for the future. There should be a bias in favor of retaining water in the system and using it more efficiently and effectively.”

Recommendation 7: Climate Change

“Recognizing that the Intergovernmental Panel on Climate Change has concluded that human activities are having a discernible effect on global climate, and despite the uncertainties associated with the modelling of future climate, the governments of Canada and the United States should fully implement their international commitments to reduce greenhouse gas emissions.”

2. Recent Developments

As early as 1996, the International Panel on Climate Change was able to reach the consensus that “the balance of evidence suggests there is a discernible human influence on the climate system.”¹⁰³ At the time of the February 2000 IJC report, the consensus that global climate warming was occurring had solidified, but there were still a significant number of detractors. It is likely fair to conclude today that the consensus is very close to, but still not completely

¹⁰³ Personal communications with Elaine Barrow, Environment Canada.

unanimous. Despite this solidifying consensus about a warming trend, there continues to be major uncertainties regarding the magnitude and timing of the many and varied possible impacts.

With specific reference to Great Lakes water supplies and water levels, there have been a few significant scientific developments since release of the IJC report. The first relates to ongoing research at the Hadley Centre in Great Britain. At the time of the February 2000 report, all models except HadCM2 projected significant declines in future net basin supplies and water levels due to climate warming. At that time, HadCM2 was at the wet, cool extreme of all model results, which when linked to a hydrologic model suggested little water level change or small increases. Since that time, climate change scenarios derived from more recent HadCM3 output indicate changes in mean temperature and precipitation which are more consistent with results from other GCMs.¹⁰⁴

Another new development has taken place at the Great Lakes Environmental Research Laboratory (GLERL) in Ann Arbor, Michigan. That research laboratory has developed the Coupled Hydrosphere-Atmosphere Research Model (CHARM). CHARM is a regional model that uses Canadian model results to define its boundary conditions, and includes a finer spatial resolution, and detailed water-atmospheric interactions. While it does include important refinements over earlier efforts, there is an inherent difficulty in nesting a regional model within, and using boundary conditions defined by, a global one. Serious discontinuities can, and in this case undoubtedly do occur between conditions at the boundary and those depicted immediately inside the boundary by the regional model. These discontinuities are dealt with by “nudging” the values near the edge of the domain towards their observed values.¹⁰⁵ While these adjustments may produce satisfactory results, that is not a certainty.

Early results from CHARM indicate somewhat lesser warming than many of the earlier models. For Lake Superior, they indicate a trend towards increasing net basin supplies during the winter months and decreasing supplies during the summer months. For Lake Erie, they indicate a trend towards higher net basin supplies in most months. These early results have led the GLERL to conclude that “there is less certainty than previously thought that net basin supplies and water levels of the Great Lakes will trend downward due to greenhouse warming.” It will be some time before we know whether this early conclusion will stand up to the test of time and international scrutiny.

¹⁰⁴ According to GLERL scientists, HadCM2 had “overactive” sulphate aerosols, i.e. the model did attempt to take account of the cooling effects of sulphate aerosol forcing, but overpredicted the cooling effect.

¹⁰⁵ Presentation on the CHARM model to Task Force members by Brent Lofgren, Great Lakes Environmental Research Laboratory, and follow-up communications, August, 2002.

The bottom line is that we simply do not know what impact climate warming will have on Great Lakes levels and flows. Based on scientific efforts to date, the result could be anywhere between a small increase in levels and a very large decrease. Because of widely divergent results in many climate change studies worldwide, and the obvious dangers of relying on any single model, the Intergovernmental Panel on Climate Change has recommended the use of multiple scenarios in impact and adaptation assessments.¹⁰⁶ For example, a study carried out in support of ongoing Lake Ontario regulation studies has suggested that four scenarios be considered in order to capture the range of future climate, ie. scenarios indicating future conditions which are generally warmer and wetter (eg. ECHAM4 from the Max-Planck Institute for Meteorology), warmer and drier (eg. CGCM1), cooler and wetter (eg. HadCM2), and cooler and drier (eg. CGCM2).¹⁰⁷ Consideration is also being given to using stochastically generated hydrologic scenarios.¹⁰⁸

In addition to climate change modelling efforts, some interesting work has been initiated on some of the less direct implications of a warming trend. For example, in a paper scheduled for publication later this year in the *Journal of Great Lakes Research*,¹⁰⁹ it is speculated that the extent and duration of ice cover could be significantly reduced, especially on Lake Erie. While not addressed directly in that paper, this raises interesting questions about what implications this might have for lake evaporation, because evaporation rates are very high in the winter months until the lakes freeze over. The same paper also looks at groundwater impacts, and concludes there could be important changes to groundwater conditions.

With respect to the recommendation on meeting international commitments, the main controversy in 2000 was whether or not the United States and Canada would ratify the Kyoto Accord. Since that time, the U.S. Administration has clearly stated that “Kyoto Protocol is fundamentally flawed. The Kyoto Protocol fails to establish a long-term goal based on science, poses serious and unnecessary risks to the U.S. and world economies, and is ineffective in addressing climate change because it excludes major parts of the world.” Rather than proceed

¹⁰⁶ Intergovernmental Panel on Climate Change, Task Group on Scenarios for Climate Impact Assessment, *Guidelines in the Use of Scenario Data for Climate Impact and Adaptation Assessment*, 1999.

¹⁰⁷ Elaine Barrow, *Climate Change in the Great Lakes - St. Lawrence Region: A Comparison of Climate Change Scenarios*, Contribution to the IJC’s Lake Ontario - St. Lawrence River Study, March, 2002.

¹⁰⁸ Personal communications with Doug Cuthbert, Canadian Co-Chairman of the Lake Ontario - St. Lawrence River Study, July, 2002.

¹⁰⁹ Brent Lofgren, Frank Quinn, Anne Clites, Raymond Assel, Anthony Eberhardt, and Carol Luukkonen, *Evaluation of Potential Impacts on Great Lakes Water Resources Based on Climate Scenarios of Two GCMs*, pending publication, 2002.

with the Protocol, the President has directed a “Cabinet-level climate change working group to press forward and develop innovative approaches in accordance with several basic principles. These approaches should: (1) be consistent with the long-term goal of stabilizing greenhouse gas concentrations in the atmosphere; (2) be measured, as we learn more from science and build on it; (3) be flexible to adjust to new information and take advantage of new technology; (4) ensure continued economic growth and prosperity; (5) pursue market-based incentives and spur technological innovation; and (6) be based on global participation, including developing countries.”¹¹⁰

In its formal response¹¹¹ to the IJC’s report dated February 8, 2002, the Government of Canada made the following points:

“The Government of Canada recognizes the potential impacts associated with climate change and the need for decisive international action to reduce greenhouse gas emissions. As a northern country, Canada is particularly susceptible and is already seeing the signs of increased temperatures, particularly in the Arctic.

“Canada is pleased with the landmark agreement recently reached in Bonn on international rules to implement the Kyoto Protocol. This agreement opens the way for Canada’s ratification of the Kyoto Protocol next year, following full consultations with the provinces, the territories, stakeholders and other Canadians. Under the Protocol, Canada is committed to a target of a 6% reduction in greenhouse gas emissions (below 1990 levels) by 2008-2012.

“The Government of Canada’s *Action Plan 2000 On Climate Change* announced in October 2000 will reduce greenhouse gas emissions by 65 megatonnes per year taking Canada one third of the way to its Kyoto target. The federal government will continue working with the provinces and territories, industry, non-governmental organizations, and communities across the country to assess how best to achieve the remainder of its Kyoto target.”

3. Remaining Issues

¹¹⁰ www.state.gov/documents/organization/4584. The two statements may be found on pages 13 and 1 of this PDF document.

¹¹¹ Government of Canada, Government of Canada Response to the International Joint Commission’s Final report on the Protection of the Waters of the Great Lakes, February, 2002.

Although some progress has been made, the remaining issues are not substantially different than they were in 2000.

There is still a wide variation in model results. Climate change could result in large decreases in water levels, small increases, or anything in between. This major uncertainty would suggest the need for more collaborative research, continuing caution in the way we use water, and more resilient approaches to water management in general.

Now that global warming is a virtual certainty, we are likely to see an increasing emphasis on some of the less direct implications of that warming. Some examples include ice cover and its relationship with evaporation, possible changes to ice retardation in the connecting channels, and impacts of climate warming on groundwater and water demand.

One of the keys to successful adaptation may be found in reducing the rigidity in the ways we manage water. In that regard, ongoing Lake Ontario regulation studies provide an excellent opportunity to test a multiple scenario approach. Important advances in this regard are expected over the next two years.

There is as yet no clear consensus emerging on how national governments, individually and collectively, will ultimately address the continuing and potentially very serious build-up of greenhouse gases in the atmosphere.

GROUNDWATER

1. Situation as of February 2000

In its report, the International Joint Commission recognized the importance of groundwater to the overall water supply of the Great Lakes, stating that “indirect groundwater discharge accounts for approximately 22 percent of the U.S. supply to Lake Erie, 33 percent of the supply to Lake Superior, 35 percent of the supply to Lake Michigan, and 42 percent of the supply to Lakes Huron and Ontario.

In its conclusions, the Commission stated:

“There is uncertainty and a lack of adequate data about groundwater and use of groundwater in the Basin. Data on withdrawals vary in quality, while data on consumption are extremely limited. It is estimated that about 5 percent of all withdrawals in the Basin are from groundwater. Current estimates of consumption of groundwater do not indicate that this consumption is a major factor with respect to Great Lakes levels. Nevertheless, it is a matter of considerable importance to more than 20 percent of the Basin's human population and to the large biological community that rely on groundwater and that can be significantly affected by local withdrawals. There is a serious lack of information on groundwater in the Basin, and governments should undertake the necessary research to meet this need. There is clear need for state, provincial, and local government attention to the monitoring and regulation of groundwater withdrawals and protection of groundwater recharge areas.”

In Recommendation VII, the Commission responded to the importance of groundwater to the Basin and to the uncertainty and lack of adequate data by saying:

“Governments should immediately take steps to enhance groundwater research in order to better understand the role of groundwater in the Great Lakes Basin. In particular, they should conduct research related to:

- a. unified, consistent mapping of boundary and transboundary hydrogeological units,
- b. a comprehensive description of the role of groundwater in supporting ecological systems,
- c. improved estimates that reliably reflect the true level and extent of consumptive use,
- d. simplified methods of identifying large groundwater withdrawals near boundaries of hydrologic basins,

- e. effects of land-use changes and population growth on groundwater availability and quality,
- f. groundwater discharge to surface water streams and to the Great Lakes, and systematic estimation of natural recharge areas, and
- g. systematic monitoring and tracking of the use of water-taking permits, especially for bottled water operations.

In recognition of the frequent and pervasive interaction between groundwater and surface water and the virtual impossibility of distinguishing between them in some instances, governments should apply the precautionary principle with respect to removals and consumptive use of groundwater in the Basin.”

The Commission was assisted in the preparation of the groundwater section of its report by USGS, and much of the Commission’s analysis, conclusion, and recommendation overlaps with the findings contained in USGS Water Resources Investigations Report 00-4008, *The Importance of Groundwater in the Great Lakes Region*.¹¹²

2. Recent Developments

In its formal response of 8 Feb 2002 to the Commission, the Government of Canada stated that “the management of groundwater is primarily a provincial responsibility” and that “the Geological Survey of Canada (GSC) has initiated consultations with the provinces, territories and other federal science agencies to develop a national program that would map out the nation’s major aquifers, including groundwater in the Great Lakes Basin. Furthermore, the Government of Canada has initiated discussions with the Government of the United States regarding the development of a coordinated approach to raising the awareness of groundwater issues throughout the Great Lakes Basin.”

Groundwater is part of the federal/provincial water use and supply project that is underway between Environment Canada and Ontario and which is linked to the effort underway at the Great Lakes Commission.¹¹³ The primary objective of this project “is to gain baseline information on water supply, use and demand at a sub-basin level, identify the ecological sensitivities of the system to water resources and make projections for the future.” The project will also develop a “prototype methodology for calculating ground and surface water supplies on a sub-basin level.” In addition,

¹¹² This report is available in PDF format at www.water.usgs.gov/ogw/pubs/WR1004008/WRIR_00-4008.

¹¹³ Project Summary, Water Use and Supply Project, undated.

the Ontario Ministry of Energy and Environment is attempting to construct a database for a Provincial Groundwater Monitoring Network that will cover Ontario's Great Lakes watershed.¹¹⁴

Groundwater is an element of concern in GLC's Water Resource Management Decision Support System (WRMDSS) project and in Annex 2001. WRMDSS discusses groundwater as a component of the water balance, and USGS groundwater specialists are part of the project management team. Directive #5 of Annex 2001 calls for "provisions for a better understanding of the role of groundwater." Directive #6 calls on the Governors and Premiers "to commit to improve the sources and impacts of the withdrawals from various locations and water sources on the ecosystem, and better understand the role of groundwater in the Great Lakes Basin by coordinating their data gathering and analysis efforts."

USGS Report 00-4008 is still the best description of the state of knowledge about groundwater in the U.S. portion of the Great Lakes. From the report, it is clear that mapping groundwater is inherently difficult. Much of the groundwater research has been, is, and will continue to be linked to specific needs that develop that require investigation. For example, in 2001, reports of domestic wells "going dry" led Michigan and USGS to begin an investigation of the effects of quarry dewatering on nearby domestic groundwater supplies in Monroe County.¹¹⁵ While records on the failure of domestic wells go back in the county to 1900, the current investigation examined records from 1991-2001, a period in which the levels of Lake Erie and annual precipitation remained fairly stable. Quarries must obtain permits in order to dump water into streams and so records for this activity are relatively accurate. From 1991-2000, quarry dewatering increased from 9 mgd in 1991 to 20 mgd in 2000. While groundwater withdrawals for agricultural and golf-course irrigation and for municipal and individual domestic use also increased over the same period, increases for this activity were less significant than the increases for quarry dewatering. The effect on water levels in wells was significant: from December 1991 to December 2001, groundwater levels declined in 24 of 31 USGS observation wells at an average of 12 feet. Groundwater quality remained constant.

USGS Water-Resources Investigation Report 01-4227 is another example of groundwater research linked to an investigation of a local problem.¹¹⁶ In summer 2000 and summer 2001, residential wells in several areas of Saginaw County went dry shortly after irrigation of crop lands commenced. In the fall of 2000, after irrigation ceased, the residential wells were restored. Using data from aquifer tests, water-level records, geological logs, and numerical models USGS concluded that

¹¹⁴ www.ene.gov.ca/envision/watershed/index.

¹¹⁵ This Open File report can be found at:
www.mi.water.usgs.gov/pubs/OF01-498/OF01-498LW.

¹¹⁶ This report can be found at:
www.mi.water.usgs.gov/pubs/WRIR/WRIR-4227/WRIR-01-4227/LW

irrigation well pumping over a three-month period produced water-level declines from 5.3 to 20 feet, 2.8 to 12 feet and 1.7 to 6.9 feet at wells at distances of about 0.5, 1.5 and 3 miles from irrigation wells, respectively. USGS also concluded that the actual extent that irrigation pumping caused reduced function of residential wells cannot be fully predicted from the data set, due to the many other factors affecting the yield of residential wells.

On a broader basis, USGS and Wisconsin officials have developed a flow model that ties together shallow and deep aquifers in Southeastern Wisconsin,¹¹⁷ where Great Lakes Basin aquifers intersect with non-Basin aquifers. In this area, groundwater withdrawals to service population and economic growth have resulted in yearly declines in the deep aquifer from 6 to 10 feet per year over the past 50 years, with intersections of aquifers causing withdrawals in one aquifer to affect water levels in others. The model is part of an effort to provide water managers with an information base and a better conceptual understanding of the ground water flow systems, both shallow and deep, and their response to urban development and water use. USGS will also use the flow model for a project to develop, among other things, a three-dimensional visualization of Lake Michigan. (See below, note 12.)

The website of the Illinois State Geological Survey (ISGS) provides another good example of the complexity of groundwater research and of the frequent link to site-specific study.¹¹⁸ ISGS maintains annual lists of its publications on groundwater geology: ISGS listed 22 publications in 2001 and 24 in 2000. The range of the studies appears to be quite broad. Sample titles include: Denitrification as revealed by isotope ratios in tile-drained agricultural watershed in central Illinois; Consequences of uncertainty in geological maps; High-resolution geophysical imaging of glacial aquifers; Groundwater Geology of DeWitt, Piatt and Northern Macon Counties, Illinois; and Testing Illinois' Statewide Map of Aquifer Sensitivity.

3. Remaining Issues

Mapping groundwater throughout the Great Lakes region will be a long, arduous process. Unlike the surface water divide, groundwater divides shift as water enters or leaves an aquifer, a fact which makes mapping at least somewhat imprecise.

¹¹⁷ Early information on the scope of this project can be found at: www.water.usgs.gov/pubs/FS/FS-051-99. According to James Krohelski, USGS Wisconsin, the USGS will publish its report on the model under the title *Regional Aquifer Model for Southeast Wisconsin*.

¹¹⁸ www.isgs.uiuc.edu/ground-w/gwpub_2001 and www.isgs.uiuc.edu/ground-w/gwpub_2000.

Much of the research that the states and provinces will fund will continue to be linked to actual problems like the drying up of residential wells and will be designed in part to enable water managers to sort out competing claims from interested parties. As a result, many of the research issues identified by the Commission and USGS in their 2000 reports are likely to be tackled on an ad hoc basis.

According to a USGS official,¹¹⁹ to date there has been little done in response to the Commission's call for unified consistent mapping of boundary and transboundary hydrogeological units (Recommendation VII, a)¹²⁰ or for improved estimates that reliably reflect the true level and extent of consumptive use (Recommendation VII, c).¹²¹ There has been progress in describing the role of groundwater in supporting ecological systems (although the availability of good quality water for drinking and ecosystems is still a largely unstudied area for the Great Lakes as a whole), on identifying the effects of land-use changes and population growth on groundwater availability and quality, on learning more about groundwater discharge to streams and on estimating natural discharge areas (Recommendation VII, b, d, f).

USGS will build upon its examination of the effects of groundwater withdrawal at quarries in Monroe County, Michigan, and look for benthic changes along the nearshore area of western Lake Erie, where the quarry withdrawals have reversed the groundwater flow. In parts of Lake Erie closest to the quarries, water is now flowing out of Lake Erie into the aquifer, and USGS will compare the benthos in this area to the benthos further down the shoreline, where groundwater is still entering Lake Erie. The Lake Erie study is the pilot for a larger aquatic biodiversity study in the Great Lakes Basin that USGS hopes to fund.¹²² This study, which will produce information on the effects of groundwater withdrawal on the ecosystem of a lake, is a nice example of how a specific local effort, an analysis of quarry groundwater withdrawals, can be used in an examination of the larger

¹¹⁹ Conversation with Jim Nicholas, District Chief, USGS Michigan. USGS had no information on progress made on Recommendation VII, g - monitoring and tracking of the use of water-taking permits, especially for bottled water operations - noting that this regulatory function is a state/local responsibility.

¹²⁰ Mapping groundwater throughout the Great Lakes region will be a long, arduous process. Unlike the surface water divide, groundwater divides shift as water enters or leaves an aquifer, a fact that makes mapping at least somewhat imprecise. Since state and provincial water use managers do not normally need to know where aquifer boundaries are to manage water use, large-scale research issues like mapping are normally viewed as federal responsibilities.

¹²¹ The GLC-led effort to develop a decision-support system for water use decision making has resulted in further explanation of the problems inherent in accurately measuring/estimating water use (both surface and groundwater).

¹²² Project overview provided by Jim Nicholas.

ecosystem issues that are targets of the Commission's recommendations.

In 2002, the Great Lakes Protection Fund issued a grant to USGS to allow a team of hydrologists to develop a three-dimensional visualization of the Lake Michigan basin which illustrates how groundwater relates to the surface water system, to produce a tool that simulates the impact of groundwater withdrawal on flows into the Great Lakes and a map that illustrates the contribution of groundwater into Great Lakes tributaries; and, with Environment Canada, to develop protocols and data reporting procedures that can be used in both Canada and the United States in routine hydrological analyses.¹²³ This effort is designed to support the Annex 2001 effort, but the issues it tackles also respond in part to the Commission's groundwater recommendations.

¹²³ The flow model for Southeastern Wisconsin will be used for this project. A summary of this latest project can be found at: www.glpf.org.02awards. See also *Groundwater and the Great Lakes: A Coordinated Binational Basin-Wide Assessment in Support of Annex 2001 Decision Making*, the proposal submitted to the GLPF by USGS and Collaborating Agencies. In its formal response to the Commission's report, the Government of Canada spoke of initiating discussions with the USGS about groundwater. This link between the USGS and Environment Canada appears to be the outcome of that discussion.

CONSERVATION

1. Situation as of February 2000

In a brief section on conservation in its 2000 report, the Commission stated that “the first step in sound management of resources and the exercise of the precautionary principle is conservation.”¹²⁴ In the future, the Commission observed that the cumulative impacts of current and new uses, global warming, and a change in the patterns of consumptive use are likely to make conservation an even more important component of any overall sustainable use strategy. The Commission advised governments and citizens to “best prepare for future uncertainty and protect the overall health of the Great Lakes ecosystem by imbedding a robust ethic of conservation into education and into every level of planning and execution”.

The Commission also included a statement on conservation in its conclusions: “Conservation measures can and should minimize the amount of water withdrawn and consumed in the Great Lakes Basin, and such measures must form part of any effort to preserve the integrity of the waters of the Great Lakes Basin and ensure the sustainability of those resources.”

In Recommendation III of its 2000 report, the Commission spoke at length:

“In order to avoid endangering the integrity of the ecosystem of the Great Lakes Basin, the governments of the Great Lakes states and Ontario and Quebec should take conservation measures to significantly improve efficiencies in the use of water in the Great Lakes Basin, and should implement the conservation measures set out in this recommendation.

The governments of the Great Lakes states and Ontario and Quebec, in collaboration with local authorities, should develop and launch a coordinated basin-wide water conservation initiative, with quantified consumption reduction targets, specific target dates, and monitoring of the achievement of targets, to protect the integrity of the Great Lakes Basin ecosystem, and to take advantage of the other economic and environmental benefits that normally flow from such measures.

In developing and implementing this initiative, the governments should, among other things, consider:

¹²⁴ International Joint Commission, Final Report on Protection of the Waters of the Great Lakes, February, 2000.

- a. state-of-the-art conservation and pollution-control technologies and practices,
- b. potential cumulative impacts,
- c. the application of sound planning practices,
- d. to the extent practicable, the setting of water prices at a level that will encourage conservation,
- e. conditioning financial help from governments for water and wastewater infrastructure on the application of sound conservation practices,
- f. promotion of eco-efficient practices, especially in the industrial and agricultural sectors,
- g. establishment of effective leak detection and repair programs for water infrastructure in all municipalities,
- h. the inclusion of strong performance and environmental standards and financial incentives for water saving in contractual arrangements for delivery of water-related services, whether public or private,
- l. the application of best practicable water saving technologies in governmental facilities,
- j. sharing experiences with respect to the planning and implementation of conservation policies and programs, and the use of water saving technologies, and
- k. joint preparation of promotional and educational materials and publication of success stories, including sponsoring conferences and workshops on water conservation, in partnership with others.”

2. Recent Developments

In its response to the IJC report, the Government of Canada¹²⁵ noted that “water conservation and water use efficiency practices have been recognized for decades as important measures to reduce water demand. Improving the understanding of the intrinsic, social and economic value of water is increasingly recognized as key to managing competing demands for the future. In this regard, the Government of Canada continues to support research in these areas, which includes developing comprehensive databases on water valuation studies in cooperation with provincial and international partners.” The Government response then went on to outline a number of specific funding initiatives in support of municipal infrastructure programs.

¹²⁵ Department of Foreign Affairs and International Trade, Government of Canada. Formal Response to the IJC’s Report on Protection of the Waters of the Great Lakes, February, 2002.

While the IJC's conservation recommendation speaks only to in-basin use, the Commission's first recommendation on out-of-basin diversions also encompasses conservation. States and provinces are proposing a more complex water management standard in Directive # 3 of their Great Lakes Charter Annex.¹²⁶ That directive is discussed in detail in the chapter on Decision-Making Regarding Consumptive Uses and Removals. Nevertheless, it is worthy of note here that Directive # 3 includes as one of its principles "preventing or minimizing Basin water loss through return flow and implementation of environmentally sound and economically feasible water conservation measures." In Directive # 6 of the Annex, the Governors and Premiers further committed themselves to "conduct a planning process for protecting, conserving, restoring and improving the Waters and Water-Dependent Natural Resources of the Great Lakes Basin," and to "develop guidelines regarding the implementation of mutually agreed upon measures to promote the efficient use and conservation of the Waters of the Great Lakes Basin."

A paper prepared as part of the Water Resource Management Decision Support System process summarizes water conservation efforts in the Basin,¹²⁷ and acknowledges that the Great Lakes region does not always have an economic incentive to pursue water conservation because suppliers' revenue goes up as deliveries go up. It should be noted, however, that even though there may be little economic incentive at the suppliers' level, there are huge but largely unrecognized economic incentives at a broader societal level. For example, if viewed from a more economic perspective, demand management can be highly beneficial in its own right, even in areas where water problems per se may not be critical. In many cases, the benefits have been demonstrated to exceed costs by a factor of 10 to 1 through reduced infrastructure and/or energy costs.¹²⁸

In the same paper, the Great Lakes Commission summarizes water use, water reporting and water conservation programs for all the states and provinces and recommends that Basin decision makers and water users include 15 water conservation measures in future water use planning. The measures are grouped into the following four categories:

Financial

- Incentives to improve water conservation, including retrofits

¹²⁶ Council of Great Lakes Governors, The Great Lakes Charter Annex, June, 2001.

¹²⁷ Dan Blake, Great Lakes Commission, Water Conservation in the Great Lakes - St. Lawrence Region, July, 2002.

¹²⁸ Study Team Contribution to the IJC's Interim report on Great Lakes Consumption, Diversions and other Removals, June, 1999.

- Conservation pricing/rate structures
- Metering and submetering for industrial uses
- Universal metering/submetering with commodity rates for public water supply

Programmatic

- Reports on water use an unaccounted-for flow
- Leak detection and repair for water utilities and industrial facilities
- Integrated resource planning
- Water system pressure management to reduce volume of water used
- Water recirculation and reuse in industrial processes

Technological

- Low-flow plumbing fixtures and other water-efficient appliances
- Efficient equipment for industrial/commercial facilities and agriculture

Behavioral

- Efficient behavioral practices in industrial/commercial facilities and agriculture
- Efficient water use and equipment for landscapes, including use of graywater systems
- Public information and school education programs
- Native and drought-tolerant turf and plants

The papers side-by-side comparison of water conservation programs as of January 1998 in the states and provinces indicates that there is considerable room for improvement. The draft summary indicates that Indiana, Michigan, Ohio, Quebec and Wisconsin either have no conservation programs or have programs that are very limited. This summary may paint too dark a picture, since, in all jurisdictions, programs exist at the local level, where much of the water management authority resides. Nevertheless, several states and provinces could do more to encourage conservation in their jurisdictions. Keeping the comparison current will serve to keep pressure on jurisdictions to establish or improve water conservation programs. That said, it will always be very difficult to collect data on and summarize conservation programs because of the very large number of local jurisdictions involved.

In addition to the conservation efforts linked to the Great Lakes Charter and Annex, in the United States, the Safe Drinking Water Act (SDWA) of 1996 required the Environmental Protection Agency (EPA) to publish guidelines for geographically tailored water conservation plans for public water systems at various levels: systems serving fewer than 3,300 persons; systems serving between 3,300 and 10,000 persons; and public water systems serving more than 10,000 persons.

EPA published its guidelines in 1998. While states have the authority to require water systems to submit a water conservation plan consistent with the EPA or other guidelines as a condition of receiving a loan under the Drinking Water State Revolving Fund, Illinois, Indiana, Michigan, New York, Ohio, and Pennsylvania do not require conservation of projects that wish to draw on revolving funds.¹²⁹ While SIDA is a federal measure, it is designed to encourage conservation at the state and municipal level. No jurisdiction is required to use the guidelines. While it is presumed they are having a positive effect, their effectiveness at the local/state level is not being measured. EPA has imbedded its guidelines in its Water Efficiency Program (WEP). The WEP website contains information on water efficiency practices, conservation pricing, technology, water recycling, as well as links to other websites promoting conservation practice.

As noted in the chapter on water use and related issues, apparent water use dropped considerably between 1993 and 1998. We do not know how much of that apparent reduction was simply “noise” in the data, and how much may represent a real trend. That chapter also notes that most water use estimates and demand forecasts have for the past 30 years have consistently and significantly overstated the magnitude of the water use issue. There have been many factors causing this overstatement. The most obvious is the lack of good data and forecasting methodology. However, there have also been some important societal shifts that were not expected, including demographic and industrial shifts, and the introduction of stricter pollution control measures. Experts have also tended to underestimate the effectiveness of water awareness and consequent conservation measures. Unfortunately, we are not able to measure how much conservation alone has contributed to the quicker than expected levelling off of consumptive uses.

¹²⁹ Minnesota requires cities to have a conservation plan to get on a revolving fund priority list. Wisconsin effectively requires a plan for new wells by virtue of a separate wellhead protection plan for new wells. Both New York and Pennsylvania give priority points to projects that have conservation features when they administer their revolving funds, but do not require conservation for projects that receive these funds. Information provided by EPA officials in Regions 2, 3 and 5.

3. Remaining Issues

In 2002, the Great Lakes Protection Fund provided a grant¹³⁰ to the Great Lakes Commission to prepare a water conservation tool kit. The Commission intends to survey water conservation practice and identify “best available” technologies and practices. When complete, the tool kit will be made available in an online directory. While much of the material that will ultimately be included in this tool kit is already available on other web sites (e.g. EPA, Environment Canada¹³¹), the kit is expected to provide more specific guidance to water managers as they take measures to conserve water in situations of existing uses, as well as new or expanded ones..

Clearly, the Great Lakes Governors and Premiers recognized the importance of conservation in Annex 2001, and are moving to incorporate conservation principles and practices into the management system they hope to develop for Great Lakes water use. It is too early to conclude the extent to which conservation measures may become mandatory, and as discussed in the water use data chapter, it is not entirely clear that a mandatory multi-jurisdictional regime would necessarily produce superior results to local solutions supported by basin-wide guidelines. Nevertheless, the perception that the Basin states and provinces need to apply sound conservation measures within the Basin in order to improve their ability to apply controls on out-of-basin demands will likely provide a powerful incentive for them to act in a concerted and coordinated manner.

There already is greater awareness of the programs that exist at the state/provincial level and recognition of the need to assist local water managers by providing them with better tools and information. At all levels of government, there is a recognition that strong political support for the principle of conservation is essential. Since the Great Lakes is a water-rich region, water shortages alone will not play an important role in forcing continuing water conservation on a region-wide basis, although local water shortages and periodic drought conditions will no doubt induce conservation at a local level. In any event, it is likely that water conservation/demand management will increasingly be recognized as being economically beneficial in its own right, regardless of its impact on the regional water balance.

In the long run, virtually all successful water conservation programs have at their core comprehensive metering, and the setting of prices in such a way that the amount of water used by any activity is a function of its price. As long as many of the water uses in the Great Lakes Basin remain unmetered, and governments continue to subsidize water use, there will continue to be considerable untapped potential to save water, and at the same time reap very substantial social,

¹³⁰ www.glpf.org/02awards.

¹³¹ www.ec.gc.ca/water/en/info/pubs/FS/e_FSA6.

economic and environmental benefits.

DIRECTIVE TO THE WATER USES THREE-YEAR REVIEW TASK FORCE

1. In February 2000 the International Joint Commission submitted its report on Protection of the Waters of the Great Lakes to the governments of the United States and Canada in response to a February 1999 reference on water uses along the boundary. In that report the Commission recommended that the Commission be given a standing reference to review its recommendations for the protection of the Great Lakes in three years and thereafter at 10-year intervals unless conditions dictate more frequent review. By letters dated, September 28, 2000 and November 2, 2000, the governments of the United States and Canada approved this further assignment under the water uses reference.
2. The purpose of this directive is to establish and direct International Great Lakes Water Uses Review Task Force to assist the Commission in carrying out the three year review of its recommendations under the extended reference.
3. The Task Force shall review and provide a status report on legislative and policy efforts of the governments of Canada and the United States, and the Great Lakes States and Ontario and Quebec concerning removals or major new or increased consumptive uses.
4. The Task Force shall also provide a status report of major accomplishments and remaining gaps with respect to data and information gathering and other management programs that affect Great Lakes water uses in the following such areas.
 - water uses (including diversions and consumptive uses by sector)
 - cumulative effects
 - climate change
 - groundwater
 - conservation
 - legal and policy considerations, including international trade law
5. The Commission will appoint members to the Task Force and Co-Chairs to lead the Task Force's efforts. The Co-Chairs will be responsible for organizing and executing the work of the Task Force, and for coordinating with and reporting to the Commission. The Task Force will be binational and multi-disciplinary and comprise an equal number of members from each country. The Task Force, with the approval of the Commission, may establish sub-groups as necessary to assist with its work. Members of the Task Force and any sub-groups will act in their personal and professional capacities and not as representatives of their countries, agencies, organizations, or other organizations. Members of the Task Force and any sub-groups will be responsible for their own

expenses unless otherwise arranged by the Commission.

6. In carrying out its work, the Task Force will take note of work of other agencies and organizations in both countries. It will review, evaluate and analyze available information and acquire new information as required. The Task Force will strive to reach decisions by consensus. Differences that may arise will be addressed by the Commission on a case by case basis.
7. The Task Force shall assist the Commission in its public consultation activities pursuant to this reference. It is expected that these activities will include, at a minimum, public hearings and one or more roundtables.
8. The Task Force will keep the Commission fully informed of its progress and direction. In addition to regular contact with designated Commission personnel, the Task Force Co-Chairs and the Commission Secretaries shall conduct bi-weekly conference calls and the Task Force shall brief the Commission at its fall 2002 Semi-Annual Meeting in Ottawa, Canada.
9. The Task Force will submit a work plan with associated schedule of activities and budget for the Commission's approval. Because of the time-sensitive nature of the governments' request, the Commission authorizes the Task Force to begin work immediately - prior to approval of the work plan, schedule and budget - provided the Task Force obtains approval for this work from the Commission Secretaries. The Task Force will provide a status report of its activities at its briefing of the Commission at the fall 2002 Semi-Annual Meeting and its final report no later than November 8, 2002. The final report or reports should include findings and conclusions regarding the matters identified above.
10. Documents, letters, memoranda, and communications of every kind in the official records of the Commission are privileged and become available for public information only after release by the Commission. The Commission considers all documents in the official records of the Task Force or any of its sub-groups to be similarly privileged. Accordingly, all such documents shall be so identified and maintained as separate files. The Commission has issued the attached on the availability of the minutes of its boards and task forces which also applies to the International Great Lakes Water Uses Review Task Force.

Signed this the _____ day of June 2002.

Murray Clamen
Secretary
Canadian Section

Gerry Galloway
Secretary
U.S. Section

TASK FORCE MEMBERSHIP

Canada

Ralph Pentland
Canadian Co-Chair
Consultant
Ottawa, Canada

J. Owen Saunders
Canadian Member
Canadian Institute of Resources Law
University of Calgary
Calgary, Alberta

United States

Thomas Callow
U.S. Co-Chair
Consultant
Washington, DC

A. Dan Tarlock
U.S. Member
Environmental and Energy
Law
Chicago-Kent College of
Law
Chicago, IL