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# A WATER RESOURCES MANAGEMENT DECISION SUPPORT SYSTEM FOR THE GREAT LAKES

## Project Work Plan



for use by:

*the Great Lakes Commission  
and  
Collaborating Agencies and Organizations*

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## 1. PROJECT OUTCOME

### A) Abstract

The Great Lakes Commission proposes to lead a large scale collaborative effort that will yield, in unprecedented detail, a status assessment of Great Lakes water resources, an inventory of the sources and use of Great Lakes water, and enhanced understanding of the ecological consequences of such use. A multi-agency, multi-disciplinary collaborative has been formed to accomplish this task and will bring the unparalleled experience, expertise and resources of the Great Lakes Commission, its ten member states and provinces, multiple U.S. and Canadian federal agencies, regional organizations, and academic institutes to bear on the issue. This team is uniquely qualified to deliver inventory products in a timely, efficient and cost-effective manner; leverage significant additional resources; and provide a means to institutionalize the inventory by ensuring its operation, maintenance and enhancement over the long term. In so doing, the Great Lakes Commission and its team of collaborators will lay the framework for a state-of-the-art decision support system that will 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. Significantly, this initiative will yield four major products which, singly and collectively, will strengthen water quantity decisionmaking and management processes.

### B) The Resource and Its Ecological/Economic Attributes

The binational Great Lakes system is one of virtually unfathomable expanse and corresponding complexity. Its myriad characteristics are inextricably linked to – and in large part the determinants of – the region's environmental health, economic well-being and overall quality of life. Yet, the expansiveness and complexity of the resource belies its fragility. Even minor stresses -- whether they be physical, biological or political—can have lasting impacts upon the sustainable use, development and protection of the resource.

The Great Lakes system enjoys global prominence, containing some 6.5 quadrillion gallons of fresh surface water, a full 20 percent of the world's supply and 95 percent of the United States' supply. Its component parts -- the five Great Lakes -- are all among the fifteen largest freshwater lakes in the world. Collectively, the lakes and their connecting channels comprise the world's largest body of fresh surface water. They lend not only geographic definition to the region, but help define the region's distinctive socio-economic, cultural and quality of life attributes, as well.

An international resource shared by the United States and Canada, the system encompasses some 95,000 square miles of surface water and a drainage area of almost 200,000 square miles. Extending some 2,400 miles from its western-most shores to the Atlantic, the system is comparable in length to a trans-Atlantic crossing from the east coast of the United States to Europe. Recognized in U.S. federal law as the nation's "fourth seacoast," the Great Lakes system includes well over 10,000 miles of coastline. The coastal reaches of all basin jurisdictions are population centers and the locus of intensive and diverse water-dependent economic activity. Almost 20 percent of the U.S. population and 40 percent of the Canadian population resides within the basin.

The role of the Great Lakes system in advancing and sustaining regional, national and binational economic development has long been recognized. The physical presence, geographic configuration, biological diversity and hydrological characteristics of the lakes have been, and continue to be, determinants of locational decisions for business and industry. Much of the early economic activity during settlement of the region was directly attributable to resource exploitation potential (e.g., fisheries, trapping, mining, forestry) and the availability of water-based transport. While the industrial base has diversified over the years, the basin's water resources continue to exercise a substantive role in the attraction, retention and day-to-day operation of industry. Every day, for example, nearly 900 billion

Renewed attention to the withdrawal and use of Great Lakes water, particularly relating to diversion and export, was prompted by the efforts of a Sault Ste. Marie, Ontario company to secure a permit to withdraw Lake Superior water in the interest of establishing an overseas market for bulk water export. Although the Ontario permit was subsequently revoked, the incident highlighted the vulnerability of Great Lakes jurisdictions to such prospective water uses and prompted studies and policy discussions at the state, provincial, federal, regional and binational levels. In late 1999, the Council of Great Lakes Governors issued a statement outlining a set of principles to guide the development and maintenance of a strengthened water resources management framework for the Great Lakes System. The Governors and Premiers also pledged to work toward a more elaborate and defined water resources management system that provides a scientifically sound and legally defensible basis for policy and management decisions. Among others, this will include the development of a common standard by which water use proposals can be reviewed and assessed.

In its statement, the Council pledged to “develop a new agreement, based upon the Great Lakes Charter and its principles, which will bind the Great Lakes States and Provinces more closely to collectively plan, manage and make decisions regarding the protection of the waters of the Great Lakes...” and “to develop a new common standard against which water projects will be reviewed. It will be based upon the standard that we have developed with the Premiers, but have never formally adopted: the protection of the integrity of the Great Lakes ecosystem.”

The Council also pledged to “secure funds to develop a better base of Great Lakes water use data. Without a good base of data, it is difficult to make sound decisions. We applaud the actions of The Great Lakes Protection Fund which has, by unanimous vote of its board at their last meeting in Chicago, agreed that funding the design and development of a water-use information system as the Fund's highest priority for the next year.” The statement outlines the following set of principles for a water management regime:

- ▶ The resource must be protected. Resource protection, restoration and conservation must be the foundation for the legal standard upon which decisions concerning water withdrawals are based.
- ▶ The management regime must be durable. The framework for decisions must be able to endure legal challenges based upon, but not limited to, interstate commerce and international trade. It must be constitutionally sound on a bi-national basis, and the citizens of the Basin must support this framework.
- ▶ The management regime must be simple. The process for making decisions and resolving disputes should be straightforward, transparent and based on common sense.
- ▶ The management regime must be efficient. Implementation of the decision making process should engage existing authorities and institutions without necessitating the establishment of new and large bureaucracies.
- ▶ The decision making process should be flexible and responsive to the demands it will confront.
- ▶ Decision making authority must be retained in the basin. Decisionmaking must remain vested in those authorities, the Great Lakes Governors and Premiers, who manage the resource on a day-to-day basis.

The Great Lakes Commission and its many collaborators propose to provide the data, information and associated analytical framework needed to assist the Governors and Premiers in the development of a water resources decision support system for the Great Lakes.

## **B. Work Plan**

### **Project Element One: Detailed Project Design and Infrastructure**

The Great Lakes Commission – in consultation with the states, provinces and other collaborators – will design and lead a scoping exercise that will establish and formalize project administrative structure, management team responsibilities, the role and responsibility of a Project Advisory Committee, grant management/contractor guidelines, tasks, activities, and associated timelines. Project design and infrastructure, as proposed in the following discussion, reflect the following key principles, all drawn from the aforementioned strategy:

- ▶ The Great Lakes states and provinces are the primary clients of project outcomes and, as such, will have an integral role in project design, oversight and conduct.
- ▶ The support and assistance of relevant federal and regional agencies, as well as academic and nongovernmental institutions, will be secured.
- ▶ The project design will reflect a bias for action and will feature interim products readily applicable to state and provincial water management needs.
- ▶ The project infrastructure will be streamlined to ensure efficient and cost-effective administration and will be institutionalized to ensure that project outcomes are maintained and pursued over the long term, consistent with the preferences of the states and provinces.

The project will be administered through a three-part structure featuring a Project Management Team, a Project Advisory Committee and a Project Secretariat (see Figure 1).

The following descriptive overview of these and related elements has been developed in consultation with the states, provinces and other collaborators. It will be refined and finalized during the first project quarter, ensuring that resources can be promptly directed at the key substantive tasks: Status Assessment of Water Resources; Inventory of Water Withdrawal and Use; and Inventory of Information on Ecological Impacts.

**A Project Management Team** will provide overall leadership and direction in the design and conduct of all project elements. It will be comprised of representatives from all ten Great Lakes states and provinces (10); the Council of Great Lakes Governors; one representative each from the several U.S. and Canadian federal agencies with major roles in primary project elements (i.e., U.S. Geological Survey; National Oceanic and Atmospheric Administration; U.S. Army Corps of Engineers; Environment Canada); and a Great Lakes Commission staff member. All will have a working familiarity with, and responsibility for, all aspects of water use monitoring, data analysis, management and policy in their jurisdiction. The eighteen member body, to be chaired by a state representative elected from among the ten states and provinces, will meet no less than quarterly to provide leadership and direction, guide project element implementation, advise the Project Secretariat and, generally, ensure that project commitments are met fully and in a timely manner. Project Management Team members will also be involved in ongoing regional discussions concerning water resources management policy and ensure that project activities and products are consistent with/contribute to these discussions.

**A Project Advisory Committee**, comprised of a larger group of primarily technical experts, will provide information and advice on various project elements and be a primary point of contact for data and information sources. This Project Advisory Committee will provide technical advice and guidance to the Project Management Team, with a primary focus on the substantive project elements. The committee membership will include representatives from the array of agencies, organizations and user groups responsible for the acquisition, analysis, dissemination and/or application of water resources-related data and information. All agencies represented on the Project Management Team will assign a representative

A critically important component of Project Element One activities will be a scoping exercise to define the breadth and detail of all project tasks. Among others, the physical boundaries of the investigation need to be specified, (i.e., if/how St. Lawrence River/basin is to be accommodated) the nature of the focus on surface and groundwater resources needs to be established, and the availability and consistency of data and information needs to be assessed. These and other matters will allow the Great Lakes Commission and its state, provincial and federal collaborators to bring further specificity to project tasks, activities and timelines.

### **Project Element Two: Status Assessment of Water Resources**

The Project Management Team, with staff support from the Project Secretariat, will assemble, characterize, interpret and display relevant available data and information concerning the distribution, abundance, interaction and potential threats associated with the Great Lakes basin's ground and surface water resources. This multi-agency collaboration will yield both quantitative and qualitative water resources data and information within the Great Lakes System.

The status assessment will be conducted using a water balance framework. This approach involves assembling data and information associated with both ground and surface water resources based on hydrologic variables such as precipitation, runoff, evaporation, groundwater levels and connecting channel flows. The assessment will also include the various hydrologic and decision models (including forecasting, simulation and water management models) that use the data to support management decisions at the local, state, provincial, regional and federal levels. This assessment will help build the foundation for a decision support system that is applicable to a broad range of areas ranging from small sub-basins (e.g., a single tributary) to the entire Great Lakes system.

A critical part of characterizing and interpreting available data will be to quantitatively and qualitatively identify errors associated with measures or estimates of the various components of the Great Lakes water balance. Errors will indicate data and information gaps that need to be filled to provide water balances that are sufficiently accurate to meet the needs of the states and provinces. For instance, streamflow to the Great Lakes is only gaged in a subset of all streams. Streamflow has an error of about 5 percent in gaged streams and a larger, undetermined error in ungaged streams. Also, evaporation from the lake surfaces is not measured directly, but rather computed from a thermodynamic model. The error associated with estimates of evaporation needs to be determined.

Also, a key component of this project task will be the development of a "one stop-shopping" Internet site for all of the basin's relevant water resources data in the context of the lakes' water budgets. This final product will be an invaluable communication tool in conveying this information to the varied constituencies interested in the project.

Several tasks are associated with this project element:

#### **a) Assemble available data and information**

Each member of the Project Management Team will be responsible for assembling existing data that its agency collects and houses. Examples of available data and information include the following:

- ▶ Climatology, meteorology, modeling and associated tools, water levels and lake basin data. These data are important because accurate historical hydrological data are required for simulation, forecasting and water resource studies on the Laurentian Great Lakes and their basins. Revised daily and monthly data for over-land and over-lake precipitation and air temperature, basin runoff, lake evaporation, net basin supplies, connecting channel flows, diversion flows,

Characterizing and interpreting the data and information with respect to quantifying the Great Lakes water balance is more problematic and will be a substantial part of the Project Management Team's effort for Project Element 2. This effort requires identifying and quantifying errors associated with terms in the water balance equation, including lake outflows, tributary inflows, precipitation on the lake surface, evaporation from the lake surface, and direct groundwater discharge to the lake. Methods are available for formally quantifying the errors associated with some of these terms. For instance, errors associated with tributary inflows and lake outflows can be estimated. On the other hand, errors associated with estimated groundwater discharge cannot be quantified. One can only determine that the maximum amount of groundwater discharge must be equal to or less than the amount available from errors in the estimates of all the other water-balance terms.

Final interpretation of data and information for a status assessment will include a description of the quantity and quality of all data and information relevant to the Great Lakes water balance. Particular attention will be paid to data gaps and their influence on errors in water-balance estimates so that states, provinces and their partners can use study results in the context of water management decisions.

### **c) Develop communications tools**

Using the Great Lakes Information Network (GLIN), the Great Lakes GIS Online project, and the Online Hydro-meteorological Station Directory, the Great Lakes Commission will take the lead on developing and expanding communication tools for the project. The centerpiece of this effort will be the development of a Great Lakes Water Use web site that consolidates and greatly expands existing online information. For example:

- ▶ The status assessment of water resources will be displayed via clickable maps, a GIS map/data interface and web-based pointers to allow users to access available data.
- ▶ Results of the water use inventory will be displayed in tabular, chart, graph and narrative format. Data and data sources will be able to be retrieved via clickable maps on the basis of jurisdiction, lake basin, and/or use category. The narrative portion of the inventory will characterize and assess all data sources.
- ▶ The GLIN hydrology pages, unveiled in September 1997, provide one-stop-shopping for current Great Lakes water level and flow information. Highlights of the site include forecasted and historical levels; interactive maps with real-time water levels data from the gauging stations; datums; and news from the agencies and organizations that collect the data and manage lake levels. The GLIN hydrology pages were created under guidance from the binational Coordinating Committee.
- ▶ The Great Lakes GIS Online project extends the regional GLIN by providing Internet-based access to a variety of spatial data covering the Great Lakes basin. The project features a library of completed maps for specific subjects, such as Great Lakes geographic data sets and online mapping tools for analyzing and depicting aspects of the Great Lakes region. The Great Lakes GIS Online project will provide a solid foundation for interagency spatial data sharing and collaboration across the binational region.
- ▶ The Online Hydro-meteorological Station Directory will use web technology and GIS-based mapping tools to depict current and historical river and weather gauging stations in the Great Lakes region. Station locations will be depicted on a regional map which can be viewed over the

the data base for ease of reference. It will also help state and provincial officials identify fundamental data/information gaps and needs that must to be addressed irrespective of the type of decision support system ultimately selected.

Project activities will include an evaluation/prospective redesign of the existing data base to enhance value as a decision support tool, software upgrading, and improving access and use by decision makers and other stakeholders. The inventory will be made available in electronic and hard copy, with the former accessible on the Internet (GLIN). It will be incorporated into the Great Lakes Water Use web site discussed in Project Element Two.

The Great Lakes Regional Water Use Data Base provides a common base of data and information on water use in the Great Lakes basin as called for in the Great Lakes Charter of 1985. Housed at Great Lakes Commission offices, the database uses a modified Microsoft Access® software package using Visual Basic for applications. Routine database operations are performed by a customized program prepared in 1987 by Acres International, Ltd. and revised in 1999/2000 by Eastern Michigan University's Center for Environmental Information, Technology and Application. This program includes standard data entry, retrieval and report generation options.

The concept of a regional water use data system to collect and maintain consistent and uniform data on withdrawals, diversions and consumptive uses of water has long been of interest to Great Lakes researchers and program managers. Prior to the establishment of the Great Lakes Regional Water Use Data Base in 1988, the Great Lakes states and provinces had for many years maintained a variety of independent water use data collection, storage and retrieval systems.

In their ongoing efforts relating to the requirements of a Regional Water Use Data Base, the states and provinces have benefitted from several projects and studies undertaken to document individual state and provincial programs, and provide guidance on how to establish a consistent approach to managing the water resources of the Great Lakes basin. For example:

- ▶ The Great Lakes Commission formed a Water Data Collection Task Force in early 1985 to evaluate regional data collection efforts. Through a survey, the Task Force determined the extent of withdrawal, return flow and water consumption data in the Great Lakes states and provinces, along with the assessment, comparability and compatibility of the data. The results are published in an October 1985 report titled *Survey and Preliminary Evaluation of the Existing Water Use Data Collection Systems in the Great Lakes State and Provinces*. This report was authored by the Great Lakes Commission.
- ▶ The USGS, in an extensive 1985-86 study undertaken with input from the Council of Great Lakes Governors' Water Resources Management Committee, examined and compared Great Lakes state and provincial data for nine water use categories. The December 1986 report titled *Water Use Data Collection Programs and Regional Data Base in the Great Lakes-St. Lawrence River Basin States and Provinces* (U.S. Geological Survey Open File Report 86-546, December 1986) influenced the design of the Regional Water Use Data Base.
- ▶ The International Joint Commission (IJC) (through Phase I and Phase II of the Reference on Great Lakes water levels and the recently completed report of the Reference on water export, use and diversion), the USACE, the NOAA Water Levels Section, and EC have all conducted studies and/or collected data pertinent to and supportive of the proposed work.
- ▶ In February 1999, the Great Lakes Commission convened a two day workshop with the technical work group of the Water Resources Management Committee to test a model version of the updated



data provided for each record: level of accuracy and level of aggregation. The accuracy level indicates whether the withdrawals are 100 percent measured; more than 50 percent measured; or estimated. The level of aggregation indicates whether the withdrawal data originate from site-specific sources or from higher level aggregate sources such as county or census databases.

Augmenting the withdrawal, consumptive use and diversion data will be new database components that incorporate outcomes associated with Project Element Two (Status Assessment of Water Resources) and Four (Inventory of Information on Ecological Impacts). Further, this project activity will include the redesign of the existing database report to ensure ease of reference and flexibility of use as a primary reference for a decision support system.

The proposed inventory will be a much-expanded version of the annual reports produced by the Great Lakes Commission as the repository for the Regional Water Use Data Base. It will be available in hard copy form and electronically via (GLIN). In addition to providing all of the information detailed above, the inventory will include a description of the status of state/provincial data collection and reporting programs, as well as a needs assessment detailing emerging issues and areas that the state and provincial water resources managers view as priorities. This needs assessment will draw on an earlier assessment conducted by the Great Lakes Commission and will include issues such as possible additional upgrades to the database; improving access and use of the data by decision makers and stakeholders; using the data for trend analysis; and, using the data to support proactive water resources management at the state/provincial and regional levels (e.g., water conservation, demand management, water use forecasting).

Tasks associated with this project element will proceed in the following sequence: needs assessment; data base redesign; software upgrading; enhancements (e.g., status assessment, ecological impacts information); data base population; refinement and testing; state/provincial approval; and recommendations and process for institutionalizing inventory/reporting activity. These tasks will be initiated in the first project quarter and completed in the seventh, with interim products in the intervening quarters.

#### **Project Element Four: Inventory of Information on Ecological Impacts**

In conjunction with the Project Management Team and Advisory Committee, the Project Secretariat will prepare a descriptive inventory of the scientific literature addressing the ecological impacts of current and prospective water use. The review will be followed by analysis and discussion, with a focus on how results might be reflected in inventory components and accommodated (quantitatively or qualitatively) in any type of decision support system the states and provinces ultimately adopt.

The Great Lakes Commission views this as a critically important component of the project. Significant uncertainties exist with regard to cumulative ecological impact, yet documentation of such impacts must be an integral component of any decision support system.

The Great Lakes hydrological system is dynamic and highly complex. Levels and flows within the system are constantly fluctuating as they adapt to both natural and human-induced factors. Given both the fragility and intensive use of the system, even modest fluctuations (short and long-term) can have pronounced social, cultural, economic and environmental impacts. These impacts can be either positive or negative, depending on the nature and direction of the fluctuation, location within the system and the affected user groups.

While natural factors (e.g., climate conditions and events) are primarily responsible for historic fluctuations in levels and flows, human interventions (e.g., withdrawals, consumptive use, diversion, dredging, shoreline alteration) also significantly impact ecological, social, cultural and economic characteristics of the system and its associated uses and user groups. These interventions are inherently

Abstracts, BIOSIS, NTIS) will be complemented by reports and materials acquired from relevant sources including the IJC, which has contributed substantially to the impact assessment literature through water use references. A subset of relevant citations will be abstracted and categorized. The resultant report will present recommendations as to how the search outcomes might be incorporated into the water use inventory and associated decision support system.

- b) **Inventory of Existing Models**: Complementing the literature search will be a descriptive inventory of models that may contribute to a better understanding of ecological impacts. This will include hydrologic (watershed); hydraulic (hydrodynamic); sediment transport; contaminant transport and other impact assessment models which reside in various agencies including USACE (Waterways Experiment Station, Institute of Water Research); NOAA; USGS; U.S. Department of Agriculture; U.S. Environmental Protection Agency; and EC. The descriptive inventory will build upon model characterization/assessment activities of the Great Lakes Commission over the past two years. The outcome will be an evaluation of model applicability to ecological impact, and will address such matters as model sensitivity, precision, data requirements and spatial capabilities. This outcome will allow the policy/management community to determine model applicability to a decision support system.
- c) **Experts Workshop**: Following the completion of draft reports for the two tasks, the Project Secretariat will convene an "experts workshop" bringing together U.S. and Canadian researchers/scientists with policy/management officials from the states, provinces and relevant federal agencies. The objective is to determine how scientific understanding and modeling capabilities can be practically and pragmatically incorporated into water use inventory and decision support system development.
- d) **Synthesis Report Incorporating Ecological Impacts Into Inventory Efforts and Decision making Procedures**: This project element includes a synthesis report that addresses literature search, model assessment and expert workshop outcomes and relates such outcomes to policy and management needs. Once endorsed by the states and provinces through the Project Management and Advisory Committees, synthesis report recommendations will be incorporated into inventory and larger decision support system development processes.

The four tasks will be initiated in the first quarter and completed by the sixth. The experts workshop will be convened in the fifth quarter, and the synthesis report will be prepared in the sixth quarter. All will have interim products available to the states and provinces and other collaborators prior to formal completion.

#### **Project Element Five: Project Synthesis and Next Steps**

The Great Lakes Commission and its collaborators recognize that the proposed work is an essential **first** step leading to a fully operational water resources management decision support system for the Great Lakes. As such, work products associated with the four preceding project elements must be synthesized and presented in a manner that will ensure immediate use and benefit to the Great Lakes states and provinces and other relevant agencies. Toward that end, several tasks will be pursued in project quarters 6-8. Each is summarized below:

- a) **Preliminary Findings/Recommendations**: The Project Secretariat will prepare (for Project Management and Advisory Team approval) a comprehensive series of findings and recommendations associated with each of the project elements and their products. These statements will 1) identify remaining gaps and unmet needs associated with the status assessment, water withdrawal/use and ecological impacts inventories; 2) propose a strategy and timeline for addressing

the Great Lakes-St. Lawrence region regularly access GLIN and rely upon it for data and information. Complementing the site will be regular announcements of project activity and interim products on the Great Lakes Commission web site, and on "GLIN Announce," a list serve for more than 400 policymakers and opinion leaders in the Great Lake-St. Lawrence region.

- 2) **Conventional "Hard Copy" Dissemination:** This dissemination effort will take place at two levels. First, the Great Lakes Commission's *ADVISOR* newsletter will be used as a means to disseminate project update information/announcements to more than 3,500 policymakers, managers, researchers and other interested parties. Over the course of the project, two special inserts will be prepared to publicize the effort and its interim/final products. Second, hard copy versions of various products (status assessment, inventories) will be published and publicized and made available to all interested parties.
- 3) **Media Relations:** The Great Lakes Commission maintains a detailed database of all media outlets in the Great Lakes region and is capable of targeting sectors of that larger community for information of special interest. Subject to the review and approval of the Project Management Team, press releases/media advisories will be periodically released and, if warranted, a press teleconference or "in-person" event will be organized to showcase project outcomes. Any such activity, however, will be preceded by consultation with the Great Lakes Protection Fund.
- 4) **Meetings and Conferences:** The Semiannual and Annual Meetings of the Great Lakes Commission will be used to report on progress, receive feedback and release interim and final reports. This will be a convenient and cost effective dissemination vehicle given that the great majority of Project Management Team and Advisory Committee members are regular attendees at such meetings. The Project Secretariat will also solicit/accept opportunities to present interim and final products at other conferences where Great Lakes interests are represented. Among many others, this may include the annual International Association for Great Lakes Research Conference, annual meetings of the Council of Great Lakes Governors, periodic meetings of various non-governmental environmental groups, association meetings, and technical sessions where project staff and participants can benefit from interaction with interested parties.

Recognizing that the states and provinces are primary clients for the project, the Great Lakes Commission and its collaborators welcome any and all opportunities to brief them, individually or collectively, at any time.

### 3. BUDGET AND GRANTS AND CONTRACTS

The total project budget for this two-year grant is \$876,476 with \$745,000 being provided by the Great Lakes Protection Fund and \$131,476 being provided as in-kind match by the Great Lakes Commission. Out of this budget, a sum of \$175,000 has been allocated over the two-year period for prospective use by state and provincial collaborators. These funds will be available only on a dollar-for-dollar match basis, and contingent upon a jurisdiction's ability to demonstrate that 1) they are needed to ensure full participation in project elements and 2) they will help build and sustain jurisdictional water use reporting capacity over the long term. Baseline data assembly/reporting requirements associated with the Great Lakes Charter and any extant state/provincial laws will not be eligible for this support. The Project Management Team will establish a protocol for application and disbursement, which the Project Secretariat will manage. Any unused funds will be available for other project activities as determined by the project secretariat.

Modest additional funding has been allocated toward consultant costs in support of Project Elements 2-4. While most project activities will be accomplished by project staff and collaborators, it is anticipated

coordinating and fostering a regional approach to Great Lakes management. Recently, the provinces of Ontario and Québec joined the Commission as Associate Members. The organization's goal, as specified in the Great Lakes Basin Compact of 1955 (P.L. 90-419) is "to promote the orderly, integrated, and comprehensive development, use and conservation of the water resources of the Great Lakes Basin." This goal is pursued through information clearinghouse, policy coordination and regional promotion efforts. The organization is governed by delegations from each Great Lakes state and newly appointed delegations from Ontario and Québec. Membership consists of governors'/premiers' appointees, state/provincial legislators and state/provincial agency officials.

The Commission's legal standing as an interstate compact agency provides it with tax exempt and non-profit status, making it an eligible recipient of grants, contracts and donations from any public or private sector source. The Commission is in sound financial condition, enjoying continued growth in revenues and staffing resources over the past decade. This positive condition, documented in the attached audit statements, will ensure that the Great Lakes Commission is in a position to bring its own resources to the project to augment Great Lakes Protection Fund support. Further, the Commission's strong connections and positive relationship with the larger Great Lakes community will ensure that maximum support from other entities is realized.

The Great Lakes Commission is unique in that it has a legislative mandate (via state and U.S. federal law) to serve its members on an array of resource management, environmental protection, transportation and sustainable economic development issues. Over its 45 year history, the Commission has developed and maintained an extensive network involving state, provincial, regional and federal agencies; governors' and premiers' offices; regional research and policy institutes; universities; and environmental, conservation, citizen and industry interest groups. Over this time, the Commission has pioneered regional coordination efforts, demonstrated economic and environmental effectiveness and benefits for its members and has successfully promoted the region's varied interests.

The Commission's interest in water resources management issues is explicitly stated in the Great Lakes Basin Compact. Among others, Article VI (B) mandates the Commission to "recommend methods for the orderly, efficient and balanced development use and conservation of the water resources of the Basin ...." and Article VI (G) calls for the Commission to "recommend uniform or other laws, ordinances or regulations relating to the development, use and conservation of the Basin's water resources...." More specifically, the Compact in Article VII, commits Great Lakes Commission signatories to consider Commission recommendations on "stabilization of lake levels" (Article A) and "diversion of waters from and into the Basin" (Article H) among others.

Recent years have demonstrated the organization's commitment to these mandates. The Commission was significantly involved in the myriad activities leading up to the signing of the Great Lakes Charter in 1985; participated on and provided secretariat support to the Water Resources Management Committee (1986 to present); and houses the Regional Water Use Data Base. The Commission has also had extensive involvement in the last two IJC water resources references; the Levels Reference Study for the Great Lakes-St. Lawrence River Basin (1990-1993) and the recent reference on water use, diversion and removal of Great Lakes water (1999-2000) which culminated in a final report to the Governments of the United States and Canada titled *Protection of the Waters of the Great Lakes*. Dr. Michael J. Donahue, Commission executive director, served as a member of the Study Team, and Commission staff authored/contributed to numerous sections of the final report.

Over its history, the Great Lakes Commission has pioneered the concept of the inseparability of environmental protection and economic development goals in the Great Lakes region. This notion is reflected in Great Lakes Basin Compact language and all program and project activity undertaken by the Commission.

**U.S. Geological Survey (USGS).** The USGS is an agency within the U.S. Department of the Interior with a mission to provide reliable scientific information to: describe and understand the earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect quality of life. It is the nation's largest earth-science agency and has the principal responsibility within the U.S. federal government for providing hydrologic information and for appraising the Nation's water resources. The USGS manages water information at offices located throughout the United States. Although all offices are tied together through a nationwide computer network, each collects data and conducts studies in a particular area. The key USGS staff person representing the water resources division will be **Jim Nicholas**, District Chief for the Water Resources Division in Michigan. Mr. Nicholas has a wealth of experience in hydrology and hydraulics studies and is also the Michigan state representative for USGS representing the water, biology, geology and mapping divisions. Mr. Nicholas' in-kind contribution to this project will be approximately 250 hours (.06 FTE). Representing the Biological Resources Division will be **Dr. John Gannon**. Dr. Gannon is a renowned limnologist and fisheries biologist with extensive Great Lakes experience. Dr. Gannon's in-kind contribution to this effort will be approximately 125 hours (.03 FTE). Further, USGS has committed 8.0 FTEs (\$400,000) as an in-kind contribution to the project.

**National Oceanic and Atmospheric Administration (NOAA)/Great Lakes Environmental Research Laboratory (GLERL).** GLERL, located in Ann Arbor, Mich., is a U.S. Department of Commerce (DOC) facility operated by the NOAA. GLERL conducts integrated, interdisciplinary environmental research in support of resource management and environmental services in coastal and estuarine waters, with a special emphasis on the Great Lakes. The laboratory performs field, analytical, and laboratory investigations to improve understanding and prediction of coastal and estuarine processes, and the interdependencies with the atmosphere and sediments. It places special emphasis on a systems approach to problem-oriented research to develop environmental service tools. Assistance is also provided to resource managers and others who wish to apply the information, tools and services developed. The key GLERL staff person supporting this project will be **Dr. Frank Quinn**, renowned international expert on hydrology and hydraulics of large lakes and river basins, Great Lakes levels and flows, hydrologic modeling, water balance studies, and climate change studies. GLERL's in-kind contribution to this effort, (e.g., involvement from Dr. Quinn and other staff) will be approximately 400 hours over the life of the project (.10 FTE)

**U.S. Army Corps of Engineers (USACE) - Detroit District.** The main mission of the USACE-Detroit District is to investigate, plan, design, construct, operate and maintain Congressionally authorized water resource projects related to navigation, flood control, beach erosion and other activities. The District operates and maintains the world famous Soo Locks plus 102 harbors on Lakes Superior, Michigan, Huron, St. Clair and the state of Michigan portion of Lake Erie. The Detroit District manages the Great Lakes Water Control Data System, making it the Corps center for hydrometeorologic and water level data collection and dissemination for the Great Lakes system (water level forecast). The key staff person for USACE will be **Roger Gauthier**, supervisory hydrologist for the Great Lakes Hydraulics and Hydrology Branch. Mr. Gauthier's in-kind contribution to the effort will be roughly 250 hours over the life of the project (.06 FTE).

**Environment Canada - Canada Centre for Inland Waters (CCIW).** The CCIW is one of the world's leading centres for water research, generating environmental information and knowledge about the Great Lakes. The organizations within the CCIW are concerned with environmental research and development, as well as monitoring, resource management, charting, and coastal and harbour engineering. The key staff person for CCIW on this project will be **Doug Cuthbert**, Chief of the Conservation and Management Branch. Mr. Cuthbert is a renowned member of the Great Lakes scientific research community having extensive knowledge and background in areas related to levels and flows, climate change studies, hydrology and hydraulics. Mr. Cuthbert's in-kind contribution to this project will be approximately 200 hours (.05 FTE).