INTERNATIONAL Upper Great Lakes STUDY

Eighth Semi-annual Progress Report of the International Upper Great Lakes Study to the International Joint Commission

covering activities from April 1 through September 30, 2010

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INTERNATIONAL UPPER GREAT LAKES STUDY BOARD

Commissioners:

The International Upper Great Lakes Study Board submits herein its eighth Semi-annual Progress Report, covering activities from April 1 through September 30, 2010.

1. SUMMARY

During this period, the emphasis has been on completing contextual narratives and defining performance indicators and coping zones for each of the technical work groups leading to incorporation into the Shared Vision Model framework for plan formulation and evaluation. Coping zones were agreed upon as the approach to address uncertainty around future hydroclimatic conditions. The tiered approach toward plan development has evolved into one that does not consider specific tiers to address coping zones, but one plan to address various conditions.

The following are highlights, with more details provided under Section 2:

- Field work proceeded through the period to aid in the definition of coping zones.
- Contextual narratives for each the TWG interests have been developed and a synthesis document is being developed for Study Board use.
- Refinements to the Independent Peer Review process continue to be discussed through teleconferences with the ASCE and CWRA liaison.
- Messrs. Joel Schlagel and Andre Plante were chosen as the U.S. and Canadian Co-Leads, respectively of the Information Management TWG.
- Mr. Christopher Baines was appointed to PIAG, filling the vacancy created when the term of Ms. Mary Muter expired. In addition, the Commission reappointed Canadian PIAG members Messrs. James Anderson and Richard Hibma and U.S. members Mr. Roger Smythe and Dr. Alan Steinman to serve through March 2012.
- Mr. Jeff Kart has been hired to assist with Study communication activities. The assistance will be provided to Mr. John Nevin, the new Public Information Officer of the IJC, Great Lakes Office in Windsor, who will continue to provide advice to the Study.
- The IUGLS website has been remodelled and efforts are being made to engage the broader public through Facebook and Twitter.

2. STUDY TEAM AND BOARD ACTIVITIES

2.1 LAKE SUPERIOR REGULATION TASK TEAM

During the reporting period, the emphasis of the Study has shifted from evaluation of factors resulting in the decline of the head difference between Lake Michigan-Huron and Lake Erie due to a variety of natural factors, to activities that will facilitate the formulation of alternative regulation plans for Lake Superior. All technical work groups have made significant progress in developing performance indicators that will play a key role in plan formulation and evaluation in the Shared Vision Model framework. Work also proceeded in the development of coping zones through which the impact of various water levels on interests will be assessed. The Adaptive Management TWG will use these coping zones and a wide range of GCM and climate scenarios, along with paleo-climate information being supplied through the Hydroclimate TWG to assess plausible risks to future water management within the Great Lakes system.

The Plan Formulation and Evaluation TWG has conducted exercises that will prepare the Study Board for the decisions that they will have to make in choosing an alternative, which best addresses principles and guidelines that they have developed to guide their evaluation. Progress on technical work group contextual narratives will also aid in this process.

Recognizing the limitations of regulation and understanding that there are risks that cannot be addressed through lake regulation alone, the AM TWG is also examining two other strategies at an exploratory level, including multi-lake regulation and basin-wide non-regulation actions.

All of the Study's work is proceeding within the guidance provided in the Commission's August 17, 2010 letter (Attachment 1).

The period also saw the establishment of an Information Management TWG to assure data and information consistency and to address archiving and stewardship once the Study is complete.

2.1.1 Performance Indicator TWGs

Coastal Processes TWG

Over the past six months, the Coastal Zone TWG has been working with its contractors to evaluate the sensitivity of flooding, low water, erosion, and shore protection impacts expected from alternative Lake Superior regulation plans. For flooding, Baird and Associates, as subcontractor to Camp Dresser & McKee Inc. (CDM), undertook a joint probability analysis at selected study sites using water levels from an initial set of regulation plans (including fencepost plans), together with historical storm surge information. Their results indicated that with the exception of the most extreme fencepost plans, the combined probability levels of high water levels combined with storm surges were not that different between preliminary plans. The work by Baird and Associates also

demonstrated the seasonal variability in storm surge conditions at all the study sites with the winter/spring and fall seasons having the most significant surge events.

CDM reviewed potential low water impacts on property values for shoreline real estate. CDM contacted real estate professionals for a set of study sites on the upper Great Lakes to further understand how market values respond to fluctuating water levels. Their preliminary findings suggest that sensitivity to low water conditions varies based on local site characteristics, and are markedly influenced by general economic conditions, more so than water levels. Shoreline areas with significant erosion concerns tended to view low water conditions more favourably, while shallow embayments or areas with considerable vegetation growth issues along the shoreline were more sensitive to potential low water impacts. The information gathered from real estate professionals was consistent with results from a concurrent literature review.

Work on both the erosion and shore protection components of the analysis are ongoing. Past shoreline classification databases were summarized to identify the extent of key shoreline types for each lake. Sensitivity modelling is being undertaken for both stable beach and cohesive sediment shorelines. The preliminary analysis of the results has not yet been completed. Similarly, the shore protection analysis has used existing shoreline classification information to identify the general extent of shoreline protection within the upper Great Lakes study area. The information will be utilized in conjunction with a model that is currently being developed by the contractor to assess the relative sensitivity of shoreline protection structures to water levels as seen in the preliminary regulation plans.

In addition to the detailed modelling work, there is an ongoing effort to complete the site characterization reports as well as to support the development of coping zones for the Adaptive Management component of the study. This includes gathering information on shoreline management approaches by state and provincial agencies.

Commercial Navigation TWG

The primary performance indicator for commercial navigation will be transportation costs, and the model for determining the impacts on transportation costs associated with alternative regulation plans has been developed. Initial runs were made that reflect U.S. vessel movements and those results were successfully integrated into the Shared Vision Model being developed by the Plan Evaluation and Formulation TWG. It is anticipated that the Shared Vision Model will be able to be used to provide a series of sensitivity analyses focusing on critical factors (shipping levels, vessel types, etc.).

An initial report was completed by contract (in coordination with the Hydropower and Environmental TWGs) that presents a broad conceptual plan for modelling current and modified peaking and ponding practices on the St. Marys River as they affect commercial navigation in that section of the river. The model will focus on ship movements, hydropower production and peaking and ponding policies based on a review of information provided by the TWGs, such as current costs and revenues to hydropower

and commercial shippers, data on monthly flows and levels at relevant gauges, navigation cost models, vessel transit logs (reasons for delay and lengths of delay), suspensions to ponding operations, electricity generation foregone and replacement costs associated with current peaking and ponding guidance. The Study Board will review the proposed model and assess the potential for obtaining meaningful additional data from the model prior to proceeding with further efforts.

A draft contextual narrative, including a summary of key points, was completed and has been updated to reflect comments received as a result of an overarching review of all of the contextual narratives developed for the study. Minor updates will continue to be made to address issues and concerns as alternative regulation plans are evaluated and additional study efforts progress, including those focusing on the impacts of hydropower peaking and ponding within the St. Marys River and development of adaptive management strategies.

Preliminary delineation of coping zones for commercial navigation have been developed for use in the adaptive management component of the overall study, including a qualitative assessment of how various factors (duration, frequency, seasonality, rate of change, etc.) could influence the ability to cope with future climate change. While initial lake levels have been established for the different zones based on input from commercial navigation interests, additional refinement will likely be made as additional input and data are obtained.

Ecosystems TWG

The TWG continues to implement an innovative approach that is focused on assessing ecosystem vulnerabilities in response to potential changes in Upper Great Lakes water level regimes. The objective of this approach is to identify water-level ranges and thresholds that support diverse biotic communities and ecosystem functions in the Upper Great Lakes. Individual field sites were selected on a set of criteria that include: geographic and eco-regional representation across a broad range of ecosystem types and components; sensitivity and responsiveness to changes in water level regime; available historical data and imagery; ongoing research and field activity; and socio-economic interest (Figure 1).

Figure 1. ETWG Site Location Map from IERM2

Note: In IERM2, clicking on the site locations displays more detailed information about the site including PIs, thresholds, PI fact sheets and a link to interact with IERM2I and review modelling results.

Late this spring a series of weekly video-conference calls between TWG site coordinators and the LimnoTech modellers were held to discuss the algorithms and inputs necessary for the final Integrated Ecological Response Model (IERM2). LimnoTech worked with each site coordinator on the development of performance indicators (PIs), water level response curves, and the methodology to identify critical water level regime thresholds that may result in significant changes to biological communities and/or ecosystem functions. These curves link descriptors of biological condition (PIs) with descriptors of water level variability (magnitude, timing, duration, frequency, and rate of change) to quantify PI responses and potential ecological thresholds. IERM2 will be used to evaluate the response of PIs and thresholds at each site for individual water management plans under a range of different net basin supplies.

In support of IERM2 development, additional bathymetric data and vegetative surveys were acquired from five sites to augment existing geospatial datasets and to validate initial IERM2 results. Field work was completed in June and July at multiple sites in the following geographic locations: north shore of Lake Superior (Minnesota), Les Cheneaux Islands (Lake Huron), St. Marys River, Batchawana and Goulais Bays (southeast Lake Superior), and Long Point (Lake Erie).

A modelling workshop was held in Ann Arbor, Michigan on September 7-8, 2010 to review the current status of PI water level response curves, thresholds, and identify any data/analysis gaps that remain. Initial runs of IERM2 (using algorithms generated using data from completed sites) were presented at the workshop and feedback from the site coordinators was provided to the model developers. Additional data/analysis needs were identified at the meeting and will be provided to the modelling contractors.

TWG site coordinators have completed field data collection and all site coordinators have provided initial draft water-level response curves and threshold analyses to LimnoTech. To date, approximately half of the sites being evaluated by the TWG are substantially complete with respect to PI development and analyses. The remaining sites will be completed by October 1st. These sites represent multiple ecosystem components and functions including wetland vegetation, fish community structure and habitat, connectivity to spawning and nursery sites, and use by birds and wildlife. LimnoTech modellers now have most of the inputs necessary to complete coding and initial testing of IERM2 model. It is anticipated that development of the IERM2 model will be completed shortly.

In conjunction with IERM2 model development, each of the site coordinators will be developing a set of PI Fact Sheets that clearly describe (and justify) site-specific PIs and associated hydrologic attributes used to generate the water level response curves. PI Fact Sheets are to be completed shortly.

One discovery pertains to investigations along the north shore of Lake St. Clair and its sensitivity to water level changes. Lowering of water levels 1 m below chart datum will significantly impact the Lake St. Clair fishery by eliminating numerous shallow-water spawning and nursery sites (Figure 2). A 50 cm drop in water levels will eliminate approximately 40% of the shallow-water spawning and nursery sites. Wetland biodiversity and ecological functions will be severely impacted as Phragmites become established on exposed lakebed surfaces and out-compete native aquatic vegetation.

St. Marys River:

U.S. EPA has funded a Great Lakes Restoration Initiative (GLRI) proposal to evaluate how flows could be manipulated at the St. Marys River control works and hydropower facilities to enhance the effectiveness of the Great Lakes Fisheries Commission (GLFC) sea lamprey control program. This work has the potential to substantially improve the Upper Great Lakes fishery and assist the GLFC in meeting their “Fish Community Goals and Objectives” for the Upper Great Lakes. This work would be done in collaboration with the International Lake Superior Board of Control, Ecosystems, Hydropower and Plan Formulation and Evaluation TWGs, and the GLFC (Dr. Chris Goddard). Funds have not yet been made available to the proposal participants, which has delayed the start of the GLFC sea lamprey control project.

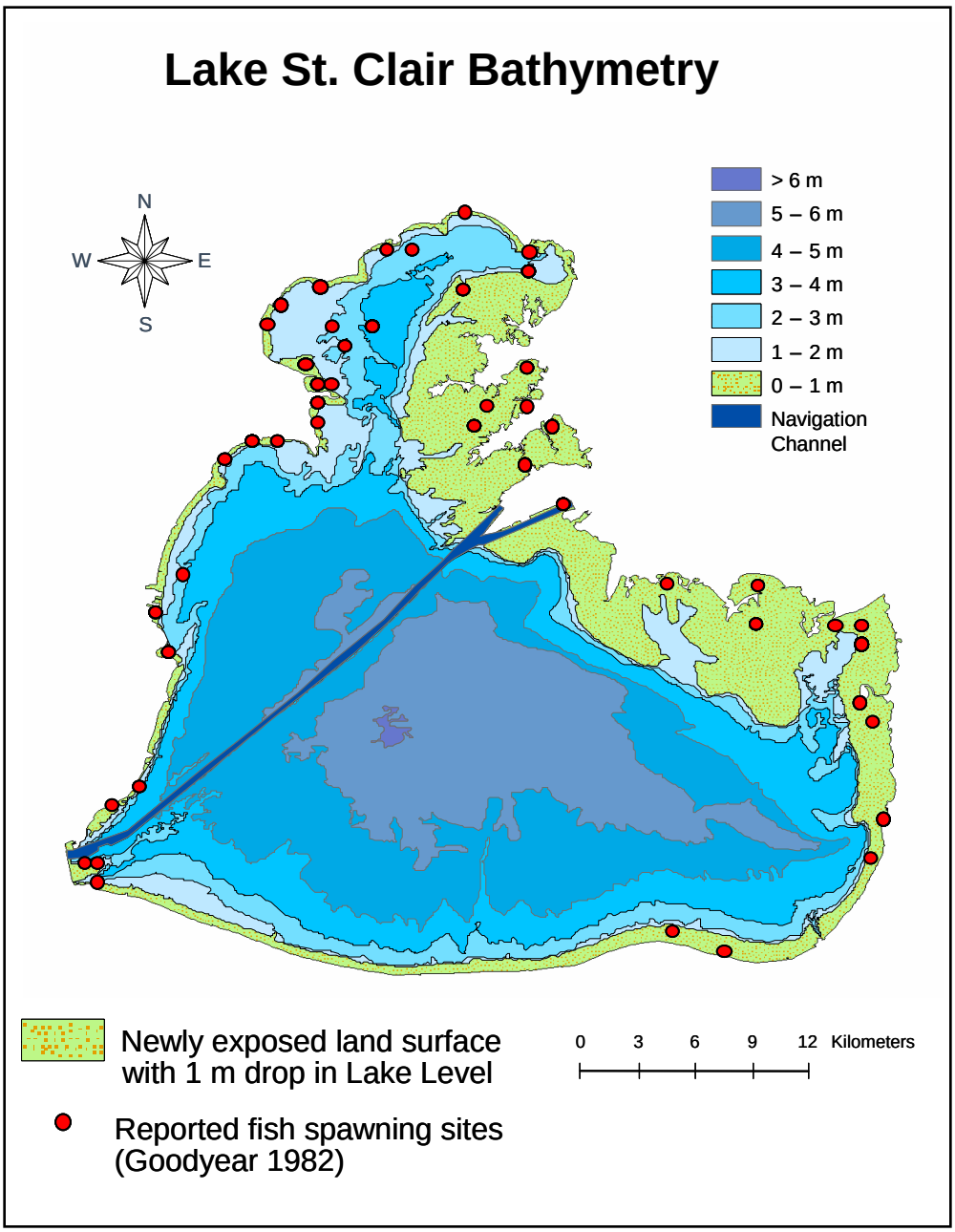


Figure 2. Shallow-water Spawning Areas in Lake St. Clair Exposed as Water Levels Decline

Other:

After October 1, additional validation and application work will be needed to evaluate the performance of IERM2 under different plan and water-level supply scenarios and to integrate IERM2 results with the Shared Vision Model. Site coordinators will have the opportunity to review and evaluate model results to ensure that the PI algorithms and associated thresholds are functioning and interacting properly. The review and evaluation of IERM2 will continue through to the end of the calendar year.

Recreational Boating, Cruise Ship and Tourism TWG

The recreational boating field research has now been completed and all data have been collected, analyzed and evaluated resulting in a detailed report. The information in the report highlights the findings from surveying over 18,000 slips in approximately 110 marinas around the Upper Great Lakes including Lake St. Clair.

Depth data have been extrapolated to develop coping zones that indicate water level ranges that are acceptable and detrimental to the marina industry. These ranges have been presented in chart form for easy interpretation.

Economic information has also been developed that shows the impact that changing water-levels may/will have on the marina industry. A detailed financial report has been prepared and will form part of the overall study report.

An extensive tourism study commissioned by the TWG began in early spring and was completed in mid-August. The final report has been presented to the TWG and will be included in the overall report given to the Study Board. Over 1600 consumer surveys were completed and over 150 suppliers responded either through personal interviews or by an e-mail survey. Four areas around the Great Lakes were surveyed.

The TWG's contextual narrative is now well underway and should be completed by mid-October. A new author had to be recruited late in the process, which meant starting from the beginning. This delayed the TWG in providing the Study Board with a draft final report in late spring as initially intended.

The cruise ship portion of the study is underway and much of the field work has been completed. An abbreviated final report will be available by early October. The contextual narrative will also address some of the key issues for this industry segment.

The performance indicator work is in its final stages and it is anticipated that this work will be finalized by October. Much work has been completed during the past three months.

Work is ongoing to develop coping zones around public and private boat launch sites. This part of the exercise has been ongoing over the summer and should be completed shortly.

The TWG has been working with the Adaptive Management TWG to develop alternatives/adaptations to changing water levels. Good information has been collected from previous survey work that will help identify "best practices" for adaptation when water levels change significantly.

Municipal, Industrial and Domestic Water Uses TWG

Information on potential impacts to operations has been gathered through a survey of 95 municipal and industrial facilities on the Upper Great Lakes. The initial survey response rate was 43% (40 out of 95). Accordingly, an additional follow-up is planned to increase the quantity and quality of data. The final report is expected in October, however, an assessment of the initial responses indicates that facilities are able to adapt within a broad range of lake levels. The study also confirms that there are substantial differences within the selected facilities.

Performance indicators are being developed based on the responses received and supplementary information. Coping zones will be refined after receiving clarification on elevation data for some of the facilities.

Municipal representatives in the Chicago area have provided intake elevations and additional information from "as-built" plans for 10 water treatment facilities. This information will be incorporated into the data base. The consulting firm that designed the plants provided information for 15 facilities to the municipalities; however, information on 5 of the facilities has not yet been shared. There are concerns over security and thus obtaining these data is proving to be challenging.

The contextual narrative has been revised to incorporate information to date and address comments received. This document will continue to be reworked as additional work is completed and the study is finalized. A synopsis has been prepared for the Study Board.

Hydropower TWG

Peaking and Ponding:

On September 6th Mr. Mark Lorie of Resolution Planning provided a revised report on his investigation into new approaches for peaking and ponding on the St. Marys River. This revision was based upon comments that he collected over the past two months.

Coping Zones:

Preliminary spreadsheets that capture plant parameters defining the three coping zones have been developed for the St. Marys River Plants (Cloverland Electric Cooperative, Brookfield Renewable Power Inc. and U. S. Army Corps of Engineers plant), Niagara River plants (Adam Beck 1 and 2, DeCew Generating Stations (GS) and Robert Moses GS), International Reach of the St. Lawrence plants (Moses-Saunders power dam), and Canadian reach plants (Beauharnois and Cedars GS). Questionnaires were sent to the hydropower operators in July. The information gleaned from the responses to the questionnaire will be used to define the coping zones for each plant. Five responses from operators have been received as of September 5th. Revised spreadsheets are due by October 1st. The final report, including documentation of the methods used and all data and information sources used to define the coping zones, is due on March 1, 2011.

Electricity Price Forecasts for Upper Great Lakes Hydropower Generation:

A request for proposal was issued on August 23rd, and an evaluation team will identify a recommended contractor shortly. Among other things, the short-term and long-term forecasts from this study will be used in the Shared Vision Model to evaluate the effects of alternative regulation plans on the economic value of hydropower production, and perform sensitivity analyses. They may also assist in evaluating the potential effects of climate change on hydropower production. The final report is to be submitted six weeks from the date when the contract is awarded.

Contextual Narrative:

The hydropower contextual narrative has been revised and updated to address comments raised as a result of Mr. Mark Dunning's (CDM) review and comments received at a joint Lake Superior Regulation Task Team/Study Board meeting. The TWG considers it, for all intents and purposes, to be the final version of the narrative, but recognizes that some small adjustments in the future may be warranted based upon the findings of the electricity price forecasts study and the final outcome of work into peaking and ponding. A four-page synopsis of the narrative has also been prepared.

The TWG supported the initial coordination and various request for data associated with the GLRI Sea Lamprey Work in the St. Marys River since the last report, mentioned previously.

2.1.2 Integration Technical Work Groups

Plan Formulation and Evaluation TWG

The focus of PFEG during this period has been in resolving issues on key performance indicators, providing continued decision support for the Study Board, technical support for the formulation and evaluation elements of adaptive management, finalizing the historical 1900-2008 hydrological base case to be used in plan evaluations, continuation of work focusing on the St. Marys River, continuation of support for IERM2, support for the new

Information Management TWG, as well as continuing work with the six TWGs and the Hydroclimate TWG to assure the Board will have the necessary information to select regulation plans.

Decision Support for the Study Board:

For the June 22-24, 2010 meeting, PFEG developed and presented an overview of how multiple net basin supplies would be used in the evaluation of plans, how uncertainties in performance indicators could affect the Board's decision and introduced the peaking and ponding decision at a conceptual level. PFEG developed and ran a so-called "Pre-Skunk" workshop in Burlington, Ontario for the Study Directors and key Study personnel to develop and test ideas on plan evaluation and ranking that would be used by the complete Board starting at their September 2010 meeting. Included in the preparatory work was a draft decision criteria paper and a draft method for determining the robustness of plan performance. PFEG developed and ran a "practice decision" for the Board at its September 21-22, 2010 meeting that began the process of laying out the sequence and interrelationships of all the evaluation factors and decisions that the Board would have to make once the various alternative plans are formulated.

Key Performance Indicators:

Hydropower and Commercial Navigation performance indicators are different from other PIs because they are expressed in dollars, measure impacts to uses explicitly recognized in the Boundary Waters Treaty and vary with both Lake Superior levels and flow releases, which are inversely related to each other. PFEG has had preliminary PIs for both uses for some time. During this reporting period, PFEG did a critical analysis of the uncertainty in each indicator and worked with the those TWGs to improve them. In hydropower, the issues were the volatility of prices, the importance of considering peaking and ponding in the evaluation of monthly release policies and the uncertainty in Niagara power estimates, which, despite very small changes in Lake Erie and Niagara River conditions due to Lake Superior regulation, may change more than Sault power estimates when an alternative Lake Superior regulation plan is simulated. In navigation, the issues were the costs of peaking and ponding for navigation, the validity of using 2005 shipping as the surrogate for future shipping, the simulation of minimum depth in the St. Marys River, and the validity of using monthly average levels versus varying within month levels to estimate shipping costs.

Information Management TWG:

Based on its participation in a June 9-10, 2010 initial meeting for the Information Management TWG in Ottawa, ON, PFEG developed a draft data and modelling map showing the relationships between the Board's decision and Study data, reports and models. The map shows how information from each TWG factors into the decision the Board will make, typically tracking research used to define a performance indicator used in simulations of future Lake Superior releases using different plans under different water supply scenarios, with the Board applying different decision criteria and weights. PFEG

proposes that the map be used as a schematic of the Adaptive Management model (Figure 3).

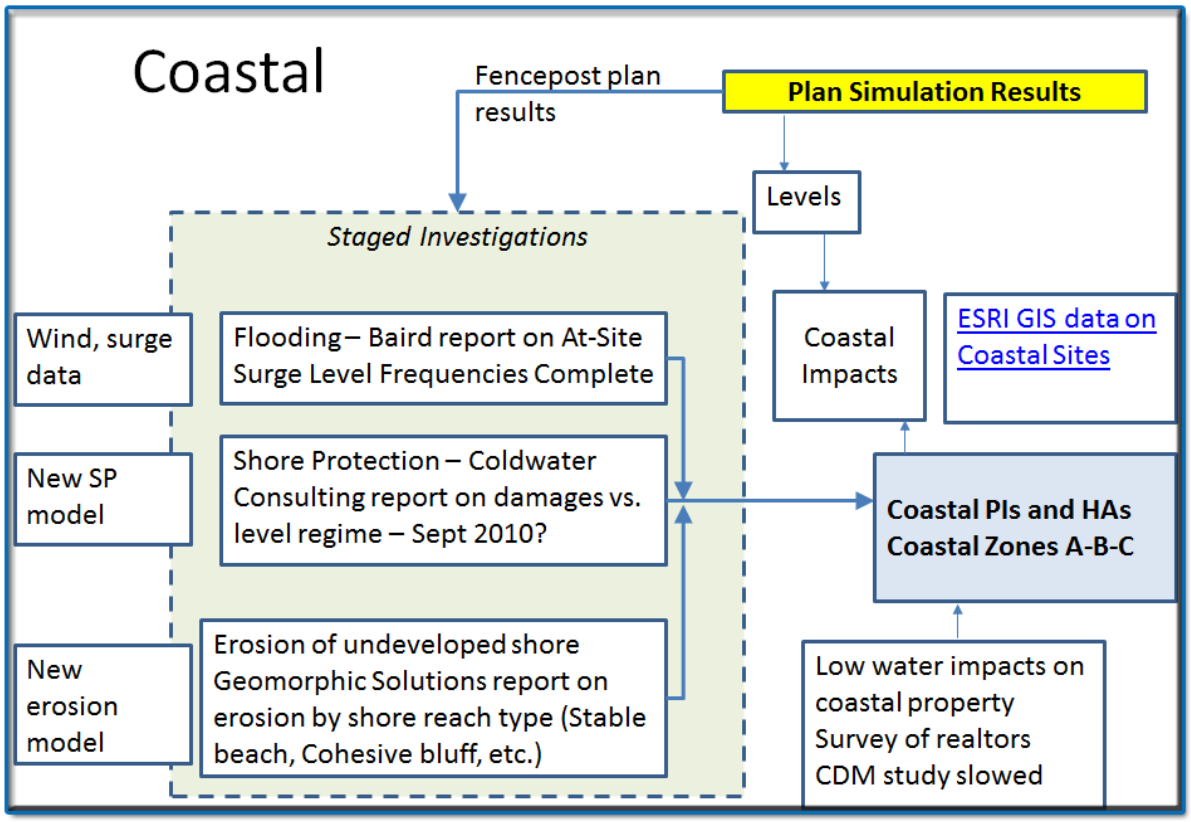


Figure 3. Map Showing the Relationship between the Board's Decision Process and Information Received. Coastal TWG is shown as an example. There are five other similar flow charts for each of the other TWG.

Support for other TWGs:

In addition to the meetings described above, PFEG participated in working meetings August 24-25, 2010 to help finalize recreational boating performance indicators and zones, an IERM2 meeting September 7-8, 2010 in Ann Arbor to help advance the design of the first draft of the model, an Adaptive Management meeting in September 2010 to present a clarified view of plan formulation and evaluation for adaptive management and a September 2010 meeting of the Information Management TWG to develop the IM Map. During the period, the PFEG Co-Leads also participated in teleconferences with the Municipal & Industrial Water Uses, Hydropower, Navigation, and Coastal TWGs to understand, and assist where possible, their development of performance indicators.

Coordination with Hydroclimate TWG:

PFEG also participated in the Hydroclimate TWG meetings in Chicago on April 26-27 to explain its proposal to use multiple net basin supply scenarios in the development and evaluation of plans, and in Quebec City on July 8, 2010 to better understand the climate scenarios and hydrologic methods used by that TWG. PFEG worked with members of the TWG to coordinate the set of historical 1900-2008 residual net basin supplies and the ice/weed retardation data for use in plan evaluations.

Hydroclimate TWG

The Study under the leadership of the Hydroclimate TWG and at the invitation of the Water2010 Conference Planners held a 14-paper day-long session in Quebec City on July 6, 2010. The Study participants provided findings from various hydroclimate and hydraulic modelling projects concerned with the quantification of uncertainty in hydroclimatic components.

The TWG collaborated with Dr. Jim Angel of the Illinois Climate Center, Urbana on climate change scenario modelling of the Upper Great Lakes. The results from computer modelling of 565 different global climate change scenarios were made available based on 23 different emission outlooks. These results are being compared against the regional climate modelling efforts being conducted by Environment Canada and Great Lakes Environmental Research Lab.

The TWG initiated a number of projects in order to: evaluate the robustness of various regulation plans being developed by the PFEG; quantify the sources of hydrological uncertainty; and, explore the plausibility of rare events happening. These projects are producing 100,000 years of stochastic water supplies based on the statistics of hydrological supplies and modelled hydrological components. Two other studies were launched to improve forecasting of water supplies and provide consequent enhancements to Lake Superior regulation; the first study is considering the hydrological indices in quantifying forecast; and, the second study is evaluating the tele-connections at global scales and improvements in the forecasting skills.

The TWG finalized an important study to improve the computational skills in producing surface runoff from ungauged watersheds. Dr. Taha Ouarda and his team at INRS, Quebec City developed methodology and software tools to increase this understanding. A workshop is being developed to transfer the technology among the operational staff at the various Canadian and US agencies.

Adaptive Management TWG

The TWG has continued to implement its work plan. To this end, the AM TWG has established a number of contracts and is working with the other TWGs to implement various components of the AM approach.

The AM TWG is relying on the six performance indicator TWGs for estimating the vulnerabilities of the various interests to changing water levels. First drafts were completed. The AMG will then screen a wide range of GCM and climate scenarios supplied through the Hydroclimate TWG to assess plausible risks. Further to the climate scenarios, Dr. John Hoehn from Michigan State University and Dr. Scudder Mackey from the University of Windsor have produced draft reports on economic and environmental scenarios. Dr. Casey Brown from the University of Massachusetts, Amherst has been contracted to assist in the development of a risk evaluation matrix and decision management framework based on the coping zones and the plausibility of problematic water supply sequences. The AMG is working on the development of an adaptive management plan for a structured, iterative process for adjusting the regulation plan in the future as information and knowledge become available collected through structured monitoring and research (e.g., improvements in the six-month forecasting) and/or as societal values evolve.

Recognizing the limitation of regulation and that there are risks that cannot be addressed through regulation alone, the AMG is also examining two other types of actions at an exploratory level including multi-lake regulation and non-regulation actions. Dr. Bryan Tolson from the University of Waterloo has been contracted to conduct an optimization approach for multi-lake regulation, unconstrained by existing plans but with existing structures in place. As a start, he will use the objective of keeping lakes within their historical range and will provide preliminary results by the end of November at the Study Board meeting in Windsor. Mr. Jacob Bruxer from Environment Canada has produced a review of past studies on further regulation and compensation in the Great Lakes-St. Lawrence River system, and Dr. Tolson will draw upon this in exploring possible structural alternatives. Mr. Douglas Brown has been contracted by the AMG to conduct an institutional/governance analysis related to the implementation of a revised Superior regulation plan or new structures in the system in the future. A first draft white paper will be produced by mid-October. In August, Dr. Michael Donahue of URS Corporation working with Baird and Associates was contracted to conduct an institutional/governance analysis of non-regulation actions. This will include a literature review and assessment of institutional barriers, and inventory of current and prospective adaptive response actions, an experts workshop and the development of a long-term adaptive management process for non-regulation actions.

The AMG is working with their membership to reach out to agencies and organizations with responsibility and authority for non-regulation actions, such as, more restrictive shoreline management practices or a streamlining of permitting procedures of protective structures. On September 14-15, 2010, the AMG met in Windsor and focused on a

strategy for approaching agencies in terms of who to contact, when, how and what the message should be. The AMG co-leads presented the draft strategy to the Study Board on September 21, 2010, which included a proposal to the IJC that a protocol with agencies associated with Great Lakes interests, be established to ensure coordination of activities addressing extreme water levels after Study completion. The Study Board will explore some of these options during the appearance.

Information Management TWG

The Information Management TWG met in Ottawa on June 8-10 and in Windsor on September 15-16. Mr. Joel Schlagel of the US Army Corps of Engineers, Institute for Water Resources and Mr. Andre Plante of Environment Canada, Ste-Foy, Quebec have been selected as the US and Canadian co-leads, respectively. The TWG is in the process of determining what information and data must be captured, safeguarded and available on line and the data management framework – metadata that will ensure easy access and archiving of all Study data, models and products. A policy framework is also being drafted.

2.1.3 Advice

Legal Advice

During the September 22-23 Study Board meeting, Ms. Susan Daniel and Mr. Gavin Murphy provided guidance on legal issues pertaining to the formulation and evaluation of alternation regulation plans for Lake Superior. They agreed to continue in an advisory role to the Study. They also mentioned that Mr. Jim Chandler, former Legal Advisor to the Commission, has also agreed to assist informally in providing legal guidance.

2.2 Independent Peer Review

The Study Board, based on a strategy presented to the Commission at the last appearance, maintained an ongoing dialogue through a series of teleconferences with IJC staff and the co-chairs of the Independent Peer Review Group. To avoid bottlenecks in the review process, the Study Board solicited its teams and received a list of key studies that are critical to the strategy in delivering the objectives of Lake Superior regulation. The following table reflects the recommended list the Study Board has provided to the IJC and the Independent Peer Review group. This series of sub-products will be made available for review.

No.	Sub-Product Review	TWG/Lead	Available
1	Economic analysis of Coastal Processes – Low Water Impacts	Mike Shantz / Scott Thieme	Dec. 01, 2010
2	Hydropower – Pricing	Paul King-Fisher / Steve Rose	Jan. 05, 2011
3	AM – Mitigation Plan (Multi-lake regulation /optimization)	Bryan Tolson	Feb. 01, 2011
4	IERM (Model only)	Joe Depinto	Feb. 01, 2011
5	St. Marys River for ecological restoration project, PI defined	Scudder Mackey	Feb. 01, 2011
6	Recreational Boating Impact Analysis	Glenn Warren / Bill Boik	Feb. 01, 2011
7	Hydroclimate – Stochastic	Laura Fagherazzi / Taha Ouarda	Feb. 01, 2011
8	Hydroclimate – Climate Change (GCM/RCM)	Murray McKay / Brent Lofgren	Mar. 01, 2011

2.3 PUBLIC INTEREST ADVISORY GROUP (PIAG)

Public Interest Advisory Group

During the period, Mr. Christopher Baines was appointed to PIAG, filling the vacancy created when the term of Ms. Mary Muter expired. With extensive experience in mediation and conflict resolution, Mr. Baines brings extensive relevant experience to PIAG, including service as president of the Georgian Bay Association and as director of the Centre for the Great Lakes. In addition, the Commission reappointed Canadian PIAG members Messrs. James Anderson and Richard Hibma and U.S. members Mr. Roger Smythe and Dr. Alan Steinman to serve through March 2012 when the Study concludes.

During the reporting period, PIAG met by teleconference once and in person once. On July 15, 2010, PIAG gathered in Muskegon, Michigan, at the Annis Water Resources Institute (Grand Valley State University). With U.S. Chair Lana Pollack and U.S. Commissioner Irene Brooks in attendance, PIAG was briefed on the progress of the Ecosystems and Hydroclimatic TWGs and learned about the decision framework the Study Board will be following. PIAG also approved a plan to use Facebook and other social media in an effort to broaden their outreach efforts.

PIAG members continued to attend various TWG and Task Team meetings and reported to their colleagues regarding key messages.

Communications and Outreach

During the period, a project to redesign and improve the functionality of the IUGLS website was completed. As a result, the website is now more user-friendly, better organized and set up for regular updates. In addition, a Facebook page under the auspices of PIAG was launched that is gaining new followers each and every day.

In September, Mr. Jeff Kart, former environmental writer for the Bay City Times (Michigan), was hired by the Study to assist PIAG in communications and outreach projects, especially through online platforms, including social networks.

2.4 STUDY MANAGEMENT

2.4.1 Meetings

The various groups associated with the Study have met throughout the last reporting period. Appendix 1 shows the groups, activities, dates and locations of these meetings. Meetings planned for October through December 2010 are shown in Appendix 2.

2.4.2 Budget/ Expenditures

Tables 2 and 3 below show approved, committed and spent amounts in the U.S. and Canada through September 30, 2010 for their respective fiscal years.

Table 2 – U.S. (in $1000US)

Activity	Budget[1]	Spent[2]	Committed[3]	Difference[4]
Study Board and Management	383.2	372.3	383.2	0.0
St. Clair Task Team & Hydroclimate TWG	220.0	90.0	90.0	130.0
Lake Superior Regulation Task Team	342.5	72.5	142.5	200.0
Public Interest Advisory Group & Communications	170.7	23.1	23.1	147.6
Information Management	0.0	0.0	0.0	0.0
Plan Formulation /Evaluation & Adaptive Management TWG	638.5	588.5	588.5	50.0
Peer Review Group	0.0	0.0	0.0	0.0
Grand Total Budget	1754.9	1146.5	1227.4	527.6

Notes:
1. Study Board budget
2. Funds spent to date
3. Funds committed through contracts or MOUs
4. Difference between the budget and committed/spent to date

Table 3 - Canadian Funding (in $1000Cdn)

Activity	Budget[1]	Spent[2]	Committed[3]	Difference[4]
Study Board and Management	441.6	213.7	45.9	182.0
St. Clair Task Team & Hydroclimate TWG	400.0	53.7	319.0	27.3
Lake Superior Regulation Task Team	1104.0	256.4	762.1	85.6
Public Interest Advisory Group & Communications	30.0	5.9	0.0	24.1
Information Management	53.0	8.5	15.3	29.2
Plan Formulation /Evaluation & Adaptive Management TWG	332.0	0.4	326.5	5.1
Peer Review Group	30.0	0.0	30.0	0.0
Grand Total Budget	2390.6	538.5	1498.8	353.3

Notes:
1. Study Board budget
2. Funds spent to date
3. Funds committed through contracts or MOUs
4. Difference between the budget and committed/spent to date

3. IJC ADVICE, CONSULTATION AND INFORMATION

The Study Board requests decisions and/or direction from the Commission on the following topics and issues:

1. **Designation of New International Gauging Stations** – The Study Board has prepared a letter requesting that the four hydrometric gauges established during the St. Clair River investigative phase of the Study, namely St. Marys River at Sault Ste. Marie, St. Clair River at Port Huron, Detroit River at Fort Wayne at Detroit and Niagara River at Fort Erie, be designated as International Gauging Stations for flow and supported by governments ensuring their longevity after the Study is completed (Attachment 2). Likewise, in that letter, the two evaporation gauges at Stannard Rock on Lake Superior and Spectacle Reef on Lake Huron, were also mentioned requesting ongoing support.

   Decision Required: *What is the process and timelines for completing this action?*

2. **Adaptive Management, Higher Level Involvement** – The Adaptive Management TWG has proposed that a protocol with agencies associated with Great Lakes interests be established to ensure coordination of activities addressing extreme water levels after Study completion.

   Decision Required*: What approach does the Commission suggest for engaging higher level agency involvement in this initiative?*

3. **Legal Issues** – The Study Board has received advice from the Commission's Legal Advisors regarding how we should proceed with alternative plan formulation and their evaluation. It has been explained that it can use any hydroclimatic scenario it deems appropriate to test the robustness of plan alternatives. However, if the resulting range of levels exceeds those included in the Orders of Approval for the St. Marys River control works, namely Lake Superior levels of 182.76 and 183.86 m, IGLD 1985, that the economic impact must be determined.

   Decision Required: *Is the Study Board interpreting this direction correctly?*

4. **Restoration of Levels** – The Study Board has begun work to determine how levels can be restored incrementally as specified in the Commission's letter dated August 17, 2010 (Attachment 1). The work is proceeding considering structural changes in the St. Clair River that would provide a restoration of levels. While the cost of making such changes and their environmental and sectorial impacts are being evaluated at an exploratory level, the timing of their installation will not be explored. The Study will be producing a separate report that addresses this issue.

   Decision Required: *Does the Commission agree with this?*

5. **<u>Challenge of Collecting Potentially Sensitive Data</u>** – The Study Board has found that in certain areas, there is a reluctance to provide data due to its sensitive nature or that it may create potential national security concerns. This has limited data collection for some interests, especially regarding the collection of water supply intake information.

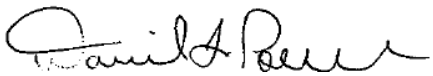
   Decision Required: *Does the Commission have any comments or direction regarding this issue?*

6. **<u>Public Dialogue</u>** – As an information item, the Study Board is proposing to conduct a series of meetings during the summer of 2011 around the Upper Great Lakes to inform the public of Study progress and preliminary alternatives to Plan 1977-A and receive and respond to their comments.

Respectfully submitted,

GENE STAKHIV
U.S. Co-Director

TED YUZYK
Canadian Co-Director



DAVID POWERS

JIM BRUCE

JAMES BREDIN

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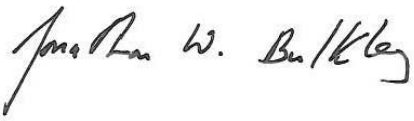
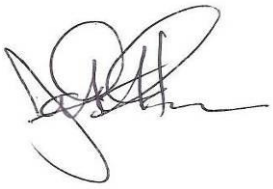


JONATHAN BULKLEY



JON GEE

JOHN BOLAND

ALLAN CHOW

TONY EBERHARDT
U.S. Study Manager

SYED MOIN
Canadian Study Manager

Appendix 1 – Meetings Held Related to the Study

	May 10	June 10	July 10	August 10	Sept. 10
Study Board		Burlington (23-24)			Romulus, MI (21-23)
Task Teams		LSRTT Burlington (22-23)			Romulus, MI (20-21)
TWGs		IM Ottawa (8-10)	Rec. Boating Lansing, MI (7-8) Hydroclimatic Group Québec City (8) Water Uses Ann Arbor, MI (14)	Rec. Boating Windsor (24-25) PFEG/ AMG "Pre-skunk Works" Meeting Burlington (Aug 30-Sept. 1)	Ecosystem Site Coordinators Meeting (7-8) AM Windsor (14-15) IM Windsor (15-16)
PIAG			Muskegon, MI (15)		
Other	IAGLR 53rd Conference on Great Lakes Research Toronto (17-21) ASCE-EWRI Congress 2010 Providence, RI (16-20)	CWRA Vancouver (15-18)	Water 2010 10th International Symposium on Stochastic Hydraulics Québec City (5-7)		

Appendix 2 – Planned Meetings Related to the Study

	Oct. 10	Nov. 10	Dec. 10
Study Board	IJC Hearing Ottawa (20)	Windsor (Nov. 30-Dec. 2)	
Task Teams			
TWGs	PFEG Burlington (14-15)	PFEG/ AMG "Skunk Works" Workshop Burlington (2-4)	
PIAG	Thunder Bay (27-28)		
Public Mtgs.			
Other			

International Joint Commission
Canada and United States

Commission mixte internationale
Canada et États-Unis

August 17, 2010

Mr. Ted R. Yuzyk
International Joint Commission
234 Laurier Ave. W. 22nd Floor
Ottawa, ON K1P 6K6

Dr. Eugene Stakhiv
IJC Upper Lakes Study Institute
for Water Resources
7701 Telegraph Rd.
Alexandria, VA 22315-3868

Dear Mr. Yuzyk and Dr. Stakhiv:

We are writing to provide you with guidance from the Commission regarding the International Upper Great Lakes Study (IUGLS). This guidance has been formulated based on careful consideration of a number of items, including but not limited to: 1) your report *Impacts on Upper Great Lakes Water Levels: St. Clair River*; 2) the letters from the Governments of Canada and the United States dated April 5, 2010 in response to the Commission's letters to them dated November 9, 2009 concerning expanding the scope of the work of the Study; 3) the 147 comments that have been received during the Commission's public consultation period on your report; and 4) the decisions requested of the Commission within your 7th Progress Report and discussions with the Study Board during its appearance before the Commission on April 21, 2010 in Washington.

The Commission wishes to acknowledge that the scientific subject matter of your report is complex and that your work has been made more difficult due to a lack of historical data to address some of the key questions you have formulated in responding to its Directive. Accordingly, the Commission compliments the Study Board on the approaches it has taken in tackling this very difficult problem; in successfully having undertaken an unprecedented, thorough, and in-depth analysis of the factors contributing to the decline in water levels between Lake Michigan-Huron and Lake Erie; and in the sound recommendations that have been put forward within the report. The Commission concurs with the recommendations and has further guidance to provide pertaining to the first recommendation.

The public has expressed both agreement and disagreement with this first recommendation, which reads "remedial measures not be undertaken in the St. Clair River at this time." The Commission clearly heard that should the analysis of remedial measures be undertaken during the second phase of the Study, all upstream and downstream interests must be considered. The Commission also heard that consideration be given to investigating measures that could re-establish hydraulic regimes to earlier times, for example, prior to the 1960-1962 channel deepening project in the St. Clair River.

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During the Study Board's appearance in April 2010, the Board proposed exploring the feasibility and implications of various levels of water restoration including 0, 10 cm (3.9 in), 25 cm (9.8 in), and 50 cm (19.7 in). The Commission is of the view that an analysis of these restorative levels and an additional level of 40 cm (15.7 in) would provide Governments and the public with extremely valuable information and insight to help form the basis for rational and scientifically-based decision making. The "zero" scenario represents status quo, or in other words, the stance of taking no restorative action. The 10 cm (3.9 in) restoration scenario would counter increases in conveyance since 1963, with the magnitude as established in your St. Clair River Report. The 25 cm (9.8 in) scenario would combine the previous scenario with the estimated impact of the 1960-1962 channel deepening project on conveyance of the St. Clair River. The 40 cm (15.7 in) scenario would approximately equal the physical effects of regime change in the St. Clair River from 1906 through today, and includes the 1933 to 1937 construction of 7.6 m (25-foot) navigation channel, the 1960 to 1962 construction of the 8.2 m (27-foot) navigation channel, and increased conveyance from 1963 to 2007 as estimated in your St. Clair River report[1]. The 50 cm (19.7 in) restoration scenario extends the previous analysis to cover the period of 1855 to 1906, which reflects the impacts on the St. Clair and Detroit Rivers for the deepening associated with the 6.1 m (20-foot) navigation channel.

These analyses would include a description of the implications on interests throughout the Great Lakes and St. Lawrence River System. Such an analysis would be similar to and be performed with the analyses of climate change impacts on water levels in Lakes Michigan and Huron and possible measures to address those impacts, as described in the letters from Governments. The analysis will include an investigation of structural and non-structural measures at an exploratory level of detail. The Commission is aware that as part of the first phase of the Study, you have already undertaken a preliminary reconnaissance of structural measures to remediate the impacts of past dredging for the St. Clair River. The public has also suggested a range of approaches, including inflatable weirs and power-generating turbines. The Commission looks forward to hearing from the Study Board how different measures might affect flow regime and whether such measures might potentially achieve the restoration scenarios detailed above.

In your 7th Progress Report, the Study Board identified four areas where the Commission is being requested to provide direction or a decision. These will now be dealt with in succession.

1) Mitigation Options for Climate Change. The 7th Progress Report indicates that mitigative options would be considered if they were found to be necessary to deal with significant climate change impacts. Given the letters from Governments on this particular aspect of the Study, the Commission has the mandate to review mitigative options based on potential climate change impacts. The Commission's opinion is the Study Board has the mandate to undertake, at an exploratory level, the related analysis as described and articulated in the letter from the Government dated April 5, 2010, and in the Commission's letter to the Study Board dated April 12, 2010. The Commission also wishes to acknowledge its pleasure with the Study Board's response of May 21, 2010,

[1] Sources: Table 1 in "Physical Effect of Regime Changes in the Detroit Rivers" and Table 2 in "Physical Effect of Regime Changes in the St. Clair River", October 1987 Great Lakes Water Level Task Force – Task Group 5 report to the IJC.

indicating that it would be able to undertake this analysis during the existing timeline of the Study and within its existing budget.

2) Proposed "Single Regulation Plan" Option. The Commission concurs with your proposal to provide one alternative to the existing regulation plan, which would be the result of extensive public input and discussion regarding a wide range of potential plans. In doing so, the Commission wants to ensure that the plan considers multi-purposes that balance all relevant interests and issues to the extent possible, and that information will be provided on both the criteria used to select the recommended plan, as well as the characteristics and performance of the other plans investigated within your phase 2 report, which is expected in March 2012.
3) Legal Issues Related to New Plan Formulation. The Commission is supportive of the efforts of the Study Board in trying to establish an updated, legally-acceptable rationale for basing future decisions on regulation plan selection that allows for the possibility of new physical conditions that can be anticipated under a changing climate, in conformance with the Boundary Waters Treaty. The Commission urges the Study Board to work closely with the Commission's Legal Advisors to address this and any related legal issues.
4) Establishment of New/ Expansion of Existing Control Board. The Commission also heard from the public on the need to consider a review of the governance regime that currently exists, with various ideas being put forward. The Commission's view is the Study Board has the mandate to investigate and recommend institutional mechanisms for the management of water resources through one or more management boards for the Great Lakes and St. Lawrence System, including its(their) structure(s), composition(s), and authorities. The Commission suggests the Study Board consult with the International Boards of Control for Lake Superior, Niagara and St. Lawrence River.

The Commission appreciates the periodical reporting on progress that the Study Board has been providing, and it looks forward to being kept apprised in a similar fashion as the Study Board continues its investigations.

Yours sincerely,

Murray Clamen
Secretary
Canadian Section

Charles A. Lawson
Secretary
United States Section

September 23, 2010

Dr. Murray Clamen
Secretary, Canadian Section
International Joint Commission
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Dr. Charles A. Lawson
Secretary, U.S. Section
International Joint Commission
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Re: Designation of New International Gauging Stations

Dear Dr. Clamen and Dr. Lawson,

The Study Board strongly supports the document entitled, "*A Hydrological Data Framework for the Canada-United States Transboundary Basins*". We were particularly pleased to see that a key component of this report is a revised protocol for International Gauging Stations (IGSs). We understand that the 1985 Protocol needed to be updated before any new IGSs would be designated.

As you are aware, the Study Board has raised this issue during its regular reporting to the Commission that the four hydrometric stations that the Study is supporting need to continue on after the Study is completed in early 2012. To ensure their longevity these stations need to be designated as IGSs for flow and supported by the governments. The data from these four stations on the inter-connecting channels are critical to understanding the water balance of the Great Lakes system. They will be instrumental in assessing the impacts of climate change as well as determining any further conveyance changes in the St. Clair River. Furthermore, they will be an integral part of an adaptive management system that is being established under the Study.

Significant effort has gone into the siting, constructing and maintaining of these four stations. Much progress has been made to establish stage-discharge relationships so that near real-time discharge data will be available on-line this fall for all of these stations. We therefore encourage the IJC to formally recommend to the governments that these stations be designated as IGSs for flow. The four stations are:

- St. Marys River at Sault Ste. Marie (USGS# 04127885)

- St. Clair River at Port Huron (USGS# 04159130)
- Detroit River at Fort Wayne at Detroit (USGS# 04165710)
- Niagara River at Fort Erie (WSC# 02HA013)

We also were very pleased to see that the above document is promoting IGSs for other important hydrological parameters. The Study has been instrumental in setting up two evaporation gauges (i.e., eddy-covariance systems) for the first time on the Great Lakes. One of the systems is on Stannard Rock (Lake Superior) and the other on Spectacle Reef (Lake Huron). The Study has been able to secure an agreement to house these systems in the lighthouse facilities up to 2017. We encourage the IJC to recommend to the governments that these two stations be considered for inclusion in any network of IGSs for evaporation because of their significant scientific importance to understanding the effects of climate change.

The Study Board would like to emphasize that having good quality, standardized and essential data are critical to making sound decisions on regulation of the Great Lakes. Lack of such data was an issue for this Study and for many of the previous studies. Ensuring the continuity of these stations is seen as an important investment in understanding the hydrology of the Great Lakes that will pay dividends for future generations.

Yours Sincerely,

Ted R. Yuzyk
Canadian Co-Chair

Eugene Z. Stakhiv
U.S. Co-Chair