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A Report to the Governments of
the United States and Canada

Transboundary Impacts of the Missisquoi Bay Causeway and the Missisquoi Bay Bridge Project

International Joint Commission
Canada and United States



Commission mixte internationale
Canada et États-Unis

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The International Joint Commission

Herb Gray
Chair, Canadian Section

Dennis L. Schornack
Chair, U.S. Section

Robert Gourd, Commissioner

Irene B. Brooks, Commissioner

Jack P. Blaney, Commissioner

Allen I. Olson, Commissioner

International Joint Commission offices

United States Section

1250 23rd Street, NW, Suite 100
Washington, D.C. 20440
Phone: (202) 736-9000
Fax: (202) 467-0746
E-mail: commission@washington.ijc.org

Canadian Section

234 Laurier Ave. West, 22nd floor
Ottawa, ON K1P 6K6
Phone: (613) 995-2984
Fax: (613) 993-5583
E-mail: commission@ottawa.ijc.org

Contributors to the report

Frank Bevacqua, Lisa Bourget, Jim Chandler, Murray Clamen, Paula Fedeski-Koundakjian, Nick Heisler, Rudy Koop, Greg McGillis

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Front cover photograph: Missisquoi Bay causeway by Frank Bevacqua.

Ce rapport est également disponible en français.

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Overview

This is the International Joint Commission's final report in response to the Reference by letters of May 7, 2004, and May 11, 2004, from the governments of Canada and the United States, respectively, regarding the potential transboundary impacts of the Missisquoi Bay causeway and the proposed new bridge (Appendix 1).

Based on the report of the Commission's International Missisquoi Bay Task Force and extensive public consultations (Appendices 2 and 3), the Commission is satisfied that the causeway does not affect water levels in Canada and affects flows or circulation patterns in Canada inconsequentially, if at all. Moreover, the Commission is satisfied that neither the causeway nor the new bridge project causes any pollution resulting in transboundary injury to health or property.

Notwithstanding the above-noted responses to the specific questions posed by the two governments, the Commission has concluded that the current state of water quality in Missisquoi Bay presents an unacceptable situation that is adversely affecting health and property in both countries and constitutes a threat to the health of Lake Champlain. The Commission recognizes that the State of Vermont and the Province of Quebec have entered into agreements and undertaken planning and other actions to address the adverse water quality situation in the bay. Nevertheless, the seriousness of the situation compels the Commission to urge the state and province to take significant immediate steps to address the elevated phosphorus levels in Missisquoi Bay and to do so in a way that will improve the ecological health of the bay as well as Lake Champlain itself. Most importantly, the Commission recommends that the state and province make additional investments and further accelerate their domestic programs to reduce phosphorus levels in the bay.

With respect to the causeway, the Commission affirms the Task Force's finding that removal would have a negligible impact on phosphorous levels in the Bay. However, the Commission also recognizes the prevailing local belief that the causeway contributes significantly to the problems of the bay. In fact, this belief is so strong that the Commission believes that so long as the causeway remains, it will continue to distract local citizens from taking the necessary actions to reduce phosphorous inputs into the bay. Therefore, the Commission recommends that the causeway be removed under the condition that an amount of money equal to the cost of causeway removal be provided by the governments of Canada and Quebec to be spent roughly equally on both sides of the boundary to reduce phosphorous inputs into the bay and to facilitate the relocation of the habitat for the spiny softshell turtles.

The Commission makes these additional recommendations having devoted considerable time to examining the issues that gave rise to the May 2004 letters from federal governments. The Commission is impressed with the effort and energy that has been expended to date both by all levels of government and by groups and individuals in the private sector to come to grips with water quality concerns. Finding and implementing appropriate and equitable solutions is extremely difficult. The Commission believes that

the public is prepared to shoulder its fair share of the burden of reducing phosphorus levels in light of the benefits all will share if the effort is successful. However, the Commission is convinced that now is the time for the state and province, supported as appropriate by the federal governments, to lead by taking actions that will galvanize and focus the energy of the public.

Setting

Missisquoi Bay is a shallow embayment on the northern end of Lake Champlain divided by the international boundary separating the State of Vermont and the Province of Quebec. Slightly over one half of the watershed area lies in Vermont (58%) and the remainder (42%) is in Quebec. The bay itself has an area of approximately 77.5 km² (19,150 acres). Major tributaries entering the bay from its 3,105 km² (767,246 acres) watershed are the Missisquoi, Pike and Rock Rivers (see Figure 1: Map of northern Lake Champlain).

Its economy, like that of the larger Lake Champlain watershed, has traditionally been a rural resource-based economy with agriculture, recreation and tourism being important factors for the region. Of a total population of about 540,000 in the Lake Champlain basin, approximately 23,000 reside in the Quebec portion of the Missisquoi Bay basin and another 28,000 in the Vermont part of the Missisquoi Bay basin.

Water Quality of Missisquoi Bay and Lake Champlain

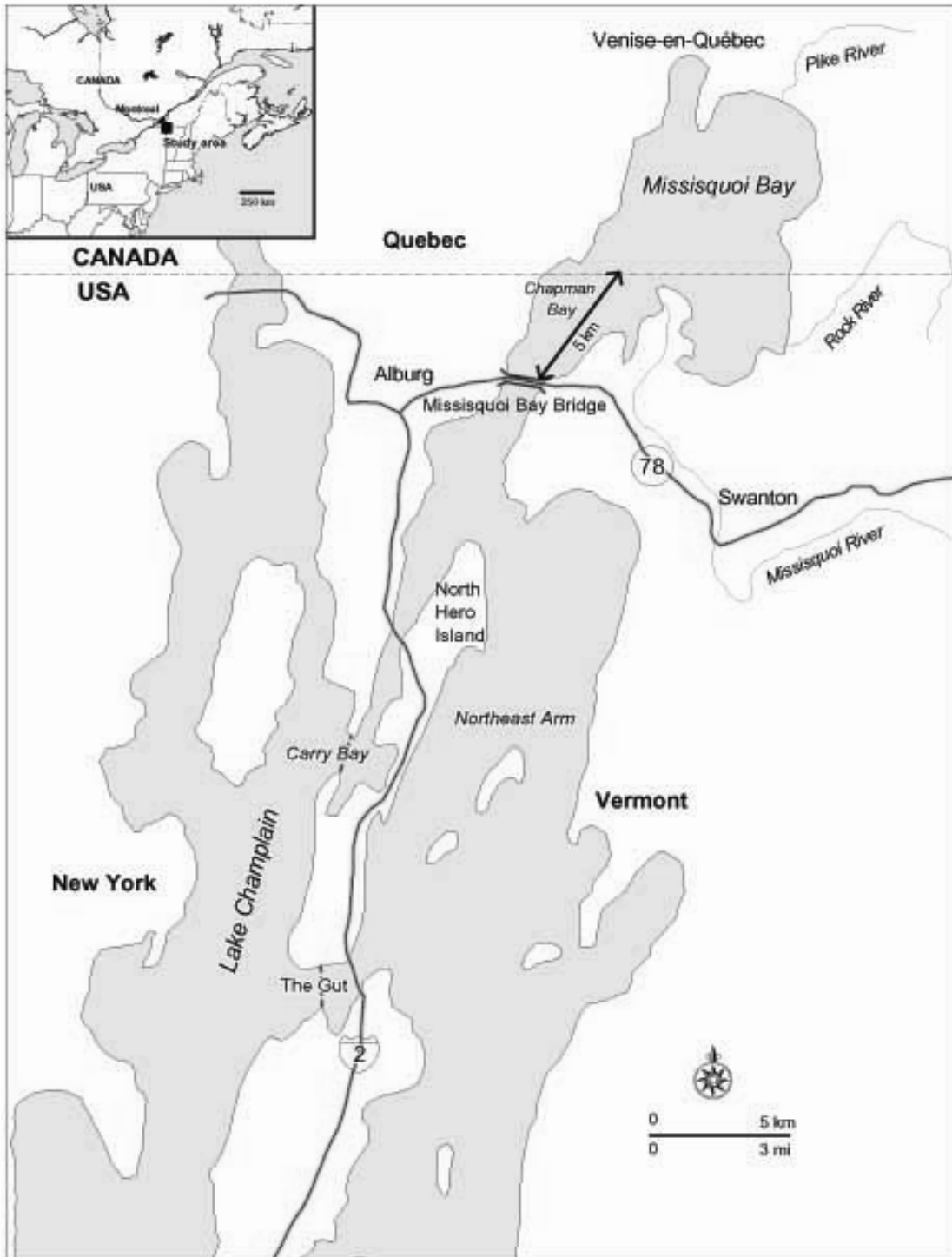
Missisquoi Bay is one of the region's most important natural resources. The surrounding communities depend upon the bay for a reliable source of drinking water. Clean water is essential for a healthy tourist industry and water-based recreation.

The quality of the bay has deteriorated over time. The bay bottom that was once primarily sand with vegetation clumps and a series of sandy beaches is now silt and organic material, and many areas are now filled with vegetation. Clean cobble areas in shallow water that were once walleye habitat no longer exist.

Anthropogenic sources of nutrients (phosphorus) and sediment loading into the bay from the surrounding watershed are major factors in this degradation. The Missisquoi Bay watershed has been determined to be the largest contributor of phosphorus to Lake Champlain, compared with all other lake segments. Phosphorus enters the bay from point sources such as municipal wastewater treatment plants and local septic systems and from non-point sources such as agricultural runoff.

Overabundant phosphorus causes algal blooms and excessive growth of aquatic plants. These plants, and the water quality problems that occur when they decompose, can harm fish and other species and limit human uses of the bay. Phosphorus also contributes to the growth of blue-green algae blooms that are a serious human health issue.

Figure 1: Map of northern Lake Champlain



The Regional Health and Social Services Board in Quebec banned swimming in the region's public beaches in 2001, 2002, 2003 and 2004 and recommended that any activities or practices involving direct contact with water cease. Phosphorus concentrations over the past five years have averaged 0.045 mg/L in Missisquoi Bay and 0.018 mg/L in the Northeast Arm. The water quality criteria for phosphorus endorsed by Vermont, Quebec and New York are 0.025 mg/L for Missisquoi Bay and 0.014 mg/L for the Northeast Arm (see Figure 2: Distribution of total phosphorus concentration).

Local jurisdictions have recognized that it will be necessary to achieve very substantial reductions in phosphorus loading to Missisquoi Bay to restore acceptable water quality to the bay. In 2002, the governments of Quebec and Vermont signed an Agreement Concerning Phosphorus Reduction in Missisquoi Bay aimed at reducing the overall phosphorus loading rate to Missisquoi Bay to 97.2 metric tons per year (mt/yr) from the 1991 baseline rate of 167.3 mt/yr in order to achieve the 0.025 mg/L phosphorus concentration criterion for Missisquoi Bay and committed to achieve their respective target loads by 2016. In August 2004, Vermont Governor James Douglas and Québec Premier Jean Charest agreed to accelerate to 2009 all pollution reduction measures in their action plans.

Missisquoi Bay and, indeed, Lake Champlain are water resources shared between Canada and the United States even though most of the lake is on the U.S. side of the boundary. Lake Champlain waters discharge into the Canadian section of the St. Lawrence River.

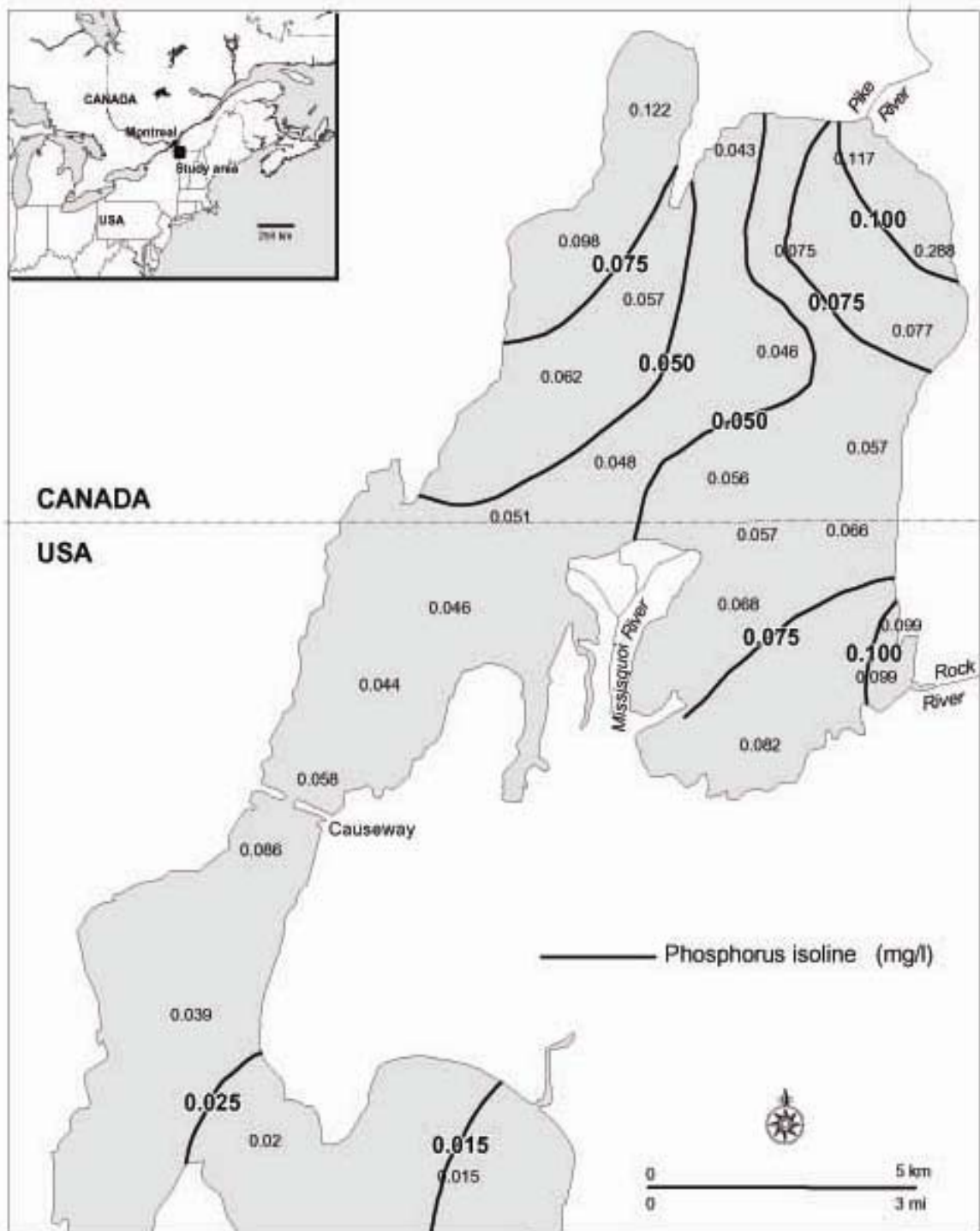
More than 30 years ago, when the Great Lakes were suffering from excess phosphorus loadings, the governments of the U.S. and Canada entered into the Great Lakes Water Quality Agreement in an effort to restore the health of the lakes. Actions taken pursuant to this agreement were highly successful in reducing phosphorus loadings. The Commission observes that a similar binational effort for Lake Champlain could significantly expedite the restoration of water quality.

The Missisquoi Bay Bridge Project

The Swanton-Alburg bridge, built in 1937, is located at the southern end of the bay, 5 km south of the Canadian border and crosses the waters connecting the Northeast Arm of Lake Champlain and Missisquoi Bay. It is nearly 1.5 km long, consisting of two causeway sections of 500 m and 650 m and a central bridge section of 170 m. The causeway has for some time been believed locally to be a significant cause of the degradation of Missisquoi Bay by restricting the natural flushing of the bay sufficiently to cause the environmental changes in the bay.

The existing causeway also provides a habitat for the spiny softshell turtle which is listed as a threatened species in both Vermont and Quebec.

Figure 2: Distribution of total phosphorus concentration (mg/L)¹



¹ Phosphorous concentration found in Missisquoi Bay on October 28, 1996. From Mendelsohn, D.L., H.Rines and T.Isaji, 1997. *Missisquoi Bay Field Study and Hydrodynamic Model Verification*, Final Report prepared for Vermont Geological Survey, Vermont Agency of Natural Resources, 103 South Main St., Center Building, Waterbury, Vt. 05671.

Because the existing bridge and causeway have become inadequate and are in a deteriorated state, they are being replaced by a new fixed bridge being built immediately south of the existing structure by the Vermont Agency of Transportation. Permits issued for the project by the Vermont Agency of Natural Resources limit the removal of the existing causeway to 100 m, leaving the remaining 1050 m in place to continue to provide habitat for the spiny softshell turtle.

Note: The primary source of factual information contained in the above sections is the International Missisquoi Bay Task Force's *Final Report to the International Joint Commission, October 20, 2004*, which is attached.

The Reference

Local concerns over the deteriorating water quality in Missisquoi Bay have for some time focused on the Swanton-Alburg Bridge, which has been seen as a contributing factor to this problem, with the causeway's removal (as part of the project to modernize the bridge) seen as a solution.

Strong public pressure eventually led the Canadian and United States federal governments, by letters dated May 7, 2004 and May 11, 2004 (see Appendix 1), respectively, to ask the International Joint Commission (IJC) to review plans by the State of Vermont to modernize the Swanton-Alburg Bridge.

The request from governments was made as a Reference under Article IX of the Boundary Waters Treaty and requested that the IJC consider the following matters:

1. Whether the original causeway in the United States affects water levels/flows in Canada;
2. Whether the original causeway in the United States causes pollution to the injury of health or property in Canada;
3. Whether the removal of the original causeway in the United States might cause pollution to the injury of health or property in the United States; and
4. Whether the proposed project in the United States will cause pollution to the injury of health or property in Canada.

The Reference from governments requested that the Commission's review be completed, ideally, by the end of the summer of 2004 and funded out of the IJC's current budget. The governments also noted that residents in the region have serious concerns about their water quality and expressed confidence that the IJC's review would be an important contribution to efforts to improve conditions in Missisquoi Bay.

The International Missisquoi Bay Task Force

Immediately after receiving the Reference, the Commission established a binational, interdisciplinary Task Force to carry out the required investigations. The four-member International Missisquoi Bay Task Force, with an equal number of members from each country, was established on June 15, 2004.

The Commission directed Task Force members to work in the spirit of consensus and in their personal and professional capacities and not as representatives of their countries or organizations. It also directed the Task Force to focus on existing available information, including various reports produced by the State of Vermont, and to coordinate its investigations with organizations in both countries to access the full breadth of available information. Eight scientific and technical experts were identified to review hydrodynamic studies. The Commission's directive to the Task Force is in Appendix 2.

The Task Force submitted its final report to the Commission on October 20, 2004 (see Appendix 3). The Task Force concluded that the presence of the causeway changes the distribution pattern of phosphorus concentrations over a few miles largely in the U.S. portion of the bay and that the presence of the causeway leads to sedimentation and a 1% increase in phosphorus concentration (bay-wide average) on the Missisquoi Bay side of the causeway. Removal of the causeway would redistribute the phosphorus but would not remove any phosphorus from the overall system. This must be done by reduction of inputs of phosphorus into the bay. The presence of the causeway leads to a very small but finite amount of pollution largely located in the United States but it is not the fundamental cause of the important water quality and health problems (associated with blue-green algae) experienced by local residents.

The Task Force recommended that the Commission

- accept the basic findings of studies that determined that the causeway leads to a 1% increase in phosphorus concentrations in Missisquoi Bay as reliable and scientifically accurate;
- encourage ongoing and planned actions to reduce phosphorus loading to the bay from the watershed;
- take into account other public considerations when determining their recommendations to governments about the project; and
- encourage further research in the three areas where information gaps were identified: turtle biology, the relationship between blue-green algae blooms and phosphorus levels, and the impact of multiple causeway removals.

Public Consultations and Hearings

Public consultations and hearings were held during and at the end of the Task Force's investigations.

The International Joint Commission and its Task Force held public information meetings in Saint-Georges-de-Clarenceville, Quebec, and Swanton/Highgate, Vermont, during the last week of August 2004 to discuss and receive input on the work to assess the transboundary water quality effects of the Missisquoi Bay causeway. Residents of the region spoke of severe water quality problems and public health concerns associated with blue-green algae. Public opinion was supportive of the new bridge and almost unanimously in favour of removing the causeway.

Public hearings were held on December 6, 2004, in Saint-Georges-de-Clarenceville, Quebec, and on December 7, 2004, in Swanton/Highgate, Vermont, to consider and receive comment on the Task Force's final report which had been released on November 9, 2004.

Testimony at both public hearings indicated, notwithstanding the fact that the removal of the causeway would reduce phosphorus levels by only 1%, that many citizens believed the causeway to be a major contributor to water quality problems in the bay and were overwhelmingly in favour of its removal. Participants noted that local municipalities had made significant investments in water treatment and sewage reduction. They also noted that tourism had suffered substantial losses because of deteriorating water quality and adverse publicity, and that further deterioration of their water supply was unacceptable. However, some recognized that a holistic approach was needed and that removal of the causeway had to be done in conjunction with other clean-up initiatives. Efforts to reduce phosphorus at source, which so far had been modest, needed to be redoubled. Removal of the causeway could be a symbolic gesture to encourage other stakeholders to take action.

Some participants favoured progressive removal of the causeway over a period of years to provide an opportunity to monitor, in a staged way, whether changes were positive or negative. Others argued that structures no longer in use, such as the causeway, should be removed to restore natural conditions

Not all testimony favoured the removal of the causeway; some stated that causeway removal would not have a significant impact on water quality and that resources could more effectively be used in ongoing phosphorus-removal programs. Two principal negative impacts to causeway removal were cited: the loss of critical habitat for the spiny softshell turtles — a threatened species in both Vermont and Quebec — and the economic cost, estimated to be approximately \$1.5 million if causeway removal were to begin in the spring of 2005.

Following the public hearings, the Commission received a number of additional written submissions in favour of protecting the habitat of the spiny softshell turtles and urging the Commission to recommend against removal of the causeway in Missisquoi Bay.

The Commission recognizes that the spiny softshell turtle is a threatened species under both Vermont and Quebec law, and that the removal of the causeway would remove some habitat for the turtles. To avoid the risk of legal conflict, the Commission recommends that habitat relocation be undertaken with some of the resources made available by Canada and Quebec when they match U.S. and Vermont expenditures on removing the causeway.

Considerations, Conclusions and Recommendations

Based upon the information provided by the International Missisquoi Bay Task Force and others during the Commission's examination of the effects of the Missisquoi Bay causeway, the Commission endorses the recommendations of the Task Force and provides the following answers to the questions posed by the governments of the United States and Canada in their 2004 letters.

1. Does the original causeway in the United States affect water levels/flows in Canada?

No. Given the distance between the causeway and the international border as well as the flow patterns within the bay, the Commission is satisfied that the existing causeway does not affect water levels in Canada. In addition, the Commission is satisfied that any effect on flows or circulation patterns in Canada would be inconsequential.

2. Does the original causeway in the United States cause pollution to the injury of health or property in Canada?

No. The causeway is not a source or cause of pollution. It does, however, influence the flow of water from Missisquoi Bay into the Northeast Arm of Lake Champlain. The consensus of experts who have reviewed this issue is that the presence of the causeway has resulted in slightly elevated (approximately 1%) concentrations of phosphorus north of the causeway and almost exclusively in the United States. The Commission is satisfied that any transboundary effect is negligible and that there is no injury to health or property in Canada as a result of the causeway.

3. Would the removal of the original causeway in the United States cause pollution to the injury of health or property in the United States?

No. In light of the minimal influence that the causeway has as far north as the international border, the Commission is satisfied that its removal would not result in any transboundary injury to health or property in the United States.

4. Will the proposed project in the United States cause pollution to the injury of health or property in Canada?

No. The proposed project involves widening the opening in the causeway. Since the only transboundary effect that the proposed project might have is the reduction of the existing

causeway's marginal influence, the Commission is satisfied that it would not result in any injury to health or property in Canada.

The 2004 reference from the U.S. and Canadian governments gave the Commission the opportunity and obligation to look into and understand the issues that were of most concern to the residents of the Missisquoi Bay region; it did this with the assistance of an outstanding task force and the thoughtful, passionate and detailed involvement of countless individuals, organizations, public servants, and elected officials. The Commission is convinced that it gained a full understanding of the fundamental issues and believes that a course of action is available to the residents of both countries to address them.

It is clear that water quality in Missisquoi Bay is of extremely poor quality. Indeed, the water is of such poor quality that it poses a hazard to the health and property of the residents of the bay. It has already resulted in a serious adverse effect on the once-vibrant economy of the bay. This is an urgent matter of binational concern. The Commission is concerned that the deterioration of water quality will continue and will not be limited to the bay; rather, this may be the leading edge of a deterioration that would extend over time throughout Lake Champlain and, ultimately, the Richelieu and St. Lawrence Rivers, posing a threat to both countries in ways that cannot as yet be foreseen.

The governments of Vermont and Quebec have recognized the seriousness of the water quality problem for many years and have entered into agreements to set targets and allocate responsibilities for phosphorus removal. They also participate in the Lake Champlain Basin Program, which is a U.S. federally-funded program that works in partnership with government agencies from New York, Vermont and Quebec, private organizations, local communities and individuals to coordinate and fund efforts which benefit the Lake Champlain Basin.

These agreements do recognize the seriousness of the situation and the need for urgent action. They have been followed by numerous planning activities and other commitments in both jurisdictions, including sewage treatment plant upgrades, aimed at achieving phosphorus reductions. However, as far as the Commission can determine from information provided by its Task Force, measured phosphorus values in the bay have not changed. In addition, algae blooms have become a more controversial issue in recent years. The Commission is convinced that every step should be taken to encourage immediate action to reduce phosphorus inputs to the watershed.

At the same time, the Commission recognizes that many residents in the area do not believe the studies' conclusions that the causeway has little effect on phosphorus levels in the bay. Others take the position that even if the impact on water quality in the bay is slight, the causeway should be removed both to demonstrate that government is doing all that it can to improve water quality in the bay and also to restore the natural setting of the bay now that the causeway is no longer needed to fulfill its original purpose of supporting the Swanton-Alburg Bridge.

The Commission concludes that public attention has been so focused on removal of the causeway that leaving the causeway in place would present an obstacle to expanding the cooperative efforts by farmers, municipalities, taxpayers and others that will be needed to achieve nutrient reductions. A well-organized and focused effort is required and it is important that unnecessary distractions not be allowed to impede this effort. Indeed, there are times that strong actions by governments can make a major difference by serving as a catalyst for a long-term process of renewal, even in cases where the immediate benefits of an action are not as great as its cost. The action by governments can help galvanize the actions of others to achieve meaningful progress.

The Commission believes that this is such a time for Missisquoi Bay and that it is both important and urgent that the governments of both Vermont and Quebec take immediate, significant action to give impetus to cleaning up the bay. The Commission also believes that the contribution of the state and province should continue to recognize the stake each has in achieving this goal.

It is from this perspective that the Commission urges the Vermont government to take the necessary steps to remove the Missisquoi Bay causeway as soon as possible, and that an amount of money equal to the cost of removing the causeway be provided by the governments of Canada and Quebec to be used roughly equally on both sides of the boundary to reduce phosphorous inputs into the bay and to facilitate the relocation of the spiny softshell turtles' habitat.

Although removing the causeway will improve the water quality of Missisquoi Bay only marginally, the Commission expects it to accelerate the many specific actions necessary for others to take to achieve real improvements in the bay and, consequently, in Lake Champlain; it will also restore the natural circulation patterns of the Lake Champlain ecosystem to those which existed in the early part of the last century. Since the causeway is located wholly in Vermont, the Commission expects the State of Vermont to take the lead on this matter.

While reducing phosphorous inputs into the bay is a matter of great urgency, the future of the spiny softshell turtles is also a matter of concern to the State of Vermont, the Province of Quebec and many individuals and groups in the region. The Commission shares this concern but is convinced that, with appropriate study, planning and action, adequate habitat for the turtles can be found or established. The Commission recommends that efforts begin immediately to develop and implement an effective strategy to resolve the matter of an appropriate habitat for the spiny softshell turtles.

In addition to the actions recommended above, the Commission recommends that the governments of Vermont and Quebec further accelerate their domestic programs to reduce phosphorus levels in the bay.

Finally, the Commission recommends that the governments of the United States and Canada take the necessary steps, both individually and jointly, to assist in reducing phosphorus levels in the bay. Since the water quality problems of the Bay will take

considerable time and effort to resolve, the Commission recommends that it be granted a reference to re-examine, five years from now, the conditions of the Bay and the success of efforts to restore water quality. Given the parallels between the current situation in Missisquoi Bay and Lake Champlain to those of the Great Lakes prior to the Great Lakes Water Quality Agreement, the Commission invites the governments of the U.S. and Canada to explore the possibility of establishing a similar agreement for these shared waters.

The poor water quality in the bay is a matter of considerable urgency. Quite simply, the health not only of Missisquoi Bay but of Lake Champlain as a whole will remain at risk until specific action is taken to restore the health of Missisquoi Bay.

Signed this 16th day of February, 2005.



Herb Gray
Chair, Canadian Section



Dennis L. Schornack
Chair, U.S. Section



Robert Gourd, Commissioner



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Appendix 1

Letters of reference

Appendix 2

Directive from the International Joint Commission to the International Missisquoi Bay Task Force

Appendix 3

**Final report to the International Joint Commission by the
International Missisquoi Bay Task Force**