International Niagara Board of Control
Ninety Fifth Semi-Annual Progress Report
to the
International Joint Commission

Covering the Period March 1 through August 31, 2000

TABLE OF CONTENTS

COVER: Niagara Board meeting with the public in Niagara Falls, New York on September 12, 2000

TABLES **PAGE**

FIGURES

ENCLOSURES

INTERNET SITES

International Niagara Board of Control
http://huron.lre.usace.army.mil/ijc/niagara.html
International Joint Commission http://www.ijc.org/
Lake Erie-Niagara River Ice Boom http://www.iceboom.nypa.gov

INTERNATIONAL NIAGARA BOARD OF CONTROL

Burlington, Ontario
Cincinnati, Ohio

September 12, 2000

International Joint Commission
Ottawa, Ontario
Washington, D. C.

Commissioners:

1. GENERAL

The International Niagara Board of Control (Board) submits its Ninety Fifth Semi-Annual Progress Report, covering the period March 1 through September 12, 2000.

2. ITEMS OF INTEREST

For the months of March through August 2000, the level of Lake Erie remained below its long-term average, but had risen to very near average in July and August. Precipitation on the Lake Erie basin during this period was above average, particularly in May and June. This contributed to the significant rise in the Lake Erie water level during the summer. Lakes Michigan and Huron

remained well below their long-term average levels during this period. This resulted in lower than average inflows to Lake Erie from upstream.

The Power Entities (Ontario Power Generation Inc. (OPG) and the New York Power Authority (NYPA)) complied with the Board's 1993 Directive for regulation of the Chippawa-Grass Island Pool water levels throughout the reporting period.

Discharge measurements were made in the Niagara River in the vicinity of the International Railway Bridge in April and at the American Falls Channel in May 2000.

The Lake Erie - Niagara River ice boom was opened on March 23rd and 24th, 2000.

Construction of the Buffalo and Fort Erie Public Bridge Authority's second bridge adjacent to the existing Peace Bridge continues to be delayed. Gauges to monitor the project's potential impacts on water levels continue to operate.

Neither the U.S. Department of State nor the Canadian Department of Foreign Affairs and International Trade have any objections to New York State's project to restore habitat at Strawberry Island.

The Board held its annual meeting with the public in Niagara Falls, New York on September 12, 2000. Five members of the public were in attendance.

3. LAKE LEVELS

All elevations in this report are referenced to International Great Lakes Datum 1985. The values are expressed in metric units, with approximate English units (in parentheses) for information purposes only. The monthly lake level data are based on a network of four gauges to better represent the average level of the lake. Recorded water level and precipitation data for the period March through August 2000 and departures from long-term averages are shown in Tables 1 and 2 and depicted graphically on Figures 1 and 2.

During the months of March through August 2000, the level of Lake Erie remained below its long-term average, but was very near average in July and August. The level of the lake started the period 24 centimetres (9.5 inches) below average. Above average precipitation on the Lake Erie basin pushed the level to within 5 centimetres (2 inches) of average by July. The August monthly mean level was 3 centimetres (1 inches) below average. Over this period the water level rose from a March mean of 173.83 metres (570.31 feet) to a peak in July of 174.27 metres (571.75 feet). In August the level was at 174.23 metres (571.62 feet). Recorded water level data for the period March through August 2000 and departures from long-term averages are shown in Table 1 and are depicted graphically on Figure 1.

The Lake Erie basin received 63.1 centimetres (24.8 inches) of precipitation during the period March through August 2000. The period of record (1900–1996) average over this six-month period is 48.5 centimetres (19.1 inches). The departure from average over the six-month period was +30%. This was largely the result of heavy rains in April, May and June. Precipitation in June was nearly double the long-term average amount for that month. Recorded precipitation data for the period March through August 2000 and departures

from long-term averages are shown in Table 2 and are depicted graphically on Figure 2.

Lakes Michigan and Huron remained well below their long-term average levels during this period. This resulted in lower than average inflows to Lake Erie from the upstream lakes. Inflows from the upper lakes for the six-month period March through August 2000 were about 7% below the long-term average.

Water supplied to Lake Erie from its local drainage basin was generally well above average for the period March through August 2000, as can be seen in Figure 3. Even though inflows from upstream remained low, excess total supply allowed the lake to rise appreciably and nearly reach its long-term average level by mid-summer.

The rise in water level on Lake Erie naturally affected the outflow into the Niagara River. As the lake level approached average so did the outflow from the lake. The flows in the Niagara River (at Buffalo, New York) are graphically depicted in Figure 4.

The September 2000 water level forecast indicates that the level of Lake Erie is expected to remain below its long-term average during the next six months.

TABLE 1 - MONTHLY AVERAGE LAKE ERIE WATER LEVELS

(Based on a network of 4 water level gauges)

International Great Lakes Datum (1985)

	Metres			Feet		
Month	Recorded* 2000	Average 1918-99	Departure	Recorded* 2000	Average 1918-99	Departure
March	173.83	174.07	-0.24	570.31	571.10	-0.79
April	173.95	174.22	-0.27	570.70	571.59	-0.89
May	174.08	174.31	-0.23	571.13	571.88	-0.75
June	174.19	174.34	-0.15	571.49	571.98	-0.49
July	174.27	174.32	-0.05	571.75	571.92	-0.17
August	174.23	174.26	-0.03	571.62	571.72	-0.10

*Provisional

TABLE 2 - MONTHLY AVERAGE PRECIPITATION ON THE LAKE ERIE BASIN

	Centimetres			Inches			
Month	Recorded* 2000	Average 1900-96	Departure	Recorded* 2000	Average 1900-96	Departure	Departure in percent
March	4.60	7.01	-2.41	1.81	2.76	-0.95	-34
April	10.52	7.95	+2.57	4.14	3.13	+1.01	+32
May	12.93	8.31	+4.62	5.09	3.27	+1.82	+56
June	15.88	8.71	+7.17	6.25	3.43	+2.82	+82
July	9.58	8.43	+1.15	3.77	3.32	+0.45	+14
August	9.60	8.10	+1.50	3.78	3.19	+0.59	+18

*Provisional

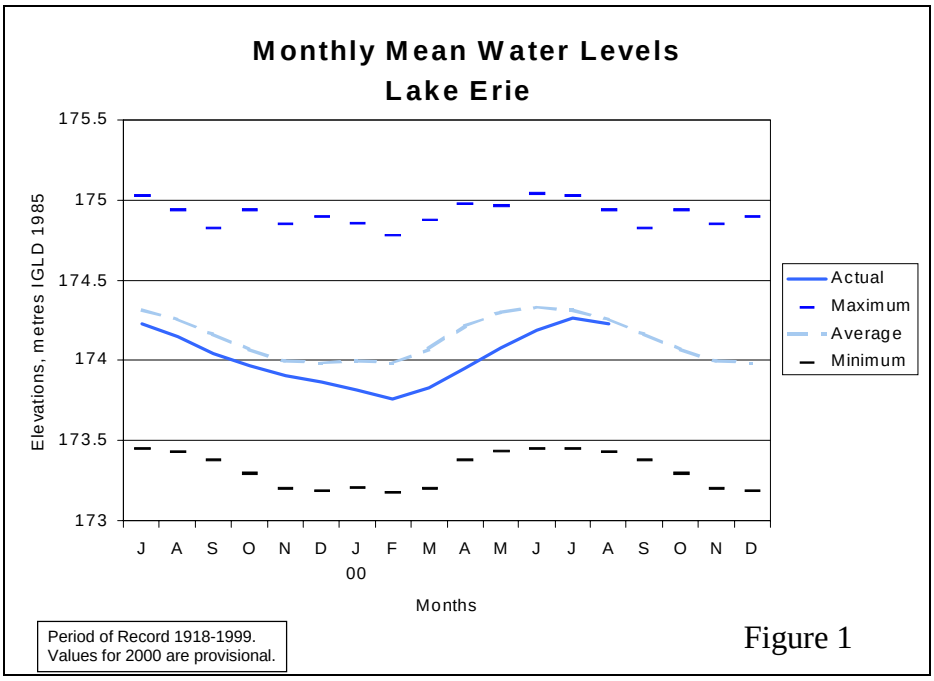


Figure 1

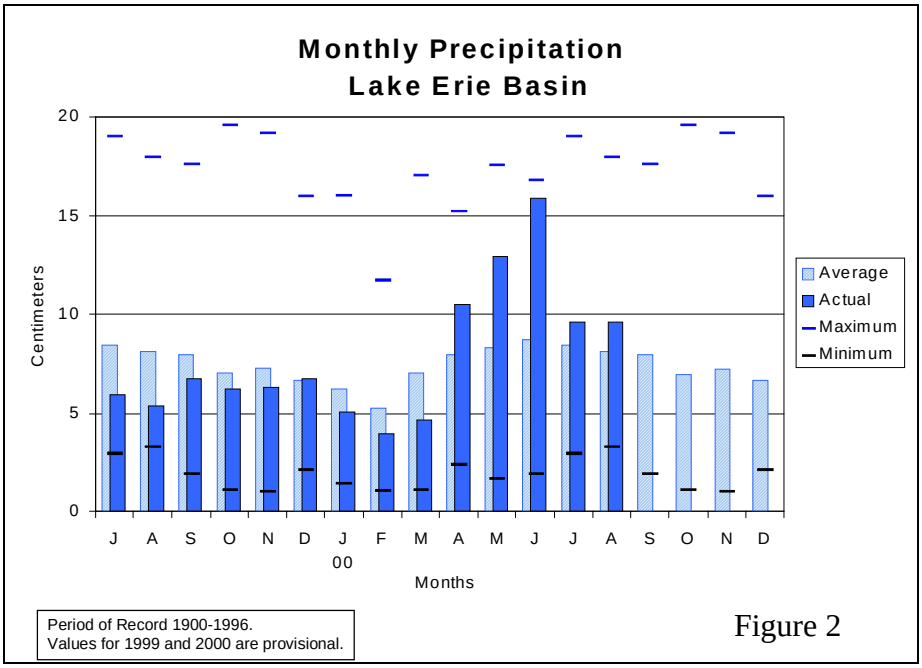


Figure 2

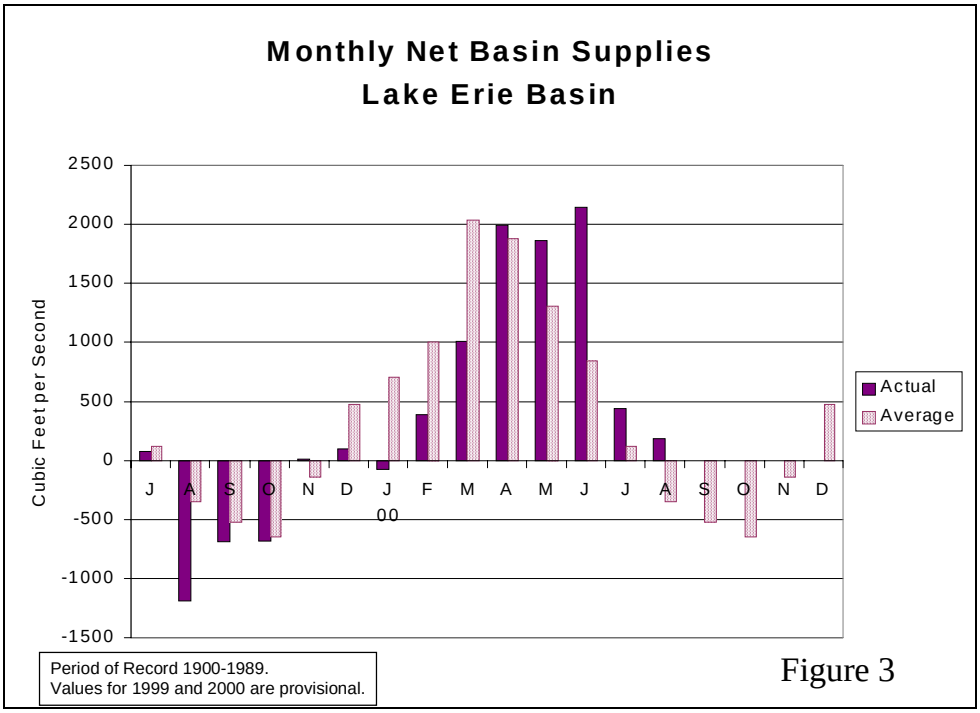


Figure 3

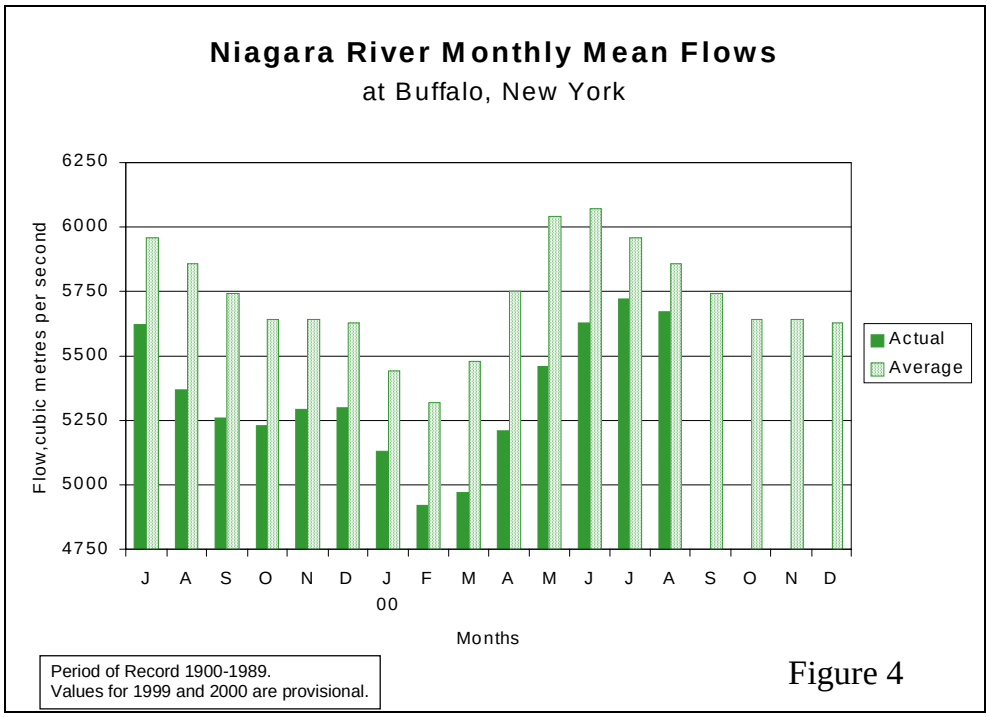


Figure 4

4. OPERATION AND MAINTENANCE OF THE CHIPPAWA-GRASS ISLAND POOL CONTROL STRUCTURE

The water level in the Chippawa-Grass Island Pool is regulated in accordance with the Board's 1993 Directive. The Directive requires that the Power Entities (Ontario Power Generation Inc. (OPG) and the New York Power Authority (NYPA)) operate the Chippawa-Grass Island Pool (Pool) control structure to ensure the maintenance of an operational long-term average pool level of 171.16 metres (561.55 feet) to ameliorate adverse high or low water levels in the pool. The Directive also establishes certain tolerances for the pool's level as measured at the Material Dock gauge. The Power Entities complied with the Board's Directive throughout the reporting period.

The accumulated deviation of the pool's level from March 1, 1973 through August 31, 2000 was 0.77 metre-month (2.53 foot-months) above the long-term average elevation. The maximum permissible accumulated deviation is 0.91 metre-month (3.00 foot-months).

Tolerances for regulation of the Chippawa-Grass Island Pool levels were suspended for 2 days in March to assist control structure operators with ice management in the Pool and for 4 days in May while discharge measurements were conducted at the American Falls Channel.

Recorded daily Material Dock water levels covering the period March through August 2000 are shown in Enclosure 1. The location of the water level gauges on the Niagara River are shown in Enclosure 2.

5. FLOWS OVER NIAGARA FALLS

During the tourist season daylight hours, the required minimum Niagara Falls flow is 2832 cubic metres per second (m^3/s) (100,000 cubic feet per second (cfs)). At night and during the winter months, the required minimum Falls flow is 1416 m^3/s (50,000 cfs). The operation of the Chippawa-Grass Island Pool control structure, in conjunction with power diversion operations, ensures sufficient flow over the Falls to meet the requirements of the Niagara Treaty of 1950.

A series of discharge measurements were conducted at the American Falls Channel Section from May 2 through May 5, 2000. As requested by the Board, gates in the International Niagara Control Works were operated in such a way as to hold the level of the Chippawa-Grass Island Pool, located immediately upstream of the Falls, constant to provide steady flow conditions during the measurements.

The Falls flow fell below the required 2832 (m^3/s) (100,000 cfs) by 139 m^3/s (4,910 cfs) at 1300 Eastern Standard Time on May 2 and by 42 m^3/s (1,480 cfs) at 1100 Eastern Standard Time on May 3, 2000.

Representatives of the International Niagara Board of Control/International Niagara Committee and Ontario Power Generation advised the Maid-of-the-Mist Steamboat Company in advance of the measurement program and communicated with its staff regarding levels in the Maid-of-the-Mist Pool before, during and following the measurements. Although Falls flows were below the minimum Treaty requirement on these two occasions, there were no adverse impacts on the

operations of tour boats. No complaints were received regarding Chippawa-Grass Island Pool levels during the measurement program.

The Governments of Canada and the United States are in agreement that Falls flows below Treaty requirements are acceptable for the purpose of conducting these International Niagara Committee sanctioned flow measurements.

Falls flows met or exceeded minimum Treaty requirements at all other times during the reporting period. The recorded daily flows over Niagara Falls covering the period March through August 2000 are shown in Enclosure 3.

6. DIVERSIONS AND FLOW AT QUEENSTON

Diversion of water from the Niagara River for power purposes is governed by the terms and conditions of the 1950 Niagara Treaty. The Treaty prohibits the diversion of Niagara River water that would reduce the flow over Niagara Falls to below the amounts specified for scenic purposes.

The high head hydro power plants, OPG's Sir Adam Beck 1 and 2 in Canada and NYPA's Niagara Power Project in the United States, withdraw water from the Chippawa-Grass Island Pool and discharge it into the lower Niagara River at Queenston, Ontario and Lewiston, New York, respectively. During the period March through August 2000, diversion flows for the Sir Adam Beck 1 and 2 plants averaged a total of 1581 m^3/s (55,830 cfs) and those by the Niagara Power Project averaged 1676 m^3/s (59,190 cfs).

The low head hydro power plant, Canadian Niagara Power's (CNP) Rankin Plant, diverts water from the Cascades, just upstream of the Horseshoe Falls, and discharges it into the Maid-of-the-Mist Pool. Since the operating efficiency of this older plant is much lower than those of the high head plants, water that is available for power generation is normally dispatched on a priority basis to the high head plants, with the excess being directed to the low head installation. During the period March through August 2000, diversion flow for the CNP Rankin plant averaged 41 m^3/s (1,450 cfs).

Records of Niagara River diversions for power generation covering the period March through August 2000, including Ontario Power Generation's withdrawal from the Welland Ship Canal, are shown in Enclosure 4.

The average flow from Lake Erie to the Welland Canal for the period March through August 2000 was 229 m^3/s (8,090 cfs). Diversion from the canal to Ontario Power Generation's DeCew Generating Stations averaged 175 m^3/s (6,180 cfs) for the same period.

The monthly average Niagara River flows at Queenston, Ontario for the period March through August 2000, were:

March	5090 m^3/s	(179,750 cfs)
April	5297 m^3/s	(187,060 cfs)
May	5497 m^3/s	(194,120 cfs)
June	5643 m^3/s	(199,280 cfs)
July	5725 m^3/s	(202,180 cfs)
August	5653 m^3/s	(199,630 cfs)

During this period, the flow averaged 5484 m^3/s (193,670 cfs). During the period March through August 1999, the average flow was 5682 m^3/s (200,660 cfs) and the monthly averages ranged between 5599 m^3/s (197,730 cfs) and 5879 m^3/s (207,610 cfs).

7. GAUGING STATIONS

The Niagara River gauges used to monitor the Chippawa-Grass Island Pool levels and flows over Niagara Falls are Slater's Point, Material Dock, American Falls and Ashland Avenue
gauges (see Enclosure 2). All gauges required for the operation of the Chippawa-Grass Island Pool control structure were in operation during the reporting period.

Both the U. S. National Oceanic and Atmospheric Administration and the Power Entities operate water level gauges at the Ashland Avenue location. Subject to continuing comparison checks of the water level data from both instruments by the International Niagara Committee (INC), the Power Entities' gauge is used for officially recording water levels used in determining the flows over Niagara Falls. Comparison of water level readings from both gauges showed that they were within acceptable INC tolerances throughout the reporting period.

NYPA is continuing its effort to assess possible measures that might be used to stabilize the riverbank near the Ashland Avenue gauge. Under consideration are alternatives for conducting an underwater survey that is needed to complete an engineering feasibility study. From this study, preliminary designs, material requirements, the construction feasibility, and

costs for several alternatives will be developed. After this preliminary evaluation of possible mitigating measures is completed, NYPA will meet with OPG to discuss the costs and benefits. Based on those discussions, a decision will be made about whether and when any remedial work should be undertaken to ensure the long-term operation of the gauge.

Ontario Power Generation are investigating relocating and upgrading the Ontario Power Generating Station tailwater gauge to increase its reliability during ice conditions. This gauge is used as a back-up to the Ashland Avenue Gauge during ice free conditions and as an indication of flow restriction in the Maid-of-the-Mist Pool caused by ice jamming/shifting.

8. FLOW MEASUREMENTS IN THE NIAGARA RIVER AND WELLAND SHIP CANAL

As part of a regular program to verify stage-discharge relationships used to determine Niagara River flows, measurements were conducted at the head of the river, near the International Railway Bridge, and in the American Falls Channel during this reporting period. All measurements were obtained through joint efforts of the United States Army Corps of Engineers and Environment Canada.

On April 4 through 6, 2000, a series of 150 discharge measurements were made near the International Railway Bridge. Acoustic Doppler Current Profilers (ADCPs) were used for all measurements. Review of these data indicates that they were within field measurement tolerance. A revised stage-discharge relationship for the Buffalo gauges as well as a two-gauge relationship using the Buffalo and Material Dock gauges are being evaluated as part of this program.

A series of measurements were made at the American Falls section during the period May 2 through 5, 2000. Using conventional measurement methodology, a total of 17 measurements were made at this section. The data from this program is still being reviewed and will be used to continue evaluations of the rating of the flow over the American Falls. Ontario Power Generation and the New York Power Authority Power cooperated in maintaining the water level in the Chippawa-Grass Island Pool (CGIP) steady during the measurements.

Discharge measurements are scheduled for the Welland Canal Supply Weir in late February or early March 2000 and for the Cableway Section in April 2000.

9. **POWER PLANTS**

a) New York Power Authority

The upgrade of the Robert Moses Niagara Power Plant (RMNPP) Unit 3 began in November, 1999 and it was returned to service in July, 2000. Index tests of Units 3 and 6 are scheduled to occur in September, 2000. Unit 12 will be the next upgraded, with the schedule calling for an October, 2000 start and completion in June, 2001.

A report on the index tests of Units 1 and 10 was completed and forwarded to the International Niagara Committee in September, 2000.

b) Ontario Power Generation

To date, seven of Sir Adam Beck II Generating Station's 16 units have been rehabilitated (including runner replacement). Upgrade work started on Unit G20 in October, 1999, and was completed in May, 2000. Upgrade to the next unit, G19, began in April, 2000, and is expected to be completed by November, 2000.

The upgrades and expansions by the Power Entities will not affect the regulation of the Chippawa-Grass Island Pool water levels as governed by the International Niagara Board of Control's Directive. In addition, they will not require any modifications to other rules or regulations (such as the 1950 Niagara Treaty) relating to the diversion of water for operation of the projects.

10. ICE CONDITIONS AND ICE BOOM OPERATIONS

As reported in the Board's previous report to the Commission, this past winter's installation of the Lake Erie-Niagara River Ice Boom began on December 19, 1999 and was completed on December 29, 1999.

The October, 1999 change in the Commission's Order of Approval providing that installation may begin on December 16, regardless of Lake Erie water temperature, was exercised making it much easier to plan the installation and reduce safety risks.

Even though ice did not form on eastern Lake Erie until the middle of January, very little damage to the steel pontoons occurred from the open water conditions. There were no lake ice runs despite several winter storms with associated high winds from the southwest. The steel pontoon spans performed as

intended, minimizing the amount of lake ice entering the Niagara River through increased resistance to ice overtopping.

Record warm air temperatures in the Buffalo area at the end of February hastened the reduction of the ice cover on the eastern basin of Lake Erie. At the end of January it was 3570 square kilometres (1,380 square miles), by February 22 it was 2850 square kilometres (1,100 square miles) and on March 3 it had diminished to 1185 square kilometres (460 square miles). Ice cover on March 9 was 360 square kilometres (140 square miles) and by March 21 was 160 square kilometres (60 square miles).

Opening of the boom began on March 23 and was completed the next day. Following the opening of the boom, some rotten lake ice entered the river. This moved downstream through the Chippawa-Grass Island Pool, over Niagara Falls and onwards down river after passing through the Maid-of-the-Mist Pool. No operational problems were experienced. All of the boom's 22 spans were removed to the on-shore storage area by March 27.

11. **PEACE BRIDGE**

On April 30, 1999, the International Joint Commission issued an Order of Approval to the Buffalo and Fort Erie Public Bridge Authority (PBA) for construction of a second span over the Niagara River between Buffalo, New York and Fort Erie, Ontario. Since then, local issues regarding the new bridge design and the review process have arisen that are delaying the start of construction.

The Commission issued a Supplementary Order December 28, 1999 extending the time frame for construction by one year.

In April, 2000, a New York State Supreme Court justice ruled that the PBA must complete a non-segmented environmental review to assess the impact of both a new bridge and the U.S. plaza that processes incoming traffic. The PBA has filed a notice of appeal. It is unlikely that condition 8 of the IJC's Order of Approval (modified by the Supplementary Order) will be met. Namely that "Construction affecting water levels and flows shall begin no later than December 31, 2000 and conclude by December 31, 2004. However, gauges to monitor the project's potential impacts on water levels continue to operate.

12. **STRAWBERRY ISLAND**

New York State has undertaken a further phase of restoration work on Strawberry Island, a small island located in the upper Niagara River between the International Railway Bridge and the southern tip of Grand Island, New York. This phase involves placement of breakwalls at the downstream portion of the existing island. Areas inside the breakwalls will be filled with material removed from the Buckhorn Marsh at the northern end of Grand Island.

Neither the U.S. Department of State nor the Canadian Department of Foreign Affairs and International Trade have any objections to the project.

13. MEETING WITH THE PUBLIC

In accordance with the Commission's requirements, the Board conducted an annual meeting with the public. The session was held in Niagara Falls, New York on September 12, 2000. A total of 5 members of the public were in attendance. Those present received information on the Board's membership, duties, Great Lakes water levels and the Lake-Erie Niagara River Ice Boom. The Board appreciates Commission participation in its meeting with the public.

14. MEMBERSHIP OF THE BOARD

Colonel James R. Hougnon, Alternate U.S. Chair, retired from the U.S. Army and resigned from the Board, effective June 1, 2000. On June 5, the Commission appointed Colonel Mark A. Roncoli as the Alternate Chair of the U.S. Section of the Board.

Lieutenant Colonel Glen R. DeWillie assumed command of the Buffalo District of the United States Army Corps of Engineers on July 14, 2000 and replaces Lieutenant Colonel Mark D. Feierstein as chairman of the United States Section of the International Niagara Working Committee. LTC Feierstein has been assigned to the Pentagon in Washington, D.C.

The remaining membership of the Board and its International Niagara Working Committee is unchanged.

15. **ATTENDANCE AT BOARD MEETINGS**

The Board met once during this reporting period on September 12, 2000 in Niagara Falls, New York. Mr. Tjoumas, member of the U.S. Section was also unable_to_attend.

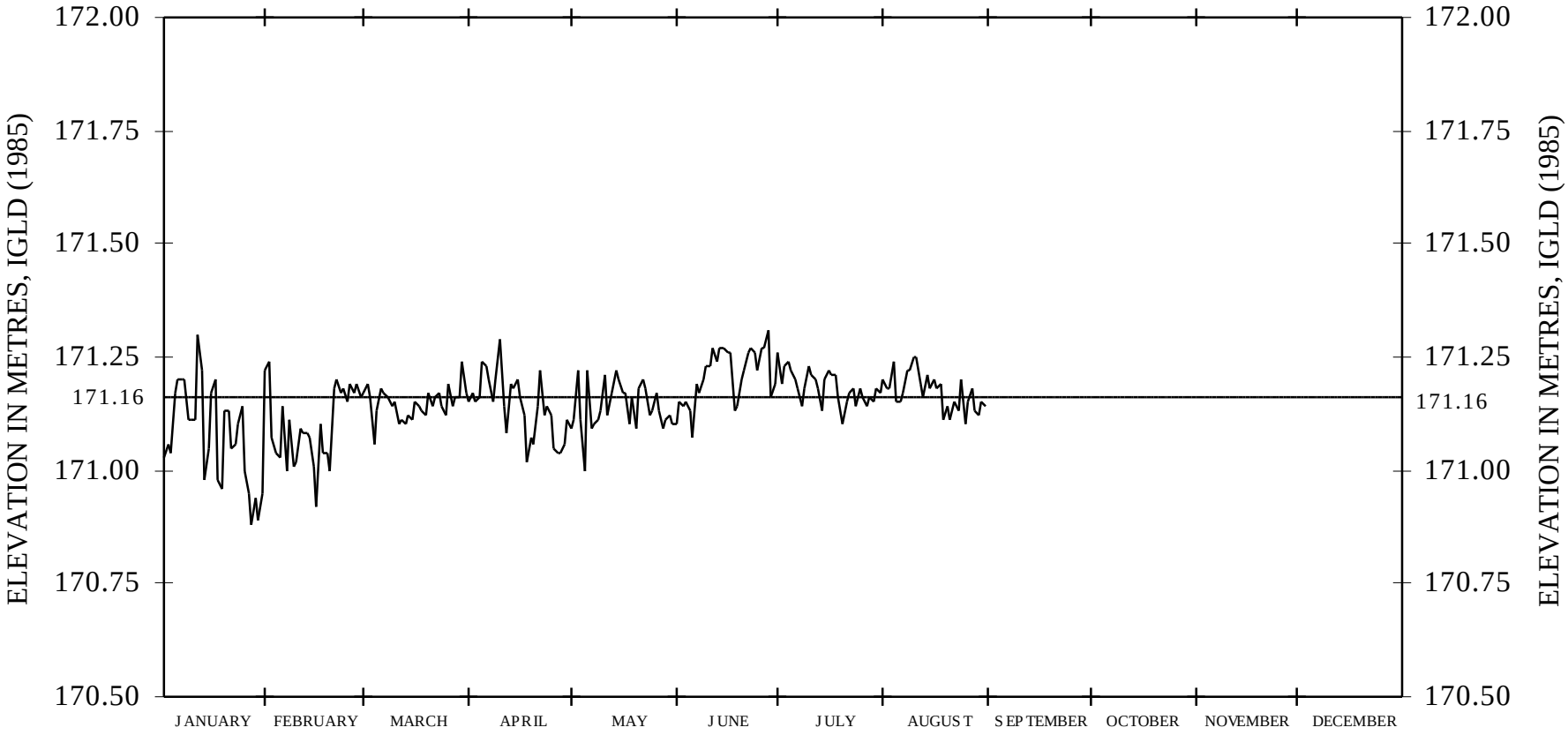
Respectfully Submitted,

DOUG CUTHBERT Chair, Canadian Section	BRIGADIER GENERAL ROBERT H. GRIFFIN Chair, United States Section
ROBERT B. CHANG Member, Canadian Section	CONSTANTINE G. TJOUMAS Member, United States Section

NIAGARA RIVER DAILY MEAN LEVEL AT MATERIAL DOCK GAUGE

NOTE: LONG-TERM MEAN STAGE = 171.16 METRES, IGLD (1985)

2000



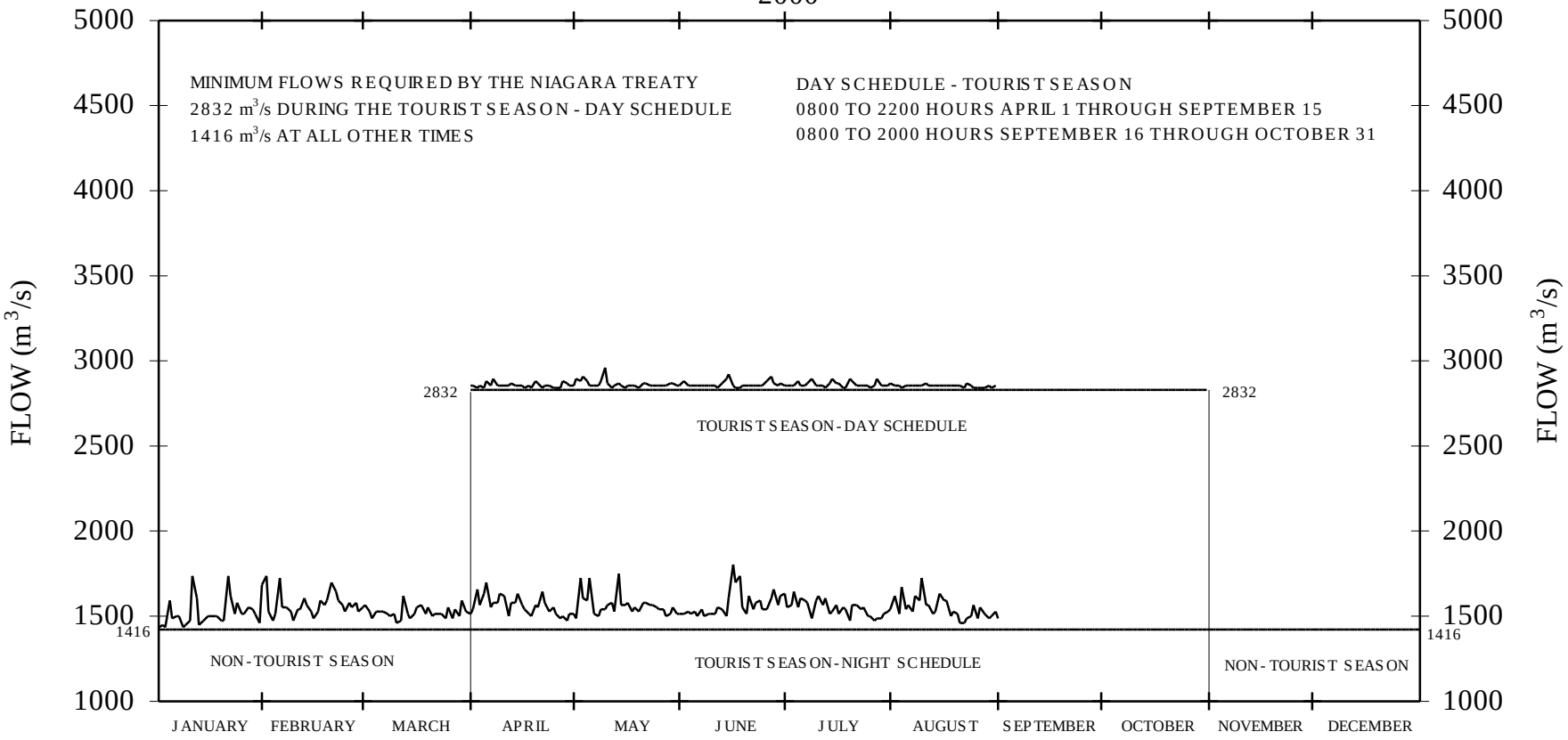
ENCLOSURE 1

DAILY FLOW OVER NIAGARA FALLS

FLOW AT ASHLAND AVENUE GAGE MINUS CN AND OP DIVERSIONS

IN CUBIC METRES PER SECOND (m^3/s)

2000

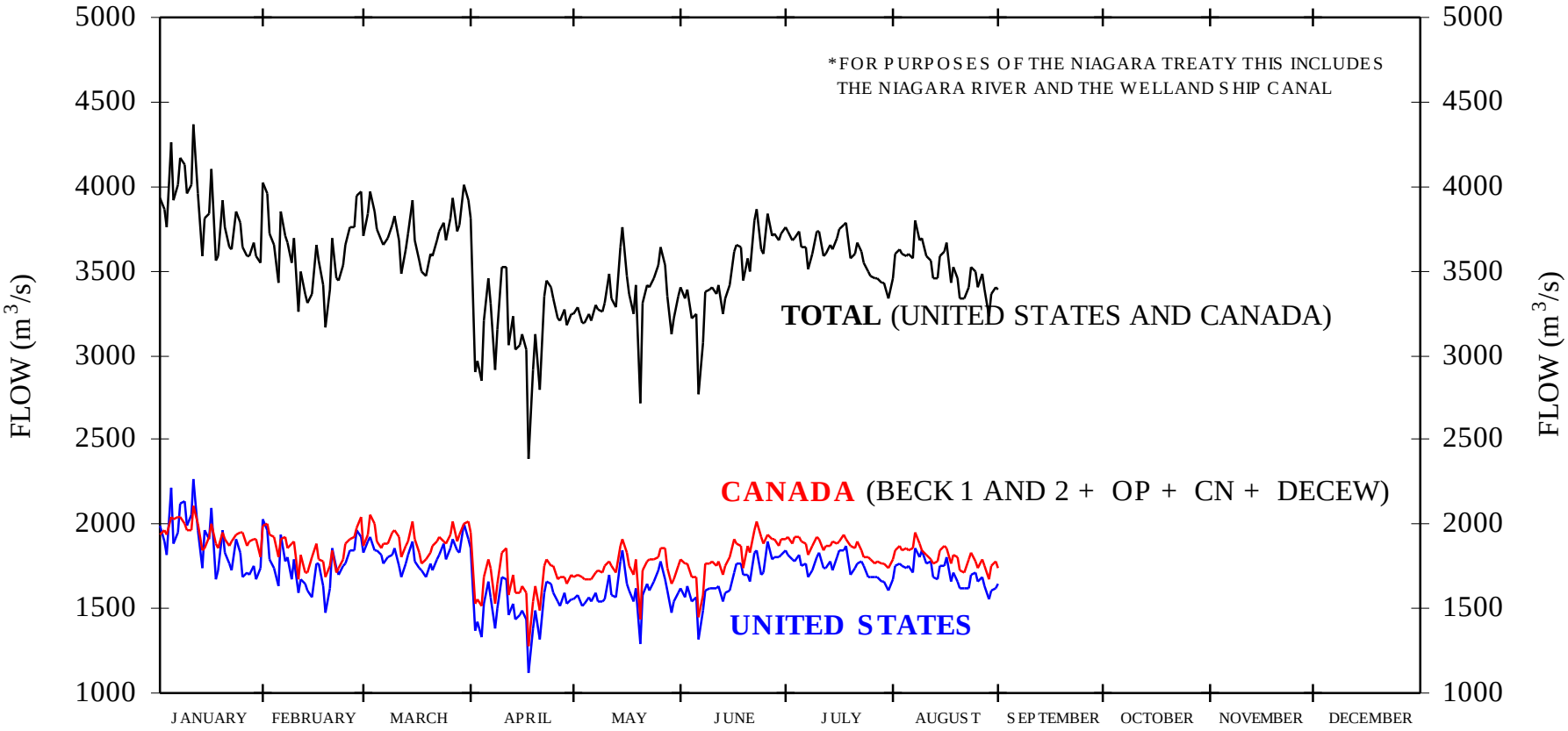


ENCLOSURE 3

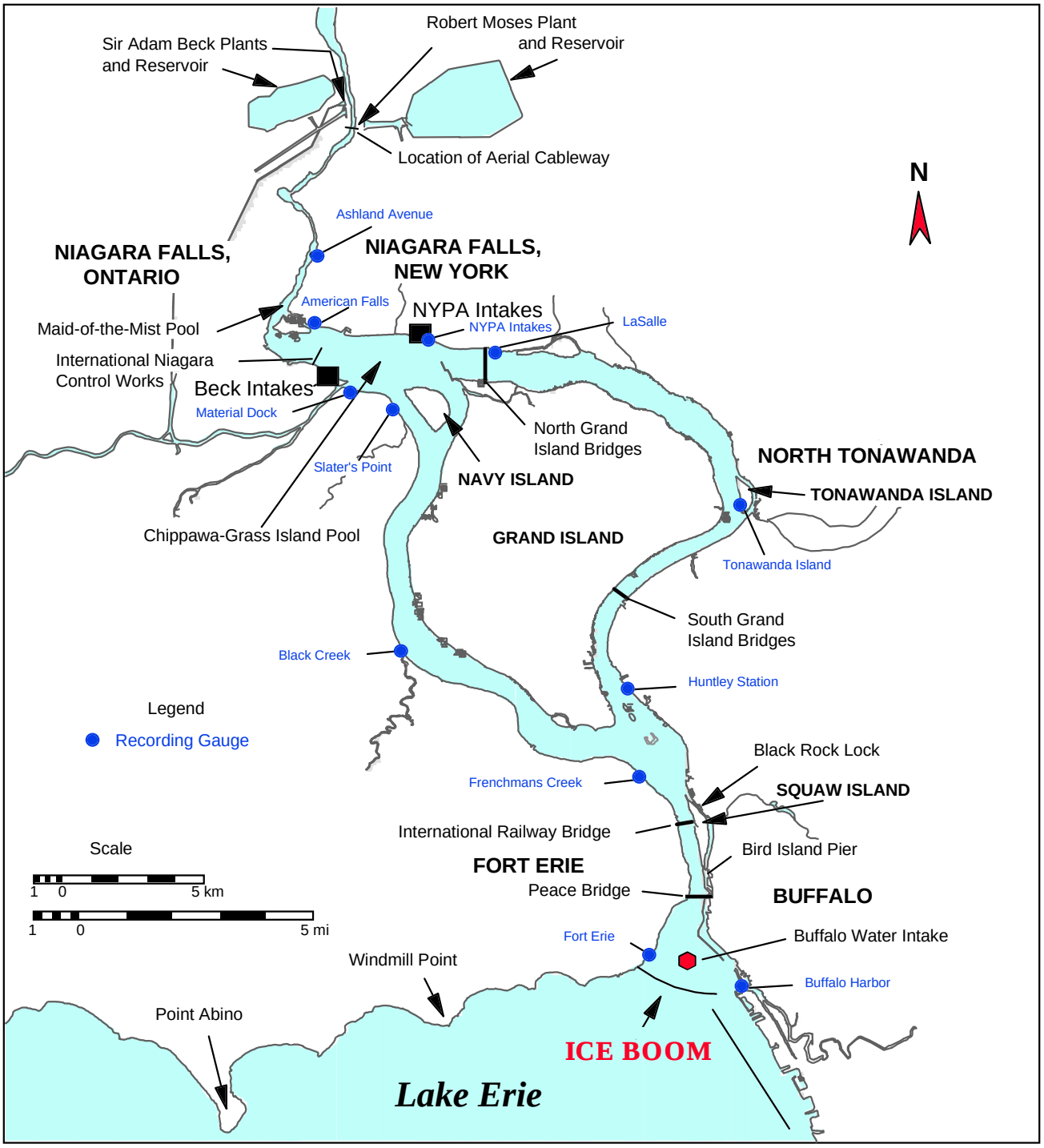
DAILY DIVERSIONS OF NIAGARA RIVER WATER* FOR POWER PURPOSES

IN CUBIC METRES PER SECOND (m^3/s)

2000



ENCLOSURE 4



MAP OF UPPER NIAGARA RIVER

ENCLOSURE 2