# International Niagara Board of Control
# One Hundred Sixth Semi-Annual Progress Report
# to the
# International Joint Commission

**ONTARIO POWER GENERATION TUNNEL PROJECT UNDERWAY**

**Covering the Period September 22, 2005 through March 28, 2006**

# EXECUTIVE SUMMARY

During the months of September 2005 through January 2006, the level of Lake Erie was below its long-term average. In February, the level rose to slightly above average. This unseasonable rise in level was the result of warm temperatures in January, which brought rain and caused the existing snow pack to melt and run off (Section 2). Precipitation on the Lake Erie basin was about 3% above average for the period.

The level of the Chippawa-Grass Island Pool was regulated in accordance with the International Niagara Board of Control's 1993 Directive (Section 3). An upgrade of the International Niagara Control Works' station service began in mid-October and was completed on December 17.

A series of discharge measurements, part of the on-going program to verify the gauge ratings used to determine flows, are scheduled for 2006 at the International Railway Bridge, Cableway and American Falls sections (Section 7).

The New York Power Authority (NYPA) is nearing completion of its generator upgrade program at the Robert Moses Niagara Power Project. In early December, New York's Governor George Pataki announced that NYPA, the City of Buffalo and Erie County had reached a settlement agreement whereby NYPA would provide an estimated $280 million in funding for vital economic and environmental projects in the region over the term of the 50-year license.

Ontario Power Generation (OPG) continues with preparations to begin boring the new Niagara Tunnel. Work commenced last fall at the outlet area where tunneling is scheduled to begin in September 2006 (Section 8).

The Lake Erie-Niagara River Ice Boom spans were installed on December 14th and 15$^{th}$ and removed on March 20 and 21 (Section 9).

The Board will hold a meeting with the public on October 3, 2006 in Niagara Falls, New York (Section 10).

Mr. Anton J. Sidoti, a long-standing member of the Board's Working Committee, passed away on February 8, 2006.

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**COVER:** Ontario Power Generation photograph of blasting at the Sir Adam Beck complex. This area is being prepared for assembly of the tunnel boring machine (TBM) that will begin tunnelling in September.

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**ENCLOSURES**



**INTERNET SITES**

International Joint Commission
www.ijc.org

International Niagara Board of Control
www.ijc.org/conseil_board/niagara/en/niagara_home_accueil.htm
www.ijc.org/conseil_board/niagara/fr/niagara_home_accueil.htm

Lake Erie-Niagara River Ice Boom
www.iceboom.nypa.gov

# INTERNATIONAL NIAGARA BOARD OF CONTROL

Chicago, Illinois
Burlington, Ontario

March 28, 2006

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

Commissioners:

## 1. GENERAL

The International Niagara Board of Control (Board) submits its One Hundred Sixth Semi-Annual Progress Report, covering the period September 22, 2005 through March 28, 2006.

## 2. LAKE LEVELS

All elevations in this report are referenced to International Great Lakes Datum 1985 (IGLD 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.

During the months of September 2005 through January 2006, the level of Lake Erie was below its long-term average. The level of the lake started the period 8 centimetres (3.1 inches) below average. It reached its seasonal low in December with a mean of 173.86 metres (570.41 feet), which was 13 centimetres (5.1 inches) below average. In February, the level was at 174.07 metres (571.10 feet). This is 9 centimetres (3.5 inches) above average. This unseasonable rise in level was the result of warm temperatures in January,

which brought rain and caused the existing snow pack to melt and run off. Recorded water level data for the period September 2005 through February 2006 and departures from long-term averages are shown in Table 1 and depicted graphically on Figure 1.

The Lake Erie basin received approximately 41.3 centimetres (16.3 inches) of precipitation during the period September 2005 through February 2006. This is about 3% above average for the period. An unseasonably cold November and December were followed by a mild January. Ice and snow of late 2005 were essentially dissipated by warm temperatures and rain in January. February precipitation fluctuated between snow and rain, and no significant snow cover was established. Recent precipitation data and departures from long-term averages are shown in Table 2 and depicted graphically on Figure 2.

Lakes Michigan and Huron remained well below their long-term average levels during this period. As a result, inflow to Lake Erie from the upstream lakes continued generally to be lower than average. In January and February, the lack of a significant ice cover on Lake St. Clair and the Detroit River essentially eliminated the retardation of flow that normally occurs at that time of year. As a result, the Detroit River flow into Lake Erie was above average in January and February, despite low levels on the upper lakes. Overall, inflow from the upper lakes for the six-month period September 2005 through February 2006 was about 6% below the long-term average, but from September to December, it was 9% below average, and from January through February, it averaged 3% above average.

Water supplied to Lake Erie from its local drainage basin during the reporting period (shown in Figure 3) was often just as dependent on the temperature as it was on precipitation. Cold temperatures in November and December caused significant portions of the precipitation received those months to be stored on the basin as snow and ice. The above average supply in January and February reflect the melting of this snow as a result of unseasonably warm temperatures. This early thaw showed up as an early “spring” rise in the water level of the lake.

The water level on Lake Erie naturally affects the flow in the Niagara River, as does the amount of flow retardation in the river due to ice and weeds. The below average level of the lake from September through December kept the flow in the Niagara River below average. In January and February, above average water levels on Lake Erie and below average ice cover on the river combined to allow higher than average flows for those months. The flow in the Niagara River is graphically depicted in Figure 4 and summarized in Section 6.

The March 2006 water level forecast indicates that the level of Lake Erie is expected to be near 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* 2005-06 | Average 1918-2005** | Departure | Recorded* 2005-06 | Average 1918-2005** | Departure |
| September | 174.08 | 174.16 | -0.08 | 571.13 | 571.39 | -0.26 |
| October | 174.01 | 174.06 | -0.05 | 570.90 | 571.06 | -0.16 |
| November | 173.89 | 173.99 | -0.10 | 570.51 | 570.83 | -0.32 |
| December | 173.86 | 173.99 | -0.13 | 570.41 | 570.83 | -0.42 |
| January | 173.98 | 173.99 | -0.01 | 570.80 | 570.83 | -0.03 |
| February | 174.07 | 173.98 | 0.09 | 571.10 | 570.80 | 0.30 |

*Provisional **Period of record is 1918-2005

**TABLE 2 - MONTHLY AVERAGE PRECIPITATION ON THE LAKE ERIE BASIN**

| | Centimetres | | | Inches | | | |
|---|---|---|---|---|---|---|---|
| Month | Recorded* 2005-06 | Average 1900-99+ | Departure | Recorded* 2005-06 | Average 1900-99+ | Departure | Departure in percent |
| September | 8.26 | 8.00 | 0.26 | 3.25 | 3.15 | 0.10 | 3 |
| October | 3.07 | 6.96 | -3.89 | 1.21 | 2.74 | -1.53 | -56 |
| November | 10.74 | 7.19 | 3.55 | 4.23 | 2.83 | 1.40 | 49 |
| December | 5.51 | 6.60 | -1.09 | 2.17 | 2.60 | -0.43 | -17 |
| January | 7.37 | 6.27 | 1.10 | 2.90 | 2.47 | 0.43 | 17 |
| February | 6.35 | 5.26 | 1.09 | 2.50 | 2.07 | 0.43 | 21 |

*Provisional +Most recent period of record is 1900-99

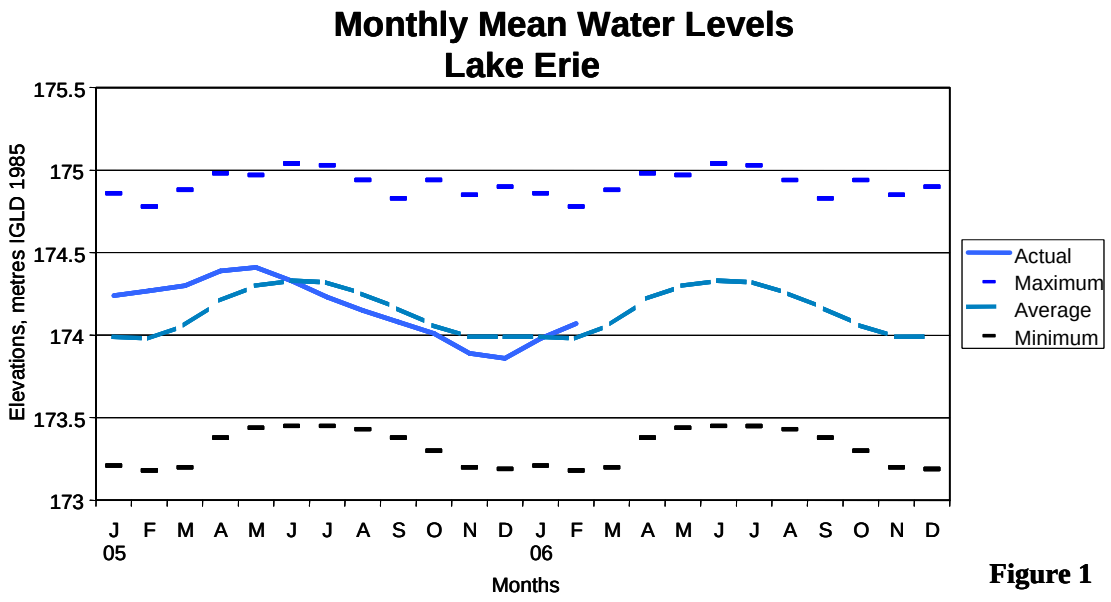



**Figure 1**

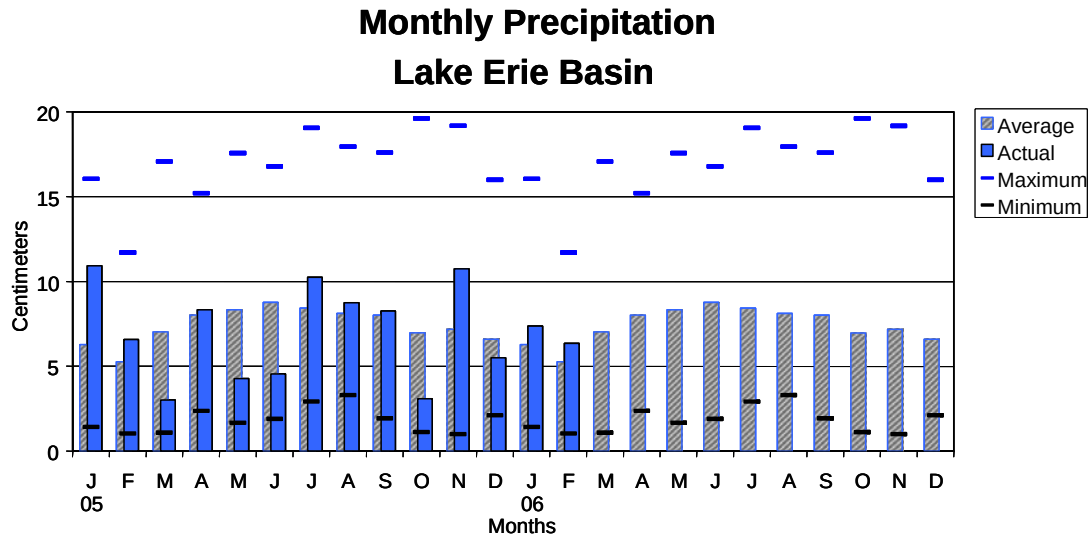



**Figure 2**

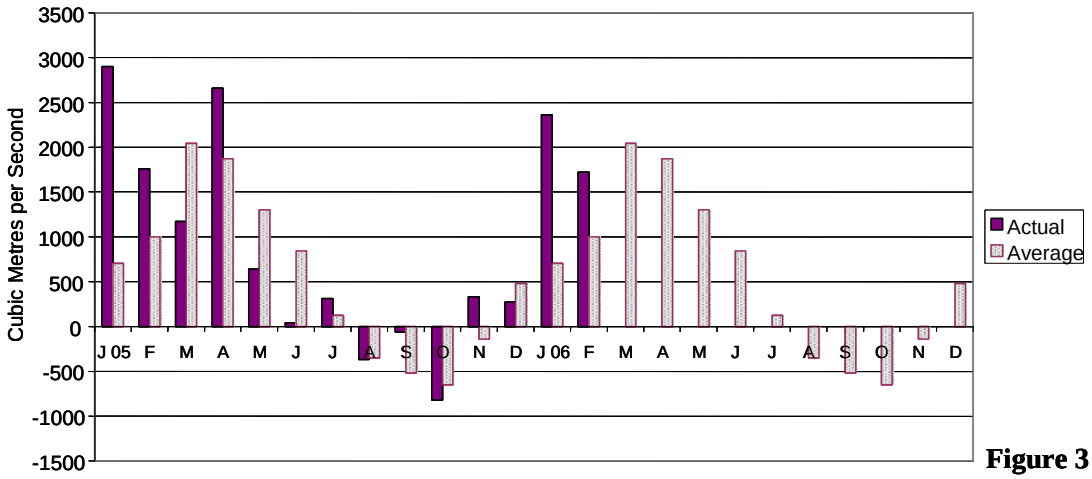



**Figure 3**

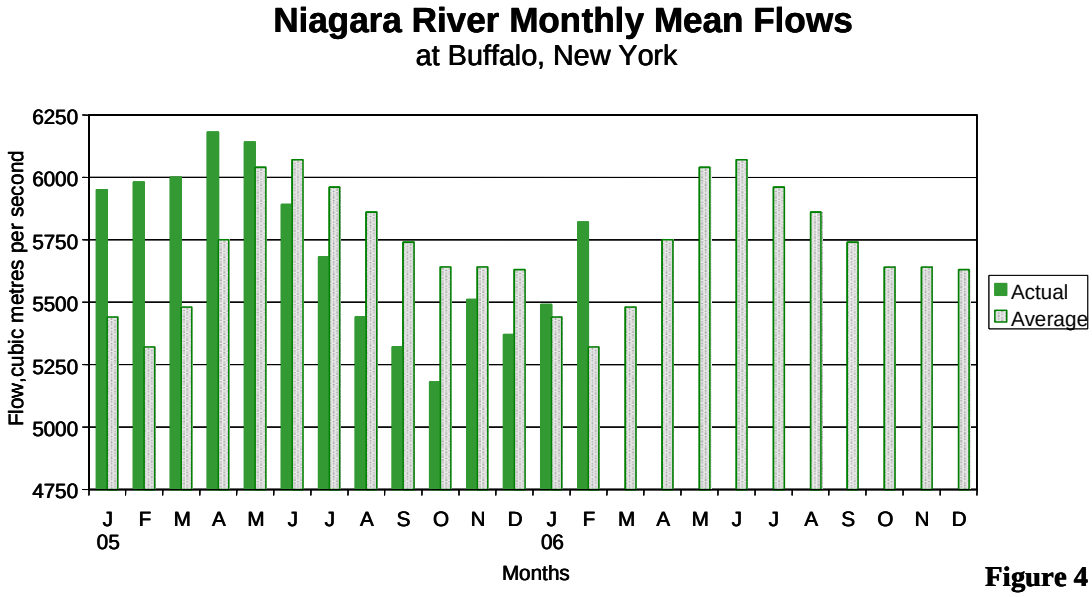



**Figure 4**

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

The water level in the Chippawa-Grass Island Pool (Pool) is regulated in accordance with the Board's 1993 Directive. The Directive requires that the Power Entities, Ontario Power Generation (OPG) and the New York Power Authority (NYPA), operate the Chippawa-Grass Island 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 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 February 28, 2006 was 0.38 metre-month (1.25 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 Pool level were suspended for November 6 and 7 as well as January 18 and 19 and February 17 as the result of abnormally high flows. Tolerances were also suspended for February 19 through 22, 27, March 4, 5 and 15 through 17 as the result of ice conditions.

The locations of the water level gauges on the Niagara River are shown in Enclosure 1. Recorded daily Material Dock water levels covering the period September 2005 through February 2006 are shown in Enclosure 2.

An upgrade of the International Niagara Control Works' station service, originally described in the Board's 102nd report, began in mid-October and was completed on December 17. This included installation of new transformers, switchgear and cables.

## 4. 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.

Falls flow met or exceeded minimum Treaty requirements at all times during the reporting period. The recorded daily flow over Niagara Falls, covering the period September 2005 through February 2006, is shown in Enclosure 3.

## 5. 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 above Niagara Falls and discharge it into the lower Niagara River at Queenston, Ontario and Lewiston, New York, respectively.

During the period September 2005 through February 2006, diversion for the Sir Adam Beck 1 and 2 plants averaged 1648 $m^3/s$ (58,200 cfs) and diversion to the Robert Moses Niagara Power Project averaged 1959 $m^3/s$ (69,180 cfs).

The low head generating station, Fortis Ontario's Rankine Plant, ceased operation at the end of 2005. The plant diverted water from the Cascades, just upstream of the Horseshoe Falls, and discharged it into the Maid-of-the-Mist Pool. Since the operating efficiency of this older plant was much lower than those of the high head plants, water that was available for power generation was normally dispatched on a priority basis to the high head plants, with the excess being directed to the low head installation. During the period September through December, diversion flow for the Rankine plant averaged 1 $m^3/s$ (40 cfs).

The average flow from Lake Erie to the Welland Canal for the period September 2005 through February 2006 was 171 $m^3/s$ (6,040 cfs) as compared to 210 $m^3/s$ (7,420 cfs) for the same period one year ago. Diversion from the canal to OPG's DeCew Generating Stations averaged 131 $m^3/s$ (4,630 cfs) for the period September 2005 through February 2006.

Records of diversions for power generation covering the period September 2005 through February 2006 are shown in Enclosure 4.

The monthly average Niagara River flows at Queenston, Ontario for the period September 2005 through February 2006 and departures from long-term averages are shown in Table 3. Maximum and minimum monthly average flows for the months of September through February are shown in Table 4.

TABLE 3 - MONTHLY NIAGARA RIVER FLOWS AT QUEENSTON

| Month | Cubic Metres per Second | | | Cubic Feet per Second | | |
|---|---|---|---|---|---|---|
| | Recorded 2005-06 | Average 1860-2005 | Departure | Recorded 2005-06 | Average 1860-2005 | Departure |
| September | 5297 | 5849 | -552 | 187060 | 206550 | -19490 |
| October | 5174 | 5756 | -582 | 182720 | 203270 | -20550 |
| November | 5538 | 5768 | -230 | 195570 | 203690 | -8120 |
| December | 5415 | 5789 | -374 | 191230 | 204440 | -13210 |
| January | 5536 | 5625 | -89 | 195500 | 198640 | -3140 |
| February | 5840 | 5492 | 348 | 206240 | 193950 | 12290 |
| Average | 5467 | 5713 | -247 | 193060 | 201760 | -8700 |

TABLE 4 - MONTHLY MAXIMUM AND MINIMUM NIAGARA RIVER FLOWS AT QUEENSTON

| Month | Cubic Metres per Second | | | | Cubic Feet per Second | |
|---|---|---|---|---|---|---|
| | Maximum | Year | Minimum | Year | Maximum | Minimum |
| September | 6880 | 1986 | 4340 | 1934 | 242960 | 153260 |
| October | 7220 | 1986 | 4320 | 1934 | 254970 | 152560 |
| November | 7030 | 1986 | 4190 | 1934 | 248260 | 147970 |
| December | 7410 | 1985 | 4270 | 1964 | 261680 | 150790 |
| January | 7240 | 1987 | 3960 | 1964 | 255680 | 139850 |
| February | 6900 | 1987 | 3320 | 1936 | 243670 | 117240 |

During this period, the flow at Queenston averaged 5467 $m^3/s$ (193,060 cfs). One year ago, flows averaged 5771 $m^3/s$ (203,800 cfs) for the period September 2004 through February 2005 with the monthly averages ranging between 5565 $m^3/s$ (196,520 cfs) and 6036 $m^3/s$ (213,160 cfs).

## 6. GAUGING STATIONS

The Niagara River gauges used to monitor the Chippawa-Grass Island Pool levels and the flow over Niagara Falls are the Slater's Point, Material Dock, American Falls and Ashland Avenue gauges (see Enclosure 1). 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 (NOAA) 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. With one exception, comparison of water level readings from both gauges showed that they were within acceptable INC tolerances throughout the reporting period. For a few hours on November 1, the Power Entities' entries into the water record accounting for the Ashland elevation were adversely affected by a temporary power supply in use during the upgrade program for the International Niagara Control Works' station service. NOAA data was used instead.

## 7. FLOW MEASUREMENTS IN THE NIAGARA RIVER AND WELLAND SHIP CANAL

Discharge measurements are regularly scheduled in the Niagara River and Welland Canal as part of a program to verify the gauge ratings used to determine flows in these channels for water management purposes. All measurements will be obtained through joint efforts of the United States Army Corps of Engineers and Environment Canada. Measurement programs require boat, equipment and personnel from both agencies to ensure safety, quality assurance checks between equipment and methods, and binational

acceptance of the data collected. The present schedule calls for Acoustic Doppler Current Profiler (ADCP) measurements at the following locations:

International Railway Bridge: These measurements are scheduled for spring 2006, in accordance with the 3-year cycle. Measurements are taken at the International Railway Bridge to provide information for evaluating stage-discharge relationships for flow entering the Niagara River from Lake Erie.

Cableway: These measurements, for verification of the Ashland Avenue rating equation, are scheduled for spring 2006. This is outside of the normal 3-year cycle. More detailed analysis of measurements taken in 2001 and 2004 is ongoing. This additional set of ADCP data will help in the process of investigating a revision to the current rating. Along with recommendations on rating curve updates, the spring 2006 measurements will be used to document a change to boat mounted hydroacoustic methods. If sufficient data supports this change from conventional measurements using the aerial cablecar, efforts will be started to decommission the cable and cablecar.

American Falls: The American Falls Section is measured to verify the rating used to determine the amount of flow in the American Falls Channel and to demonstrate that a dependable and adequate flow of water is maintained over the American Falls and in the vicinity of Three Sisters Islands. Since American Falls flow is directly related to the operation of the Chippawa-Grass Island Pool, the Board monitors this relationship. The American Falls Section was scheduled for measurement in 2005, following the 5-year cycle for this location. The prospect of continuing to conduct conventional measurements from the pedestrian bridges crossing the channel has been made difficult. This is due to measures taken by the State Park to ensure public safety while plans for replacing the bridges are formulated. Plans are to utilize new technology in the form of an ADCP mounted on a remote controlled tethered boat, at a location upstream of the bridge, nearer to the American Falls gauge. Measurements using this new hydroacoustic method will be compared with data previously acquired using conventional methods. This process will be

started in the fall of 2006 and may require additional measurements outside of the 5-year cycle.

If the new remote controlled tethered boat is not available this Fall, conventional measurements will be conducted from the bridges and ensure deviations from the schedule are minimized. Data from the May 2000 measurements were in general slightly higher than the 1978 rating. This continues to reflect a trend in the measurements since 1984. This may be due to the rating previously being derived with measurements affected by weed retardation, while subsequent measurements were taken during weed free months. A change in the measurement schedule from 2005 to 2006 is therefore not expected to have any impacts. The rating was recommended for future review. Based on pending changes in methodology and section location, the equation could be revised after sufficient data is collected.

Welland Canal: These measurements are scheduled for 2007, in accordance with the 3-year cycle.

## 8. **POWER PLANTS**

a) New York Power Authority

Twelve of the thirteen generating units at the Robert Moses Niagara Power Plant have been upgraded. Upgrade of Unit 9 was completed in December 2005 and Unit 8 is scheduled for completion in December 2006, concluding the upgrade program which will increase generating capacity by 325 megawatts. Testing to verify performance and finalize water use determination will follow.

The New York Power Authority is proceeding with the re-licensing process for the Robert Moses Niagara Power Project. The current license expires August 31, 2007. The process is following the U. S. Federal Energy Regulatory Commission's (FERC)

Alternative Licensing Procedures (ALP). The New York Power Authority's application was submitted to the Federal Energy Regulatory Commission on August 18, 2005. A Niagara re-licensing website continues to be updated with all pertinent information including correspondence and comments received from stakeholders, meetings, etc. The website is: http://niagara.nypa.gov

In early December, New York's Governor George Pataki announced that NYPA, the City of Buffalo and Erie County had reached agreement whereby NYPA would provide an estimated $280 million in funding for vital economic and environmental projects in the region over the term of the 50-year license.

b) Ontario Power Generation

Ontario Power Generation continues with preparations to begin boring the new 10.4 kilometre (6.5 mile) long Niagara Tunnel. Work commenced last fall in the outlet area where tunneling will begin. Actual tunneling, using one of the largest tunnel boring machines in the world, is expected to begin this September. Site preparation for the staging area for construction of the tunnel intake at the International Niagara Control Works is also proceeding.

Additional power generation from the increased diversion of water is expected to commence in late 2009.

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.

## 9. ICE CONDITIONS AND ICE BOOM OPERATIONS

In accordance with Condition (d) of the Commission's October 5, 1999 supplementary Order of Approval, installation of the Lake Erie-Niagara River Ice Boom's spans commenced on December 14, 2005. The water temperature at Buffalo reached 4 degrees Celsius ($^{o}$C) (39 degrees Fahrenheit ($^{o}$F)) on December 9. Installation may begin when the Lake Erie water temperature at Buffalo reaches 4$^{o}$C (39$^{o}$F) or on December 16th, whichever occurs first.

Preparations for span placement began on December 5 when seven floatation barrels were installed. The remaining 16 barrels were installed on December 8. Removal of the strings of pontoons from the summer storage area and their placement inside the Buffalo Harbor breakwall was completed during the morning of December 14.

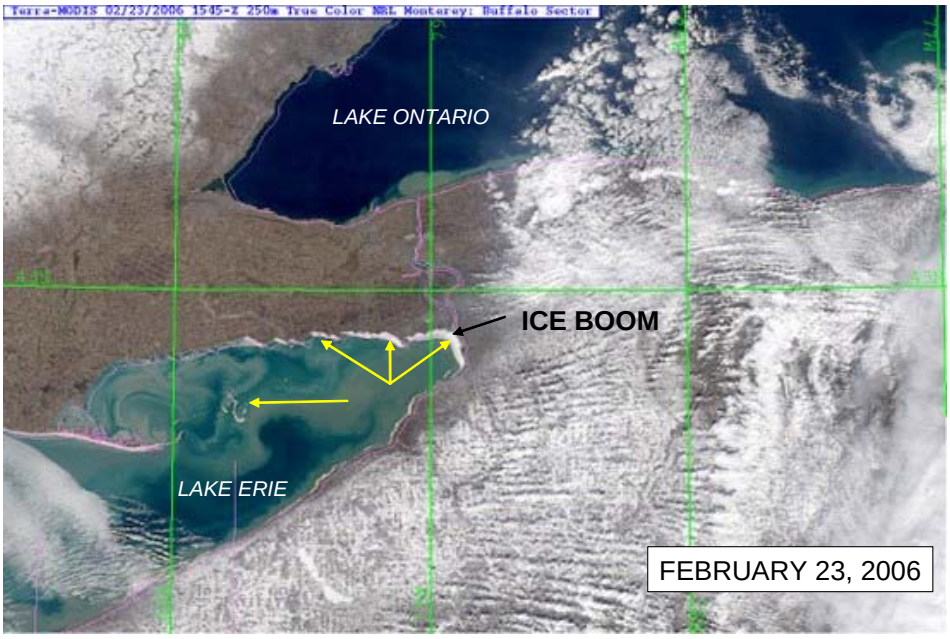
Installation of the ice boom's spans began on December 14 when 12 spans were placed starting from the Canadian side. The remaining 10 spans, continuing on towards the US shore, were installed the next day.

The five months prior to December had above average air temperatures at Buffalo. Although December was slightly colder than normal, January was the warmest in 56 years. The mild trend continued into February, resulting in the Lake Erie water temperature at Buffalo remaining above freezing and virtually no ice cover forming on the Lake.

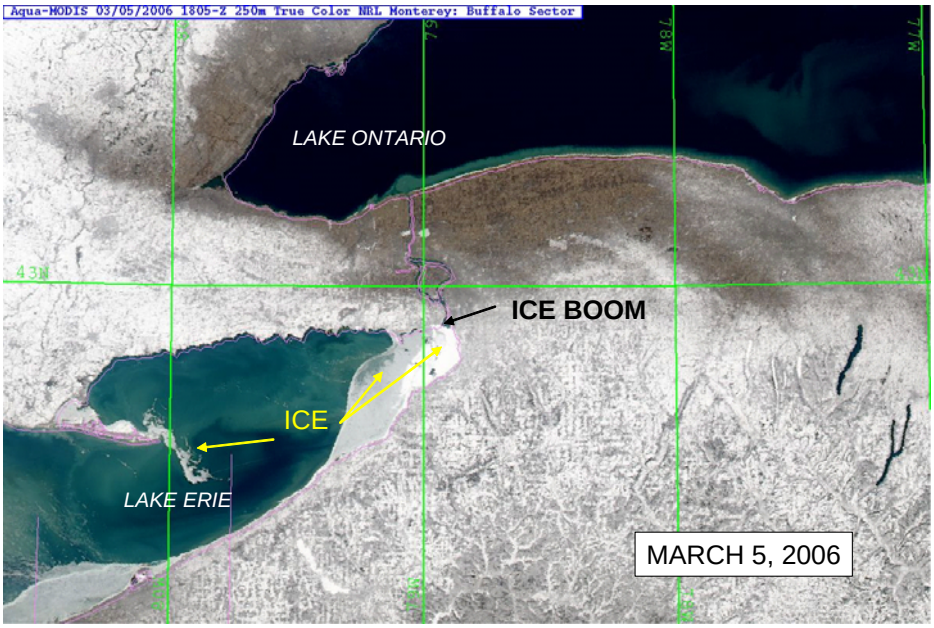
Two major windstorms were experienced in the Buffalo area in February. With no ice cover formed, the exposed spans of the ice boom suffered some damage from wind driven waves. Span E was observed on February 8 to be broken and was replaced on February 10 by the NYPA crew. Ends of pontoons adjacent to the broken span were badly dented indicating collisions with one another from strong wave action in the open water condition. On February 13, it was noted that span F was broken. It was replaced with a spare span on February 16.

The stresses exerted on the boom during storm events in both open water and ice conditions have resulted in some broken spans or trailing pontoons at various times throughout the boom's history. Occasional broken spans throughout the year are not unusual and do not adversely affect the function of the ice boom. They are normally replaced or repaired when the storm subsides.

Ice began forming behind the ice boom and in the bays along the north shore of eastern Lake Erie around the third week of the month as seen in this NEXSAT image.



A break in span M, closest to the middle of the ice boom, was observed by the NPYA crew on March 1. They completed a splice repair on March 2. By March 6, the ice cover on the eastern basin of Lake Erie reached its maximum as seen in the NEXSAT image below. It was determined to be 1390 square kilometres (540 square miles) or 27%.




With warmer than normal air temperatures during the second week in March, the ice cover on eastern Lake Erie began to diminish. A storm event on March 14/15 resulted in a lake ice run that required ice breaker activity at the Chippawa-Grass Island Pool. Two spans, H and I, were observed to be opened as the result of the storm. Only a small amount of ice remained in the extreme eastern end of Lake Erie by March 17 and so the Board issued a media advisory that, with favorable weather conditions, ice boom opening would begin on March 20. The NYPA crew were able to remove the boom's 22 spans on March 20 and 21.

## 10. MEETING WITH THE PUBLIC

In accordance with the Commission's requirements, the Board will hold an annual meeting with the public. The meeting will be held during the evening of October 3, 2006 in Niagara Falls, New York. The Board welcomes participation by Commissioners and staff. Information on items including current and projected Great Lakes levels and the operation of the Lake Erie-Niagara River Ice Boom will be presented.

## 11. MEMBERSHIP OF THE BOARD

The Board was advised of the passing of Mr. Anton Sidoti on Wednesday, February 8th. Mr. Sidoti, of the U.S. Federal Energy Regulatory Commission, was a member of the Board's International Niagara Working Committee and had provided valuable advice and support to the Board since August 1985. His professional demeanour and affable personality will be missed. The remaining membership of the Board and its Working Committee is unchanged from the last reporting period.

## 12. ATTENDANCE AT BOARD MEETINGS

The Board met once during this reporting period. The meeting was held on March 28, 2006 in Chicago, Illinois. Colonel Gary Johnston acted as U.S. Chair of the Board as Brigadier General Berwick was unable to attend. Canadian Board Member Mr. Rob Messervey was also unable to attend. All other Board members were in attendance.

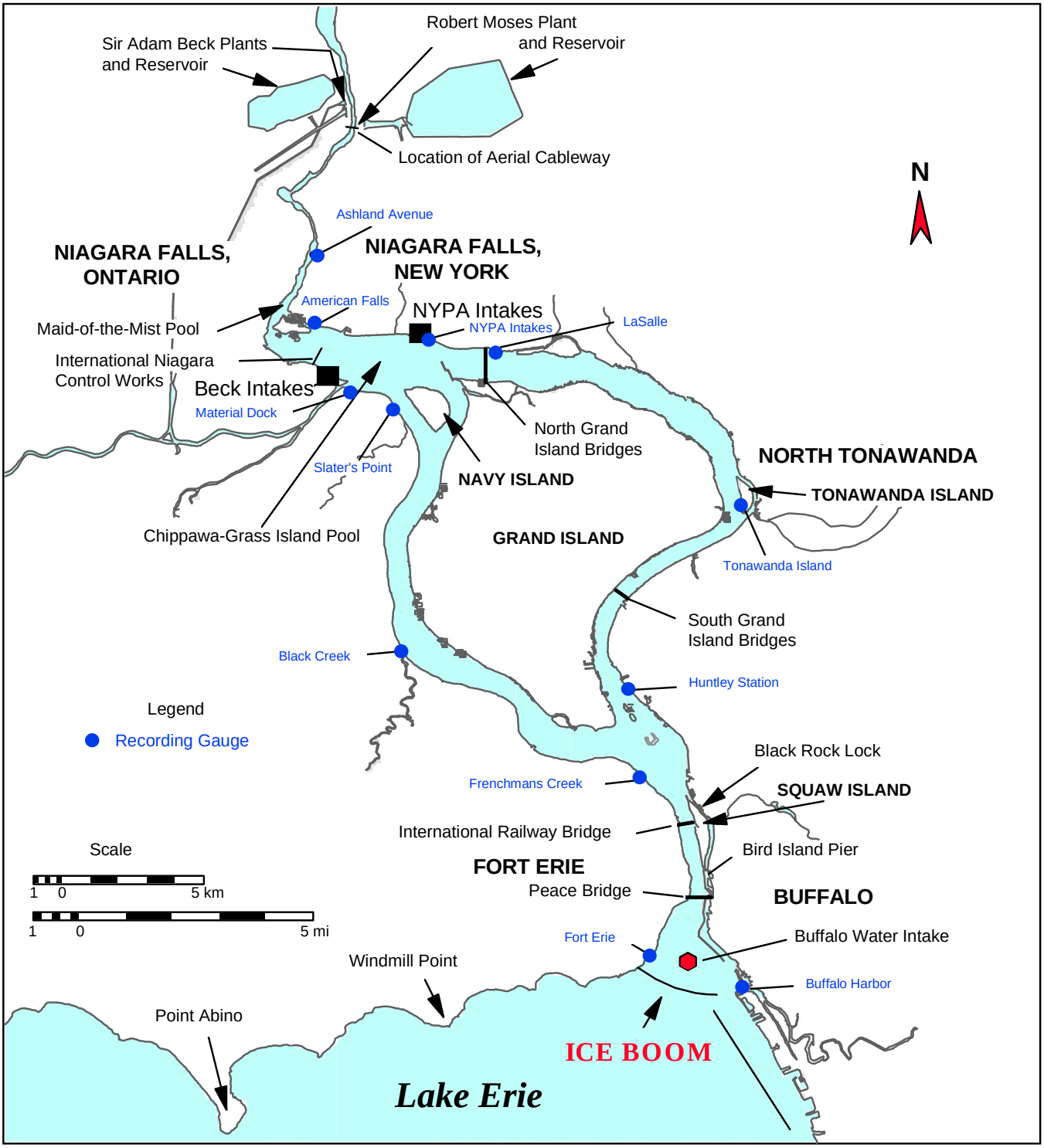
Respectfully Submitted,

BG BRUCE A. BERWICK
Chair, United States Section

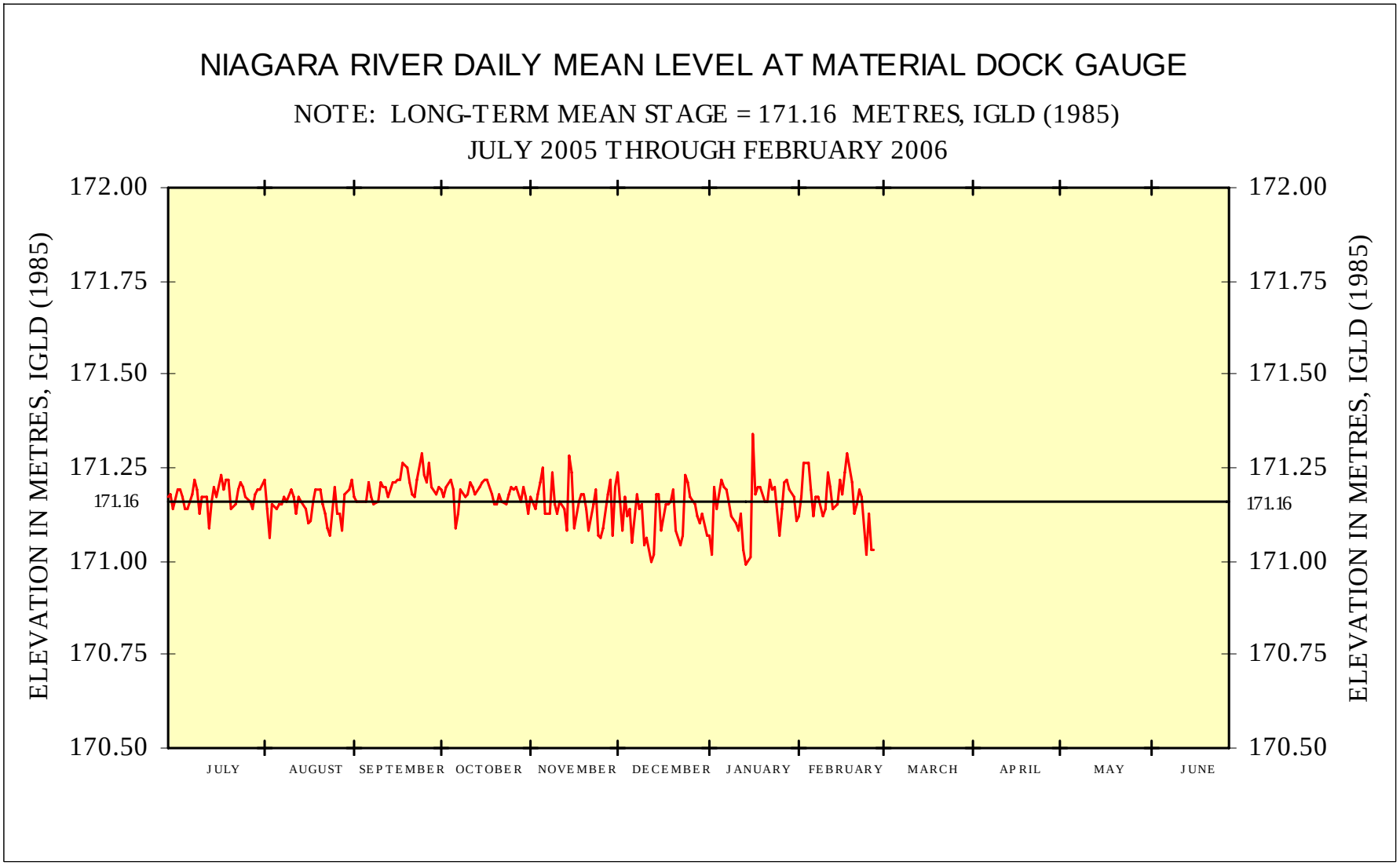
CARR MCLEOD
Chair, Canadian Section

CONSTANTINE G. TJOUMAS
Member, United States Section

ROBERT MESSERVEY
Member, Canadian Section


Sir Adam Beck Plants
and Reservoir
Robert Moses Plant
and Reservoir
Location of Aerial Cableway
N
Ashland Avenue
NIAGARA FALLS,
ONTARIO
NIAGARA FALLS,
NEW YORK
American Falls
NYPA Intakes
NYPA Intakes
LaSalle
Maid-of-the-Mist Pool
International Niagara
Control Works
Beck Intakes
Material Dock
North Grand
Island Bridges
NORTH TONAWANDA
TONAWANDA ISLAND
Slater's Point
NAVY ISLAND
Chippawa-Grass Island Pool
GRAND ISLAND
Tonawanda Island
South Grand
Island Bridges
Black Creek
Huntley Station
Legend
Recording Gauge
Black Rock Lock
Frenchmans Creek
SQUAW ISLAND
International Railway Bridge
Bird Island Pier
Scale
FORT ERIE
Peace Bridge
BUFFALO
1 0 5 km
1 0 5 mi
Fort Erie
Buffalo Water Intake
Windmill Point
Buffalo Harbor
Point Abino
ICE BOOM
Lake Erie

ENCLOSURE 1


NIAGARA RIVER DAILY MEAN LEVEL AT MATERIAL DOCK GAUGE
NOTE: LONG-TERM MEAN STAGE = 171.16 METRES, IGLD (1985)
JULY 2005 THROUGH FEBRUARY 2006
ELEVATION IN METRES, IGLD (1985)
172.00
171.75
171.50
171.25
171.16
171.00
170.75
170.50
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE

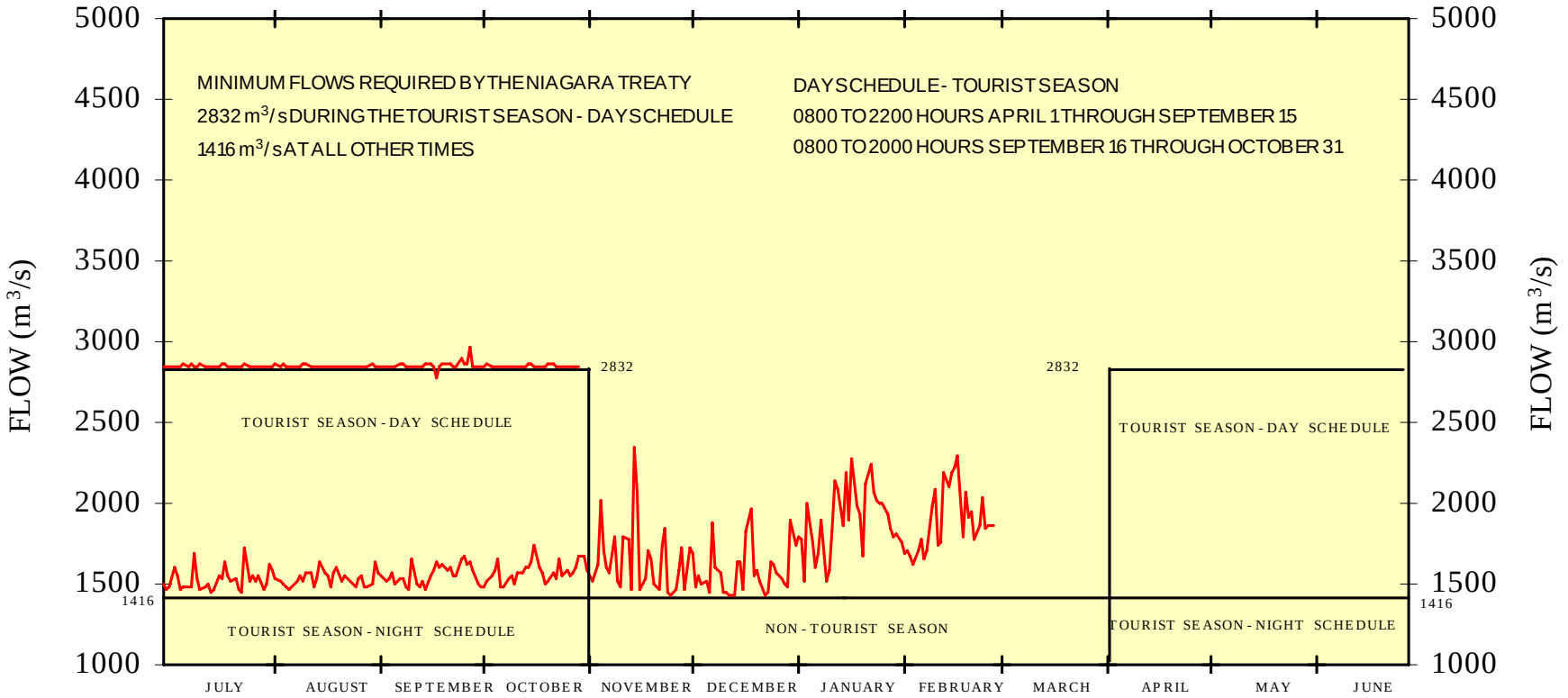
ENCLOSURE 2

# DAILY FLOW OVER NIAGARA FALLS

## FLOW AT ASHLAND AVENUE GAGE MINUS CN AND OP DIVERSIONS

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

## JULY 2005 THROUGH FEBRUARY 2006

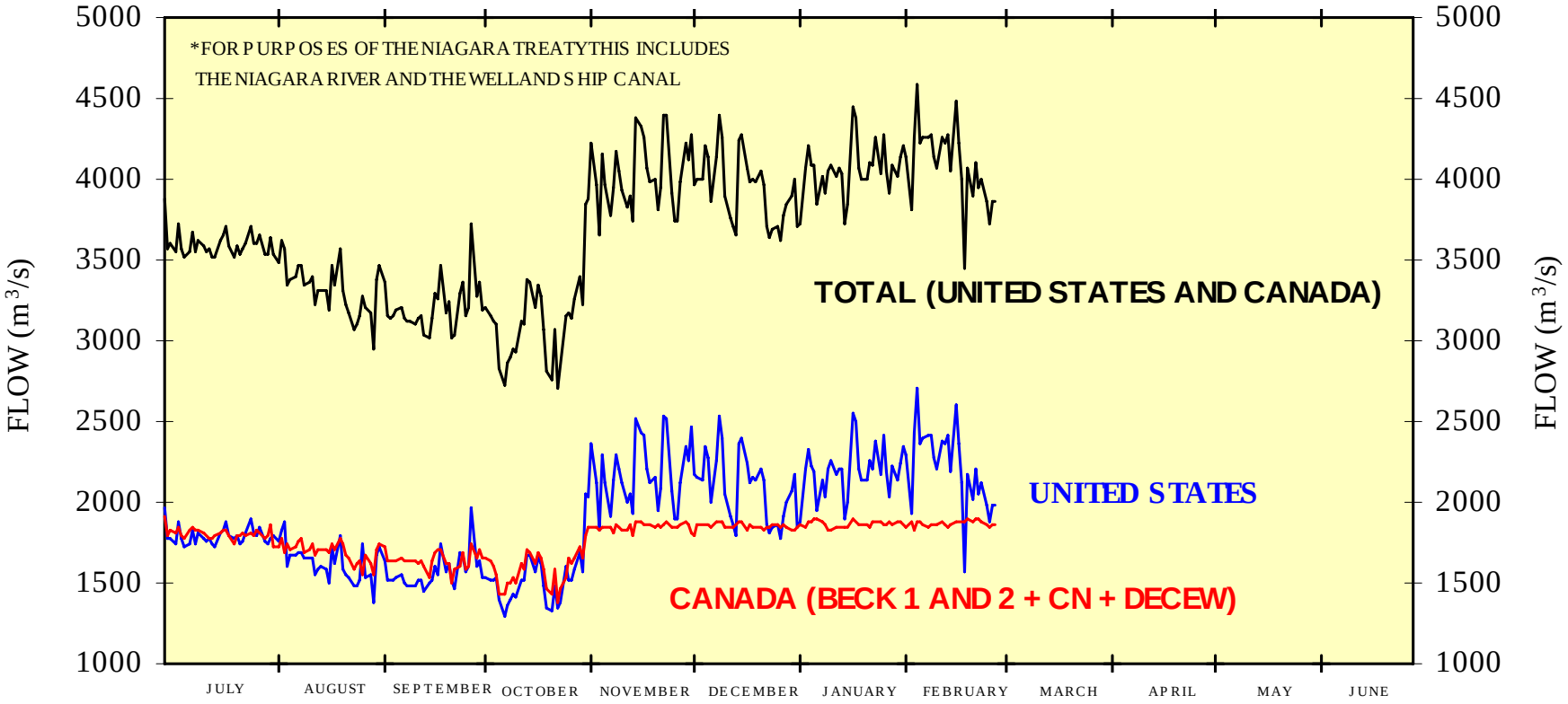



ENCLOSURE 3

# DAILY DIVERSIONS OF NIAGARA RIVER WATER* FOR POWER PURPOSES

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

JULY 2005 THROUGH FEBRUARY 2006




ENCLOSURE 4