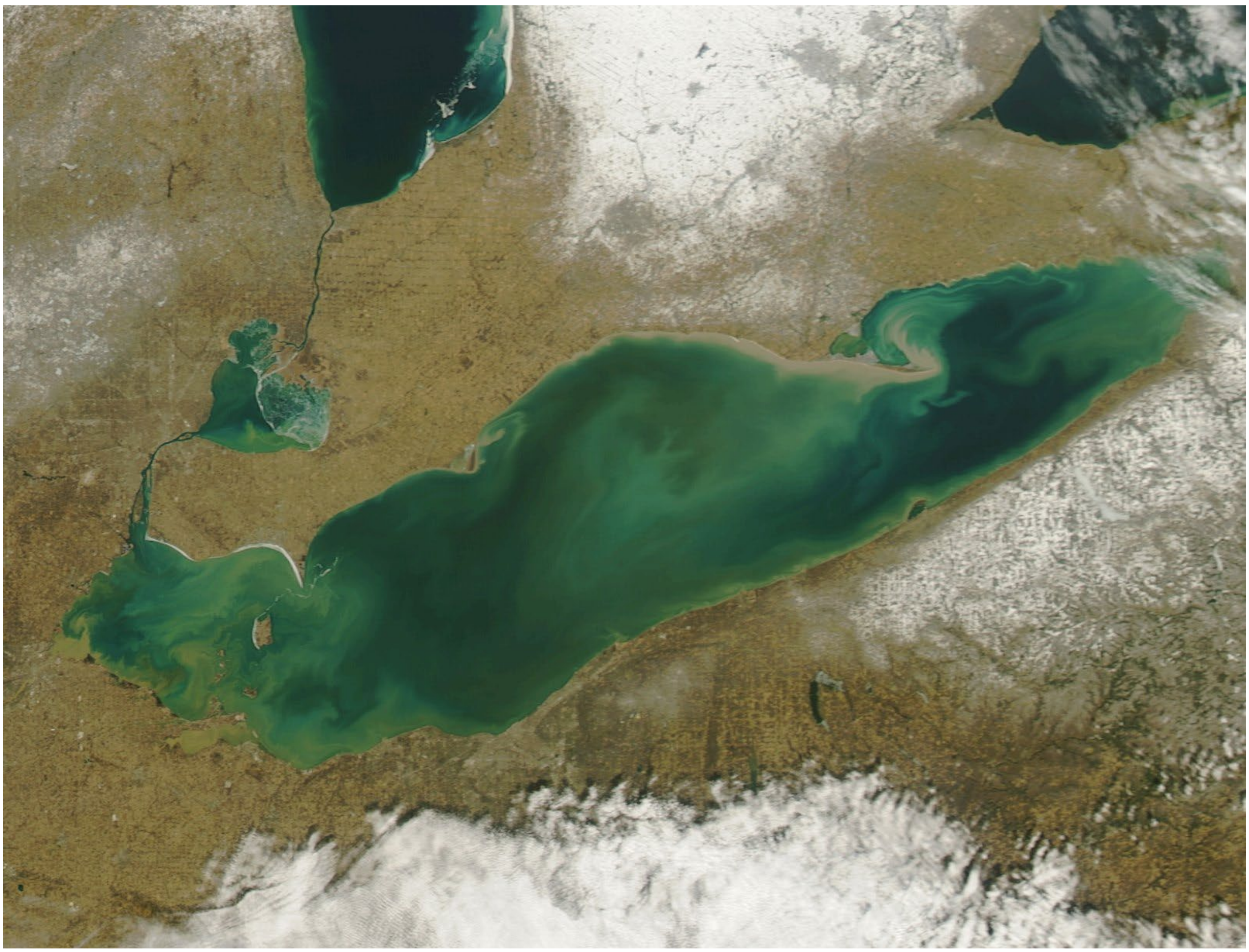
International Niagara Board of Control

One Hundred Thirty Fourth Semi-Annual Progress Report

to the

International Joint Commission



Covering the Period September 1, 2019 through February 29, 2020

Executive Summary

The level of Lake Erie began the reporting period with a September monthly mean level 71 cm (28 inches) above its 1918-2018 period-of-record, long-term average level for the month. The level of Lake Erie remained above average on a monthly basis throughout the remainder of the reporting period. The February mean water level was 90 cm (35 inches) above average (Section 2).

The level of the Chippawa–Grass Island Pool (CGIP) is regulated under the International Niagara Board of Control's 1993 directive. The Power Entities—Ontario Power Generation (OPG) and the New York Power Authority (NYPA)—were able to comply with the board's directive during the reporting period, except for two occurrences; one on 31 October 2019 and one on 1 November, 2019. The board accepted the INWC's recommendation that these exceedances were acceptable due to the abnormally high flows in the Niagara River due to the high water levels of Lake Erie and a wind driven seiche event (Section 3).

Gauges were operating during this reporting period to provide flow measurements over Niagara Falls (Section 4).

During this reporting period, flow over Niagara Falls fell below the minimum Treaty requirement on September 11 due to a request from Niagara Regional Police to reduce flows above the Falls to aid in rescue operations, and on September 17 and 18 to allow for planned Government flow measurements for the Ashland Avenue Flow Gauge (Section 5).

During the reporting period, the Niagara River flow at Queenston averaged 7,374 m^3/s (260,410 cfs), 1,721 m^3/s (60,780 cfs) above the 1900-2019 average of 5,653 m^3/s (199,630 cfs) and 149 m^3/s (5,260 cfs) above the average for the same period in 2018-19 (Section 7).

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 flow in these channels for water management purposes. The regularly scheduled discharge measurements completed this reporting period were taken in the Lower Niagara River at the Ashland Avenue gauge were completed on September 17 and 18, 2019. (Section 8).

Installation of the Lake Erie-Niagara River Ice Boom for the 2019-2020 ice season was completed on December 21, 2019. Warmer than average temperatures in 2019-2020 prevented formation of any significant ice cover across Lake Erie by the end of this reporting period (Section 10).

New York State Parks is in the preliminary design phase of rehabilitation/reconstruction of the two pedestrian bridges spanning the American Falls Channel. Preliminary plans have been reviewed by members of the INWC. Additional information has been requested to assess the impacts of the project. The board will continue to review the plans and advise the IJC of the potential for impact on the operation of the CGIP in accordance with the board's 1993 directive (Section 11).

The board held a virtual annual meeting with the public in the fall of 2019 and will look to schedule another webinar style meeting for the Fall of 2020 (Section 12).

Changes to the board membership during this reporting period included Mr. Stephen Durrett replaced MG Mark Toy as the US Co-Chair, and Mr. Kyle McCune replaced Mr. Stephen Durrett as the Alternate US Co-Chair in September 2019. Changes to the INWC during this reporting period included Ms. Lauren Schifferle, USACE, replaced Mr. Keith Koralewski, USACE, as the US Alternate Co-Chair of the International Niagara Working Committee and Mr. Derrick Beach replaced Dr. Frank Seglenieks as the Canadian Co-Chair of the Working Committee in October 2019. (Section 13).

COVER: Lake Erie MODIS Imagery, Feb 24, 2020 (Photo NOAA)

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INTERNET SITES

International Joint Commission
https://www.ijc.org/enInternati
onal Niagara Board of Control
English: https://ijc.org/en/nbc

French: https://ijc.org/fr/ccrn

Lake Erie-Niagara River Ice Boom
https://iceboom.nypa.gov/

INTERNATIONAL NIAGARA BOARD OF CONTROL

Cincinnati, Ohio
Burlington, Ontario

March 12, 2020

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

Commissioners:

1. General

The International Niagara Board of Control (the board) was established by the International Joint Commission (IJC) in 1953. The board provides advice to the IJC on matters related to the IJC's responsibilities for water levels and flows in the Niagara River. The board's main duties are to ensure the operation of the Chippawa-Grass Island Pool (CGIP) upstream of Niagara Falls within the limits of the Board's 1993 directive and provide oversight of the operation of the Lake Erie-Niagara River Ice Boom at the outlet of Lake Erie. The board also collaborates with the International Niagara Committee (INC), a body created by the 1950 Niagara Treaty to determine the amount of water available for Niagara Falls and hydroelectric power generation.

The board is required to submit written reports to the IJC at its semi-annual meetings in the spring and fall of each year. In accordance with this requirement, the Board herewith submits it's One Hundred Thirty Fourth Semi-Annual Progress Report, covering the reporting period September 1, 2019 to February 29, 2020.

All elevations in this report are referenced to the International Great Lakes Datum 1985 (IGLD 1985). Values provided are expressed in metric units, with approximate customary units (in parentheses) for information purposes only. Monthly Lake Erie water levels are based on a network of four gauges to better represent the average level of the lake.

2. Basin Conditions

The level of Lake Erie was above average throughout the reporting period. It began the reporting period with a September mean level at 71 cm (28.0 inches) above its 1918–2018 period-of-record long-term average level for the month. Between September and February, the monthly mean lake level on average gained 3 cm (1.2 inches), which is relatively rare as on average the lake declines 17 cm (7.0 inches) during this period. Lake Erie's water level began to rise 2 months earlier than its seasonal average with its monthly average water level rising 22 cm (8.7 inches) from December to February, when on average the level declines slightly. Lake Erie levels ended the reporting period with February mean water level 90 cm (35.4 inches) above average, with its level continuing to rise through the beginning of March. Recorded monthly water levels for the period September 2019 through February 2020 are shown in Table 1 and depicted graphically in Figure 1. The following paragraphs provide more detail on the main factors that led to the water level changes observed on Lake Erie during the reporting period.

Table 1: Monthly average Lake Erie water levels based on a network of four water level gauges and the International Great Lakes Datum (1985).

	Meters			Feet		
Month	Recorded* 2019-2020	Average 1918-2018	Departure	Recorded* 2019-2020	Average 1918-2018	Departure
September	174.87	174.16	0.71	573.72	571.39	2.33
October	174.74	174.08	0.66	573.29	571.13	2.16
November	174.68	174.01	0.67	573.10	570.90	2.20
December	174.68	174.01	0.67	573.10	570.90	2.20
January	174.80	174.01	0.79	573.49	570.90	2.59
February	174.90	174.00	0.90	573.82	570.87	2.95

* Provisional

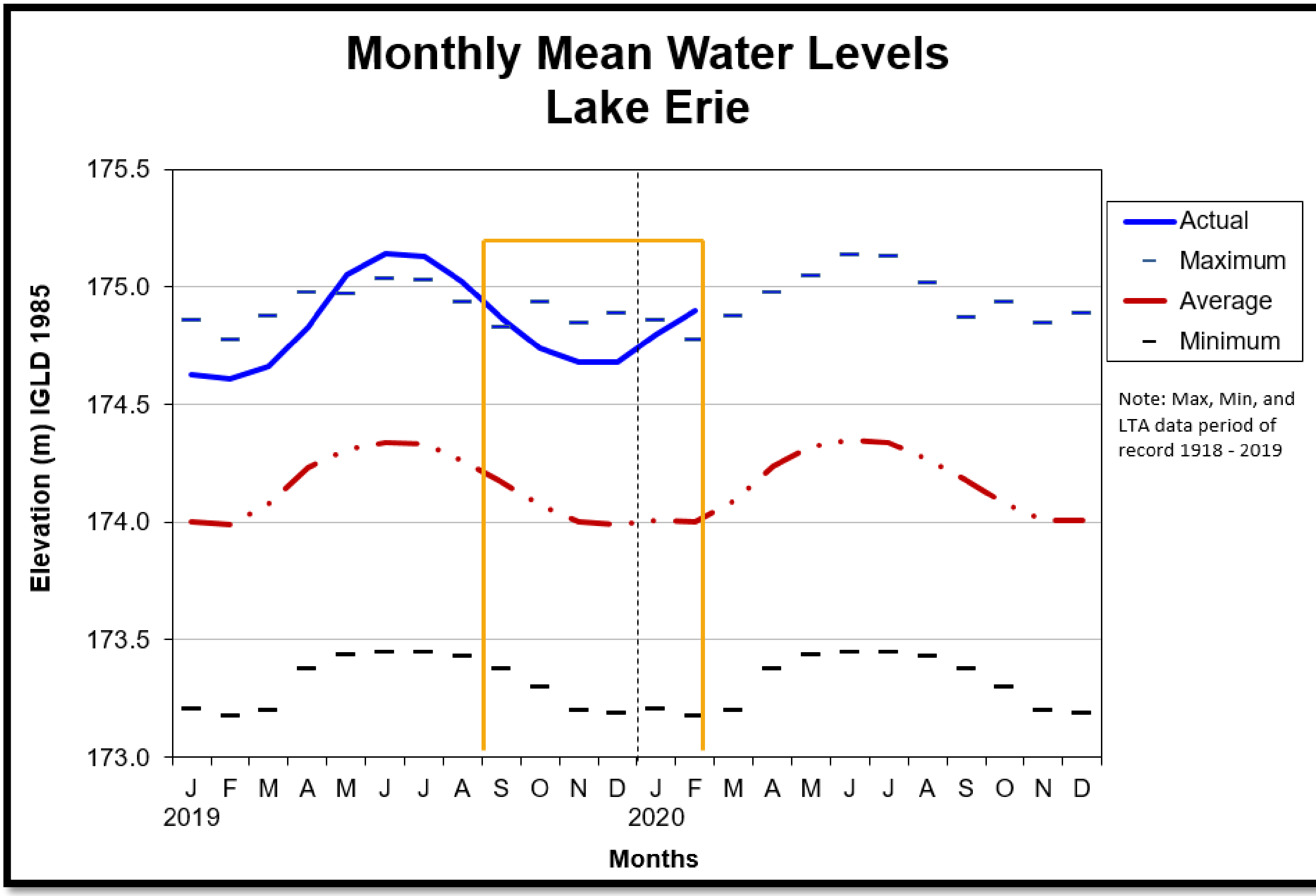

Figure 1: Lake Erie mean monthly and, long-term maximum, minimum and average water levels.

Lake Erie receives water from its local drainage basin and from upstream lakes. The water supplied to a lake from its local drainage basin is referred to as its net basin supply (NBS). A lake's NBS is the sum of the amount of water the lake receives from precipitation falling directly on its surface and runoff (including snow melt) from its surrounding land area, minus the amount of water that evaporates from its surface. The sum of Lake Erie's NBS and the inflow from Lake Michigan–Huron via the St. Clair-Detroit Rivers system is its net total supply (NTS).

Precipitation is a major contributor to NBS, both directly on the lake and through runoff due to rain and snowmelt. Recent precipitation data and departures from the long-term average are shown in Table 2 and depicted graphically in Figure 2. Overall, precipitation on the Lake Erie basin was dryer than average for the reporting period, with the basin receiving 36.6 cm (14.4 inches) of precipitation from September 2019 to February 2020, which is approximately 10.7 percent below average for the period. Precipitation was below average all months during the reporting period, except for October and January.

Table 2: Monthly average precipitation on the Lake Erie basin.

	Centimeters			Inches			
Month	Recorded* 2019-2020	Average 1900-2016	Departure	Recorded* 2019-2020	Average 1900-2016	Departure	Departure (in percent)
September	6.40	8.20	-1.80	2.52	3.23	-0.71	-22
October	10.26	7.20	3.06	4.04	2.83	1.21	43
November	3.33	7.30	-3.97	1.31	2.87	-1.56	-54
December	6.50	6.80	-0.30	2.56	2.68	-0.12	-4
January	7.06	6.30	0.76	2.78	2.48	0.30	12
February	3.07	5.30	-2.23	1.21	2.09	-0.88	-42

* Provisional

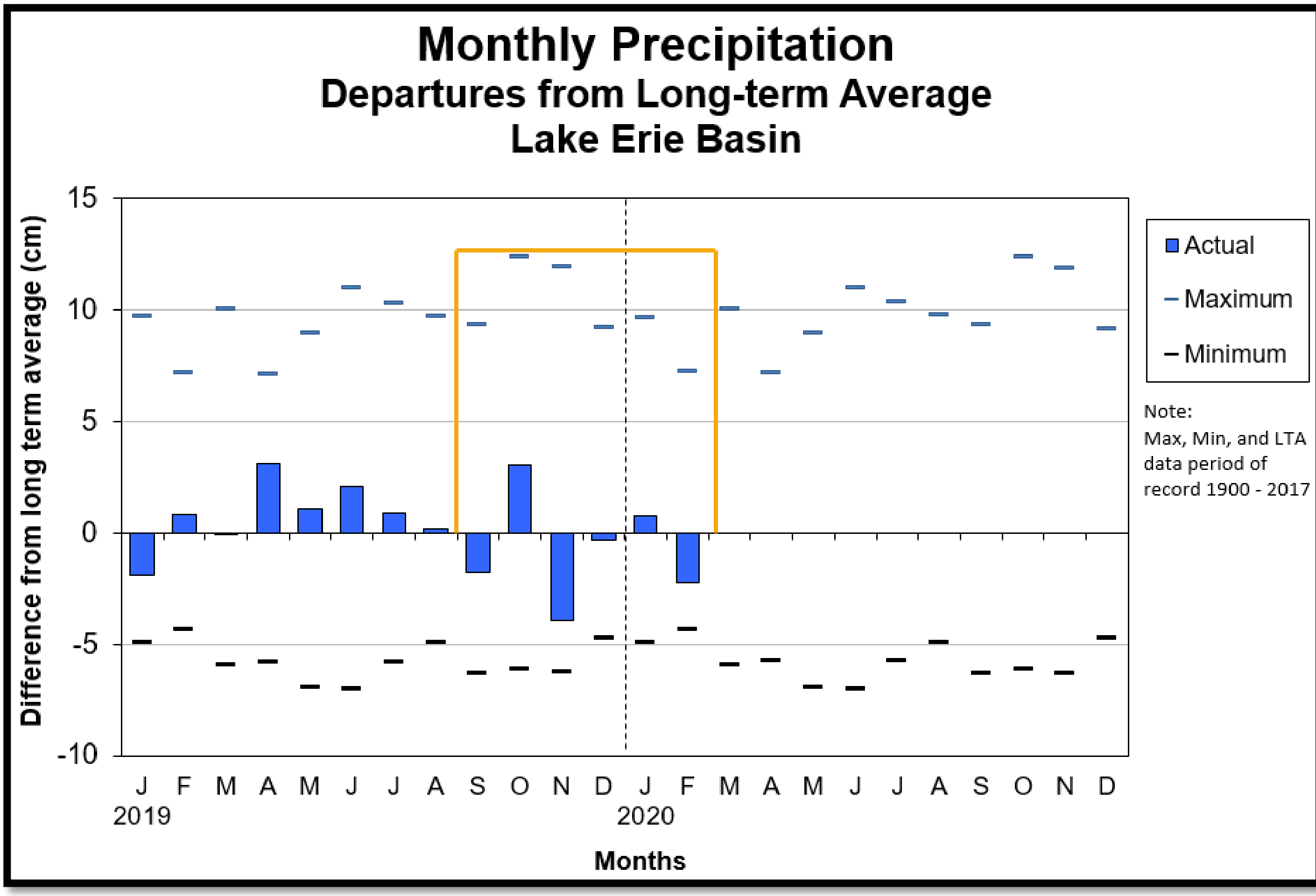

Figure 2: Monthly actual, maximum and minimum precipitation departures from the long-term average on Lake Erie basin.

The recent NBS to Lake Erie is shown relative to average on a monthly basis in Figure 3. A negative NBS value indicates that more water left the lake during the month due to evaporation than entered it through precipitation and runoff. On Lake Erie, average NBS is negative from August through November. For the remainder of the year, average combined precipitation and runoff are greater than the water lost to evaporation. During the reporting period, the lake's NBS was above average for November, January and February, and below average for September, October, and December.

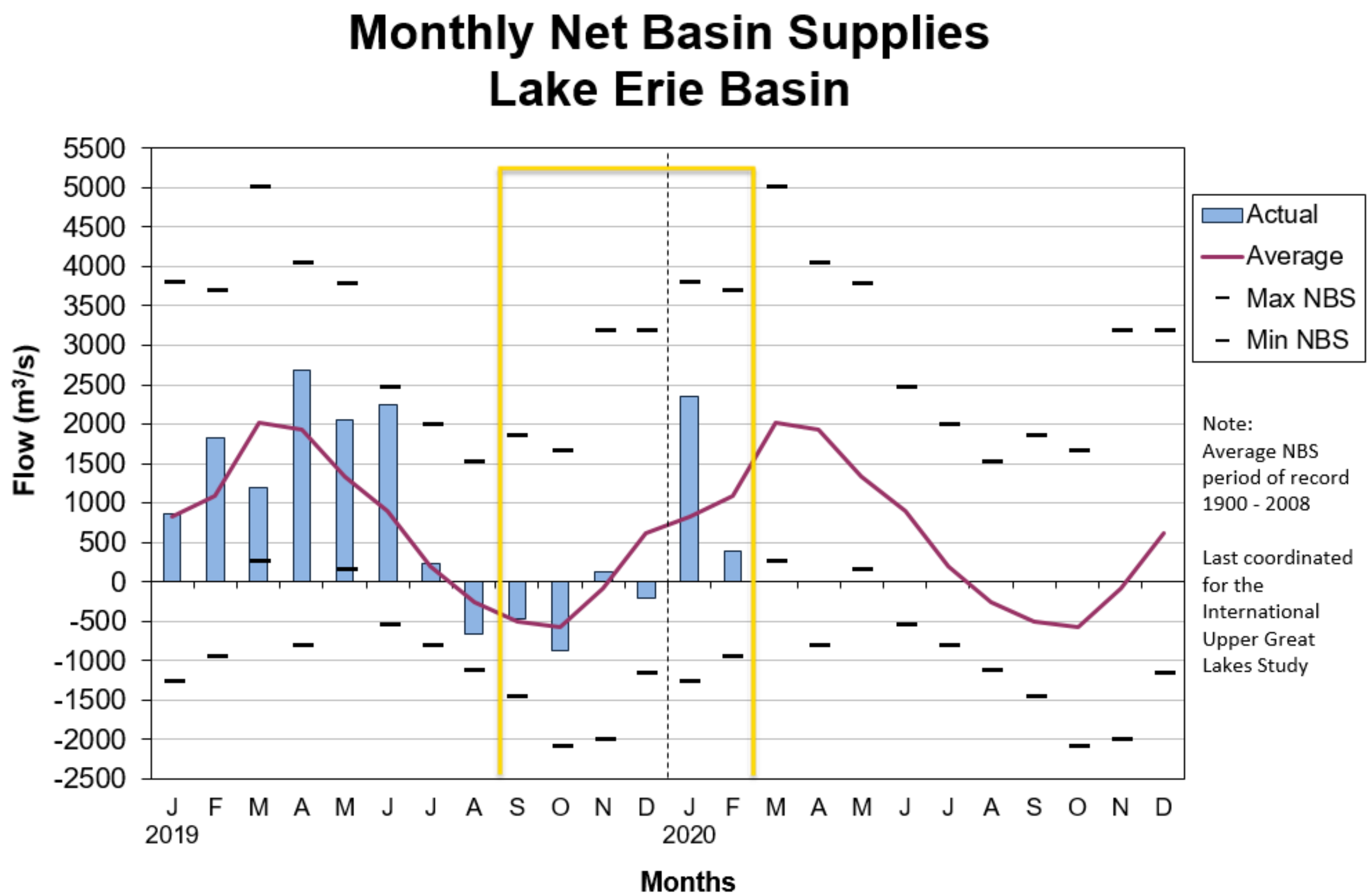

Figure 3: Mean monthly and long-term maximum, minimum and average net basin supplies on Lake Erie basin.

Inflow via the Detroit River is the major portion of Lake Erie's NTS, and is greatly influenced by the level of Lake Michigan–Huron. Similar to the last reporting period, the level of Lake Michigan–Huron was near record high levels the first four months of the current reporting period and surpassed the previous monthly maximums for the months of January and February. The high lake levels resulted in above average flows into the Detroit River for the entire reporting period. The monthly mean water level on Lake Michigan–Huron and the monthly mean flow in the Detroit River are provided in Figures 4 and 5, respectively.

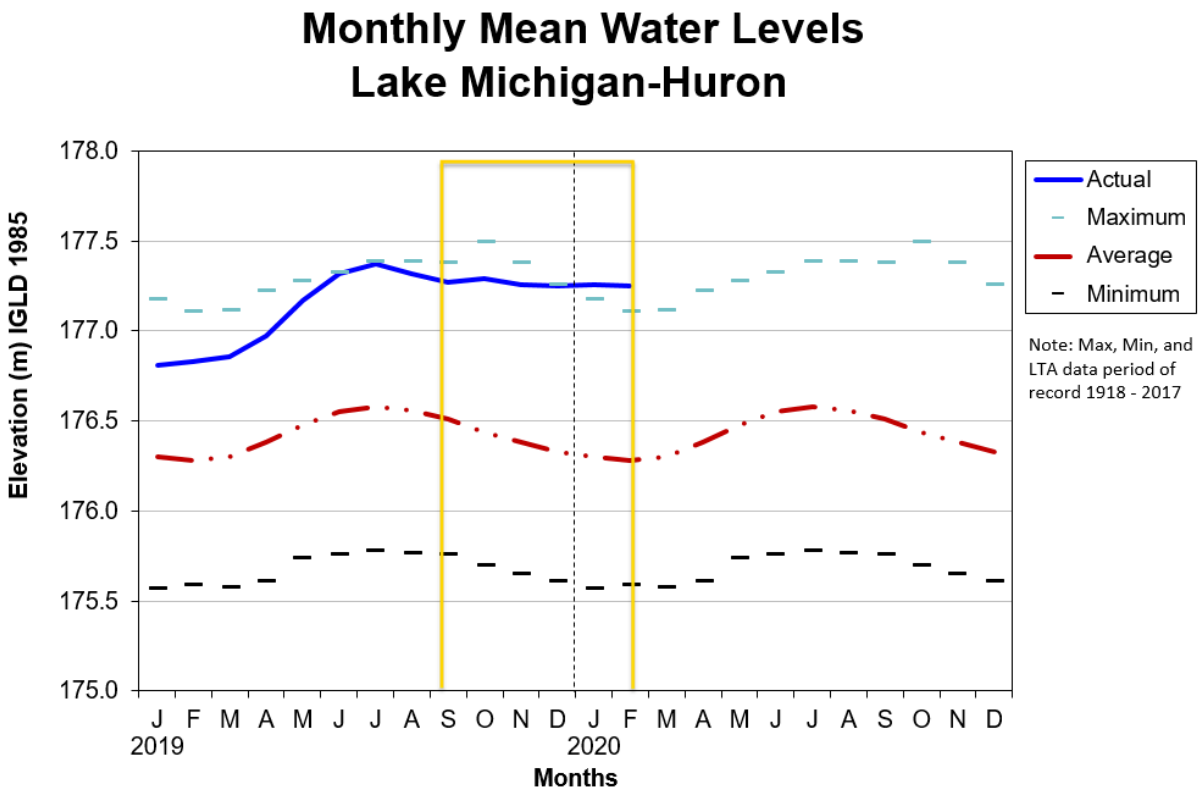

Figure 4: Lake Michigan-Huron mean monthly, and long-term maximum, minimum and average water levels.

Chart Area

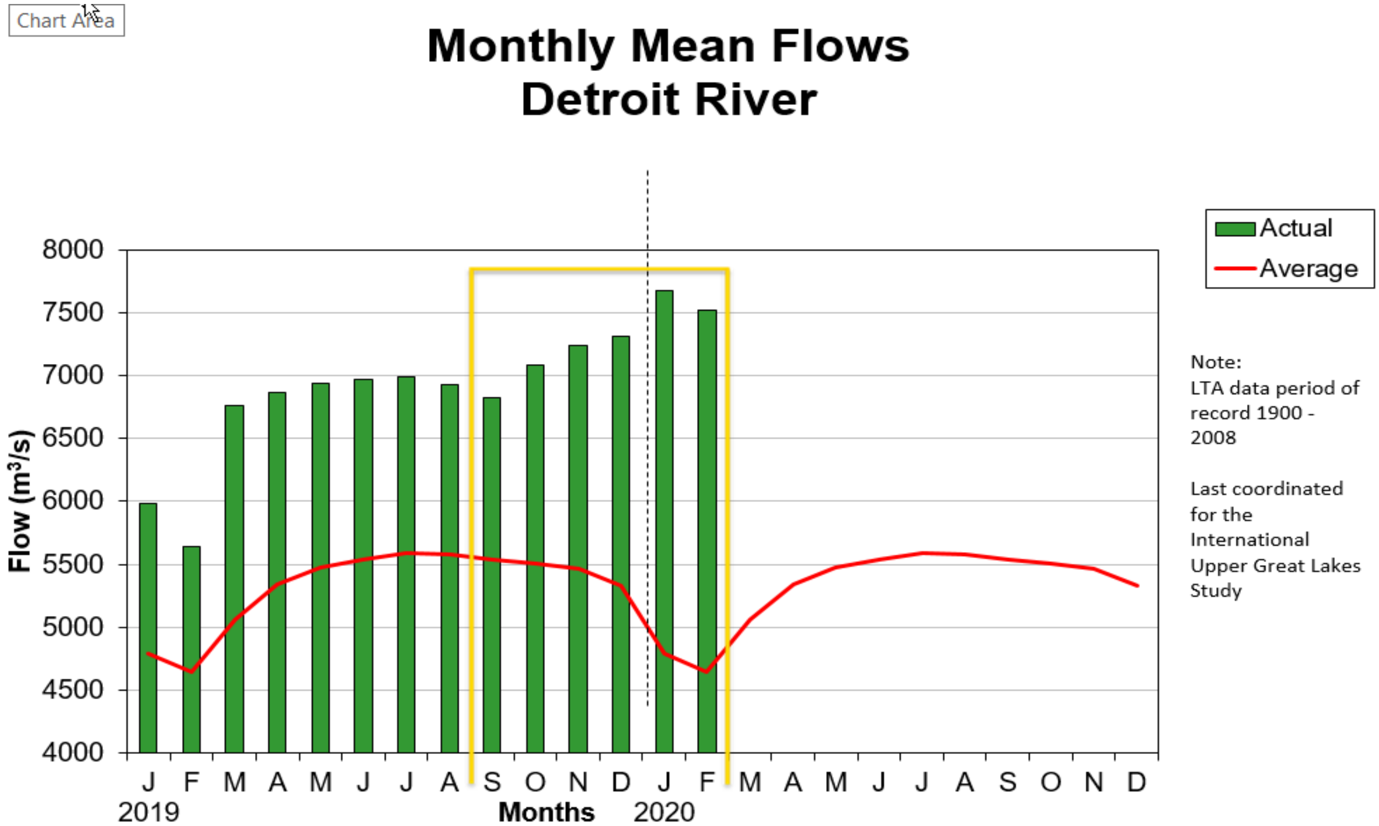

Figure 5: Detroit River mean monthly and long-term average flows.

The record high inflows from Lake Michigan–Huron via the Detroit River combined with Lake Erie's NBS, resulted in well-above-average NTS throughout the reporting period. The recent NTS to Lake Erie is depicted relative to average in Figure 6.

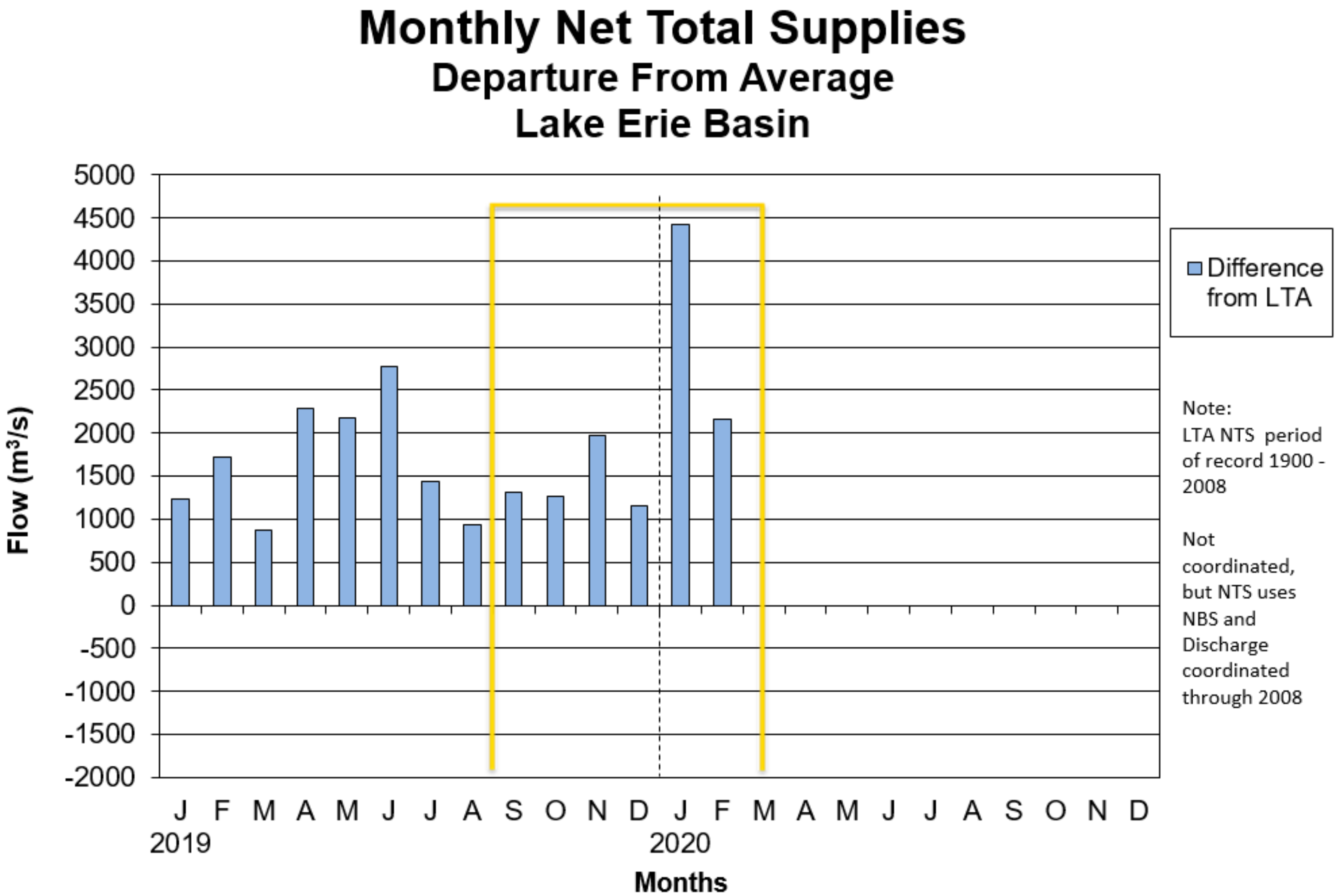

Figure 6: Lake Erie basin monthly net total supplies difference from the long-term average.

Lake Erie discharges water to Lake Ontario through the Niagara River and the Welland Canal. The portion of Lake Erie outflow that is diverted through the Welland Canal is relatively small, about 4 to 5% of the total Lake Erie outflow, and is used for navigation purposes through the canal and generation of electricity at Ontario Power Generation's (OPG's) DeCew hydroelectric plants. Most of the outflow from Lake Erie occurs through the Niagara River and depends on the level of the lake at its outlet. Generally speaking, above-average lake levels result in above-average outflow, and below-average lake levels lead to below-average outflow. Flow in the river is also influenced by ice during the winter and aquatic plant growth during the summer, both of which can reduce the flow. Additionally, seasonal trends in prevailing winds typically raise levels at the eastern end of Lake Erie relative to levels at the western end and the lake's average level. Recent monthly outflow via the Niagara River is graphically depicted in Figure 7. The lake's well-above average water level conditions from September 2019 through February 2020 resulted in Niagara River flow at Buffalo also being well above average during those months. Flows ranged from 7,150 m^3/s (252,500 cfs) to 7,700 m^3/s (284,990 cfs) (Figure 7) due to above average levels on Lake Erie. Seasonal record high values (1900-2020) were set for the months of September, November, January and February. The values for this reporting period fell just short of the period-of-record highest monthly mean flow recorded in June (8,070 m^3/s) of 2019.

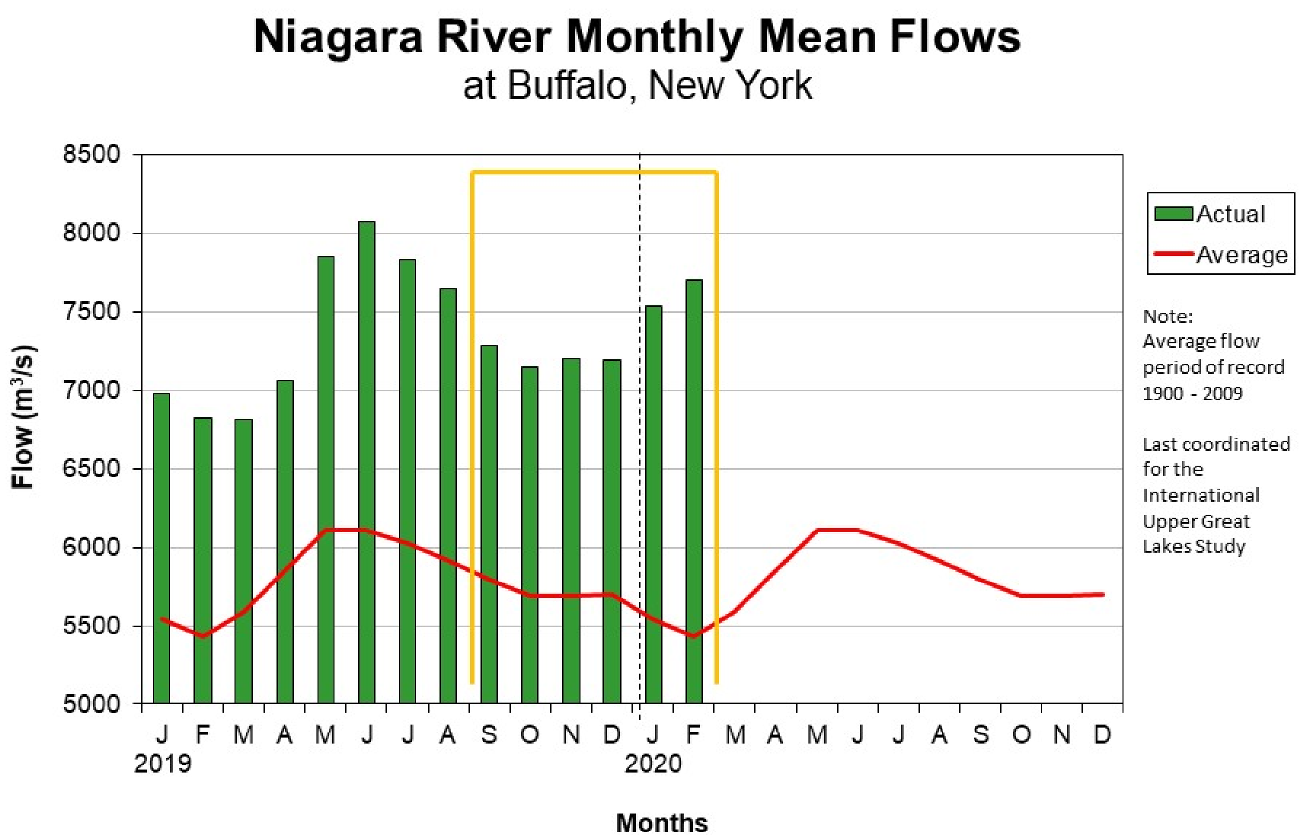

Figure 7: Niagara River mean monthly and long-term average flows at Buffalo, New York.

The six-month water level forecast prepared at the beginning of March by the U.S. Army Corps of Engineers (USACE) and Environment and Climate Change Canada (ECCC) indicates that Lake Erie water levels will likely remain well above average throughout the spring and summer, with possibility of record breaking highs. This forecast is made using historical water supplies and current lake levels, and it should be noted that the accuracy of this prediction is limited and actual conditions could vary from the prediction.

3. Operation and Maintenance of the International Niagara Control Works

Water levels in the CGIP are regulated in accordance with the board's 1993 directive (revised 2017). The directive requires that the Power Entities– OPG and the New York Power Authority (NYPA)–operate the International Niagara Control Works (INCW) to ensure the maintenance of an operational long-term average CGIP level of 171.16 m (561.55 feet) to reduce adverse high or low water levels in the CGIP. The Directive also establishes tolerances for the CGIP's level as measured at the Material Dock gauge.

During this reporting period, one exceedance of the board's Directive occurred on November 1, 2019 at 01:00 hours EST when the elevation of the Chippawa-Grass Island Pool went above the abnormal flow conditions limit of 171.77 metres (563.55 feet) by 3 cm (1.18 in). As a result of strong westerly winds beginning on 31 October 2019, the level of Lake Erie at Buffalo rose rapidly by 2.09 m (6.86 feet), resulting in a rapid rise in the flow in the Niagara River, with the hourly flow rising by 4,473 m^3/s at 17:00 on 31 October to a maximum hourly flow of 11,151 m^3/s at 23:00 on 31 October. Hourly flows did not recede to below 7000 m^3/s until 10:00 on November 1. Since the Directive was put in place in 1973 there have been only five reported exceedances of the limits in the Directive prior to this reporting period, three of these have been a result of the water level in the CGIP exceeding the upper limit. The INWC was not aware of any negative impacts to riparian interests due to the high water level in the CGIP. The tolerances of the Directive in place for this reporting period appear to continue to function well in high water periods. The INWC and board will continue to monitor and assess if abnormally high flows continue.

The accumulated deviation of the CGIP's level from March 1, 1973 through February 29, 2020 was 0.05 meter-months below the long-term operational average elevation. The accumulated deviation was within the maximum permissible accumulated deviation of ±0.91 meter-months for this reporting period.

Tolerances for regulation of the CGIP were suspended on a number of occasions for abnormally high flows during the reporting period, as follows: September 4, 14, 15 (3), October 23, 24, 27, 28, 30, 31 (6), November 1, 27, 28 (3), December 11, 12, 15, 30, 31 (5), January 1, 6, 7, 12, 16, 18, 19, 26, 27 (9), and February 13, 14, 21, 22, and 27-29. Additionally, operating tolerances were suspended for emergency rescue and or recovery on September 11, 12, 2019 for a Jet Ski through control dam, October 29, 2019 for a body recovery in the Canadian Niagara Plant forebay, and November 7, 8, 2019 for an American Falls channel rescue. Also, tolerances were suspended on September 17 and 18, 2019 for Government flows testing.

Due to the persistence of abnormally high flows throughout the reporting period, the Board and the Working Committee continued to review the 1993 Directive to assess whether the Directive would need to be updated in light of the high water conditions on Lake Erie. The Directive was reviewed after the high flow conditions of 1986 and the limits were found to be satisfactory. Comparing operations of the INCW during this reporting period to those of 1986 found levels of the CGIP less impacted by the high Niagara River flows. After review and discussion it was concluded that the current version of the 1993 Directive adequately addresses the current high water conditions and no updates or revisions to the Directive is recommended at this time. Given that high flow conditions in the Niagara River are expected to continue, the board will continue to monitor as abnormally high flows continue.

The locations of the water level gauges on the Niagara River are shown in Enclosure 1. Recorded daily Material Dock water levels covering the reporting period are shown in Figure 8.

Gate 5 of the INCW was out of service for major overhaul from May 16 to Nov 21 2019, and Gate 4 has been out of service to investigate hydraulic issues from Nov 16, 2019 and is tentatively set to return to service March 1, 2020.

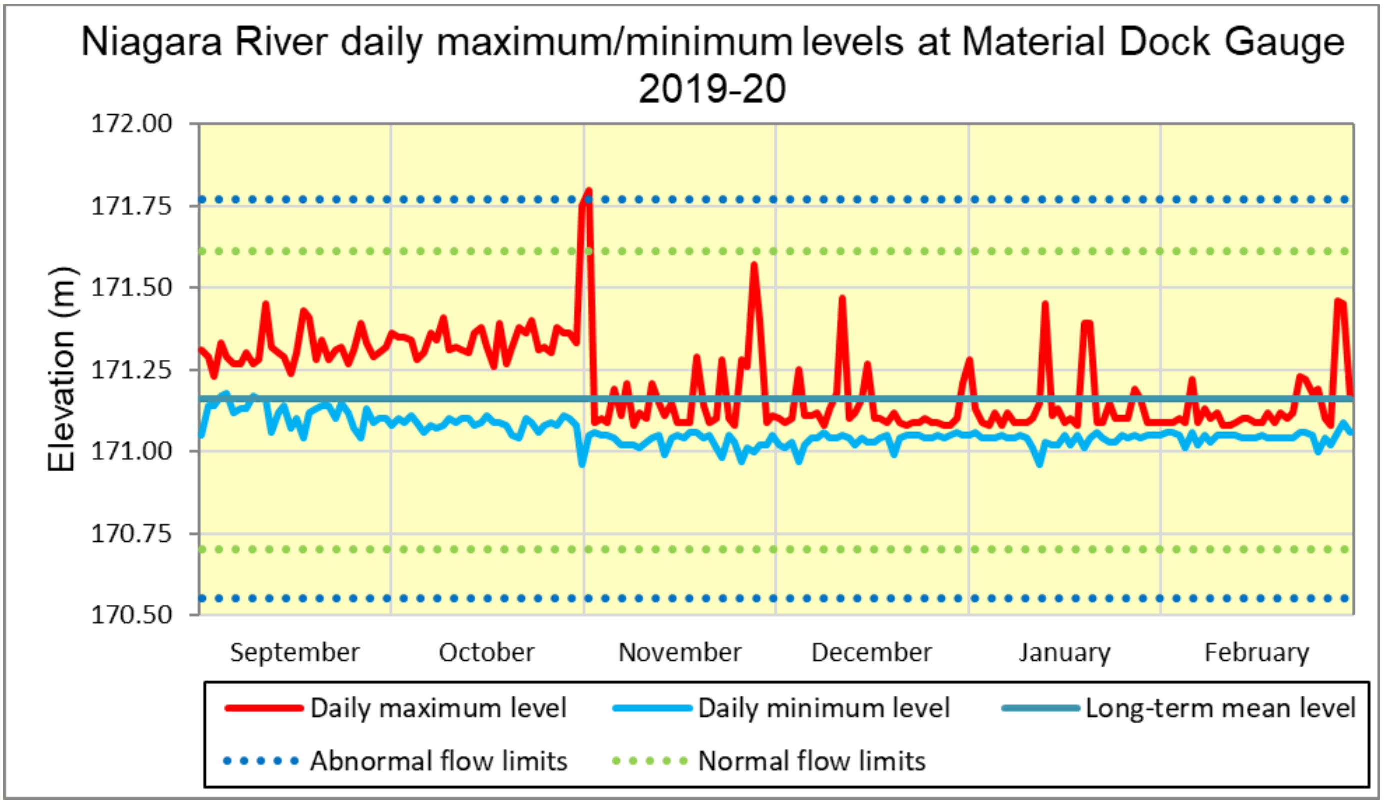

Figure 8: Niagara River daily maximum and minimum water levels at Material Dock gauge.

4. Gauging Stations

The Fort Erie, Material Dock and Ashland Avenue gauges (as shown in Enclosure 1) are used to determine flows in the Niagara River, monitor the CGIP levels and monitor the flow over Niagara Falls. The Buffalo, Slater's Point, and U. S. National Oceanic and Atmospheric Administration (NOAA) Ashland Avenue gauges are used as alternatives in the event of primary gauge failure. The Slater's Point and Material Dock gauges are owned and operated by the Power Entities. NOAA and the Power Entities own and operate water level gauges at the Ashland Avenue location. All gauges required for the operation of the INCW were in service during this reporting period, except the Fort Erie gauge had a communication outage on Oct 2, 2019 for 1 hour and the Frenchman's Creek gauge on September 25, 2019 for 4 hours and October 1, 2019 for 4 hours.

5. Flow over Niagara Falls

The International Niagara Treaty of 1950 sets minimum limits on the flow of water over Niagara Falls. During the tourist season (April-October) day time hours, the required minimum Niagara Falls flow is 2,832 cubic metres per second (m^3/s) (100,000 cubic feet per second (cfs)). At night and at all times during the non-tourist season months (November-March), the required minimum Falls flow is 1,416 m^3/s (50,000 cfs). Appropriate operation of the INCW, in conjunction with power diversion operations, maintains sufficient flow over the Falls to meet the requirements of the 1950 Niagara Treaty. During this reporting period, flow over Niagara Falls were allowed to fall below the minimum Treaty requirement on September 11 due to a request from Niagara Regional Police to reduce flows above the Falls to aid in rescue operations, and on September 17 and 18 to allow for planned Government flow measurements for verification of the Ashland Avenue Flow Gauge measurements. The recorded daily flow over Niagara Falls, covering the period September 2019 through February 2020, is shown in Figure 9.

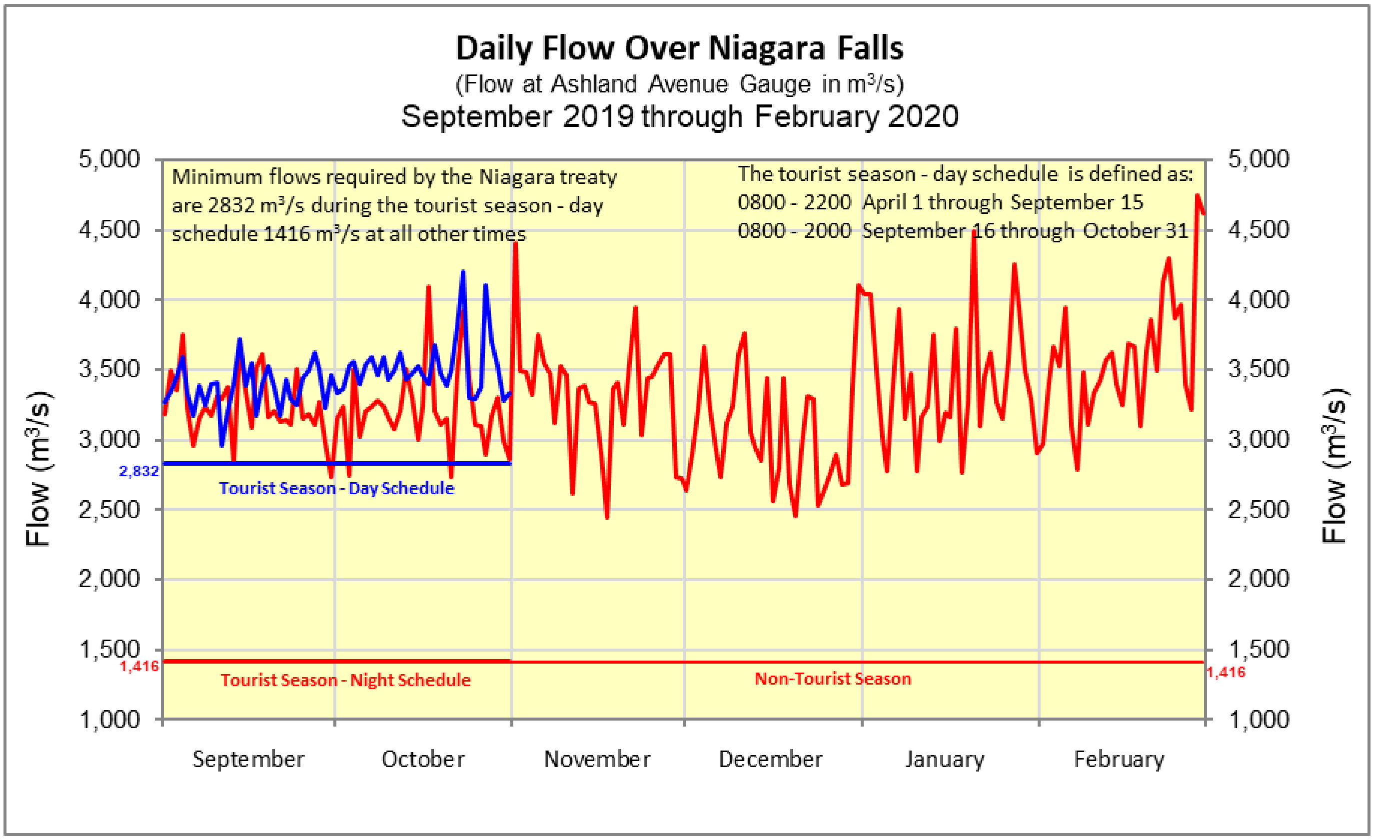

Figure 9: Daily flow over Niagara Falls (flow at Ashland Avenue in m^3/s from September 2019 through February 2020).

6. Falls Recession

As per article 2.B.b of the Niagara Board's Directive from the IJC, the board monitors the Horseshoe Falls for changes in its crestline that might result in a broken curtain of water along its crestline or suggest the formation of a notch in the crestline. The formation of a notch could signal a period of rapid Falls recession that has not been seen in more than a century. The review of recently available imagery (the most recent image found was taken on August 29, 2019) suggests that no notable changes in the crestline of the Falls have occurred.

7. 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 for scenic purposes to below the amounts specified previously in Section 5 of this report. The hydroelectric power plants, OPG's Sir Adam Beck (SAB) I and II in Canada and NYPA's Robert Moses Niagara Power Project in the United States, withdraw water from the CGIP upstream of Niagara Falls and discharge it into the lower Niagara River at Queenston, ON and Lewiston, NY, respectively. During the period of September 2019 through February 2020, diversion to the SAB I and II plants averaged 1,532 m^3/s (54,100 cfs) and diversion to the Robert Moses Niagara Power Project averaged 2,489 m^3/s (87,900 cfs).

The average flow from Lake Erie to the Welland Canal for the period September 2019 through February 2020 was 218.7 m^3/s (7,730 cfs). Diversion from the canal to OPG's DeCew Falls Generating Stations averaged 171.5 m^3/s (6,070 cfs) for the same period of time.

Records of diversions for power generation covering the period September 2019 through February 2020 are shown in Figure 10.

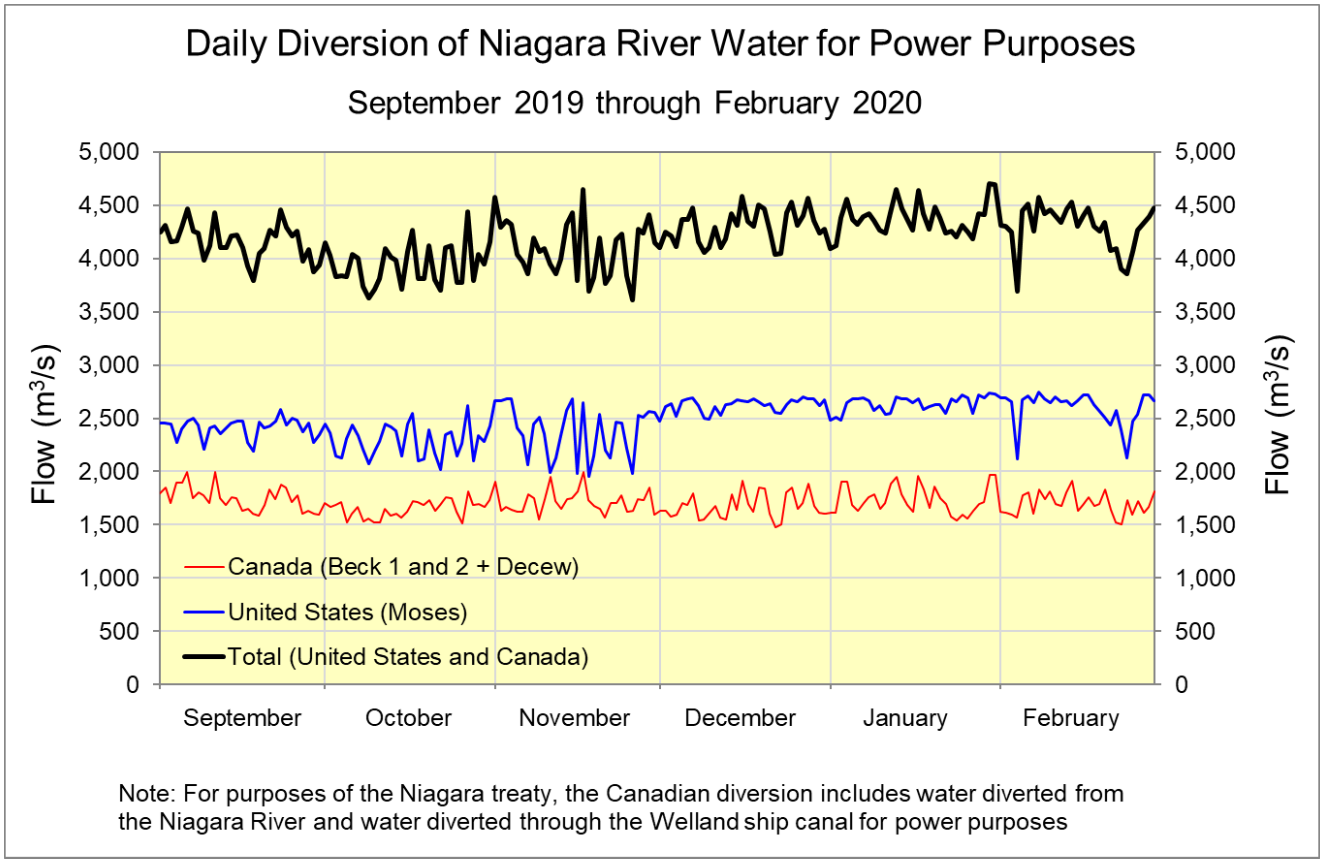

Figure 10: Daily diversion of Niagara River water for power purposes.

The monthly average Niagara River flows at Queenston, Ontario, for the period September 2019 through February 2020, and departures from the 1900–2019 long-term average are shown in Table 3. Maximum and minimum monthly average flows for the 1900–2019 period of record are shown in Table 4. During the period September 2019 through February 2020, the flow at Queenston averaged 7,374 m^3/s (260,410 cfs), 1,721 m^3/s (60,780 cfs) above the 1900-2019 average of 5,653 m^3/s (199,630 cfs) and 149 m^3/s (5,260 cfs) above the average for the same period in 2018-19. Monthly values ranged between 7,157 m^3/s (252,750 cfs) and 7751 m^3/s (273,720 cfs) with September, November, January and February setting new record high values for these months. All monthly mean flows for this reporting period were below the period-of-record high flow of 8,059 m^3/s recorded in June 2019.

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Table 3: Monthly Niagara River flows at Queenston.

	Cubic Meters per Second			Cubic Feet per Second		
Month	Recorded 2019-2020	Average 1900-2019	Departure	Recorded 2019-2020	Average 1900-2019	Departure
September	7274	5754	1520	256,880	203,200	53,680
October	7157	5679	1478	252,750	200,550	52,200
November	7228	5700	1528	255,250	201,290	53,960
December	7239	5736	1503	255,640	202,560	53,080
January	7593	5577	2016	268,140	196,950	71,190
February	7751	5473	2278	273,720	193,280	80,440
Average	7374	5653	1721	260,410	199,630	60,780

Table 4: Monthly maximum and minimum Niagara River flows at Queenston.

	Maximum Flows			Minimum Flows		
Month	Year	m^3/s	ft^3/s	Year	m^3/s	ft^3/s
September	2019	7274	256,880	1934	4340	153,270
October	1986	7220	254,970	1934	4320	152,560
November	2019	7228	255,250	1934	4190	147,970
December	1985	7410	261,680	1964	4270	150,790
January	2020	7593	268,140	1964	3960	139,850
February	2020	7751	273,720	1936	3320	117,240

8. Flow Measurements in the Niagara River and Welland 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 flow in these channels for water management purposes. Measurements are obtained through joint efforts of the USACE and ECCC. Measurement programs require boats, equipment and personnel from both agencies to ensure safety, quality assurance checks between equipment and methods, and bi-national acceptance of the data collected. The USACE and ECCC continue efforts to standardize measurement equipment and techniques. Historically, measurements were made at several locations as described below. During the 2019 field season, measurements were taken at the Ashland Avenue gauge. The measurements are documented below.

Upper Niagara River: Regularly scheduled measurements are taken near the International Railway Bridge, located in the Upper Niagara River, on a 3-year cycle to provide information to evaluate stage-discharge relationships for flow entering the Niagara River from Lake Erie. The regularly scheduled discharge measurements near the International Railway Bridge were taken in May 2018. The next measurements at the International Railway Bridge are scheduled for spring 2021. These measurements support the stage-discharge relationship known as the Buffalo rating equation, due to the use of water level data from the Buffalo NOAA gauge. The Buffalo rating equation is used in the Great Lakes water supply routing models to estimate the flow in the Niagara River.

Lower Niagara River: Discharge measurements are made on a 3-year cycle at the Ashland Avenue Gauge Rating Section, located just upstream of the OPG and NYPA hydroelectric generating stations at Queenston–Lewiston, to verify the 2009 Ashland Avenue gauge rating of the outflow from the Maid-of-the-Mist Pool below the Falls. The Ashland Avenue gauge rating is used to determine the flow over Niagara Falls for purposes of the 1950 Niagara Treaty. Measurements taken in September 2019 are currently under internal review. The next measurements at this location are scheduled for September 2022. This set of measurements has been coordinated between ECCC, USACE and the Power Entities.

American Falls Channel: Discharge measurements are made in the American Falls Channel on a 5-year cycle to verify the rating equation 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 as required by the IJC directive to the board. Since the American Falls flow is directly related to the operation of the CGIP, the board monitors this relationship. The measurements are made using a section near the upper reach of the American Falls channel near the American Falls Gauge site. Following the 5-year cycle, the next scheduled measurements at this location are expected to be made in the spring of 2022.

Welland Canal: Discharge measurements are made on a 3-year cycle in the Welland Supply Canal above Weir 8 to verify the index-velocity rating for the permanently installed Acoustic Doppler Velocity Meter (ADVM), which are used in the determination of flow through the Welland Canal. Measurements were made in the Welland Supply Canal in May 2018. These measurements are currently under review. The next measurement series in the Welland Supply Canal will take place in the spring of 2021.

9. Power Plant Upgrades

OPG continues a unit rehabilitation program began in 2007, with Sir Adam Beck 1 units G3, G7, G9 and G10 scheduled for upgrades. Currently the G10 Gibson draft report is under review by NYPA. The G5 overhaul is ongoing, beginning in January 2020 and expected to be complete in March 2021. SAB 1 units G1 and G2 are undergoing a frequency conversion from 2021 to 2022 with the installation of new 60 Hz units. The power canal refurbishment project has been delayed until 2027. SAB 2 unit overhauls will begin in September 2020.

NYPA continues to improve the Lewiston Pump Generating Plant with PG 3 put back in Service January 31, 2020, and an 8 month replacement outage started February 3, 2020 on PG 10. Of the 12 pump-turbine units, PG 1 remains to be completed with the outage scheduled for November 2020. At the Robert Moses Plant planned control upgrades are scheduled to start in June 2020. The unit control boards will be upgraded in the secondary control room in September 2020. The Robert Moses Unit 1 refurbishment is scheduled to be completed in May 2021, and unit mechanical upgrades will begin in 2023.

10. Ice Conditions and Ice Boom Operation

In accordance with Condition (d) of the Commission's October 5, 1999 supplementary Order of Approval, installation of the ice boom may begin when the Lake Erie water temperature, as measured at the Buffalo Water Intake, reaches 4ºC (39ºF) or on December 16, whichever occurs first. Preparations for installing the ice boom began on November 21, with raising the anchor cables from the bottom of the lake and attaching them to buoys. Repairs to the anchor cables were completed by dive crews and all anchor cables were raised and ready for attachment to boom pontoon spans by December 17. Towing of the boom's pontoon spans from dry land summer storage out to the Buffalo Harbor breakwall by tug began on December 6 and was completed by December 16. As required by the Order, the board issued a media advisory to the public on December 16, informing that installation of the boom would start as early as December 17. Installation of the ice boom was initiated starting from the Canadian side on December 17, with the first of the boom pontoon spans attached to the anchor buoys on Lake Erie. Some installation delays were encountered due to high wind and wave conditions. All twenty-two spans of the boom were placed by the end of day December 21.

Weekly reports on the ice conditions for Lake Erie and the Niagara River were prepared and submitted to the board by the Power Entities beginning on December 14, 2020. Data jointly compiled by the Canadian Ice Centre and the U.S. National Ice Center of weekly ice coverage for Lake Erie comparing the heavy ice season of 2018-19 to ice cover during this reporting period is shown in Figure 11. The 2019 -2020 ice season was very mild and no solid ice formed on Lake Erie in the vicinity of the ice boom at any time during this reporting period.

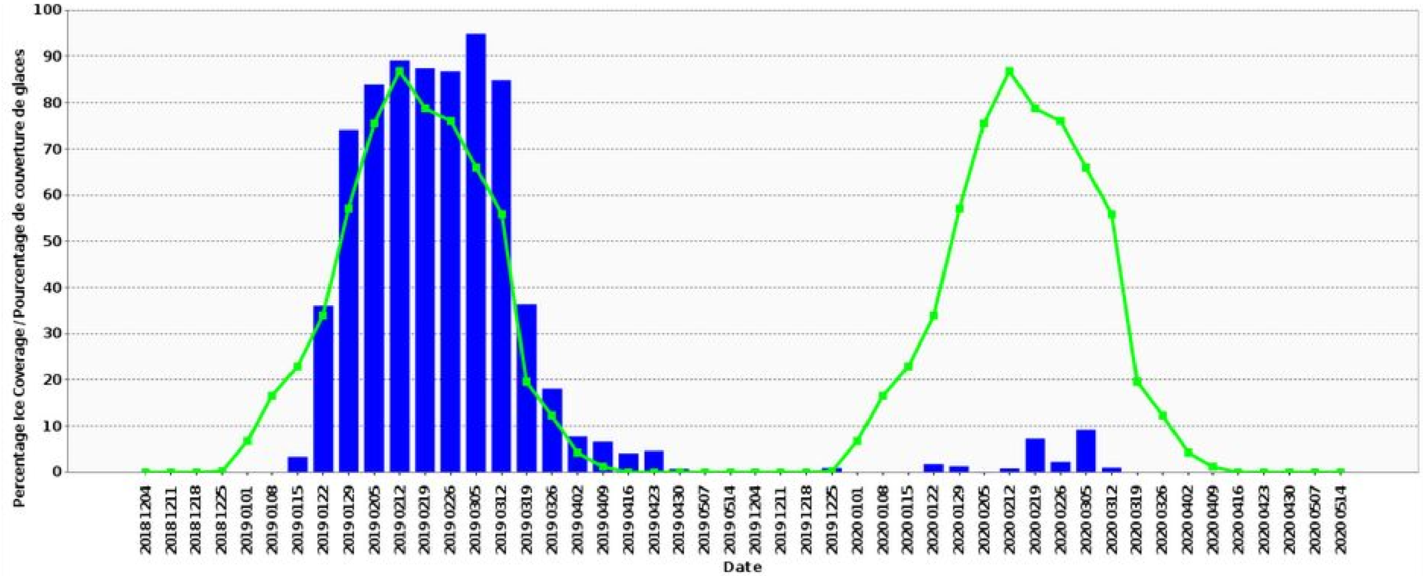


Figure 11: Weekly ice coverage for Lake Erie during the 2018-19 and 2019-20 ice season up to March 31, 2020.

Given the lack of ice, helicopter flights to measure ice thickness on the eastern part of Lake Erie were not required. Similarly, due to the availability of satellite imagery of the ice on Lake Erie for observations of ice on lake, the fixed- wing flights to determine the extent and condition of the ice cover were not needed this year.

The IJC's Order directs that the International Niagara Board of Control monitor the operation of the ice boom and so advise the Commission. Every 5 years a comprehensive review report is prepared and submitted to the Commission in order to meet this directive. The 5 year review report was drafted and is being reviewed by the board for submission to the IJC.

11. Other Issues

American Falls Bridges Project: There are two pedestrian bridges spanning the American Falls Channel. These bridges have fallen into a state of disrepair and require significant work to make them functional again. New York State Parks (NYSP) has worked with consultants to evaluate the existing condition of the structures and possible rehabilitation and replacement alternatives. The two pedestrian bridges in question are the ones crossing the American Falls Channel from Prospect Park to Green Island and from Green Island to Goat Island.

The New York State Office of Parks, Recreation and Historic Preservation (Parks), in conjunction with the New York State Department of Transportation (NYSDOT) and their contractor Greenman-Pedersen, Inc. (GPI), have been developing a feasible path towards the reconstruction of the Goat Island Road bridges. The two bridges cross the American channel of the Niagara River and traverse very turbulent water flows. These challenging conditions require a higher level of preliminary planning including a greater emphasis on constructability. The most formidable challenge will be diverting water flows to construct the bridge foundations. Beyond the difficulties associated with constructing water diversion structures such as cofferdams, the implications of diverting water flow may greatly affect international waters. The ramifications of various cofferdam options need to be considered with a heightened focus on the rise and reduction of water flow levels within the Niagara River, specifically within the Canadian channel and further upstream.

This project will be closely monitored by the International Working Committee and progress will be reported as needed to IJC staff over the next several months.

12. Meeting with the Public

In accordance with the Commission's requirements, the Board held an annual webinar style meeting with the public on October 8, 2019. IJC communications staff helped with facilitation of the meeting. The Canadian co-chair delivered the webinar presentation, and members of the board and INWC also attended. Members of the public joined from 6 different locations. No questions were asked by the public during the meeting.

13. Membership of the Board and the Working Committee

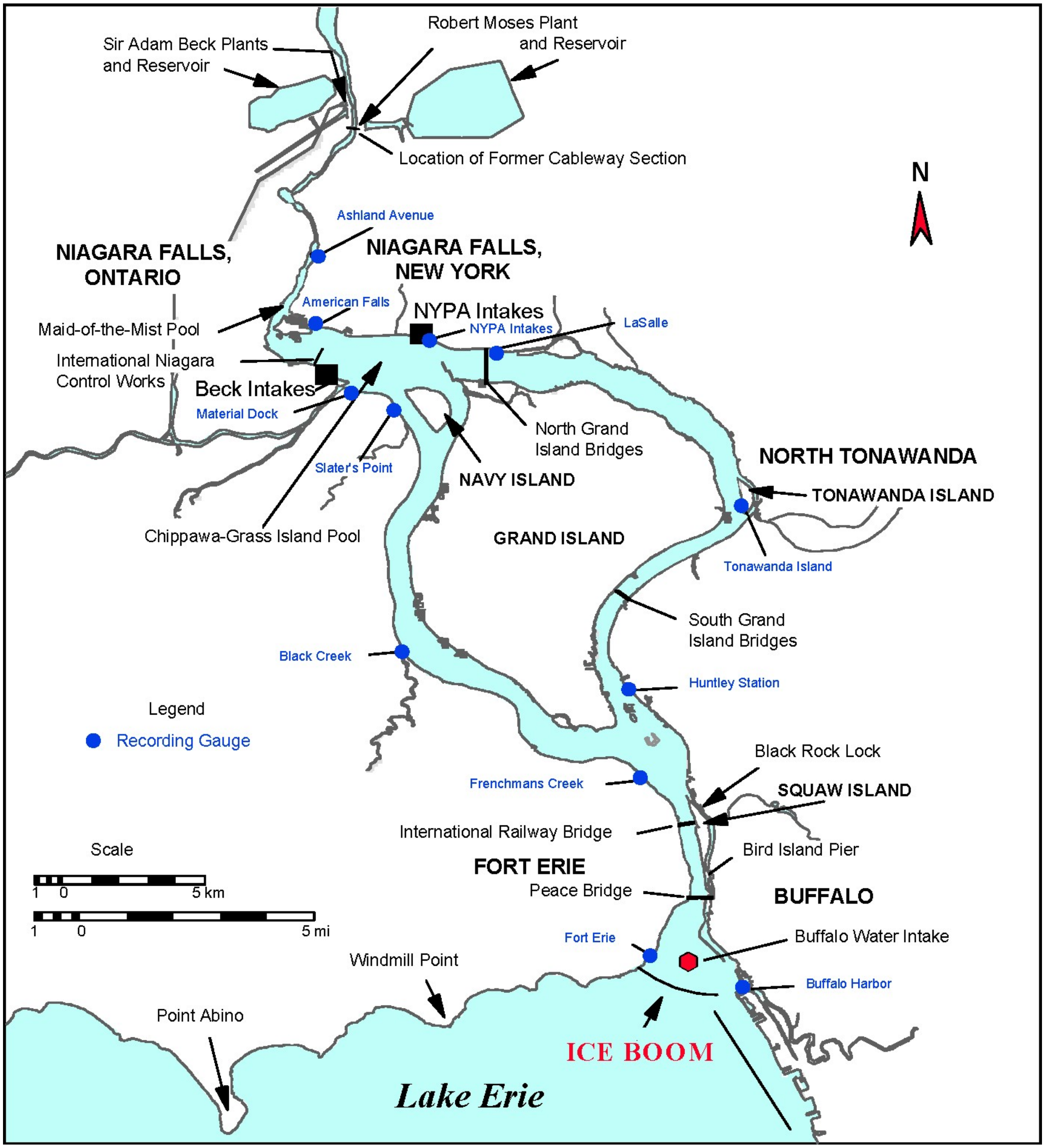
Mr. Stephen Durrett replaced MG Mark Toy as the board US Co-Chair, and Mr. Kyle McCune replaced Mr. Stephen Durrett as the Alternate US Co-Chair in September 2019. Changes to the board's Working Committee during the reporting period were: Ms. Lauren Schifferle, USACE, replaced Mr. Keith Koralewski, USACE, as the US

Alternate Co-Chair. Mr. Derrick Beach replaced Dr. Frank Seglenieks as the Canadian Co-Chair in October 2019.

14. Attendance at Board Meetings

The Board met once during this reporting period. The meeting was held on September 26, 2019 at the Canadian Centre for Inland Waters in Burlington, Ontario. Mr. Aaron Thompson, Canadian Section Chair, and Mr. Stephen Durrett, U.S. Section Chair, were in attendance, and Canadian and US members, Mr. David Capka and Ms. Jennifer Keyes joined the meeting via webinar. The Canadian and US Secretaries were also present.

The next board meeting is scheduled for March 12, 2020 at the Great Lakes Environmental Research Laboratory in Ann Arbor, Michigan.



Enclosure 1: Map of the upper Niagara River showing water level gauge locations.

Aaron Thompson

Digitally signed by: Aaron Thompson
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Mr. Aaron F. Thompson
Chair, Canadian Section

Mr. Stephen G. Durrett
Chair, United States Section

Ms. JENNIFER L. KEYES
Member, Canadian Section

Mr. DAVID CAPKA
Member, United States Section