International Lake Superior
Board of Control

Semi-Annual Progress Report to the International Joint Commission

Covering the period March 1, 2018 to August 31, 2018

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International Lake Superior Board of Control

Canada
Mr. Jean-François Cantin, Member
Mr. Rob Caldwell, Secretary

United States
MG Mark Toy, Member
Mr. Arun Heer, Secretary

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

19 September 2018

Commissioners:

This semi-annual report covers the Board's activities from 1 March to 31 August 2018.

1. Highlights

From March through August, the monthly mean water levels of Lake Superior ranged from 11 to 31 cm (4.3 to 12.2 in) above average, and ranged from 13 cm (5.1 in) lower to 15 cm (5.9 in) higher than in 2017.

In the past six months, monthly mean Lake Michigan-Huron levels ranged from 39 to 46 cm (15.4 to 18.1 in) above average. Lake Michigan-Huron ranged from 5 cm (2.0 in) lower to 23 cm (9.1 in) higher than in 2017.

Lake Superior outflows through the winter from December 2017 through April 2018 were determined according to a deviation strategy (approved 28 November 2017 by the IJC) to continue to reduce the potential for adverse consequences of high and fluctuating flows in the St. Marys Rapids. To achieve this objective, the Board allowed release of approximately 100 m^3/s of additional flow through the Compensating Works by maintaining a gate setting equivalent to one gate fully open instead of the typical winter setting equivalent to one-half gate open. However, the total flow capacity was limited through much of the winter, primarily owing to an unscheduled hydropower outage due to a bearing failure at Brookfield Renewable's Clergue plant. The additional flow through the Compensating Works partially offset the effect of this unscheduled hydropower outage.

The Board requested and received Commission approval to deviate from the regulation plan by letters dated 11 April 2018 and 17 April 2018 in order to better manage operational limitations on hydropower flow capacity and reduce the potential for adverse consequences of high and fluctuating flows in the St. Marys Rapids, as well as to offset the effect of previous unintentional deviations. To achieve these objectives while minimizing the long-term impacts on both Lake Superior and Lake Michigan-Huron water levels, flows above those prescribed by Plan 2012 were released from May through August.

Flow through the Compensating Works continued to be managed by employing multiple, partially open gates in lieu of fully open gates, with the equivalent gate settings ranging from one gate fully open in March through the beginning of May to a high of seven gates fully open at the end of August.

Since March, monthly outflows from Lake Superior have been between 110 and 132 percent of average. The monthly outflows from Lake Michigan-Huron ranged from 108 to 128 percent of average. Water supplies to Lake Superior were consistently below average with the exception of July (above average) and August (near average). Water supplies to Lake Michigan-Huron were below average in March and July, above average in April, May and August and near average in June.

A construction project to automate four of the Compensating Works gates (Gates #11-14) was completed from late-July through early-September. The automated gates offer improved flexibility in setting the height of gate openings and the rate at which they are opened and closed to maximize benefits to the St. Marys Rapids. The Commission approved temporary closure of Gate #1 to facilitate underwater inspections of Gates #1-2. A small amount of wooden debris wedged under the gates prevented their complete closure but underwater video was obtained and the next underwater inspection is scheduled for 2020.

The Board continued its ongoing public communications and outreach efforts including a public webinar on 19 July, participating in Engineer's Day in Sault Ste. Marie, Michigan, on 29 June, and informal discussions between Board staff, key stakeholders and the public throughout the reporting period. The Board continued to issue News Releases and other content through the Board's website and Facebook pages, which continue to grow in popularity. Some stakeholders voiced concerns about high levels and erosion impacts on lakes Superior and Michigan-Huron. Some remain concerned about potential impacts due to climate change and variability.

2. Monitoring of Hydrologic Conditions

The Board continuously monitors the water levels of lakes Superior and Michigan-Huron, and also the water levels and flows in the St. Marys River. The regulation representatives' monthly reports to the Board provide hydrologic assessments and recommendations for the regulation of outflows from Lake Superior. These reports indicate the amount of water available for hydropower purposes, after the requirements for domestic use, navigation, and the fishery (St. Marys Rapids) are met.

Tables 1 and 2 list the recent monthly water levels, net basin supplies, and outflows for lakes Superior and Michigan-Huron, respectively. Figures 1 and 2 compare the monthly water levels for this period to long-term averages and extremes for each lake. Figures 3 and 4 show the monthly precipitation over the lakes Superior and Michigan-Huron basins. Figures 5 and 6 show the monthly net basin supplies for each basin.

Precipitation over the Lake Superior basin was 82 percent of average from March through August 2018 and would be expected to be exceeded 90 percent of the time. Precipitation was below average in March, April, July and August, and near average in May and June. The net basin water supplies to Lake Superior, which are the net amount of precipitation, evaporation, and runoff to the lake, were consistently below average, with the exception of July (above average) and August (near average). April's net basin supply is provisionally a new record low. On the whole, the March through August net basin supplies to Lake Superior would be expected to be exceeded 91 percent of the time.

Lake Superior's monthly mean levels over the past six months ranged from 11 to 31 cm (4.3 to 12.2 in) above average. Lake Superior's water levels remained consistently above chart datum (183.2 m or 601.1 ft) throughout the reporting period, and on 31 August, the lake was at elevation 183.65 m (602.5 ft), which was 11 cm (4.3 in) above average, but 15 cm (5.9 in) lower than at the same time last year.

Precipitation over the Lake Michigan-Huron basin was 92 percent of average over the past six months and would be expected to be exceeded 74 percent of the time. Precipitation was above average in May and August, below average in March, June and July, and near average in April. Net basin water supplies to Lake Michigan-Huron were below average in March and July, above average in April, May and August and near average in June. On the whole, the March through August net basin supplies to Lake Michigan-Huron would be expected to be exceeded 58 percent of the time.

Monthly mean Lake Michigan-Huron levels ranged from 39 to 46 cm (15.4 to 18.1 in) above average. Water levels remained consistently above chart datum (176.00 m or 577.4 ft) throughout the reporting period, and on 31 August, Lake Michigan-Huron was at elevation 176.96 m (580.6 ft), 43 cm (16.9 in) above average, but 1 cm (0.4 in) lower than last year.

3. Regulation of Lake Superior Outflows

3.1. Outflows

On 28 November 2017, the Board received IJC approval to temporarily deviate from Plan 2012 from December 2017 through April 2018 to continue to reduce the potential for adverse consequences of high and fluctuating flows in the St. Marys Rapids. To achieve this objective, the Board allowed release of approximately 100 m^3/s of additional flow through the Compensating Works by maintaining a gate setting equivalent to one gate fully open instead of the typical winter setting equivalent to one-half gate open. Primarily due to an unscheduled hydropower outage owing to a bearing failure at Brookfield Renewable's Clergue plant, the total flow capacity was limited through much of the winter. However, the additional flow through the Compensating Works partially offset the effect of the unscheduled hydropower outage.

The Board requested Commission approval to deviate from the regulation plan by letter dated 11 April 2018 in order to better manage operational limitations on hydropower flow capacity and reduce the potential for adverse consequences of high and fluctuating flows in the St. Marys Rapids, as well as to offset the effects of previous unintentional deviations. The Commission granted approval on 17 April. To achieve these objectives while minimizing the long-term impacts on both Lake Superior and Lake Michigan-Huron water levels, flows above those prescribed by Plan 2012 were released from May through August.

Lake Superior outflows were 117 percent of average over the past six months, with monthly flows ranging from 2,270 to 2,770 m^3/s (80,000 to 97,900 cfs).

Several scheduled and unscheduled flow reductions continued to occur at the hydropower plants over the past six months (details are provided in *Section 6* of this report). Flow capacity limitations in April could not be addressed by adjusting the gate setting at the Compensating Works because the gates remained frozen until early May. Operational limitations on hydropower flow capacity in May through August were addressed by adjusting the gate setting at the Compensating Works in accordance with the Board's approved deviation strategy.

The Board's deviation strategy, combined with hydropower maintenance activities and uncontrolled hydrologic impacts, resulted in total outflows being, on average, slightly more than the flow that was prescribed by Plan 2012 during the reporting period, and largely offset the effects of previous unintentional deviations.

3.2. Compensating Works Gate Settings and St. Marys Rapids Conditions

During the reporting period, the Board continued to work with the Commission, the hydropower entities, and other stakeholders, to address issues raised related to the gate setting of the Compensating Works, and the unusually high water level and flow conditions in the St. Marys Rapids, while adhering to the principles of the Boundary Waters Treaty and the Orders of Approval for Lake Superior regulation.

Flow through the Compensating Works continued to be managed by employing multiple, partially open gates in lieu of fully open gates, with the equivalent gate settings ranging from one gate fully open in March through the beginning of May to a high of seven gates fully open at the end of August. A complete summary of gate setting changes is provided in Table 3.

The gate setting was increased from the setting equivalent to one gate fully open (which was maintained through the winter in lieu of the typical minimum one-half gate open equivalent setting) to a setting equivalent to approximately two gates open on 7-8 May. On 4 June, four gates were raised slightly. On 9 July, gates were further opened to an equivalent of approximately three gates fully open and this equivalent setting was maintained (with minor adjustments to facilitate a construction project to automate four of

the gates) until 7 August, when the gates were further opened to an equivalent of approximately six gates fully open. Minor adjustments to the gate setting continued in August as the construction project to automate four of the gates continued. On 23 August, attempts were made to temporarily close several gates to facilitate underwater inspections of Gates #1, 2 and 8. After the inspections were completed, the gates were set to an equivalent of approximately seven gates fully open.

Throughout the reporting period, Gate #1, which supplies water to the Fishery Remedial Works, remained set at approximately 15 m^3/s (530 cfs), with the exception of a six hour period on 23 August when it was temporarily partially closed to facilitate inspection.

From 7 May through 6 August, Gate #16 was set at 5 cm open at the request of the US Fish and Wildlife Service to facilitate sea lamprey trapping.

4. Governing Conditions during the Reporting Period

The monthly mean levels of Lake Superior ranged between 183.46 and 183.65 m (601.9 and 602.5 ft) during the reporting period, within the limits of 182.76 and 183.86 m (599.6 and 603.2 ft) specified in the Commission's Order (Criterion A).

During the reporting period, the daily mean water levels in the lower St. Marys River at the U.S. Slip gauge downstream of the US Locks varied between 176.94 and 177.33 m (580.5 and 581.8 ft). Therefore, Criterion B of the Commission’s 2014 Orders, which restricts outflow to no more than preproject values when the level at U.S. Slip is above 177.94 m (583.8 ft), was not a concern. Furthermore, daily mean U.S. Slip levels stayed well above the ponding restriction threshold (see *Section* 10) of 176.09 m (577.7 ft) for the reporting period. However, while ponding was permitted during the entire reporting period, there was no opportunity for plants to perform ponding operations as they were running at full capacity.

5. Inspection and Repairs at the Compensating Works

Routine monthly maintenance inspections continued to be conducted on the Canadian portion of the Compensating Works by Brookfield Renewable. Monthly inspection observations included public safety features such as fencing and signs, the concrete and masonry structure, gates, and mechanisms, on-site safety equipment such as life jackets and air horns, as well as the noting of anything unusual. In addition to the monthly inspections, the annual dam safety inspection was completed by the Regional Dam Safety Engineer and an Independent Consulting Engineer on 30 August. The annual inspection was performed on the Compensating Works structure and the earth dam north of the structure. The inspections found the Compensating Works facilities to be in good condition. No major issues were noted.

An underwater inspection of the downstream apron of Gate #8 was completed on 23 August. A cold joint and a crack in the apron concrete are being monitored and a repair design is being prepared by Brookfield Renewable.

To facilitate the 23 August underwater inspections upstream and downstream of Gate #1 and upstream of Gate #2, closure of Gates #1-3 was required. On 8 August, the Commission approved these short, temporary closures in accordance with the temporary supplementary Order provided at that time. A small amount of wooden debris wedged under Gate #1 and Gate #2 prevented their complete closure and resulting flow velocities under the gates prevented divers from entering the water. Gate #1 was lowered to an opening of 5 cm (2 in) from its standard 20 cm (8 in) opening while Gate #2 was lowered to an approximate 2.5 cm (1 in) opening. While it was not possible to carry out the full planned inspection, a video of the gate openings, confirming the debris, was taken with an underwater camera. Based on findings of the underwater inspections in 2010, the dam safety assessment in 2015, and the regular annual inspections, no signs of deterioration or concern have been identified, and the debris was left in place. The next underwater inspection will be undertaken along with the dam safety assessment scheduled in 2020.

Water levels in the rapids on 23 August were such that the concrete retaining wall was overtopped with flow into the fish channel downstream of Gate #1 (see cover photo). Water levels in the fish channel lowered as Gates #1-3 were closed but no areas were de-watered nor aquatic life stranded. Natural resource technicians from Batchewana First Nation patrolled the shoreline and were ready, on standby, to retrieve aquatic life should it have become necessary.

Monthly inspections and routine maintenance continued to be conducted on the US portion by the US Army Corps of Engineers (USACE) Soo Area Office. The monthly inspections found the Compensating Works facilities to be in good condition overall.

USACE completed automation of four US gates (Gates #11-14) at the Compensating Works from late-July through early-September (see cover photo). Construction was deferred to 2018 due to previous delays in the delivery of critical equipment. Gate settings during mobilization and construction were discussed and coordinated between the USACE project team and Board staff. The automated gates offer improved flexibility in setting the height of gate openings and the rate at which they are opened and closed to maximize benefits to the St. Marys Rapids.

6. General Conditions, Repairs and Maintenance at the Hydropower Facilities

6.1. General Conditions at the Hydropower Facilities

All three hydropower plants experience variations in flow capacity as a result of changing hydrologic conditions at any given time of the year, which can affect the plants' abilities to use their full allocations. Allocations were set at "maximum capacity" for each plant throughout the reporting period.

In addition to hydrologic constraints, maintenance activities at the plants can also lead to reduced capacity. Scheduled and unscheduled outages that occurred at the plants during the reporting period are described below.

6.2. Brookfield Renewable

Planned unit outages at Brookfield's Clergue plant totaled 421 hours during the reporting period (9.5 percent of the reporting period where at least one unit was shut down). Most of these outages were due to annual maintenance on Units G2 and G3. Unplanned outages during the reporting period totaled 1,283 hours (29 percent of the reporting period) and were mostly due to a cracked runner blade on Unit G1.

6.3. US Government Hydropower Plant

There were 21 unit outages totaling 217 hours (4.1 percent of the reporting period), with 5 hours owing to anchor ice, 1.4 hours due to issues external to the hydropower plant, and the remaining hours for scheduled maintenance. There were no outages in July. Minor outages are scheduled through fall 2018 for preventative maintenance and extended outages are being planned for February through May 2018. These extended outages were typically planned for the summer months; however the Midcontinent Independent System Operator (MISO) is expected to mandate "resource adequacy" for the summer 2019, which means all five units are expected to be online from 1300 -1800 hours EST Monday through Friday during June, July, and August. MISO is the Authority responsible for stability of the electric power grid for the Sault Ste. Marie, Michigan area.

6.4. Cloverland Electric Cooperative

Canal restoration work, which began in the spring of 2015, continued during this reporting period beginning on 30April and lasting through 26 June. Canal restoration work will resume in September through early November again this year. These repairs require flows to be reduced during working hours, resulting in total plant capacity being limited to an estimated 595 to 625 m^3/s (21,000 to 22,000 cfs) during this period. The canal repairs will continue in 2019 on a similar schedule.

7. Flow Verification Measurements

No flow verification measurements were taken this reporting period.

8. Water Usage in the St. Marys River

Table 4 (and Table 5 in cubic feet per second) lists the distribution of outflows from Lake Superior for January 2017 to August 2018. Water uses are divided into four categories: domestic, navigation, fishery, and hydropower. According to the 1979 Supplementary Order, after the first three water requirements are satisfied, the remaining outflow is shared equally between the United States and Canada for hydropower purposes. Any remainder, beyond the flow capacity of the hydropower plants, is discharged through the Compensating Works into the St. Marys Rapids.

As shown in the tables, water used for domestic and industrial purposes was 3 m^3/s (106 cfs) over the past six months, or 0.1 percent of the total monthly outflow. The monthly flow through the locks depends on traffic volume and varied from 3 to 15 m^3/s (109 to 530 cfs) during the past six months. As a percentage of the total river flow, water allocated for navigation can vary seasonally from 0.1 percent (when the locks are closed for the winter) to 1 percent in the busiest part of the navigation season. The Canadian lock opened on 15 May and the US locks opened on 25 March.

From 30 July to 3 August, an estimated 70 m^3/s (2,470 cfs) was discharged through the Davis Lock following an apparent failure of a discharge valve or bulkhead. USACE worked quickly to install bulkheads across the upstream end of the lock chamber to stop this unintentional discharge. The discharge through the Davis Lock had a minor impact of about 4 to 7 m^3/s (140 to 250 cfs) on the July and August monthly mean flows and is included in the US navigation flows reported in Tables 4 and 5.

In accordance with the Commission's Orders to fulfill the fishery needs in the main rapids, a minimum gate setting of one-half gate open is required at all times at the Compensating Works. A setting equivalent to one-half gate open for the main rapids is maintained by having four gates partially open to supply the same quantity of water. This spreads the flow more evenly across the main rapids, and reduces potential damage from ice floes impacting the gates. In addition, a flow of at least 15 m^3/s (530 cfs) is normally also maintained in the Fishery Remedial Works through Gate #1. The flow in the St. Marys Rapids, including that through the Fishery Remedial Works, ranged from 185 to 860 m^3/s (6,500 to 30,400 cfs) over the last six months, or approximately 8 to 31 percent of the total monthly outflow.

The hydropower plants passed an average of 2,060 m^3/s (72,800 cfs) from March to August for electric power production, or approximately 84 percent of the total river flow. All plants were directed to run at their maximum capacities throughout the reporting period, which varies depending on hydrologic conditions, but on average, is assumed to be approximately 2,280 m^3/s (80,500 cfs) for all three plants. The total average monthly difference of

220 m^3/s (7,700 cfs) was due primarily to unit outages as a result of scheduled and unscheduled plant maintenance requirements. Usages at each plant are shown in Tables 4 and 5.

9. Long Lac, Ogoki and Chicago Diversions

Ontario Power Generation (OPG) continued to provide the Board with information on the operations of the Long Lac and Ogoki Diversions. The Ogoki Diversion into Lake Nipigon (which flows into Lake Superior) averaged 108 m^3/s (3,810 cfs) and the Long Lac Diversion averaged 43 m^3/s (1,520 cfs) from March through August. Combined, these diversions were about 90 percent of average for the period 1944-2017.

Slots cut into Waboose Dam provide a minimum flow northward to the Ogoki River of approximately 2 m^3/s (to meet fisheries requirements). This "slot flow" averaged 2.3 m^3/s (80 cfs) from March through August.

Continuous minimum flows of at least 2 m^3/s (70 cfs) are maintained from the Saturday of Victoria Day weekend (in May) through Labour Day from the northern outlet of Long Lake (Kenogami Dam) for environmental enhancement. Outflows through the Kenogami Dam during the reporting period averaged 4.2 m^3/s (150 cfs).

The Chicago Diversion is comprised of actual withdrawals of water from Lake Michigan, plus the diversion of runoff that once drained to Lake Michigan naturally to the Illinois River. The Chicago District, Corps of Engineers, continues to monitor the measurements and the computation of the diversion of Lake Michigan water by the State of Illinois through the Chicago Diversion. A report is traditionally published annually. These reports typically contain a diversion accounting report for one or more of the previous years, depending on when the diversion accounting data was ready to be reported. A technical committee report is also published every fifth year. Since final numbers are often unavailable for several years, a constant preliminary estimate of 91 m^3/s (3,210 cfs) is employed in regulatory computations. This equates to the maximum amount of diversion permitted on a yearly basis. Actual monthly values tend to be lower than this maximum annual diversion, but can occasionally be higher. Final monthly diversion estimates are currently coordinated through September 2013.

During the reporting period, it was reported that the water diverted into the System at Lake Superior (Ogoki Diversion + Long Lac Diversion) was 151 m^3/s (5,330 cfs). Water diverted from the System at Lake Michigan (Chicago Diversion) was estimated to be 91 m^3/s (3,210 cfs). Therefore, the net inflow into the Lake Superior – Michigan-Huron System was approximately 60 m^3/s (2,120 cfs).

10. Peaking and Ponding Operations at Hydropower Plants

Peaking and ponding operations are the within-day and day-to-day flow variations, respectively, that enable the hydropower plants to better match their electricity production with demand. However, these variations cause the water levels in the St. Marys River downstream of the plants to fluctuate more than they otherwise would. The Commission has approved guidelines within which the Board may restrict peaking and ponding operations under certain conditions. Specifically, if the minimum level at the U.S. Slip gauge on the lower river is expected to be below the threshold level of 176.09 m (577.7 ft) as a result of ponding operations, then the power entities are required to pass on-peak flows for at least an 8-hour period each weekend and holiday day to provide periods of relatively higher levels on the lower St. Marys River each day. The Board provides summaries of peaking and ponding in its semi-annual reports. Since 2016, the Board provides written reviews every five years that are to include any recommendation for adjusting the IJC Directive, if necessary.

Continued above-average outflows from Lake Superior combined with above-average Lake Michigan-Huron levels resulted in levels at U.S. Slip remaining well above the established threshold, such that ponding was permitted throughout the report period. However, the power entities were unable to conduct peaking and ponding because the hydropower plants were operating at maximum capacity from March through August.

To continue to provide timely information on expected flow variations to the users, the USACE distributes monthly notices during the shipping season (March through January) on expected Lake Superior outflows, and a schedule of flow variations. No related concerns were reported to the Board during the period.

Figure 7 compares the hourly Lake Superior outflow and the hourly levels at U.S. Slip on the lower St. Marys River for the past six months.

11. Great Lakes – St. Lawrence River Adaptive Management Committee

Over the last six months, the Great Lakes – St. Lawrence River Adaptive Management (GLAM) Committee has continued to focus primarily on preparing a report on conditions and water level impacts in 2017. The report is expected to be completed by the end of 2018, but a draft was circulated to the Board for review and comment on 16 August. GLAM has also moved forward several work plan items and International Watershed Initiative (IWI) projects in support of the Board, and coordinated with USACE Detroit District on plan review initiatives using the two-dimensional integrated ecosystem response (IERM2D) model of the St. Marys Rapids.

12. Public Communications and Outreach

The Board hosted its annual public meeting at noon on 19 July using a combined webinar and teleconference format. A total of about 42 people participated, including members of the public, along with IJC staff, Board members, staff, and associates. The Canadian Chair, Mr. Jean-François Cantin, presented information describing Plan 2012, expected flows and deviations, current and expected water levels, the gate movement limit study and other Board initiatives. The meeting was then opened for public comment, questions, and concerns. The slide presentation shown during the webinar was also made available online to callers beforehand, and callers were able to interact with the Chair and other participants during the event. A recording of the webinar was posted online following the webinar. The Board will hold a similar webinar/teleconference meeting with the public again in 2019, the date of which will be set at the March Board meeting.

Board staff also attended and participated in the annual Soo Locks Engineer's Day on 29 June, hosted by the USACE – Soo Area Office. This was the sixth year that Board staff have participated in this event, which was once again well-attended by the public, with almost 8,500 people in attendance. Many of those in attendance stopped at the Board's display table, with professionally-printed banners and large posters showing Great Lakes water levels and an infographic of Plan 2012, along with numerous brochures and information bulletins to hand out (see cover photo). The Board representatives in attendance were kept busy throughout the day, speaking directly with dozens of people about water levels, flows, regulation, and other topics of interest. Much of the conversation centered around recent water level conditions, with many curious about how long Lake Superior and Michigan-Huron water levels are expected to remain above average. Several people were concerned that levels are high, and the impacts of higher levels on beaches and waterfront property including shoreline erosion. Board staff plans to participate in this annual event again next year.

During these events and informally throughout the reporting period, stakeholders voiced concerns and asked questions about water level and flow conditions, how the current regulation plan balances levels, the Board's degree of control of lake levels, and the Board's deviation strategy. Stakeholders in the St. Marys River, including anglers, hydropower entities, commercial navigation and Batchewana First Nations have also expressed concerns over recent gate settings and the resulting high St. Marys River flows. However, the Board noted that people have now become more accustomed to the higher levels and flows in recent years, and most recent comments have been personal accounts. There has also been some positive feedback received with regard to recent conditions as well as the Board's deviation strategy, and the use of multiple partially-open gates in lieu of multiple gates open fully. Some remain concerned about potential impacts due to climate change and variability.

The Board continues to issue, at the beginning of each month (and before any significant change in outflows or gate settings), news releases informing the public about Lake

Superior regulation and water level conditions. These news releases are sent by both the Canadian and US regulation representative offices to e-mail distribution lists that include various agencies, stakeholders and media outlets. The Board also makes these news releases available to the public online through the Board's Website (http://ijc.org/en_/ilsbc) and the Board's Facebook page (https://www.facebook.com/InternationalLakeSuperiorBoardOfControl), both of which continue to grow in popularity. Additional content available online includes information on Board Members and responsibilities, semi-annual reports, meeting minutes, regulation updates, hydrologic data summaries, and an interactive map describing some of the important features related to the regulation of outflows through the St. Marys River. Additionally, the Board is currently working with the IJC on a website modernization project. The Board website is expected to be migrated to the modernized platform by the end of the year. The Board is looking forward to continuing its efforts to incorporate new ideas into the website as it is modernized.

With the expected continuation of above-average water levels on the Upper Great Lakes, the Board continues to develop strategies for increased outreach. The Board hopes to leverage existing outreach events through the regulation representative offices to further engage with the public.

13. Board Membership and Meetings

LTC Greg Turner replaced LTC Dennis Sugrue as US Regulation Representative on 26 July.

The Board held meetings on 28 March in Buffalo, New York and 19 September in Cornwall, Ontario.

Respectfully submitted,

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Jean-François Cantin	Stephen Durrett
Chair for Canada	Alternate Chair for United States

TABLE 1. 2017-2018 Lake Superior Hydrologic Factors

Month	Levels				Net Basin Supplies			Outflows		
	Monthly Mean Recorded[1]		Difference From Average[2]		Monthly Mean Recorded		Exceedence Probability[3]	Monthly Mean Recorded		Percent of Average[4]
	metres	feet	metres	feet	m^3/s	tcfs	(%)	m^3/s	tcfs	
Mar-17	183.39	601.67	0.16	0.52	620	22	71	2,310	82	124
Apr-17	183.41	601.74	0.15	0.49	6,090	215	10	2,150	76	111
May-17	183.56	602.23	0.20	0.66	5,660	200	36	1,920	68	91
Jun-17	183.67	602.59	0.22	0.72	5,400	191	24	2,300	81	105
Jul-17	183.75	602.85	0.24	0.79	3,320	117	58	3,250	115	143
Aug-17	183.78	602.95	0.24	0.79	4,420	156	9	3,300	117	140
Sep-17	183.80	603.02	0.26	0.85	3,310	117	17	2,800	99	120
Oct-17	183.81	603.05	0.30	0.98	3,260	115	8	3,100	109	137
Nov-17	183.78	602.95	0.31	1.02	-180	-6	70	3,080	109	139
Dec-17	183.72	602.76	0.32	1.05	1,500	53	<1	2,240	79	109
Jan-18	183.65	602.53	0.32	1.05	-560	-20	59	2,060	73	106
Feb-18	183.58	602.30	0.32	1.05	740	26	25	2,100	74	111
Mar-18	183.54	602.17	0.31	1.02	-130	-5	90	2,470	87	132
Apr-18	183.46	601.90	0.20	0.66	940	33	>99	2,270	80	118
May-18	183.50	602.03	0.14	0.46	4,650	164	60	2,320	82	110
Jun-18	183.56	602.23	0.11	0.36	4,070	144	56	2,470	87	113
Jul-18	183.65	602.53	0.14	0.46	4,210	149	30	2,510	89	110
Aug-18	183.65	602.53	0.11	0.36	2,660	94	48	2,770	98	118

Notes: m^3/s = cubic metres per second tcfs = 1000 cubic feet per second

[1] Water Levels are a mean of five gauges on Lake Superior, IGLD 1985

[2] Average levels are for period 1918-2017, based on a mean of five gauges. Differences computed as metres and then converted to feet.

[3] Exceedence probabilities are based on the period 1900-2008.

[4] Average flows are for the period 1900-2008.

TABLE 2. 2017-2018 Lake Michigan-Huron Hydrologic Factors

Month	Levels				Net Basin Supplies			Outflows		
	Monthly Mean Recorded[1]		Difference From Average[2]		Monthly Mean Recorded		Exceedence Probability[3]	Monthly Mean Recorded		Percent of
	metres	feet	metres	feet	m^3/s	tcfs	(%)	m^3/s	tcfs	Average[4]
Mar-17	176.53	579.17	0.23	0.75	5,410	191	44	5,840	206	120
Apr-17	176.66	579.59	0.28	0.92	11,800	417	6	5,820	206	113
May-17	176.80	580.05	0.32	1.05	8,900	314	19	5,820	206	109
Jun-17	176.88	580.31	0.33	1.08	8,880	314	6	5,730	202	105
Jul-17	176.99	580.68	0.41	1.35	4,250	150	33	6,070	214	110
Aug-17	177.00	580.71	0.44	1.44	1,150	41	57	6,150	217	111
Sep-17	176.93	580.48	0.42	1.38	-100	-4	66	6,180	218	113
Oct-17	176.87	580.28	0.43	1.41	3,020	107	8	6,030	213	111
Nov-17	176.85	580.22	0.47	1.54	460	16	61	6,130	216	114
Dec-17	176.79	580.02	0.46	1.51	240	8	62	5,960	210	115
Jan-18	176.73	579.82	0.43	1.41	2,900	102	22	4,870	172	107
Feb-18	176.74	579.86	0.46	1.51	5,140	182	4	5,360	189	121
Mar-18	176.76	579.92	0.46	1.51	2,050	72	92	6,220	220	128
Apr-18	176.84	580.18	0.46	1.51	8,290	293	43	6,000	212	117
May-18	176.92	580.45	0.44	1.44	9,570	338	13	5,990	212	112
Jun-18	176.98	580.64	0.43	1.41	5,540	196	52	6,130	216	112
Jul-18	176.98	580.64	0.40	1.31	1,280	45	95	5,930	209	108
Aug-18	176.95	580.54	0.39	1.28	3,270	115	15	5,950	210	108

Notes: m^3/s = cubic metres per second tcfs = 1000 cubic feet per second

[1] Water Levels are a mean of six gauges on Lake Michigan-Huron, IGLD 1985

[2] Average levels are for period 1918-2017, based on a mean of six gauges. Differences computed as metres and then converted to feet.

[3] Exceedence probabilities are based on the period 1900-2008.

[4] Average flows are for the period 1900-2008.

TABLE 3
COMPENSATING WORKS GATE CHANGES

Date	Gate Change	Final Gate Settings *	Gate Equivalent (approx.)	Notes
2018				
7-May	Partially opened 13 - 16	5 - 15 open 26 cm (10 in.); 16 open 5 cm (2 in.)	1	Deviation strategy to better manage operational limits on hydropower flow capacity and to offset effects of previous unintentional under-discharge deviations from Plan 2012; Sea lamprey trapping**
8-May	Partially opened 2 - 4	2 - 15 open 26 cm (10 in.); 16 open 5 cm (2 in.)	2	
4-Jun	Raised 7 - 10	2 - 6 and 11 - 15 open 26 cm (10 in.); 7 - 10 open 33 cm (13 in.); 16 open 5 cm (2 in.)	2	
9-Jul	Raised 2 - 15	2 - 15 open 53 cm (21 in.); 16 open 5 cm (2 in.)	3	
23-Jul	Raised 2 - 8, closed 9 - 15	2 - 8 open 76 cm (30 in.); 16 open 5 cm (2 in.)	3	Construction project to automate Gates 11 - 14; Deviation strategy to better manage operational limits on hydropower flow capacity and to offset effects of previous unintentional under-discharge deviations from Plan 2012; Sea lamprey trapping**
26-Jul	Partially opened 14 - 15	2 - 8 and 14 - 15 open 76 cm (30 in.); 16 open 5 cm (2 in.)	3	
31-Jul	Closed 8	2 - 7 and 14 - 15 open 76 cm (30 in.); 16 open 5 cm (2 in.)	3	
2-Aug	Partially opened 8	2 - 8 and 14 - 15 open 76 cm (30 in.); 16 open 5 cm (2 in.)	3	
6-Aug	Closed 14 - 16	2 - 8 open 76 cm (30 in.)	3	
7-Aug	Raised 2 - 8 and partially opened 9 - 10	2 - 10 open 140 cm (55 in.)	6	Construction project to automate Gates 11 - 14; Deviation strategy to better manage operational limits on hydropower flow capacity and to offset effects of previous unintentional under-discharge deviations from Plan 2012
22-Aug	Lowered 9 - 10 and partially opened 11 - 12	2 - 8 open 140 cm (55 in.); 9 - 12 open 91 cm (36 in.)	6	Construction project to automate Gates 11 - 14; Deviation strategy to better manage operational limits on hydropower flow capacity and to offset effects of previous unintentional under-discharge deviations from Plan 2012; Temporary gate adjustments to facilitate underwater inspections of Gates 8 and 1 -2
23-Aug	Closed 7 - 9 and partially opened 13 - 16	2 - 6 open 140 cm (55 in.); 10 - 16 open 91 cm (36 in.)	6	
	Closed 1 - 3 and partially opened 7 - 9	4 - 6 open 140 cm (55 in.); 7 - 16 open 91 cm (36 in.)	6	
	Partially opened 1 - 3 and lowered 4 - 6	2 - 16 open 91 cm (36 in.)	7	

* Gate 1 remained open 20 cm (8 in.) throughout reporting period (fishery requirement of approximately 15 m^3/s) except during temporary closure on 23 August.

** Gate 16 set to 5 cm (2 in.) open at request of US Fish and Wildlife Service to allow for sea lamprey trapping

TABLE 4
MONTHLY DISTRIBUTION OF LAKE SUPERIOR OUTFLOWS
(UNITS: m^3/s)

YEAR AND MONTH	POWER CANALS US GOVT HYDRO	POWER CANALS CEC	POWER CANALS US TOTAL	POWER CANALS BREG	POWER CANALS TOTAL POWER CANALS	NAVIGATION CANALS UNITED STATES	NAVIGATION CANALS CANADA	NAVIGATION CANALS TOTAL NAV CANALS	DOMESTIC USAGE SAULT STE MARIE US + CAN	DOMESTIC USAGE ESSAR ALGOMA STEEL	DOMESTIC USAGE ST MARYS PAPER	DOMESTIC USAGE TOTAL DOM USAGE	FISHERY ST MARYS RAPIDS	TOTAL LAKE SUPERIOR OUTFLOW
2017														
JAN	396	760	1,156	934	2,090	5.1	0	5	0.2	2.6	0	3	88	2,186
FEB	384	733	1,117	1,090	2,207	0	0	0	0.3	2.5	0	3	87	2,297
MAR	392	702	1,094	1,129	2,223	2.1	0	2	0.2	2.6	0	3	86	2,314
APR	282	698	980	1,008	1,988	9.3	0	9	0.2	2.5	0	3	146	2,146
MAY	362	582	944	574	1,518	11.3	0.4	12	0.2	2.7	0	3	390	1,923
JUN	374	687	1,061	637	1,698	11.8	1.2	13	0.2	2.7	0	3	582	2,296
JUL	395	793	1,188	1,153	2,341	12.3	1.7	14	0.2	2.8	0	3	892	3,250
AUG	395	798	1,193	1,157	2,350	12.2	1.6	14	0.2	2.9	0	3	937	3,304
SEP	395	604	999	844	1,843	12.1	1.2	13	0.2	3.0	0	3	939	2,798
OCT	389	585	974	1,106	2,080	10.0	0.3	10	0.2	2.9	0	3	1,002	3,095
NOV	393	691	1,084	1,042	2,126	10	0	10	0.2	2.8	0	3	942	3,081
DEC	394	777	1,171	858	2,029	8.0	0	8	0.2	2.8	0	3	196	2,236
2018														
JAN	390	777	1,167	699	1,866	3	0	3	0.2	2.8	0	3	193	2,065
FEB	392	777	1,169	736	1,905	0	0	0	0.2	2.6	0	3	191	2,099
MAR	385	748	1,133	1,144	2,277	3.1	0	3	0.2	2.5	0	3	188	2,471
APR	367	709	1,076	994	2,070	7.8	0	8	0.2	2.7	0	3	185	2,266
MAY	371	664	1,035	998	2,033	9.3	0.3	10	0.2	3.1	0	3	272	2,318
JUN	390	651	1,041	1,092	2,133	10.7	1.2	12	0.2	3.1	0	3	319	2,467
JUL	392	787	1,179	809	1,988	17.3	1.9	19	0.3	3.0	0	3	496	2,506
AUG	388	778	1,166	719	1,885	19.6	1.7	21	0.2	3.1	0	3	860	2,769

NOTE: Power canals columns include flows through power plants and spillways
NOTE: Discharge through Davis Lock included in US navigation flows (July and August 2018)

TABLE 5
MONTHLY DISTRIBUTION OF LAKE SUPERIOR OUTFLOWS
(UNITS: cfs)

YEAR AND MONTH	POWER CANALS					NAVIGATION CANALS			DOMESTIC USAGE				FISHERY	TOTAL
	US GOVT HYDRO	CEC	US TOTAL	BREG	TOTAL POWER CANALS	UNITED STATES	CANADA	TOTAL NAV CANALS	SAULT STE MARIE US + CAN	ESSAR ALGOMA STEEL	ST MARYS PAPER	TOTAL DOM USAGE	ST MARYS RAPIDS	LAKE SUPERIOR OUTFLOW
2017														
JAN	14,000	26,800	40,800	33,000	73,800	180	0	180	7	92	0	106	3,100	77,200
FEB	13,600	25,900	39,500	38,500	78,000	0	0	0	11	88	0	106	3,100	81,200
MAR	13,800	24,800	38,600	39,900	78,500	74	0	74	7	92	0	106	3,000	81,700
APR	9,960	24,600	34,600	35,600	70,200	328	0	328	7	88	0	106	5,200	75,800
MAY	12,800	20,600	33,400	20,300	53,700	399	14	413	7	95	0	106	13,800	68,000
JUN	13,200	24,300	37,500	22,500	60,000	417	42	459	7	95	0	106	20,600	81,200
JUL	13,900	28,000	41,900	40,700	82,600	434	60	494	7	99	0	106	31,500	114,700
AUG	13,900	28,200	42,100	40,900	83,000	431	56	487	7	102	0	106	33,100	116,700
SEP	13,900	21,300	35,200	29,800	65,000	427	42	469	7	106	0	106	33,200	98,800
OCT	13,700	20,700	34,400	39,100	73,500	353	11	364	7	102	0	106	35,400	109,400
NOV	13,900	24,400	38,300	36,800	75,100	353	0	353	7	99	0	106	33,300	108,900
DEC	13,900	27,400	41,300	30,300	71,600	283	0	283	7	99	0	106	6,900	78,900
2018														
JAN	13,800	27,400	41,200	24,700	65,900	106	0	106	7	99	0	106	6,800	72,900
FEB	13,800	27,400	41,200	26,000	67,200	0	0	0	7	92	0	106	6,700	74,000
MAR	13,600	26,400	40,000	40,400	80,400	109	0	109	7	88	0	106	6,600	87,200
APR	13,000	25,000	38,000	35,100	73,100	275	0	275	7	95	0	106	6,500	80,000
MAY	13,100	23,400	36,500	35,200	71,700	328	11	339	7	109	0	106	9,600	81,700
JUN	13,800	23,000	36,800	38,600	75,400	378	42	420	7	109	0	106	11,300	87,200
JUL	13,800	27,800	41,600	28,600	70,200	611	67	678	11	106	0	106	17,500	88,500
AUG	13,700	27,500	41,200	25,400	66,600	692	60	752	7	109	0	106	30,400	97,900

NOTE: Power canals columns include flows through power plants and spillways

NOTE: Discharge through Davis Lock included in US navigation flows (July and August 2018)

NOTE: Flows for individual users were originally coordinated in m^3/s, and are converted here to U.S. customary units (cfs) and rounded to 3 significant figures.
Total flow for each category and total Lake Superior flow in this table are computed from the individual flows in cfs.

Figure 1 - LAKE SUPERIOR MONTHLY WATER LEVELS

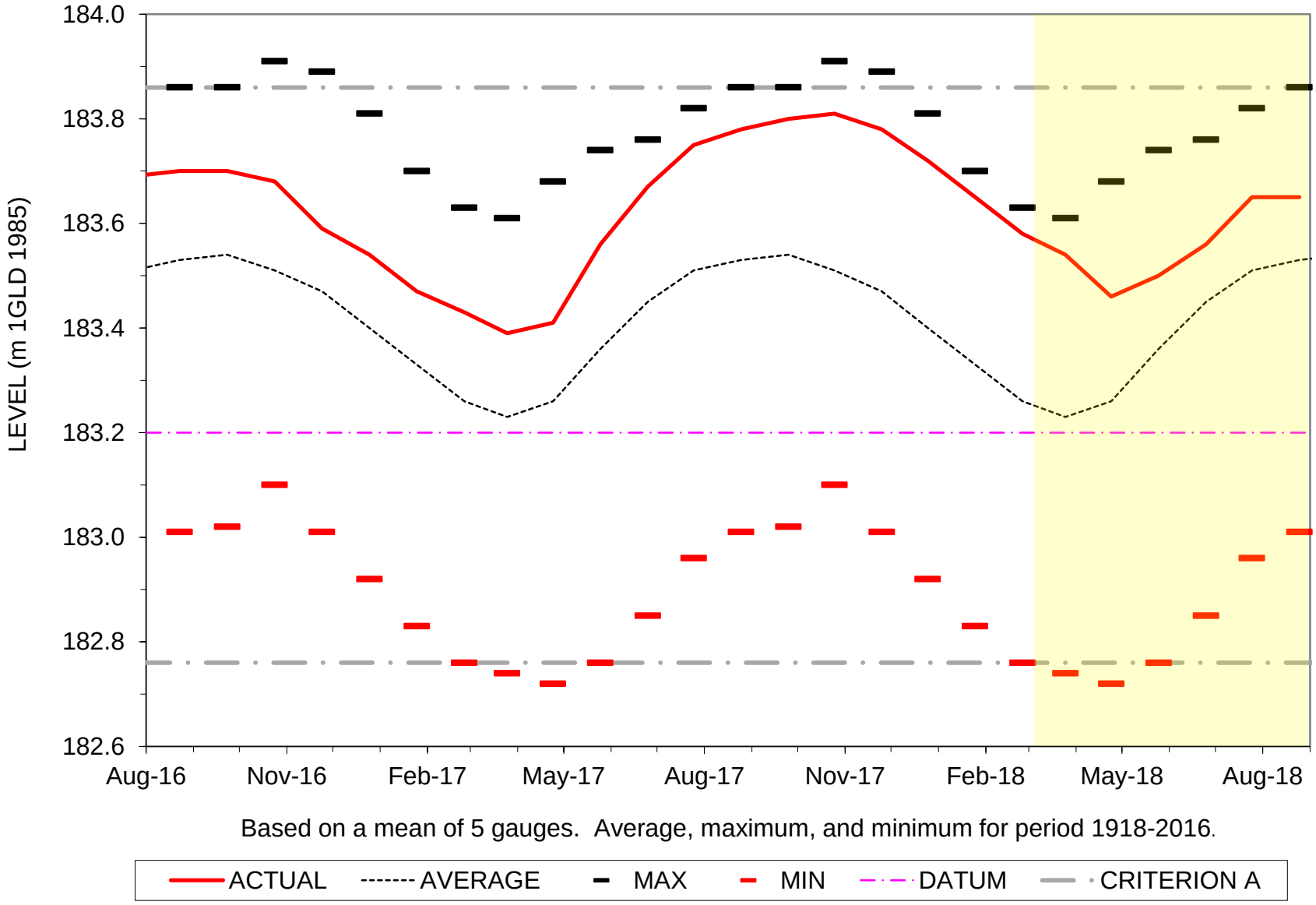
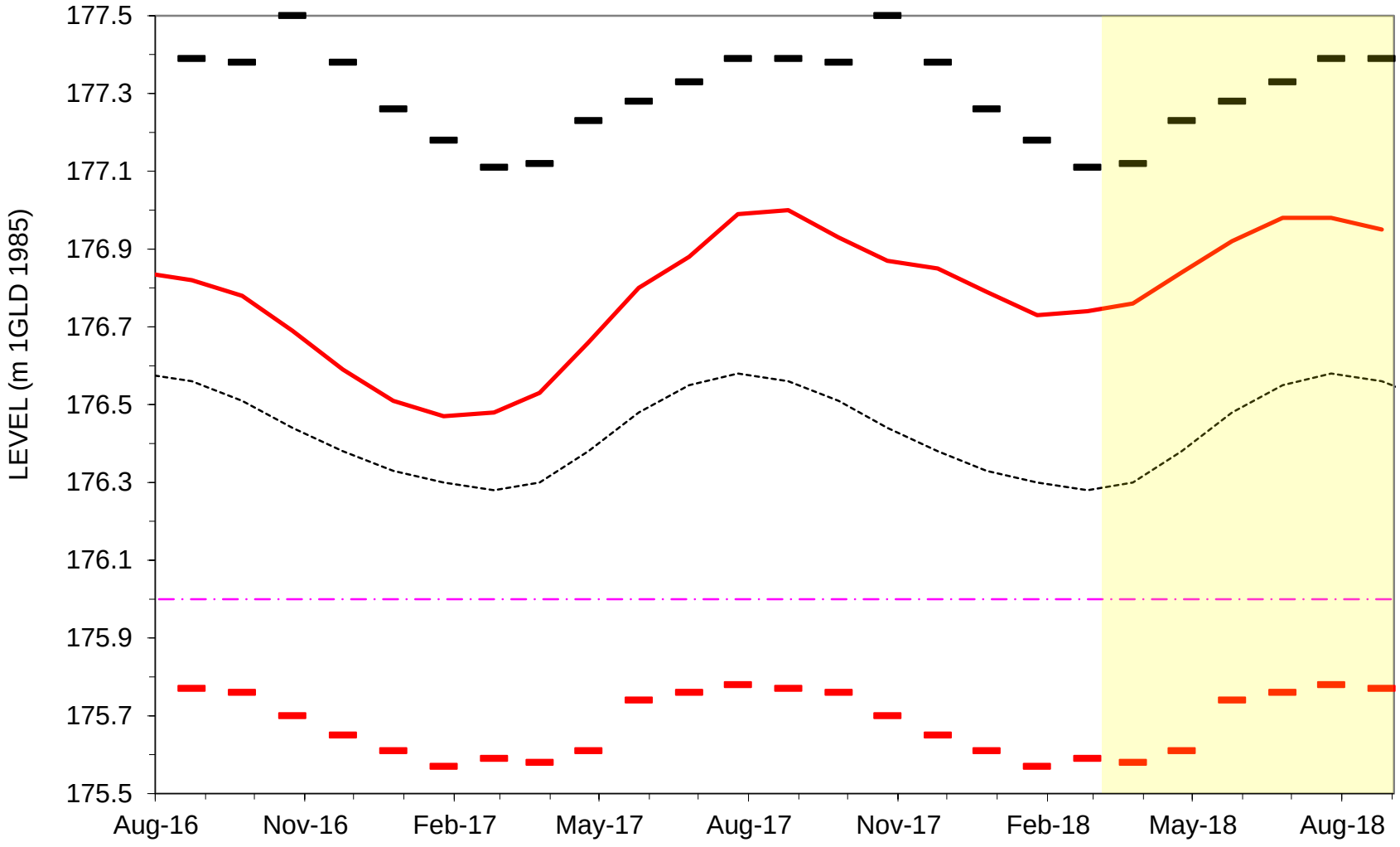


Figure 2 - LAKE MICHIGAN-HURON MONTHLY WATER LEVELS



Based on a mean of 6 gauges. Average, maximum, and minimum for period 1918-2016.

Figure 3 - LAKE SUPERIOR BASIN MONTHLY PRECIPITATION

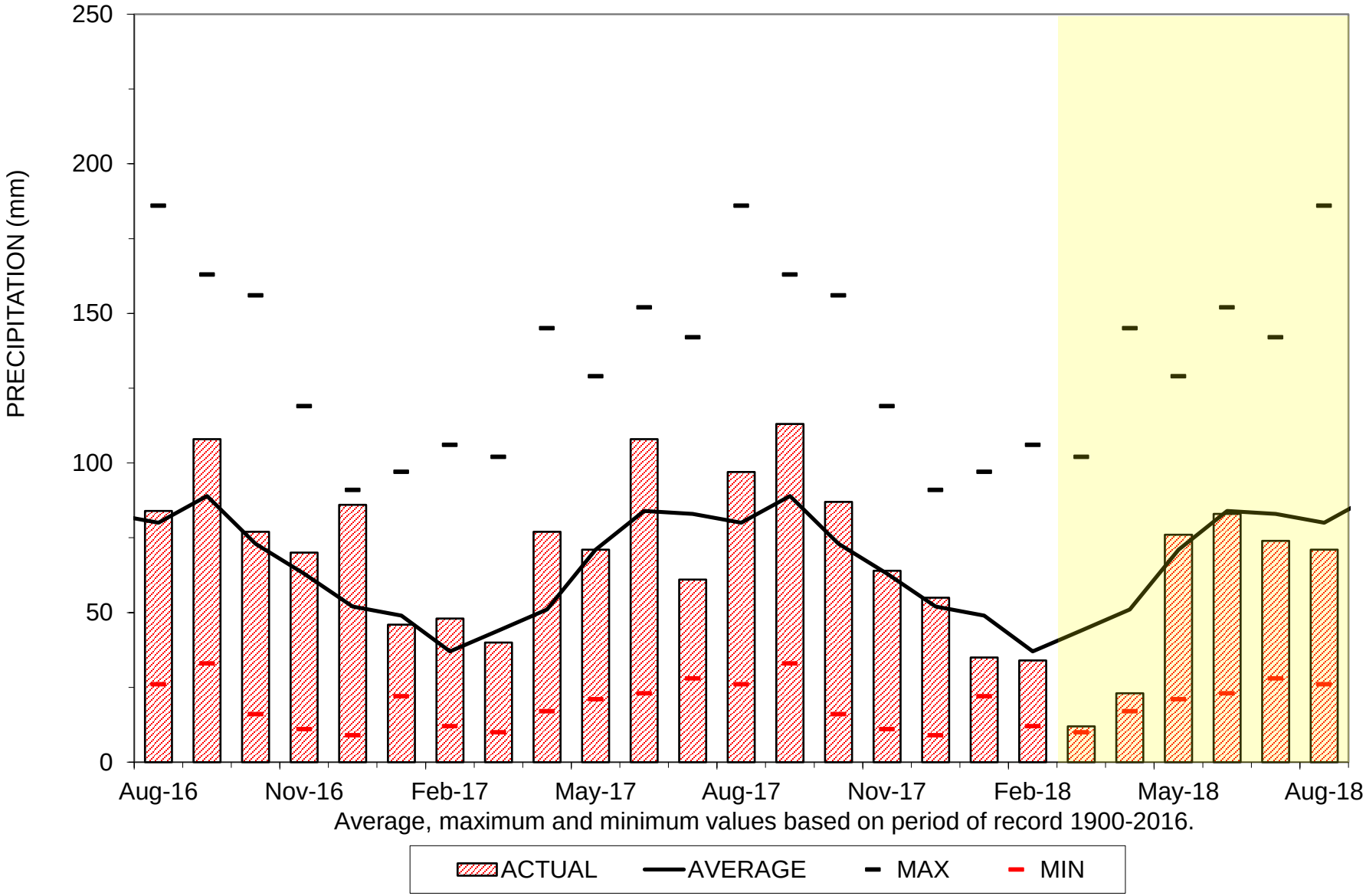


Figure 4 - LAKE MICHIGAN-HURON BASIN MONTHLY PRECIPITATION

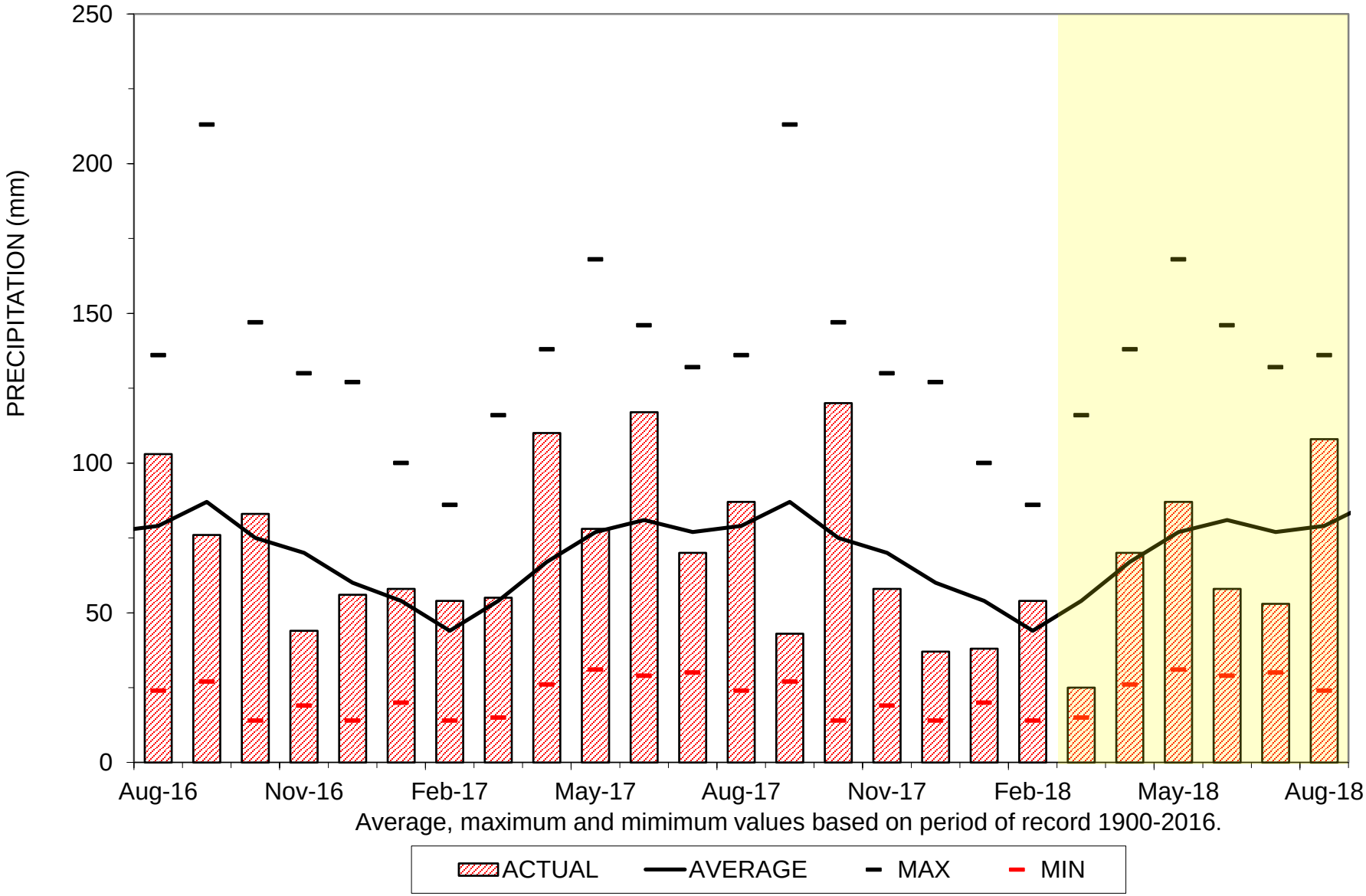
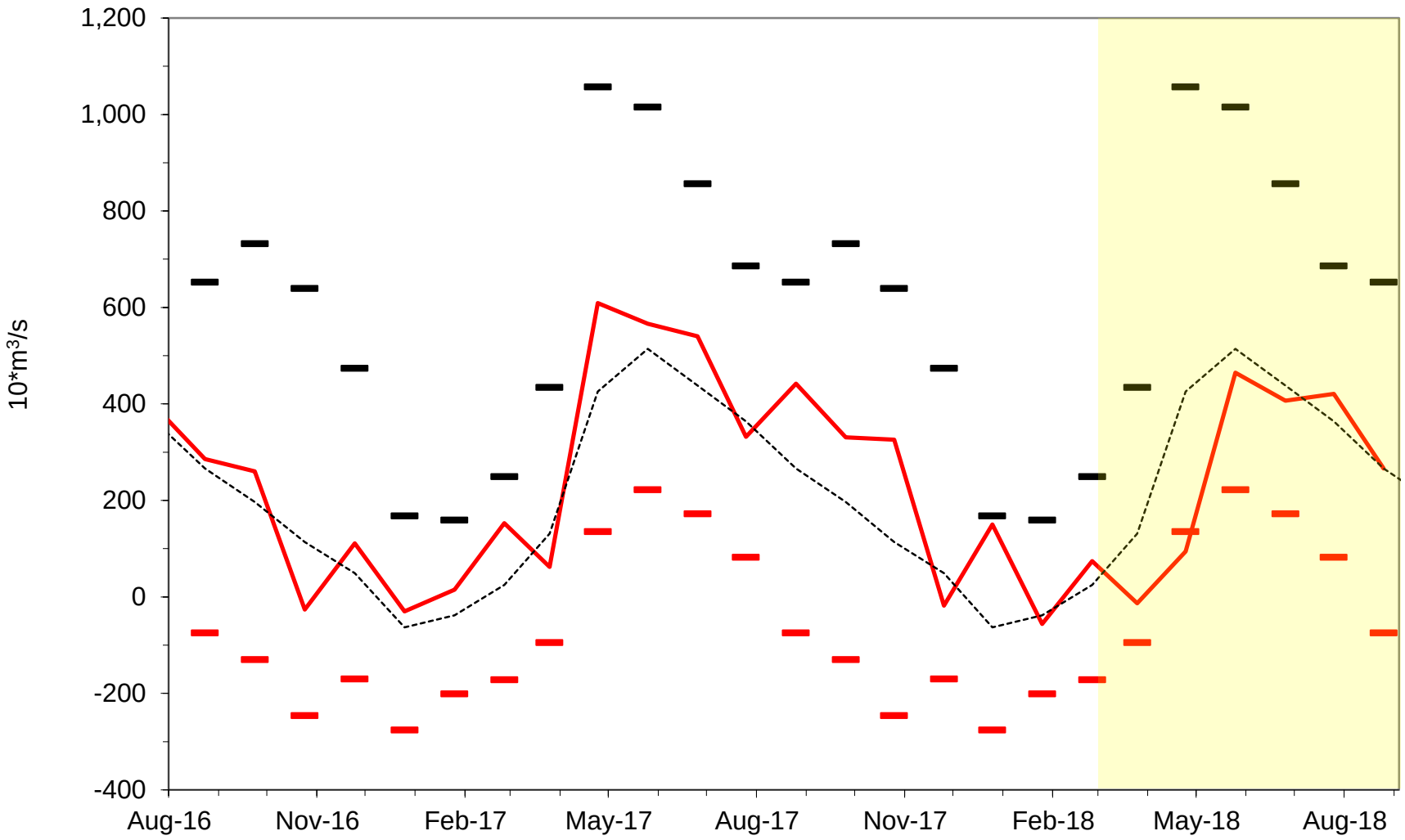
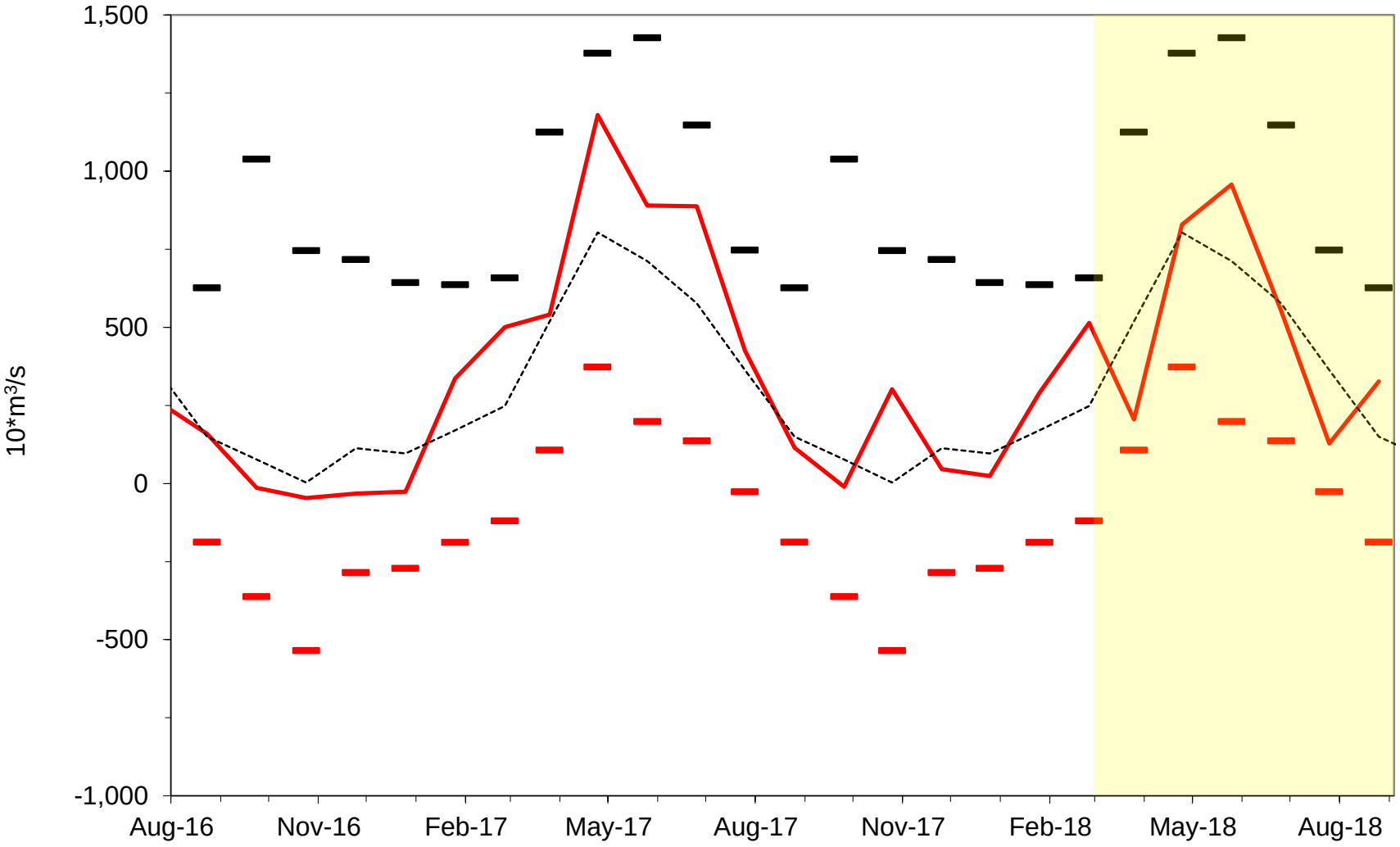


Figure 5 - LAKE SUPERIOR MONTHLY NET BASIN SUPPLIES



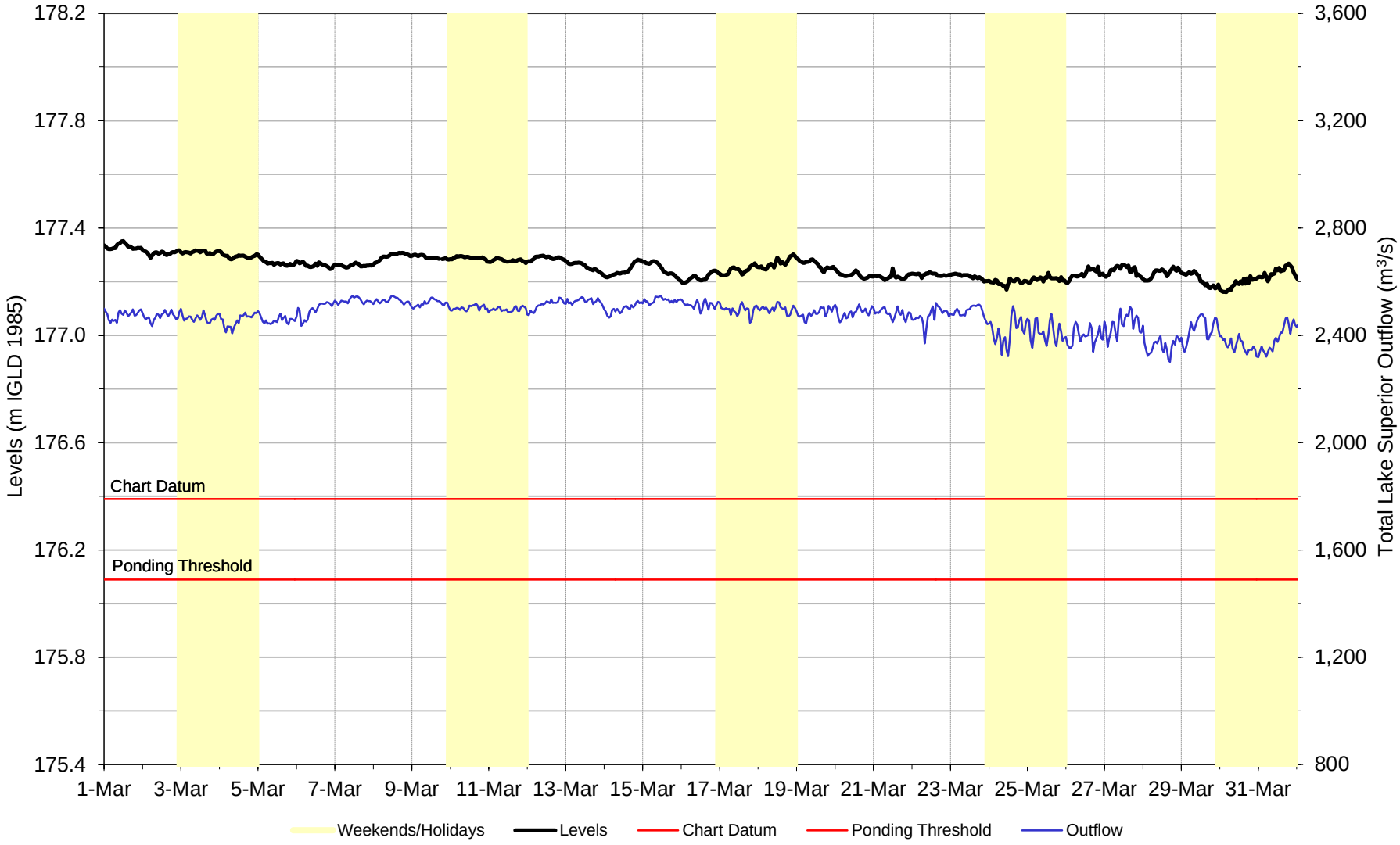
Average, maximum and minimum values based on coordinated period of record 1900-2008.

Figure 6 - LAKE MICHIGAN-HURON MONTHLY NET BASIN SUPPLIES

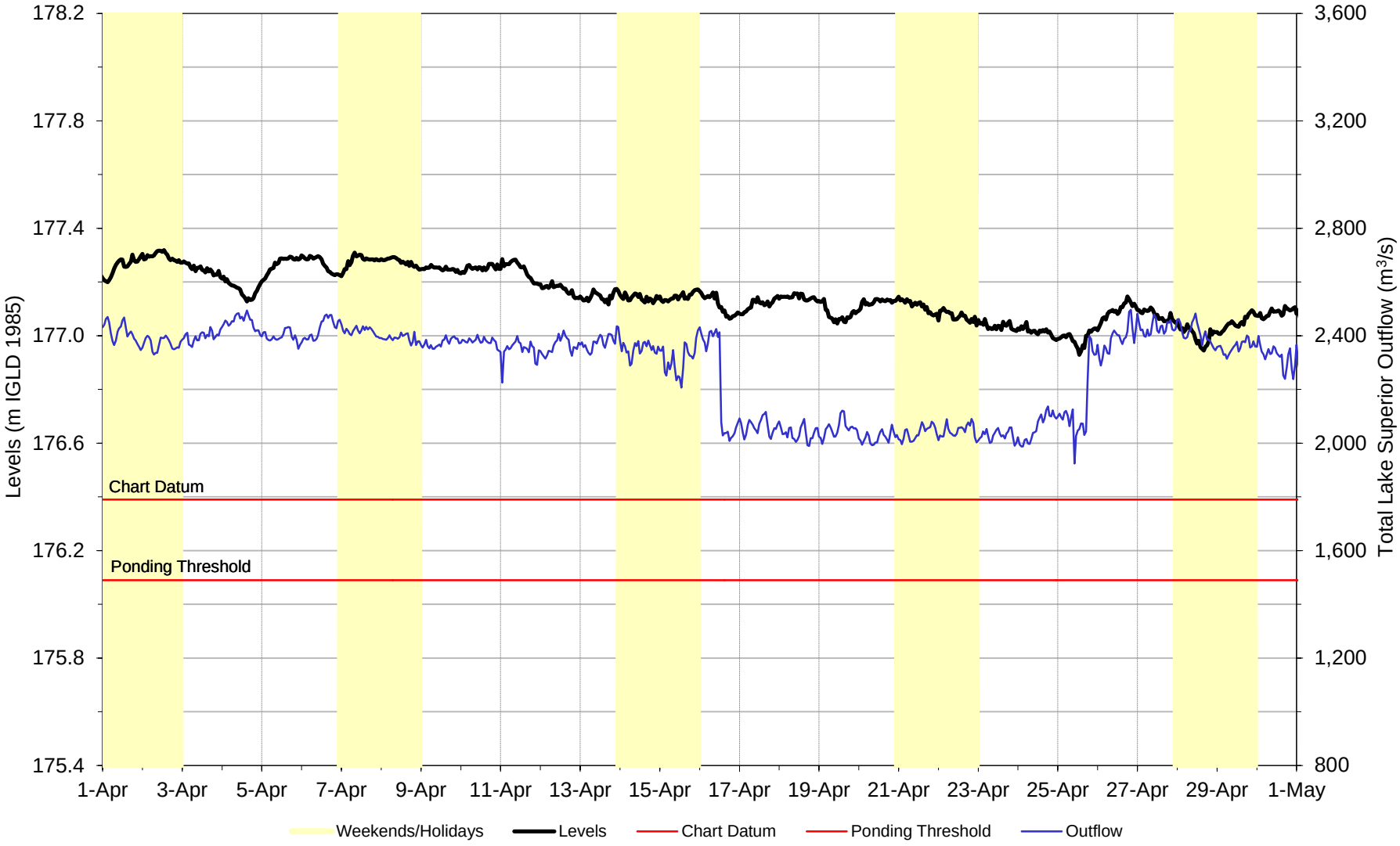


Average, maximum and minimum values based on coordinated period of record 1900-2008.

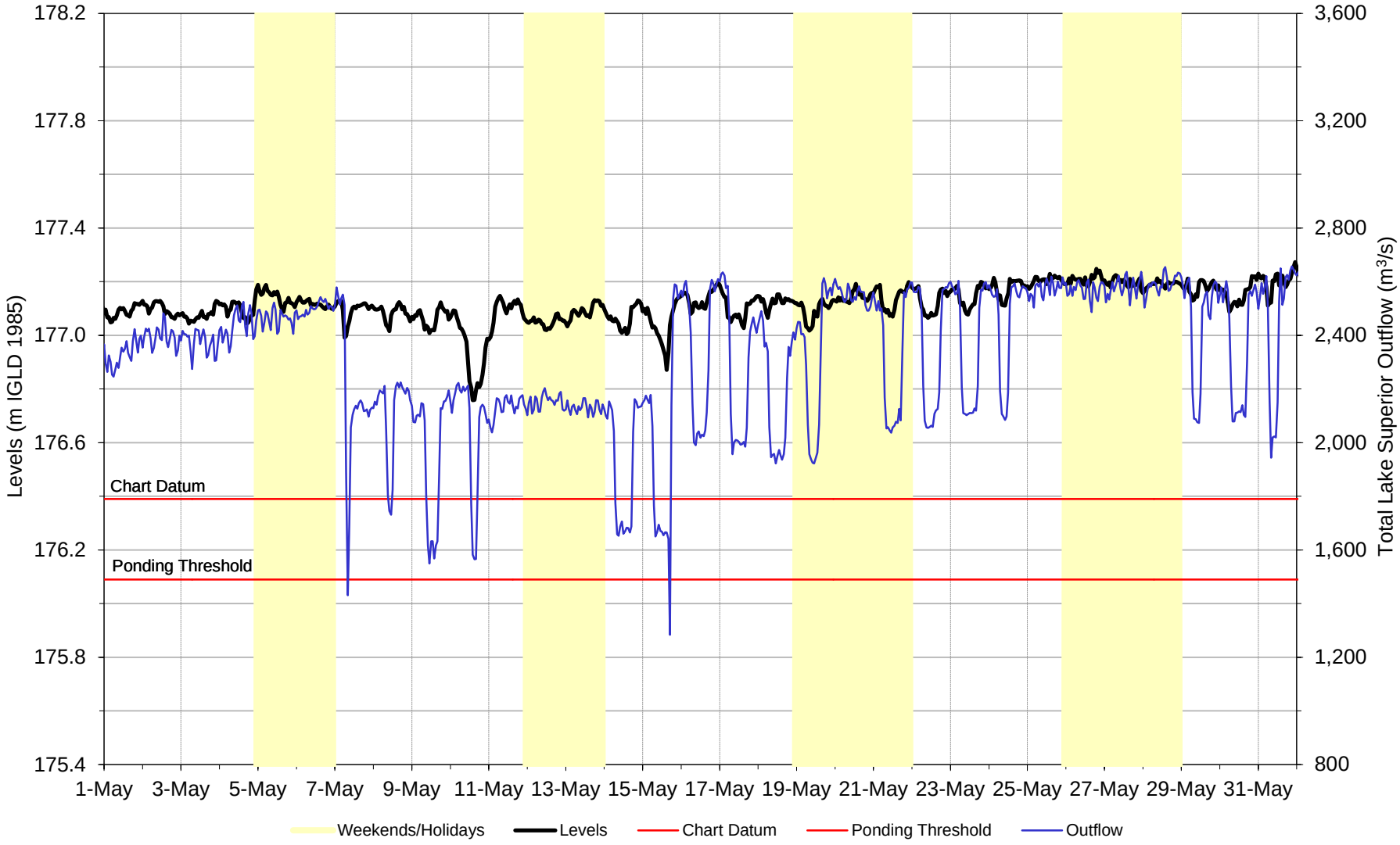
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7a - March 2018



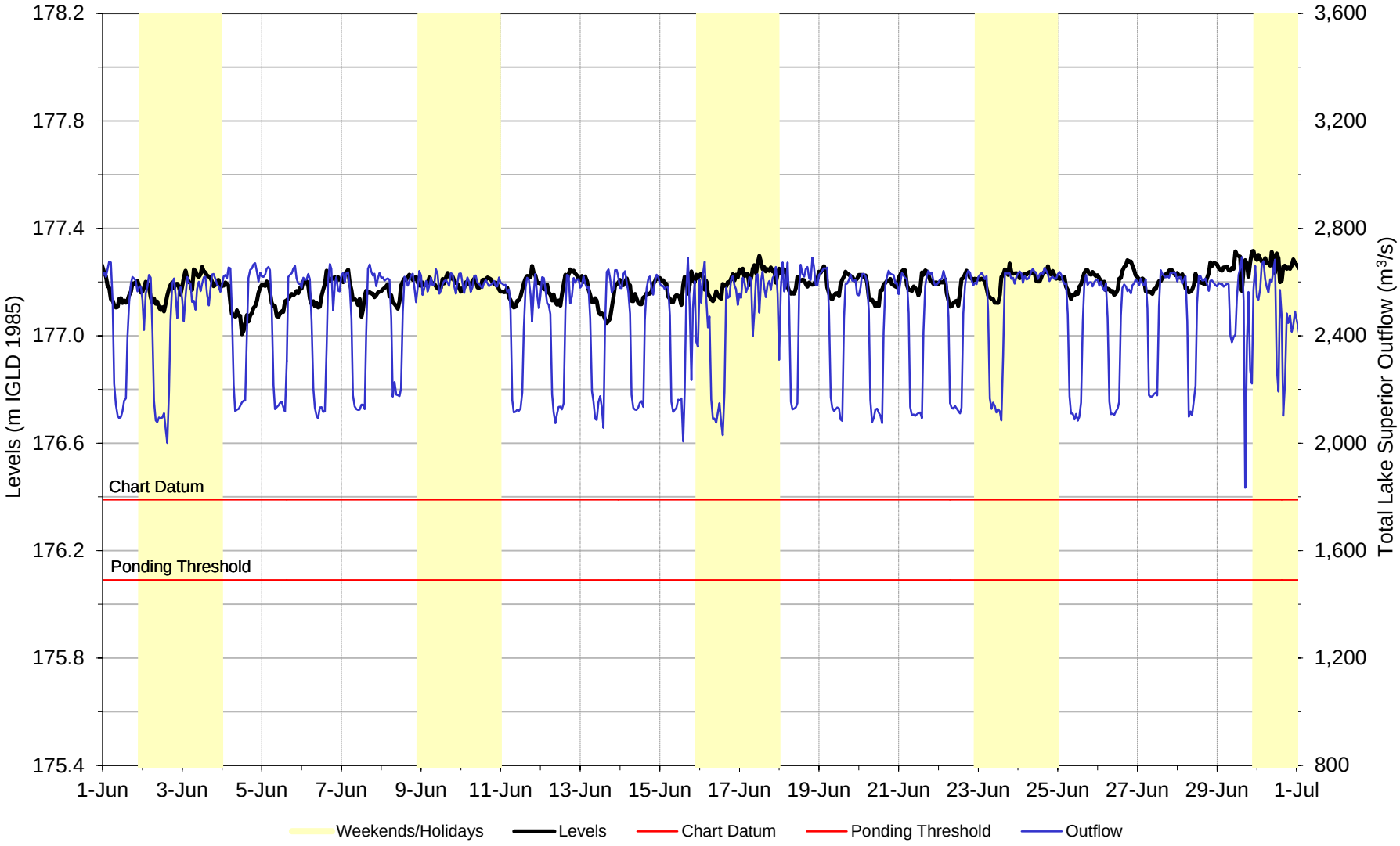
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7b - April 2018



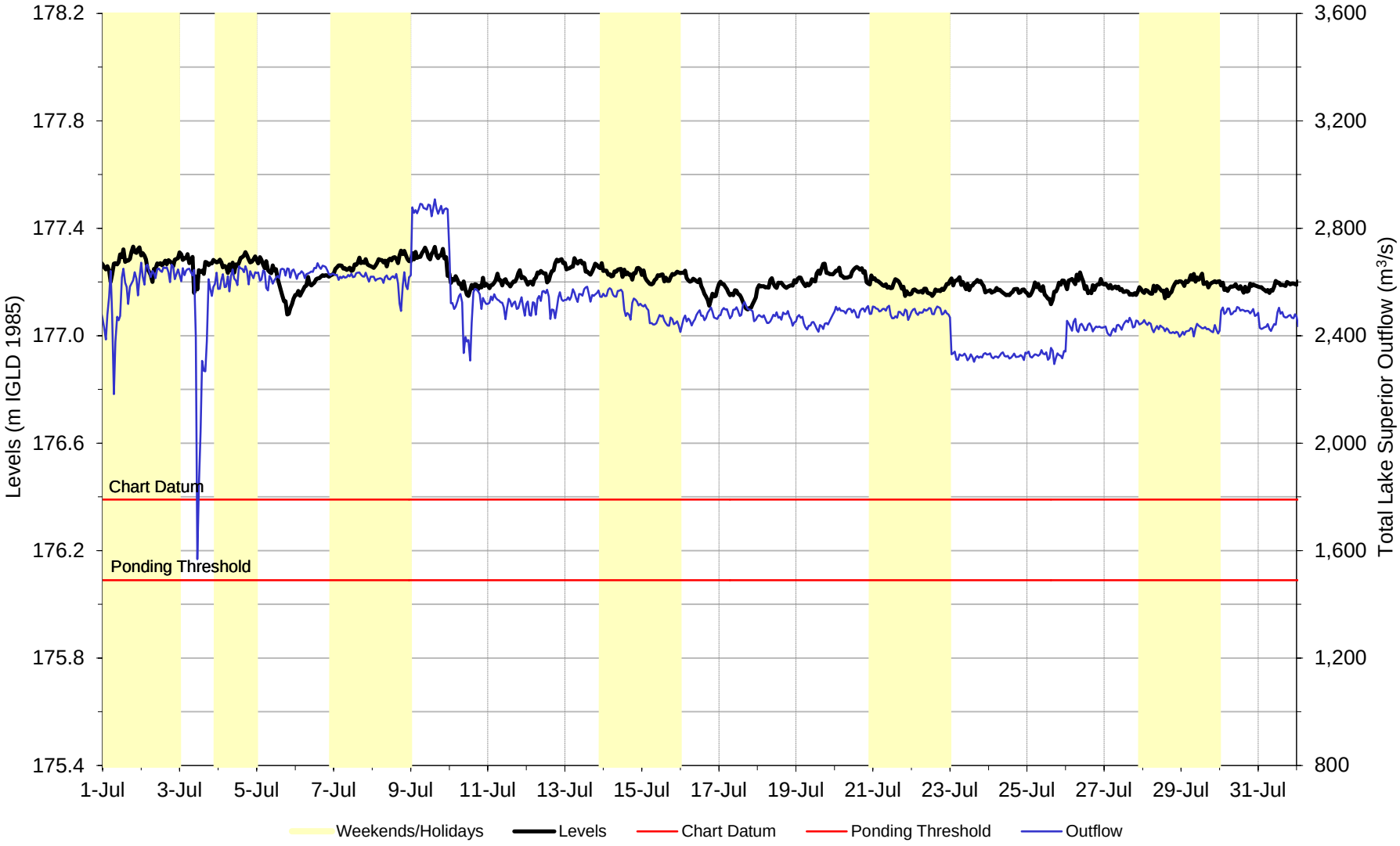
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7c - May 2018



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7d - June 2018



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7e - July 2018



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7f - August 2018