International Lake Superior
Board of Control

Semi-Annual Progress Report to the International Joint Commission

Covering the period September 1, 2017 to February 28, 2018

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Cover photo: *USCGC BRISTOL BAY (WTGB-102). Cutting ice in the St. Marys River near the Soo Locks in Sault Ste. Marie, Michigan.*

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International Lake Superior Board of Control

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International Joint Commission
Ottawa, Ontario
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April 25, 2018

Commissioners:

This semi-annual report covers the Board's activities from 1 September 2017 to 28 February 2018.

1 Highlights

From September 2017 through February 2018, the monthly mean water levels of Lake Superior ranged from 27 to 33 cm (11 to 13 in) above average, and from 10 cm (4 in) to 19 cm (8 in) above last year's levels.

The monthly mean levels of Lake Michigan-Huron were also above average throughout the reporting period, ranging from 43 to 47 cm (17 to 19 in) above average, and from 15 to 28 cm (6 to 11 in) above the levels of the same period last year.

Lake Superior outflows through September 2017 continued to be determined according to a deviation strategy approved 14 April 2017 by the International Joint Commission (IJC). This deviation strategy, employed beginning May 2017, allowed the International Lake Superior Board of Control (Board) to better manage operational limitations on hydropower flow capacity and reduce the potential for adverse impacts of high and fluctuating flows in the St. Marys Rapids. The Board released flows prescribed by Plan 2012 in October and November.

Lake Superior outflows through the winter from December 2017 continuing through April 2018 were determined according to a deviation strategy approved 28 November 2017 by the IJC. This deviation strategy allowed the Board 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 released slightly more 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.

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 a high of six gates open in October, to the setting of one gate open from the end of November through February.

Since September, Lake Superior outflows have been between 107 and 139 percent of average. Monthly outflows from Lake Michigan-Huron ranged from 107 to 128 percent of average.

2 Monitoring Hydrologic Conditions

The Board continuously monitors the water levels of lakes Superior and Michigan-Huron, and the water levels and flows in the St. Marys River. The regulation representatives' monthly reports to the Board provide hydrologic assessments and recommendations on 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* show the recent monthly water levels, net basin supplies, and outflows for lakes Superior and Michigan-Huron, respectively. *Figures 1* and *2* compare monthly water levels over a two year period to long-term averages and extremes. *Figures 3* and *4* show the monthly precipitation over the Lake Superior and Michigan-Huron basins. Monthly net basin supplies are depicted in *Figures 5* and *6*.

In general, the past six months overall were characterized by relatively seasonable temperatures, but punctuated by periods of extreme temperature fluctuations at times. Likewise, the past six months saw slightly wet conditions across the upper Great Lakes basin overall, but with a few notable events making up the bulk of the precipitation received. Net water supplies to Lake Superior were above average, with the exception of November and January. December had near-record-setting supplies on Lake Superior. Water supplies to Lake Michigan-Huron were above average during October, January and February, while water supplies in September, November and December were below average. While temperatures during the past six months overall were near seasonal normal values, there were significant variations during this period, and this affected precipitation and snowpack accumulation during the late winter. For example, the late-February mild temperatures caused snowmelt around Lake Michigan-Huron and Lake Erie.

Lake Superior's water level has been above average since April 2014 and ended the reporting period 34 cm (13 in) above average, which is the highest end of February level since the record high in 1986. Lake Superior's monthly mean levels over the past six months ranged from 27 to 33 cm (11 to 13 in) above average. Levels were 10 cm (4 in) to 19 cm (8 in) above those from last year during this same period. For the month of February, Lake Superior was at a mean elevation of 183.58 m (602.30 ft), which is 32 cm (13 in) above February's monthly average. This is 15 cm (6 in) higher than one year ago, and 28 cm (11 in) below the Criterion "a" level. Lake Superior is also 38 cm (15 in) above chart datum.

Precipitation over the Lake Superior basin was between 71 and 127 percent of average from September through February and would be expected to be exceeded 56 percent of the time. The net basin water supplies (NBS) to Lake Superior, which are the net effect of precipitation, evaporation, and runoff to the lake, were generally above average during the reporting period, with the exception of November and January.

Lake Michigan-Huron levels have been above average since September 2014 and ended the reporting period 51 cm (20 in) above average, which is the highest on record since 1997. Monthly mean Lake Michigan-Huron levels ranged from 43 to 47 cm (17 to 19 in) above long-term average over the past six months. Levels were 15 cm (6 in) to 28 cm (11 in) above those from last year during this same period. For the month of February, Lake Michigan-Huron was at

an elevation of 176.74 m (579.86 ft), 46 cm (18 in) above February's monthly average, 26 cm (10 in) higher than one year ago, and 74 cm (29 in) above chart datum.

Precipitation over the Lake Michigan-Huron basin was between 49 and 160 percent of average over the past six months and would be expected to be exceeded 63 percent of the time. Water supplies to Lake Michigan-Huron were above average during October, January and February, while water supplies in September, November and December were below average.

The fluctuating temperatures experienced during much of this winter have affected snow and ice conditions observed within the basin. Modeled snow water equivalent (SWE) data from the National Operational Hydrologic Remote Sensing Center (NOHRSC) indicates that SWE was above last year's value and near the mid-range of SWE recorded in recent years (2009 – 2017) through most of the winter. As of the end of February, the SWE remained at about the mid-range and higher than that of last year's value for the Lake Superior basin but was relatively lower for the Lake Michigan-Huron basin.

Ice cover on the lakes also varied, as extreme cold at the end of December and start of January promoted rapid increases in ice coverage early on, while the extreme warm at the end of February caused it to diminish rapidly. Total Great Lakes ice concentration peaked in early-February at 69 percent, greater than last year's peak of 20 percent that occurred in mid-March. Lake Superior's ice concentration peaked at 77 percent in early-February this year, much higher than the 19 percent peak cover of the previous winter. Lake Michigan's ice concentration peaked at 51 percent, and Lake Huron's ice concentration peaked at 81 percent. Last year, ice concentrations on Lake Michigan and Lake Huron peaked at 18 percent and 35 percent, respectively. Lake Superior, Lake Michigan, and Lake Huron ended the reporting period with approximately 56 percent, 12 percent, and 24 percent ice cover, respectively. The total Great Lakes ice coverage was approximately 33 percent.

3 Regulation of Lake Superior

3.1 Outflows

On 14 April 2017, the Board received IJC approval to deviate from Lake Superior Regulation Plan 2012 from May to November 2017 in order to better manage operational maintenance at the hydropower plants and limitations on maximum side-channel flow capacity, as well as to reduce the potential for adverse impacts of high and fluctuating water levels and flows in the St. Marys Rapids. The Board released flows greater than those prescribed by Plan 2012 in July and August, and less than Plan 2012 in May, June and September when side-channel capacity was limited. The Board released flows prescribed by Plan 2012 in October and November.

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 slightly more 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. 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 helped partially offset the larger flow reduction that would have occurred if the Board had followed the Plan 2012 normal maximum winter outflow.

Lake Superior outflows were 121 percent of average over the last six months, with monthly flows ranging from 2,060 to 3,100 m^3/s (72,800 to 109,400 ft^3/s).

A few scheduled and unscheduled flow reductions occurred at the hydropower plants during the reporting period. Flow capacity limitations from September through November were addressed by adjusting the gate setting at the Compensating Works in accordance with the Board's approved deviation strategy. From December to April the Compensating Works gates are typically maintained at the normal winter setting equivalent to one-half gate open. This year, in accordance with the approved deviation strategy, they were set to a one-gate equivalent, which is where they remained, due to the difficulty of moving frozen gates. Additionally, natural factors, including seasonal water level fluctuations and ice conditions, can also result in reduced hydropower flows.

The Board's deviation strategy, hydropower maintenance activities, and uncontrollable hydrologic factors resulted in total outflows being, on average, less than the flow prescribed by Plan 2012 during the reporting period. The regulation representatives have developed a strategy to offset the effects of this deficit which will be submitted for IJC approval.

3.2 Compensating Works gate settings and St. Marys Rapids conditions

During the reporting period, the Board continued to work with the IJC, the hydropower entities, and other stakeholders, to address issues related to the gate settings 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.

The gates at the Compensating Works supplying flow to the main portion of the St. Marys Rapids were set to the equivalent of approximately five gates open in September, and the equivalent of approximately six gates open in October. The reduction of the gate setting from the equivalent of six to one gates open in late November was staged over two days to slow the rate of change. The gate setting was maintained at one gate open for the remainder of the reporting period.

The equivalent gate settings were achieved throughout the reporting period by using Gates #2 through #15 at various partially open settings. The Compensating Works gates were set to the equivalent of one-gate open from the end of November through the remainder of the reporting period. The equivalent one-gate setting was achieved using Gates #5 to #12 open 26 cm (10 in) each. Flow through Gate #1, which supplies water to the Fishery Remedial Works, was maintained at a rate of approximately 15 m^3/s throughout the reporting period.

There remains concern regarding the effects of large and rapid changes to hydrodynamic conditions in the St. Marys Rapids due to the rate of Compensating Works gate movements, and the impacts these changes have on fish and other aquatic organisms. The Board has continued working toward evaluating the effects of gate changes on water levels, flows and velocities in the rapids, and establishing operational guidelines to reduce the risk of adverse impacts, as directed in the IJC's 2014 Supplementary Order of Approval, Condition 8. Details can be found in *Section 11*.

A complete summary of gate settings for the period is provided in *Table 3*.

4 Governing Conditions during the Reporting Period

The monthly mean levels of Lake Superior ranged between 183.58 and 183.81 m (602.30 and 603.05 ft) during the reporting period, and within the limits of 182.76 and 183.86 m (599.61 and 603.22 ft) specified in the IJC's Orders of Approval.

During the reporting period, the daily mean water levels in the lower St. Marys River at the US Slip gauge downstream of the US Locks varied between 176.89 and 177.62 m (580.35 and 582.74 ft). Therefore, Criterion "b" (which restricts outflow to no more than pre-project values when the level at US Slip is above 177.94 m (583.79 ft) was not a concern. Furthermore, daily mean US Slip levels generally stayed well above the ponding restriction threshold (see *Section 10*) of 176.09 m (577.72 ft) for the reporting period. However, while ponding was permitted during the entire reporting period, there was no opportunity for the hydropower plants to perform ponding operations as they were running at full capacity.

5 Inspections and Repairs at the Compensating Works

Routine monthly maintenance inspections continued to be conducted on the Canadian portion by Brookfield Renewable. Monthly inspections included public safety features such as fencing and signs, on-site safety equipment features such as life jackets and air horns, and maintenance inspection of the concrete and masonry structure, gates, mechanisms, and as well as anything unusual. In addition to the monthly inspections, the 2017 annual dam safety inspection was completed by the Regional Dam Safety Engineer and an Independent Consulting Engineer on 10 August 2017. The annual inspection was performed on the Compensating Works structure and the earth dam at the north end of the structure. The inspections found the earth dam and Compensating Works facilities to be in good condition. No major issues were noted.

The underwater inspection of Gate #1 and upstream of Gate #2 that was planned for late October 2017 did not receive the approval of the Ontario Ministry of Natural Resources and Forestry (OMNRF). Owing to the number of fish species present in the St. Mary's Rapids, OMNRF has established "In-water Work Timing Window Guidelines" that would allow the closure of Gate #1 between June 15 and September 1. The underwater inspection work will be planned in that window in 2018.

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. High water levels at US Slip in late October required the installation of temporary plugs to prevent water from impacting the generator floor at Cloverland Electric Co-operative. Additionally, anchor ice caused temporary flow reductions during three nights in late

December. Otherwise, water level conditions were generally favorable and did not inhibit the plants from passing maximum flows.

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 478 hours during the reporting period (11 percent of the reporting period where at least one unit was shut down). These outages were due to stator core lamination issues, trash rack cleaning, a leaking oil head, and dam concrete repairs. Unplanned outages during the reporting period totaled 1,833 hours (42 percent of the reporting period).

Most of the unplanned outages were due to a bearing failure which reduced the total flow capacity by approximately 440 m^3/s from 13 December 2017 through 27 February 2018. However, the additional flow (approximately 100 m^3/s) through the Compensating Works helped partially offset this reduction. Brookfield plans to complete additional monitoring as part of their regularly scheduled maintenance on all Clergue units going forward to identify and correct future bearing issues.

6.3 Cloverland Electric Co-operative

The #2 Generator Step-up Transformer was replaced between 9-18 September. The plant flow was reduced to about 425 m^3/s (15,000 ft^3/s) during that time. The canal restoration work resumed on 19 September and suspended for the winter on 23 November (36 percent of the reporting period). While the contractor was working in the canal, the flow was reduced to about 283 m^3/s (10,000 ft^3/s). When the contractor was not working, the flow was about 796 m^3/s (28,100 ft^3/s). The total flow reduction owing to this work was about 193 m^3/s (6,800 ft^3/s) for September, 210 m^3/s (7,400 ft^3/s) for October, and 105 m^3/s (3,700 ft^3/s) for November.

There was anchor ice on 27, 28 and 29 December which caused the plant flow to be reduced to about 351 m^3/s (12,400 ft^3/s) on 27 December, 204 m^3/s (7,200 ft^3/s) on 28 December, and 447 m^3/s (15,800 ft^3/s) on 29 December. The total flow reduction due to the icing was about 19 m^3/s (655 ft^3/s) for the month of December.

Looking forward, the canal restoration work is expected to resume in late April and continue through June, with an estimated 595 to 625 m^3/s (21,000 to 22,000 ft^3/s) total outflow capacity expected.

6.4 US Government Hydropower Plant

There were 12 unit outages totaling 116 hours (3 percent of the reporting period), with 12 hours owing to anchor ice, 8 hours in support of the Compensating Works construction contract, and 10 hours due to instrumentation issues. The remaining 86 hours of outages were for scheduled maintenance. These outages accounted for approximately 5 to 10 m^3/s (175 to 350 ft^3/s) of outflow reduction each month. There were no outages in January and February. Minor outages

are scheduled through the fall 2018 for preventative maintenance and in support of the Compensating Works gate automation project.

7 Flow Verification Measurements

No flow verification measurements were taken this reporting period. There will be availability for further flow measurements this summer if needed.

8 Water Usage in the St. Marys River

The distribution of outflows from Lake Superior for January 2017 to February 2018 can be found in *Table 4* (*Table 5* in English units). 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 Canada and the United States 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 about 3 m^3/s (106 ft^3/s) or about 0.1 percent of the total monthly outflow. The monthly flow through the locks depends on traffic volume and varied from 0 to 13 m^3/s (0 to 470 ft^3/s) over the past six months. The locks are closed for navigation in the winter months, beginning 15 January 2018. Water used for navigation accounted for less than one percent of total river flow. Hydropower passed an average of 1,980 m^3/s (69,700 ft^3/s) each month and accounted for approximately 80 percent of the total outflow. All plants were requested to run at their maximum capacities throughout the reporting period.

In accordance with the IJC'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, which is usually 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. This winter, however, a one-gate-open equivalent was maintained by having eight gates partially open. In addition, a flow of at least 15 m^3/s (530 ft^3/s) is normally also maintained in the Fishery Remedial Works through Gate #1. The flow through the St. Marys Rapids, including that through the Fishery Remedial Works, ranged from 191 to 1002 m^3/s (6,700 to 35,400 ft^3/s) over the last six months, or an average of approximately 21 percent of the total monthly outflow. The equivalent gate setting ranged from one to six gates open.

9 Long Lac and Ogoki Diversion

Ontario Power Generation (OPG) continued to provide the Board with information on the operations of the Long Lac and Ogoki Diversions. The Ogoki Diversions into Lake Nipigon (which flows into Lake Superior) averaged 74 m^3/s (2,610 ft^3/s) and the Long Lac Diversion averaged 44 m^3/s (1,550 ft^3/s) from September through February. Combined, these diversions were about 85 percent of average for the period 1944-2016.

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 2.0 m^3/s (71 ft^3/s) from September through February.

Continuous minimum flows of at least 2 m^3/s (70 ft^3/s) are maintained from the Saturday of Victoria Day weekend (in May) through Labor Day from the northern outlet of Long Lake (Kenogami Dam) for environmental enhancement. Outflows through the Kenogami Dam during the reporting period averaged 2.7 m^3/s (95 ft^3/s).

10 Peaking and Ponding Operations at Hydropower Plants

Peaking and ponding operations are the within-day and day-to-day flow variations that enable the hydropower plants to better align 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 IJC has approved guidelines within which the Board may restrict peaking and ponding operations by the hydropower entities under certain conditions. Specifically, if the minimum level at the US Slip gauge on the lower river is expected to be below the threshold level of 176.09 m (577.72 ft) as a result of ponding operations, then the power entities are required to pass peak flows for at least an eight-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.

Water levels at US Slip remained above the established threshold, such that ponding was permitted during the entire reporting period. However, the power entities were unable to perform peaking and ponding operations as they were operating at maximum capacity.

To continue to provide timely information on expected flow variations, the US Army Corps of Engineers (USACE) Detroit District distributes monthly notices during the shipping season (March through January) on expected Lake Superior outflows, and a schedule of flow variations at the hydropower plants.

Figures 7a-7f compare the hourly Lake Superior outflow and the hourly levels at US Slip on the lower St. Marys River. In general, US Slip levels were higher to last year's levels during the same period.

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 focused primarily on preparing their Annual Report for 2017. This report captures GLAM's progress on assessing impacts observed in 2017 as well as GLAM's Plan Review and Evaluation initiatives. 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.

11.1 GLAM Annual Report for 2017

The GLAM Annual Report for 2017 is currently under production. It will include an overview of the entire Great Lakes-St. Lawrence River system, observed conditions and regulatory impacts in 2017, a hydroclimate summary, an impact assessment of the six major interests, and a plan review and evaluation section capturing the efforts to validate the existing modeling tools that

were used to develop the current regulation plan. The impact assessment section will include a coping zone assessment of municipal and industrial interests, commercial navigation interests, hydropower interests, coastal zone interests, ecosystem interests, and recreational boating and tourism interests. Coping zone assessments will be verified with observed conditions corroborated from specific interest groups across the Upper Great Lakes Basin. The Annual Report for 2017 is expected to be completed in October 2018, however a draft will be circulated to the Board for review and comment in the spring/summer of 2018.

11.2 GLAM Work Plan Tasks and IWI Projects

GLAM's work plan includes impact assessment tasks related to the Board. A project proposal was submitted to the IWI to support further data collection that will support improvements to the IERM2D model that was recently developed for the St. Marys Rapids.

The other three tasks all relate to furthering the understanding of ecosystem and flood vulnerability in the St. Marys Rapids area. These tasks are targeted for completion in September 2018. These include:

- St. Marys River IERM2D Rapids data collection to collect additional biologic data in the 2018 field season,
- Assimilate St. Marys River IERM2D into the Shared Vision Model (SVM), and
- Development of initial flooding performance indicator for the St. Marys River

11.3 Plan Review and Evaluation

A two-dimensional hydrodynamic model was developed by USACE covering the full extent of the St. Marys River. Work in 2017 focused on recreating the gated flow scenarios from 2015. In 2015, a partial-gate strategy was implemented to more evenly spread water across the rapids. These scenarios were contrasted with a more traditional full-gate opening approach. Water depths and velocities were computed throughout the rapids. These data, combined with imagery, temperature and biological data, were compiled using the Integrated Environmental Response Model (IERM2D). The IERM2D predicts areas where various fish species are likely to spawn and their fry are able to survive. Work is expected to continue in 2018 with the goal of optimizing habitat based on the St. Marys Fisheries Task Group. This modeling work will assist in the development of performance indicators for the St. Marys Rapids.

Other ongoing plan review efforts include the review of impacts due to reductions in maximum side-channel capacity of the St. Marys River. Though simulations have been done to support the annual report preparation as part of this task, further review of the existing performance indicators and exploration of new performance indicators must be completed before conclusions can be drawn from the model runs.

12 Public Communications and Outreach

The Board intends to hold its annual public meeting on 19 July by teleconference and webinar.

The Board will again have a presence this year at the Soo Locks in Sault Ste. Marie, Michigan, as part of the USACE's annual Engineer's Day festivities on 29 June. At the Board's information booth, Board representatives will have the chance to speak directly with the public regarding the regulation plan, current conditions and answer any specific questions they may have.

Throughout the reporting period, stakeholders voiced concerns regarding high water levels and flow conditions, and asked how the current regulation plan balances levels. Reports of erosion on Lake Superior and on Lake Michigan-Huron have been received. Some citizens on both lakes 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), 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 (ijc.org/en_/ilsbc) and the Board's Facebook page (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 is developing strategies for increased outreach. This will include developing talking points for key messages the Board will communicate to the public and increased information disseminated through the Facebook page. The Board also hopes to leverage existing outreach events through the US and Canadian regulation representative offices to further engage with the public.

13 Board Membership and Meetings

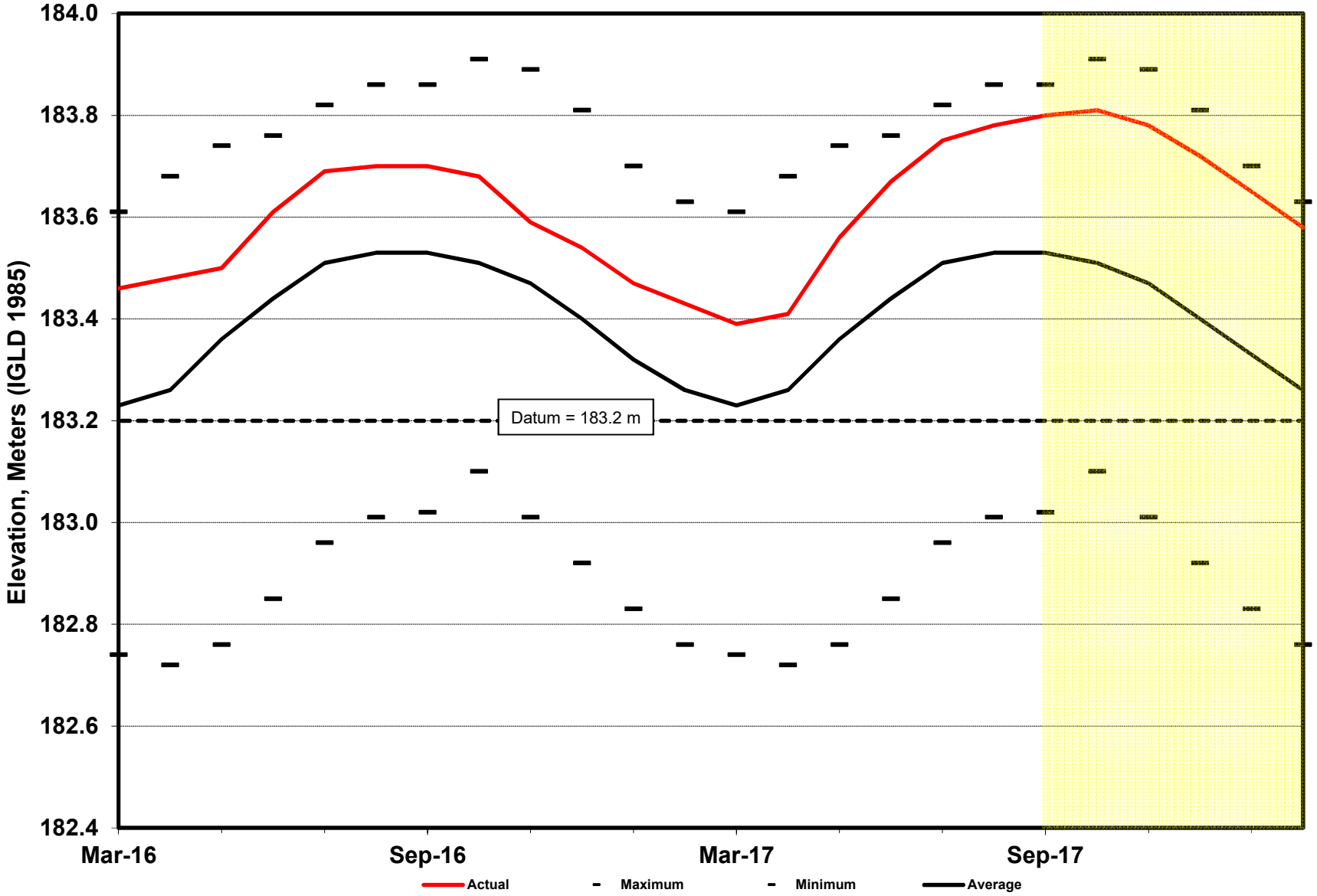
There were no membership changes this reporting period.

The Board held its spring semi-annual meeting on 28 March 2018 in Buffalo, New York. The next meeting is scheduled for 19 September 2018 in Cornwall, Ontario.

Respectfully submitted,

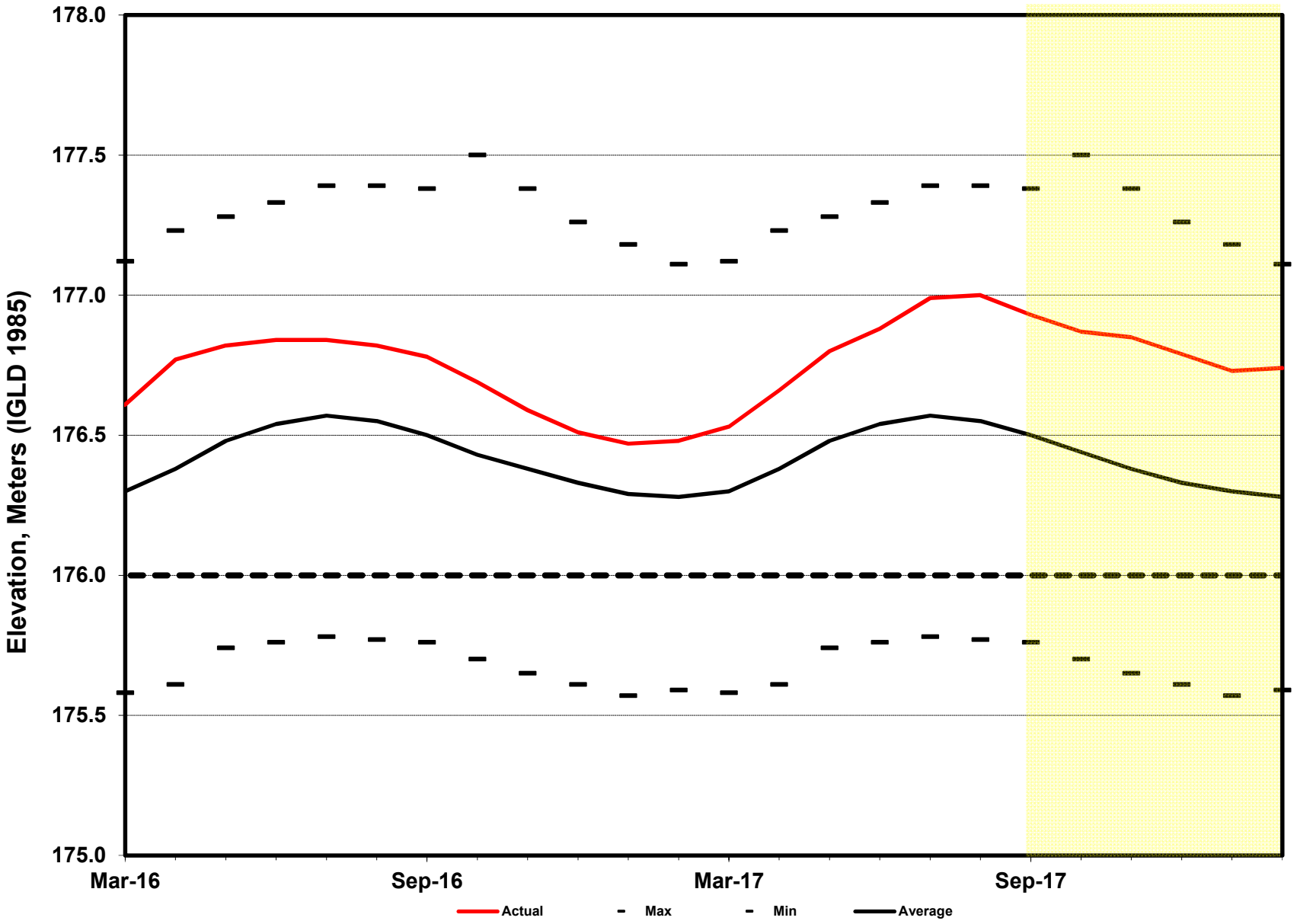
_____	_____
Mr. Jean-François Cantin	BG Mark Toy
Member for Canada	Member for United States

Figure 1: Monthly Mean Levels Lake Superior



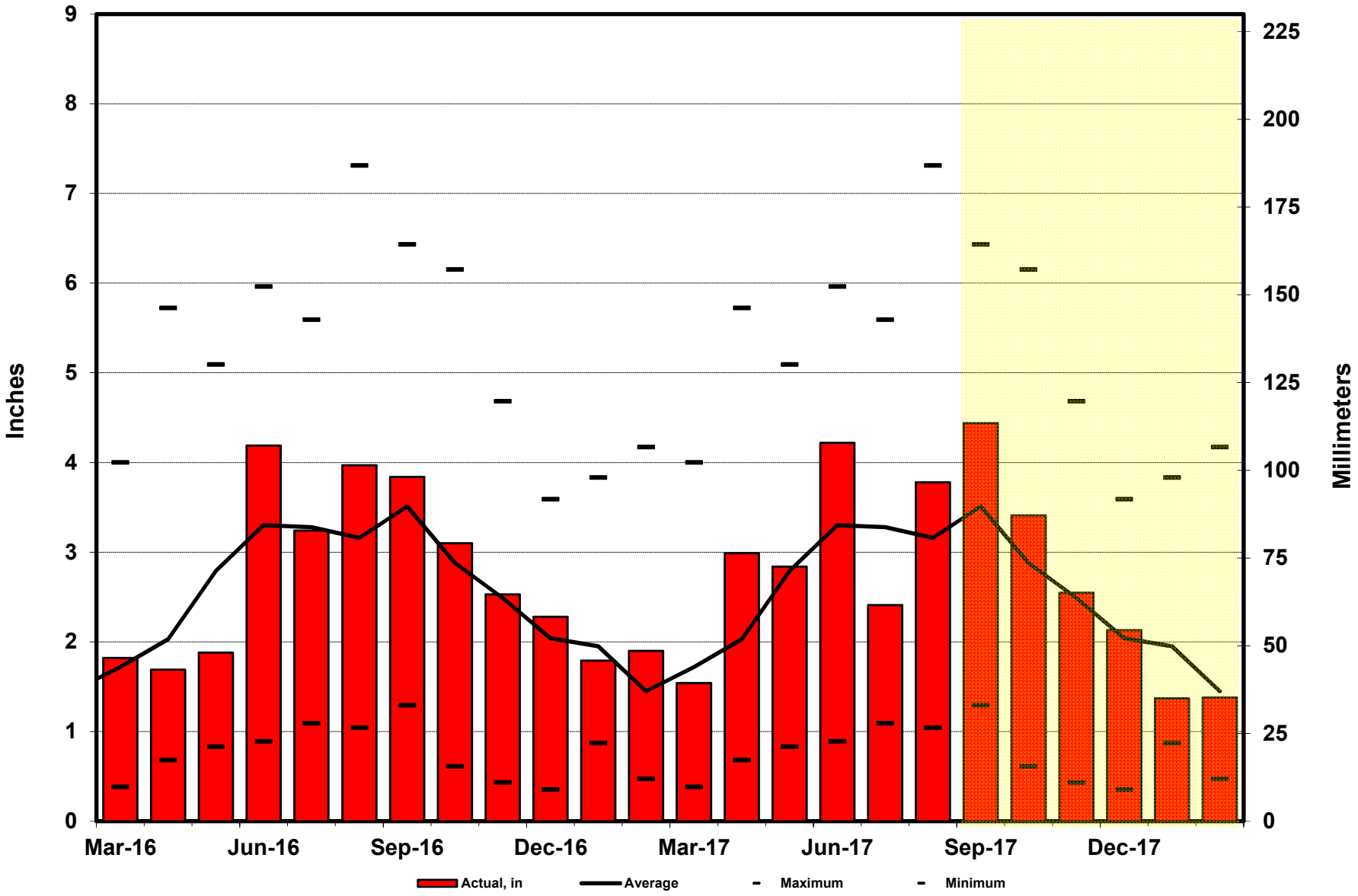
Based on a mean of 5 gages. Average, Maximum and Minimum values for the Period of Record 1918-2016

Figure 2: Monthly Mean Levels Lake Michigan-Huron



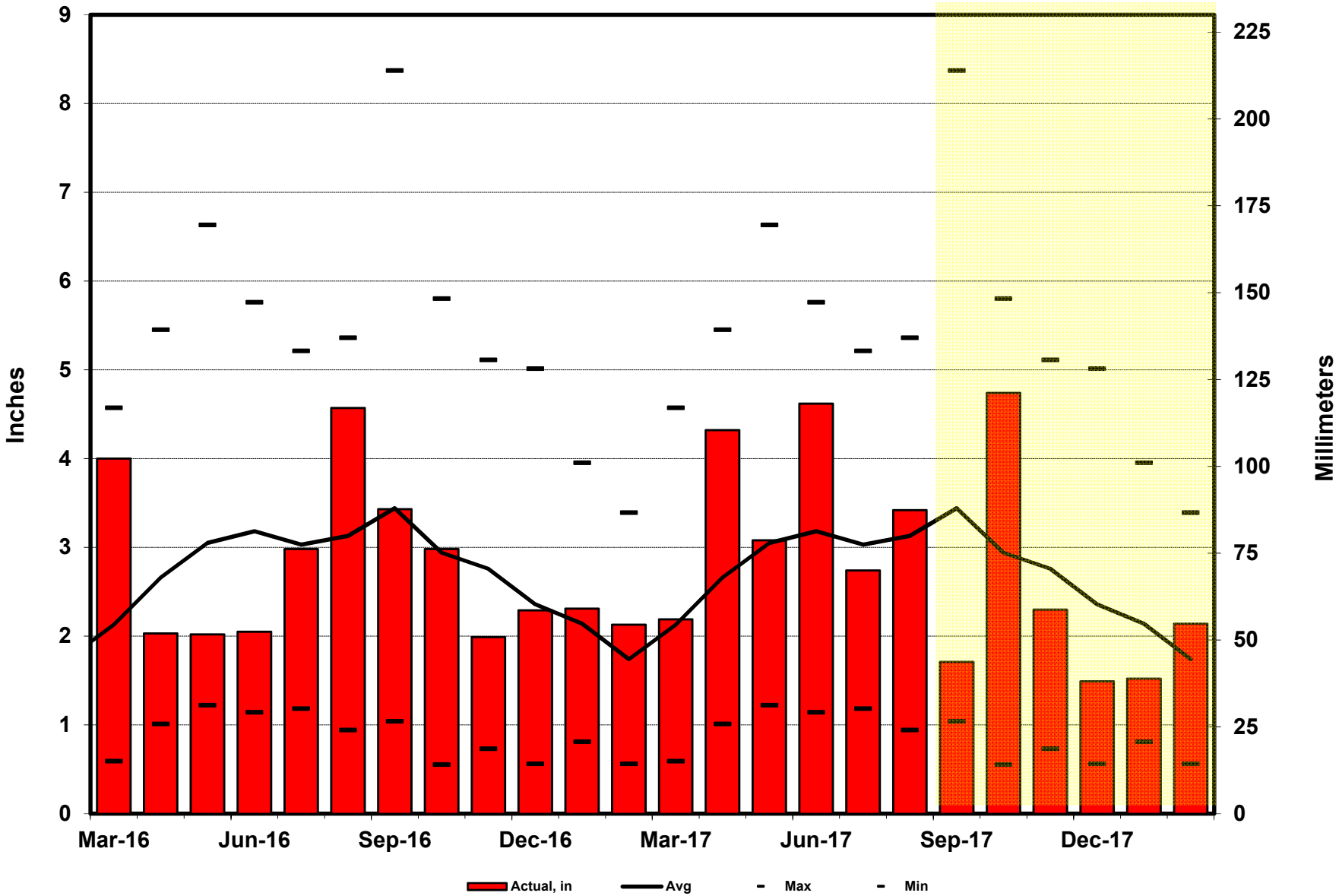
Based on a mean of 6 gages. Average, Maximum and Minimum values for the Period of Record 1918-2016

Figure 3: Monthly Precipitation Lake Superior



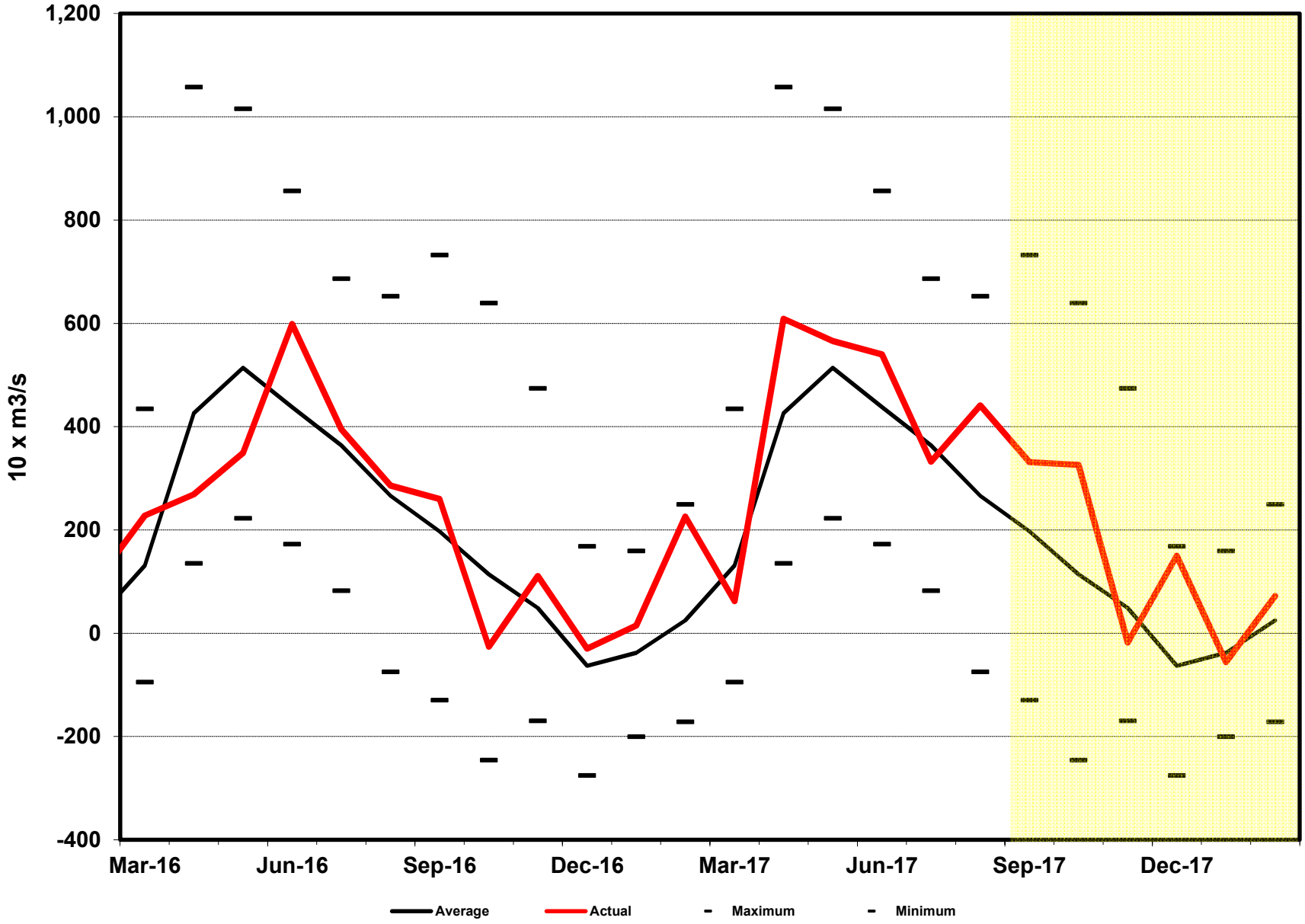
Maximum, Minimum and Average Precipitation Values based on Period of Record 1900 - 2016

Figure 4: Monthly Precipitation Lake Michigan-Huron



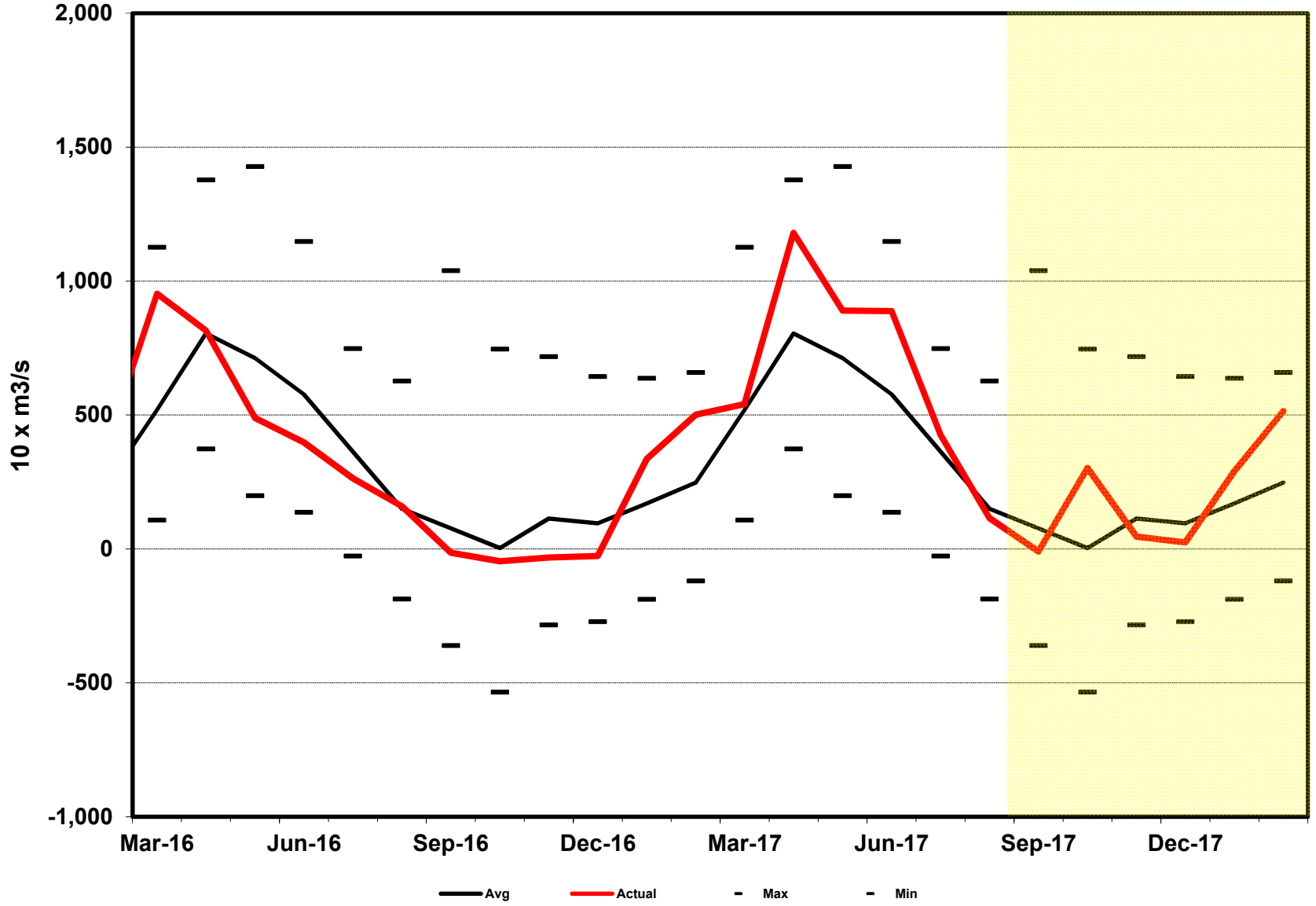
Maximum, Minimum and Average Precipitation Values based on Period of Record 1900 - 2016

Figure 5: Monthly Net Basin Supplies Lake Superior



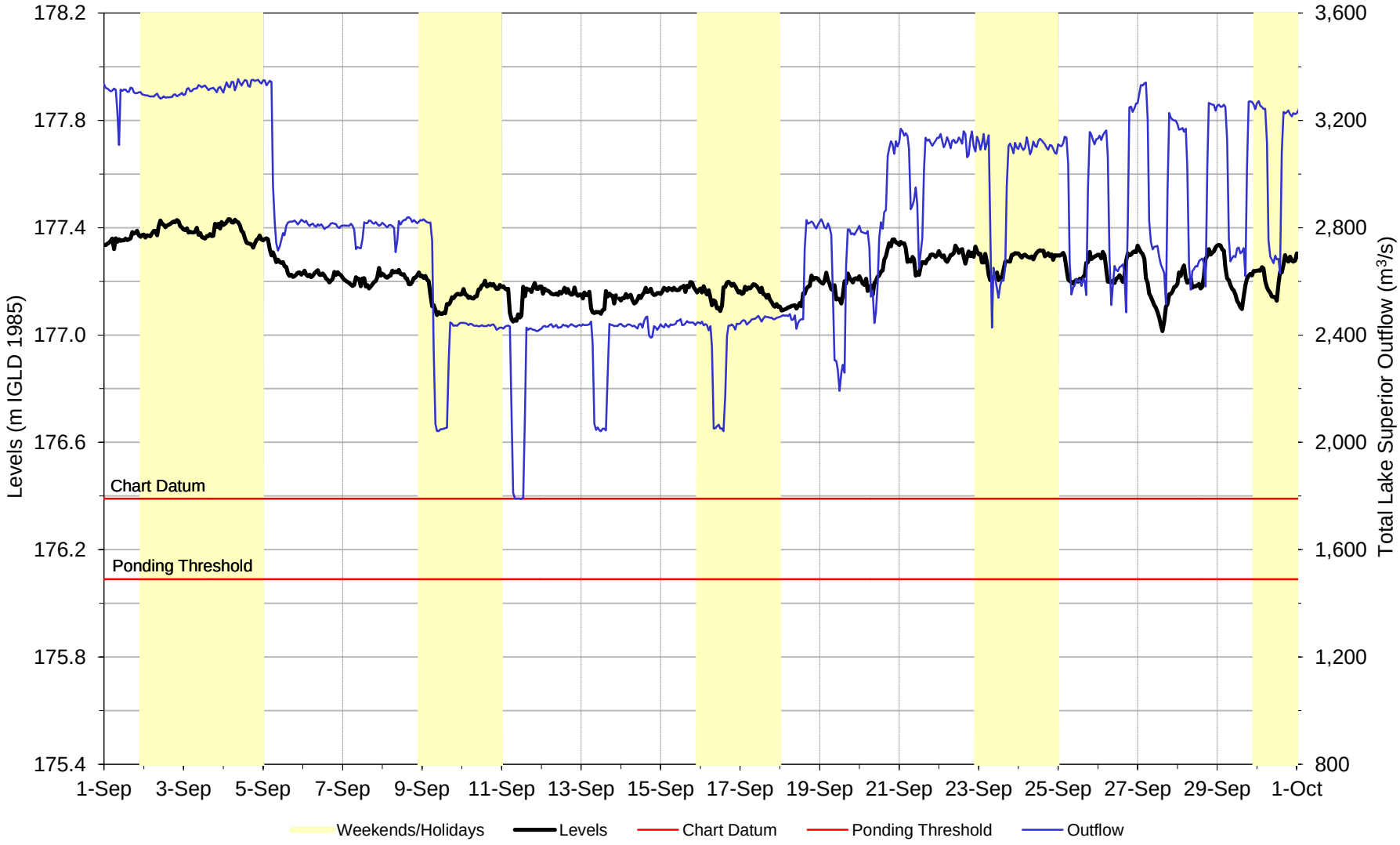
Average, Maximum and Minimum Based on Coordinated Period of Record 1900-2008

Figure 6: Monthly Net Basin Supplies Lake Michigan-Huron

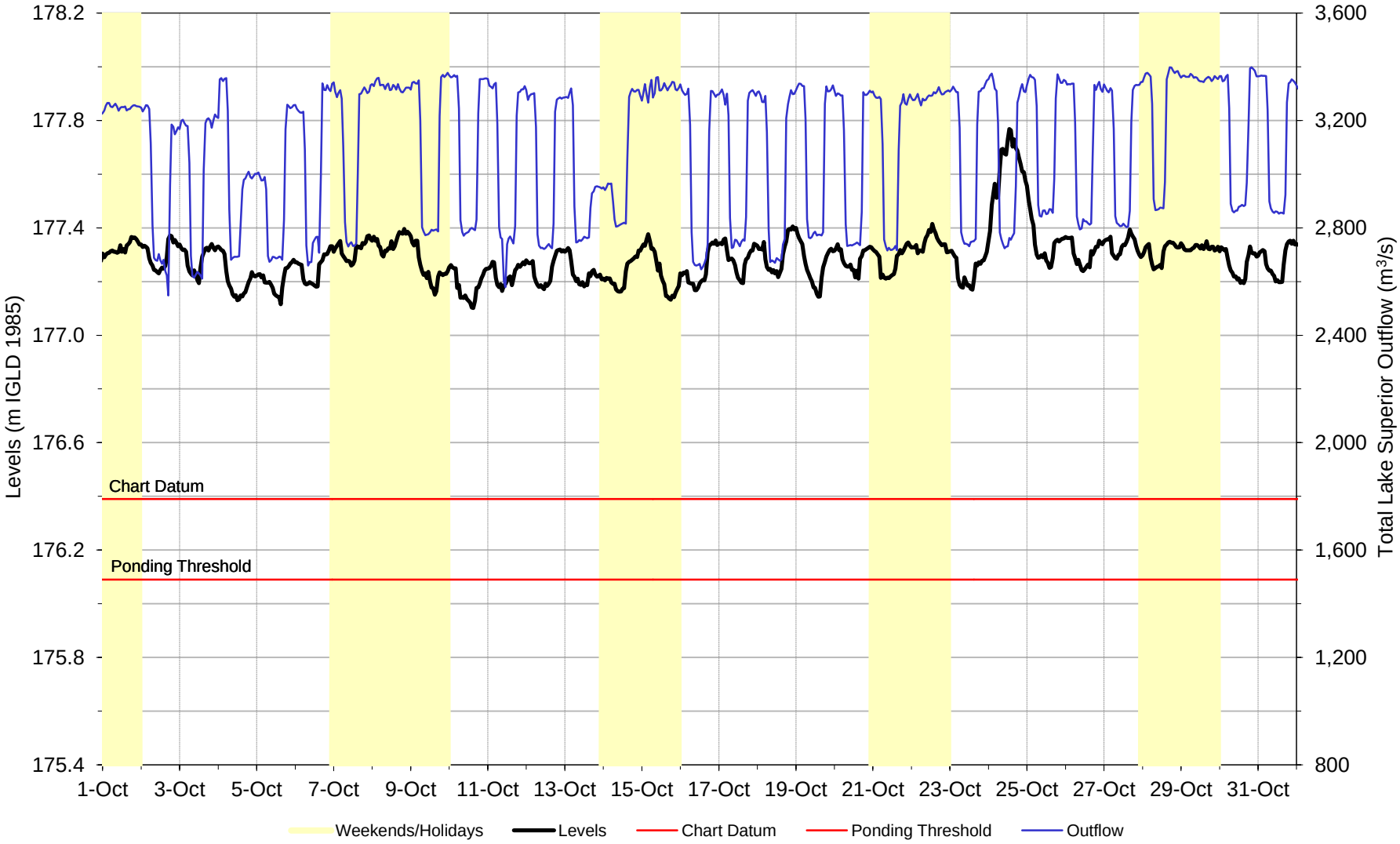


Average, Maximum and Minimum Based on Coordinated Period of Record 1900-2008

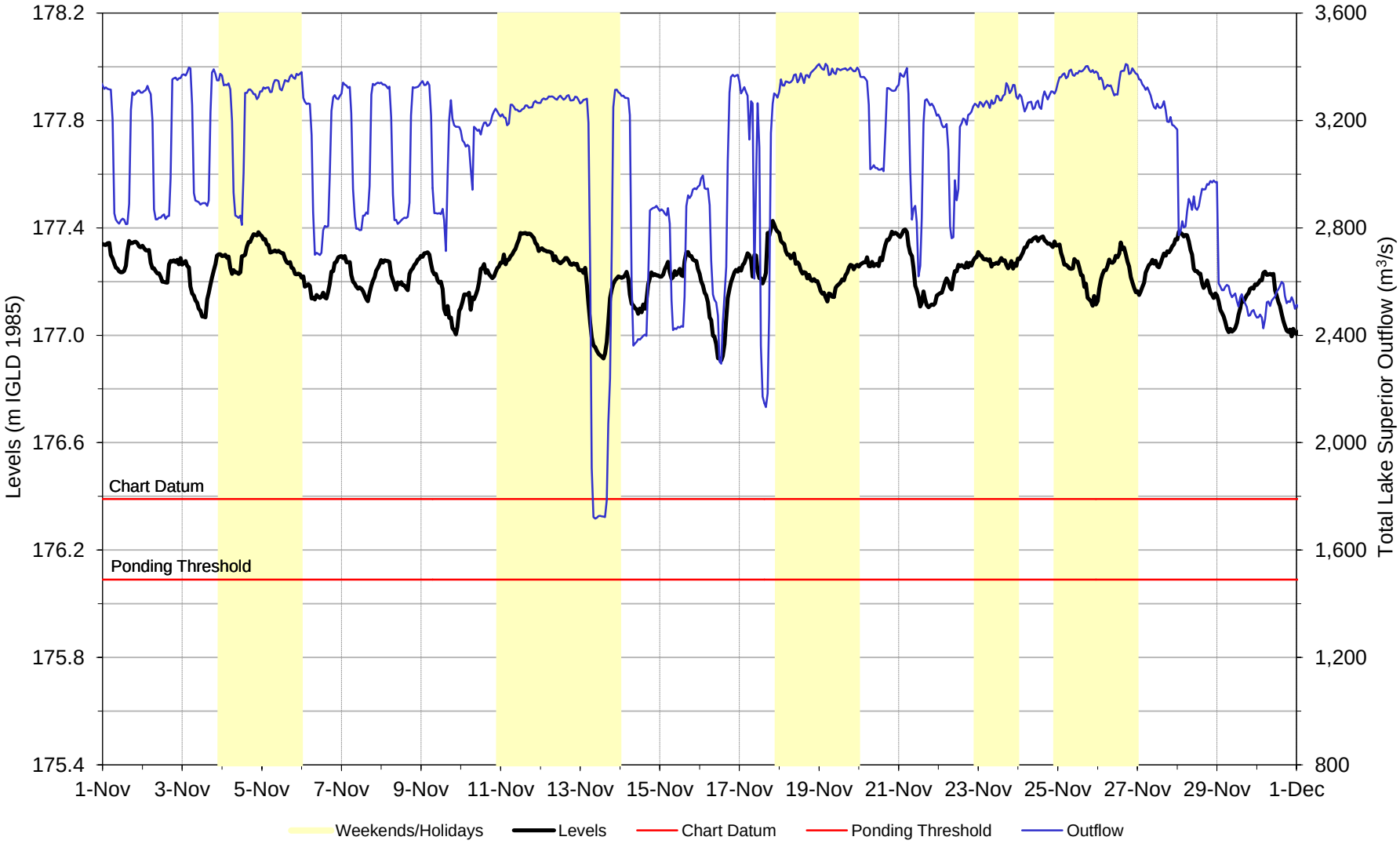
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7a - September 2017



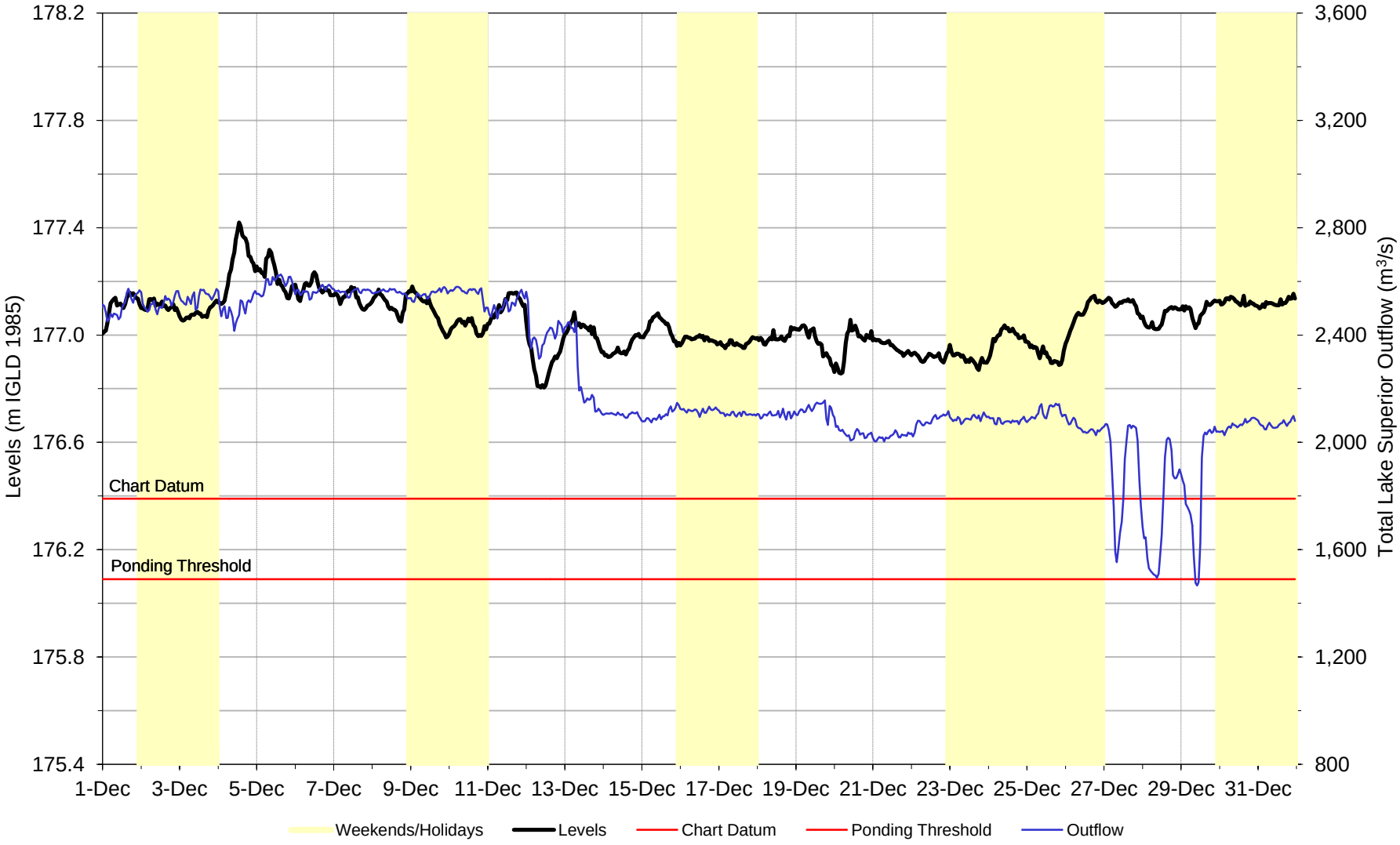
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7b - October 2017



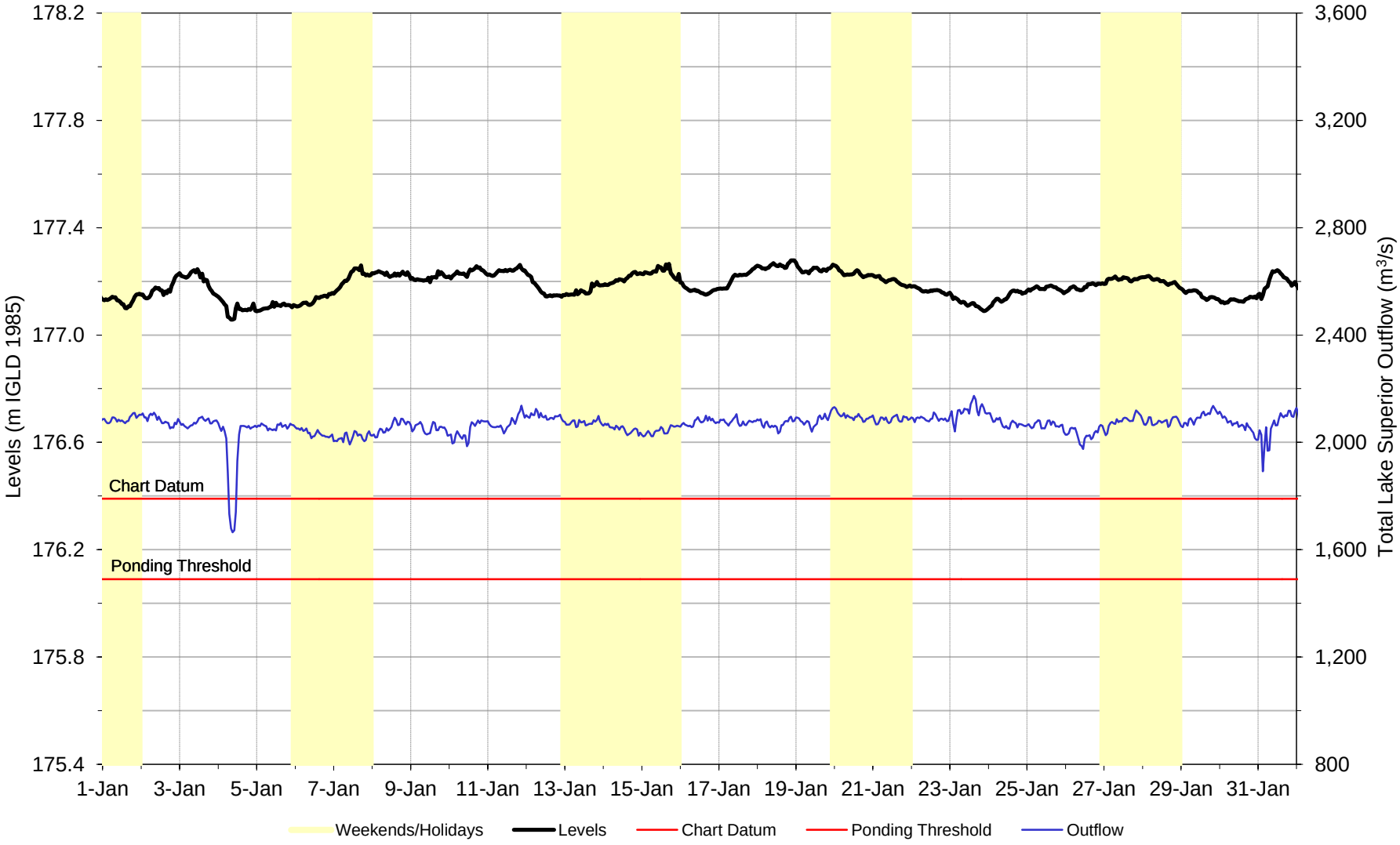
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7c - November 2017



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 7d - December 2017



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



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

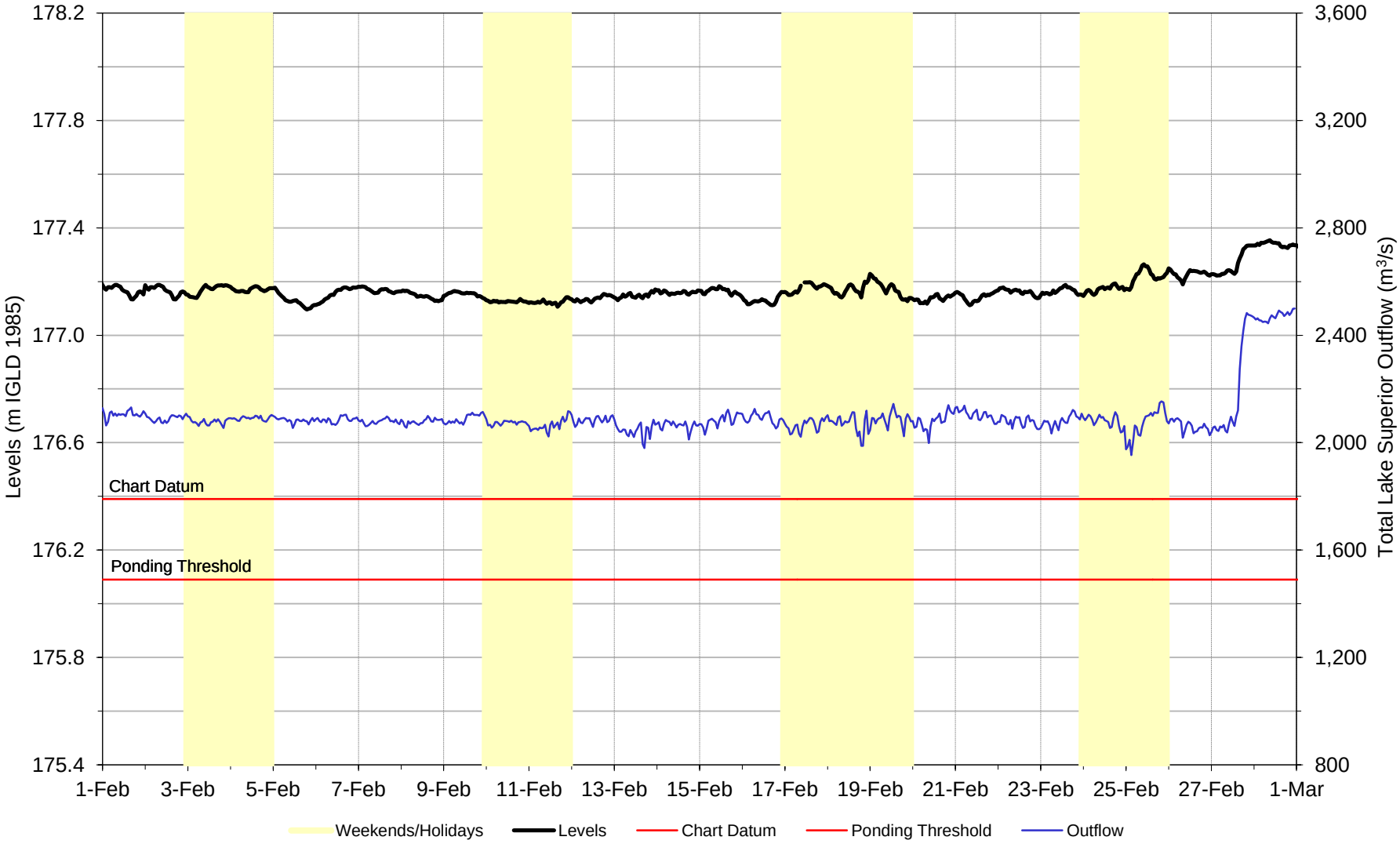


TABLE 1: 2017 - 2018 Lake Superior Hydrologic Factors

Month	Levels				Net Basin Supplies			Outflows		
	Monthly Mean Recorded[1]		Difference From Average[2]		Monthly Mean Recorded		Exceedance Probability[3]	Monthly Mean Recorded[4]		Percent of Average[5]
	Meters	Feet	Meters	Feet	m^3/s	tcfs	(%)	m^3/s	tcfs	
2017										
JAN	183.47	601.94	0.15	0.49	150	5	22	2,190	77	113
FEB	183.43	601.80	0.17	0.56	1530	54	6	2,300	81	121
MAR	183.39	601.67	0.16	0.52	620	22	71	2,310	82	124
APR	183.41	601.74	0.15	0.49	6,090	215	10	2,150	76	111
MAY	183.56	602.23	0.20	0.66	5,660	200	36	1,920	68	91
JUN	183.67	602.59	0.23	0.75	5,400	191	24	2,300	81	105
JUL	183.75	602.85	0.24	0.79	3,320	117	58	3,250	115	143
AUG	183.78	602.95	0.25	0.82	4,420	156	9	3,300	117	140
SEP	183.80	603.02	0.27	0.89	3,310	117	17	2,800	99	120
OCT	183.81	603.05	0.30	0.98	3,260	115	8	3,100	109	137
NOV	183.78	602.95	0.31	1.02	-180	-6	70	3,080	109	139
DEC	183.72	602.76	0.32	1.05	1,500	53	<1	2,240	79	116
2018										
JAN	183.65	602.53	0.33	1.08	-560	-20	59	2,060	73	106
FEB	183.58	602.30	0.32	1.05	740	26	25	2,100	74	111

Notes: m^3/s = cubic meters per second tcfs = 1,000 cubic per second

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

[2] Average levels are for the period 1918-2016, based on a mean of five gauges. Differences computed as meters and then converted to feet.

[3] Exceedance probabilities are based on 1900 - 2008.

[4] Outflows are rounded to the nearest 10 m^3/s.

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

TABLE 2: 2017 - 2018 Lakes Michigan-Huron Hydrologic Factors

Month	Levels				Net Basin Supplies			Outflows		
	Monthly Mean Recorded[1]		Difference From Average[2]		Monthly Mean Recorded		Exceedance Probability[3]	Monthly Mean Recorded[4]		Percent of Average[5]
	Meters	Feet	Meters	Feet	m^3/s	tcfs	(%)	m^3/s	tcfs	
2017										
JAN	176.47	578.97	0.18	0.59	3,360	119	15	5,460	193	120
FEB	176.48	579.00	0.20	0.66	5,010	177	5	5,430	192	122
MAR	176.53	579.17	0.23	0.75	5,410	191	44	5,840	206	120
APR	176.66	579.59	0.28	0.92	11,800	417	6	5,820	206	113
MAY	176.80	580.05	0.32	1.05	8,900	314	19	5,820	206	109
JUN	176.88	580.31	0.34	1.12	8,880	314	6	5,730	202	105
JUL	176.99	580.68	0.42	1.38	4,250	150	33	6,070	214	110
AUG	177.00	580.71	0.45	1.48	1,150	41	57	6,150	217	111
SEP	176.93	580.48	0.43	1.41	-100	-4	66	6,180	218	113
OCT	176.87	580.28	0.44	1.44	3,020	107	8	6,030	213	111
NOV	176.85	580.22	0.47	1.54	460	16	61	6,130	216	114
DEC	176.79	580.02	0.46	1.51	240	8	62	5,960	210	115
2018										
JAN	176.73	579.82	0.44	1.44	2,900	102	22	4,870	172	107
FEB	176.74	579.86	0.46	1.51	5,140	182	4	5,360	189	121

Notes: m^3/s = cubic meters per second tcfs= 1,000 cubic per second

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

[2] Average levels are for the period 1918-2016, based on a mean of five gauges. Differences computed as meters and then converted to feet.

[3] Exceedance probabilities are based on 1900 - 2008.

[4] Outflows are rounded to the nearest 10 m^3/s.

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

TABLE 3
COMPENSATING WORKS GATE CHANGES

Date	Gate Change	Final Gate Settings *	Gate Equivalent (approx.)	Notes
2017				
25-Apr	Opened 2 - 16	2 - 16 open 33 cm (13 in.)	2	Lack of ice allowed the gates to be opened in order to help offset the effects of reduced capacity of the hydropower plants and to meet Plan 2012 flow
2-Jun	Lowered 16	2 - 15 open 33 cm (13 in.); 16 open 5 cm (2 in.)	2	Sea lamprey trapping**
6-Jun	Further opened 2 - 15	2 - 15 open 56 cm (22 in.); 16 open 5 cm (2 in.)	4	Deviation strategy to better manage operational limits on hydropower flow capacity; Sea lamprey trapping**
5-Jul	Further opened 2 - 15	2 - 15 open 84 cm (33 in.); 16 open 5 cm (2 in.)	5	
4-Oct	Further opened 2 - 15	2 - 15 open 94 cm (37 in.); 16 open 5 cm (2 in.)	6	
28-Nov	Lowered 9 - 12, closed 13 - 16	2 - 8 open 94 cm (37 in.); 9 - 12 open 26 cm (10 in.)	3	Deviation strategy in consideration of the continuing high water levels and to accomodate expected maintenance at the hydropower plants in 2018
29-Nov	Lowered 5 - 8, closed 2 - 4	5 - 12 open 26 cm (10 in.)	1	

* Gate 1 remained open 20 cm (8 in.) throughout reporting period (fishery requirement of approximately 15 m^3/s).

** 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 (cubic meters/second)

	POWER CANALS					NAVIGATION CANALS			DOMESTIC USAGE				FISHERY	TOTAL LAKE
Year and Month	U.S. Gov't Hydro	Cloverland	U.S. Total	Brookfield	Total Power	United States	Canada	Total Navigation	Sault Ste. Marie U.S. + CAN	Algoma Steel	St. Marys Paper	Total Domestic Usage	St. Marys Rapids	Superior Outflow
2017														
JAN	396	760	1156	934	2090	5	0	5	0.2	3	0	3	88	2186
FEB	384	733	1117	1090	2207	0	0	0	0.3	3	0	3	87	2297
MAR	392	702	1094	1129	2223	2	0	2	0.2	3	0	3	86	2314
APR	282	698	980	1008	1988	9	0	9	0.2	3	0	3	146	2146
MAY	362	582	944	574	1518	11	0	12	0.2	3	0	3	390	1923
JUN	374	687	1061	637	1698	12	1	13	0.2	3	0	3	582	2296
JUL	395	793	1188	1153	2341	12	2	14	0.2	3	0	3	892	3250
AUG	395	798	1193	1157	2350	12	2	14	0.2	3	0	3	937	3304
SEP	395	604	999	844	1843	12	1	13	0.2	3	0	3	939	2798
OCT	389	585	974	1106	2080	10	0	10	0.2	3	0	3	1002	3095
NOV	393	691	1084	1042	2126	10	0	10	0.2	3	0	3	942	3081
DEC	394	777	1171	858	2029	8	0	8	0.2	3	0	3	196	2236
2018														
JAN	390	777	1167	699	1866	3	0	3	0.2	3	0	3	193	2065
FEB	392	777	1169	736	1905	0	0	0	0.2	3	0	3	191	2099

NOTE: (1) Power canals columns include flows through power plants and spillways

TABLE 5
MONTHLY DISTRIBUTION OF LAKE SUPERIOR OUTFLOWS (cubic feet/second)

	POWER CANALS					NAVIGATION CANALS			DOMESTIC USAGE				FISHERY	TOTAL LAKE
Year and Month	U.S. Gov't Hydro	Cloverland	U.S. Total	Brookfield	Total Power	United States	Canada	Total Navigation	Sault Ste. Marie U.S. + CAN	Algoma Steel	St. Marys Paper	Total Domestic Usage	St. Marys Rapids	Superior Outflow
2016														
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	81,100
MAR	13,800	24,800	38,600	39,900	78,500	74	0	74	7	92	0	106	3,000	81,700
APR	10,000	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	67,900
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	57	487	7	102	0	106	33,100	116,700
SEP	13,900	21,300	35,200	29,800	65,000	427	42	470	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
2017														
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

NOTE: (1) Power canals columns include flows through power plants and spillways

(2) Flows for individual users were originally coordinated in m3/s, and are converted here to U.S. customary units (cfs) and rounded to 3 signficant figures.

(3) Total flow for each category and total Lake Superior flow in this table are computed from the individual flows in cfs.