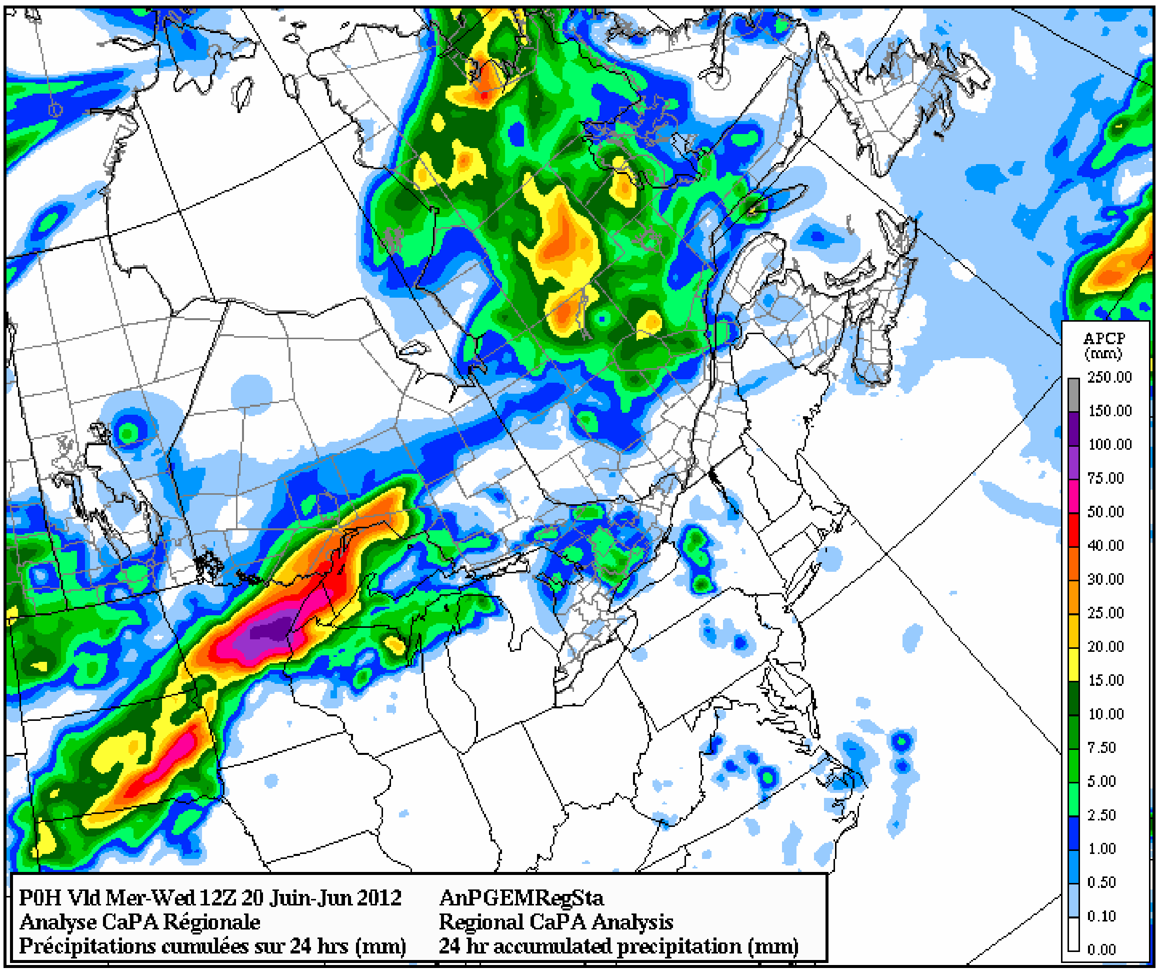
International Lake Superior Board of Control

Semi-Annual Progress Report to the International Joint Commission

Covering the Period March 23, 2012 to September 20, 2012



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International Lake Superior Board of Control

Canada
Jaymie Gadal, Member
Rob Caldwell, Secretary

United States
BG Margaret W. Burcham, Member
John W. Kangas, Secretary

20 September 2012

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

Commissioners:

This semi-annual report covers the Board's activities from 23 March to 20 September 2012.

1. Highlights

From March through August, the water levels of Lake Superior remained below average but were 1 cm (0.4 in.) lower to 9 cm (4 in.) higher than in 2011. Monthly mean Lake Superior levels remained 21 to 30 cm (8 to 12 in.) below average. Lake Superior levels have been consistently below average since April of 1998, which is the longest sustained period of below-average monthly levels in the 1918-2011 record.

The levels of Lakes Michigan-Huron have been below average since January of 1999, also the longest period on record of consistently below average levels. In the past six months, monthly mean Lakes Michigan-Huron levels remained 30 to 59 cm (12 to 23 in.) below average. Lakes Michigan-Huron were 19 cm (7 in.) higher than last year's levels in March, but by August, were 27 cm (11 in.) lower than those of 2011.

The Lake Superior outflows were as specified by Regulation Plan 1977-A, except for an increase in discharge in June to facilitate sea lamprey control testing, and in August during flow verification measurements at the Compensating Works. Since March, these monthly outflows have been between 74% and 93% of average. The monthly outflows from Lakes Michigan-Huron ranged from 88% to 95% of average. Water supplies to Lake Superior were below average in April, July, and August, but were otherwise above average. Water supplies to Lakes Michigan-Huron were above average in March, but have been below average since. The April supply was a new record low.

Ponding by the hydropower entities was permitted on weekends and holidays during the reporting period.

The Board hosted its annual public meeting and teleconference on the evening of 21 August in Sault Ste. Marie, ON. Six members of the public and media attended the meeting at

Sault College (along with several Board Members, staff, and associates), while one person participated via the teleconference line. Most participants remain concerned about potential impacts due to climate change and variability. There remains significant trepidation surrounding the expected outcomes following the International Upper Great Lakes Study and the IJC hearings held in July, and several people expressed disappointment regarding the Study's recommendation that no structures be constructed in the St. Clair River (to restore upstream water levels). After the meeting, attendees had an opportunity to talk one-on-one with the Board and Commission representatives.

The second part of a USEPA-funded study by the Great Lakes Fisheries Commission (GLFC) to assess potential improvements to sea lamprey trapping efficiencies in the St Marys River at Sault Ste, Marie was undertaken primarily in June and July. The International Joint Commission (IJC) authorized over-discharge deviations during these two months to facilitate the testing, with increased hydropower flows at night. This was believed to attract the lamprey to the traps located near the plants. An amount of about 90 m^3/s above the Plan-prescribed outflow was passed in June but the outflow was Criterion (c) limited in July, so no additional water could be passed during that month. Trapping efficiency did not improve significantly. The GLFC will not seek flow adjustments in the future, but wish to continue to have the gate pattern at the Compensating Works altered during May to July each year to improve trapping efficiency there.

Detailed monthly inspections of the Compensating Works were conducted during the reporting period, with no major issues identified.

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. Figure 1 compares the monthly water levels for this period to long-term averages and extremes. Figure 2 shows the monthly precipitation over the lakes Superior and Michigan-Huron basins. Figure 3 shows the monthly net basin supplies for the basins.

Precipitation over the Lake Superior basin was 105% of average from March through August 2012 and would be expected to be exceeded 34% of the time. Precipitation was above average until July and below average thereafter. The net basin water supplies to Lake Superior, which are the net amount of precipitation, evaporation, and runoff to the lake, were below average in April, July, and August and were otherwise above average. On the whole, the March through August net basin supplies to Lake Superior would be expected to be exceeded 64% of the time.

Lake Superior's water levels had been consistently below chart datum (183.2 m or 601.1 ft.) since late October 2011, but rose above chart datum on 20 June following a brief period of intense rainfalls in the western portion of the basin. Levels remained above datum until just before the end of the reporting period and, on 20 September, were 1 cm (0.4 in.) below chart datum. Its levels over the past six months ranged from 21 to 30 cm (8 to 12 in.) below average. On 20 September, its level was at elevation 183.19 m (601.02 ft.), which was 34 cm (13 in.) below average and 3 cm (1 in.) lower than last year. The levels of Lake Superior have been consistently below average since April of 1998, which is the longest sustained period of below-average monthly levels in the 1918-2010 period of record.

Precipitation over the Lakes Michigan-Huron basin was 87% of average over the past six months according to provisional data and would be expected to be exceeded 85% of the time. Net basin water supplies to Lakes Michigan-Huron were above average in March, and below average since. The April supply was a new record low. On the whole, the March through August net basin supplies to Lakes Michigan-Huron would be expected to be exceeded about 98% of the time.

Monthly mean Lakes Michigan-Huron levels ranged from 30 to 59 cm (12 to 23 in.) below long-term averages. Water levels had been consistently below chart datum (176.00 m or 577.4 ft.) since late January but rose above on 19 March where they remained until July 7 before falling below again. On 20 September, Lakes Michigan-Huron were at elevation 175.85 m (576.94 ft.), 64 cm (25 in.) below average, 26 cm (10 in.) lower than last year, and 15 cm (6 in.) below chart datum. The level of Lakes Michigan-Huron has been below average since January of 1999, also the longest sustained period of below-average monthly levels on record.

3. Regulation of the Outflow from Lake Superior

The outflows of Lake Superior were as specified by Regulation Plan 1977-A during the reporting period, except in June to facilitate sea lamprey control testing and in August to facilitate flow verification measurements at the Compensating Works. Lake Superior outflows were 83% of average over the last six months, with monthly flows ranging from 1,500 to 2,180 m^3/s (53,000 to 77,000 cfs). Outflows were limited by Criterion (c) of the Orders during July and August. Plan-prescribed outflows were limited to the normal minimum outflow of Plan 1977-A (1560 m^3/s) during April and May. The International Joint Commission (IJC) authorized over-discharge deviations during June and July to facilitate sea lamprey control testing, with increased hydropower flows at night. This was believed to attract the lamprey to the traps located near the plants. About 90 m^3/s above the Plan-prescribed outflow was passed in June, but the outflow was Criterion (c) limited in July, so no additional flow could be passed. Also, about 50 m^3/s above the Plan-prescribed outflow was passed in August for flow verification measurements at the Compensating Works. These very small amounts of extra water removed from Lake Superior, equivalent to a total of about 0.4 cm, were likely not sufficient to affect regulatory computations.

The gate settings at the Compensating Works supplying the main portion of the St. Marys Rapids were at an equivalent one-half gate open from March through 21 August and since 24 August. The equivalent one-half gate open setting was initially maintained in the typical pattern with Gates 7, 8, 9, and 10 each set at 20 cm (8”). To facilitate the sea lamprey control tests, these four gates were closed and Gates 13 to 16 were each opened on 29 May to the 20 cm equivalent opening. Gate settings were varied from 1 to 5 gates open between 21 to 24 August during flow verification measurements at the Compensating Works. The International Joint Commission (IJC) authorized over-discharge deviations during August to facilitate the flow measurements. A total amount of about 30 m^3/s above the Plan-prescribed outflow was passed in August, as authorized by the IJC. Gates 9, 10, 14, and 15 were each opened on 24 August. The first three were set to the 20 cm equivalent opening, but Gate 15 was inadvertently set to an incorrect 30 cm (12”) opening. On 11 September, Gate 15 was reset to the correct setting. The additional water passed during this 19-day period was approximately 7 m^3/s. The gates were returned to the typical pattern on 20 September. Gate 1, which supplies water to the Fishery Remedial Works, remained set at 15 m^3/s (530 cfs).

Several scheduled and a few unexpected flow reductions occurred at the three hydropower plants to facilitate maintenance and make repairs. Details are provided in Section 6. All flow reductions were easily offset by flow increases at other times within each month. When units are taken off-line, water levels immediately downstream of the plants (as indicated by the U.S. Slip gauge) fall, but quickly rise again as the idled units are brought back on-line. No problems related to water levels were reported as a result of these variations. No ships were reported delayed due to the flow variations.

4. Governing Conditions during the Reporting Period

The monthly mean levels of Lake Superior ranged between 182.93 and 183.30 m (600.2 and 601.4 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 Orders of Approval.

During the reporting period, the daily mean water levels in the lower St. Marys River at the U.S. Slip gauge downstream of the U.S. Locks, varied between 175.99 and 176.43 m (577.4 and 578.8 ft). Therefore, the requirement for maintaining the level below 177.94 m (583.8 ft.) was satisfied. Daily mean U.S. Slip levels fell below the ponding restriction threshold (see Section 10) of 176.09 m (577.72 ft.) for seven days during April, May, and September but no impacts to navigation were reported.

5. Inspection and Repairs at the Compensating Works

Ongoing routine maintenance and inspections of the Compensating Works occurred in the past six months. The structure is generally in good condition.

Routine monthly maintenance inspections continue to be conducted on the Canadian portion by Brookfield Renewable Energy Group (BREG). Inspection observations include 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 anything unusual. The August monthly inspection found the Compensating Works facilities to be in good condition. The annual fall inspection is scheduled to be completed by the end of September.

Monthly inspections and routine maintenance continue to be conducted on the U.S. portion by the U.S. Army Corps of Engineers (USACE) Soo Area Office. The 11 September monthly inspection found the Compensating Works facilities to be in good condition. The incorrect Gate 15 setting (open 30 cm in lieu of the typical 20 cm) was discovered during the inspection.

The next periodic inspection of the U.S. portion of the Compensating Works is scheduled for 2015. From 16-25 July, a more thorough periodic assessment was undertaken on the entire Soo complex, but focussed on the Main/Unit #10 and connecting dikes sections.

6. Repairs and Maintenance at the Hydropower Facilities

a. U.S. Government Hydropower Plant

The plant was offline for a total of 242 hours during the reporting period as a result of maintenance and inspections. The ongoing project to rehabilitate the timber crib dam was completed on 17 April with a diver inspection. Periodic inspections and assessments were completed in July and the inspection reports are currently being prepared. Preventative maintenance on the governor control system was also performed in June (the governor control system controls the opening and closing of the wicket gates). Annual electrical testing was also performed, but resulted in no down time. No maintenance is scheduled for the next six months. The plant is operating well and all water allocations were used.

b. Brookfield Renewable Energy Group

Scheduled maintenance outages continued to be performed. Unit G1 was shut down from 14 to 17 May for annual inspections. Daytime plant outages are scheduled on 25 and 26 September for repair work on a boom and safety signage. Units G2 and G3 annual inspections will be conducted from 1 to 10 October and 19 to 25 November, respectively. A series of minor, unscheduled outages also occurred. Unit G1 tripped off briefly on 20 June and 21 and 22 August due to transmission line issues and faulty instrumentation. The plant was shut down temporarily on 17 May and 1 September to permit lamprey control test instrumentation installation/removal. During the 1 September shutdown, the annual underwater cable inspection and maintenance for Lake Superior Power Ltd. was also performed. The power entity was able to pass the allotted flows each month.

c. Cloverland Electric Coop

The plant was offline for a total of 365 hours during the reporting period as a result of work being done by railroad contractors on the railroad bridge. All allocations were used and there are no planned outages for the next six months.

7. Flow Verification Measurements

Hydropower flow verification measurements were performed from 21-24 August at the Compensating Works following completion of BREG's multi-year refurbishment of the Canadian side of the structure last year. Gate settings ranging from 1 to 5 gates open were measured.

Measurements at the power canals continue on a five-year cycle and are expected to be next completed in 2015.

Flow measurements were made at model sections in the lower St. Marys River on 24 and 25 August. These measurements are for use in the calibration of hydraulic models and are not related to the power plant or Compensating Works flow verification programs. It is expected that within the next year or so, United States Geological Survey (USGS) acoustic Doppler velocity meter (ADVM) data will be available as a second means of estimating the total flow in the river.

8. Water Usage in the St. Marys River

Table 3 (Table 4 in cubic feet per second) lists the distribution of outflows from Lake Superior for January 2011 to August 2012. 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 U.S. 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 around 10 to 11 m^3/s (353 to 388 cfs) over the past six months, or 0.5 to 0.7% of the total monthly outflow.

The monthly flow through the locks depends on traffic volume and varied from 4 to 14 m^3/s (141 to 494 cfs) during the past six months. As a percentage of the total river flow, water allocated for navigation can vary seasonally from 0.1% (when the locks are closed for the winter) to 1.0% in the busiest part of the navigation season.

The U.S. locks opened on 25 March. The Canadian lock reopened on 15 May.

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 ½ 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 is thought to reduce potential damage from ice floes impacting the gate. 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 82 to 135 m^3/s (2,900 to 2,930 cfs) over the last six months, or approximately 4 to 6% of the total monthly outflow.

The hydropower plants passed an average of 1,646 m^3/s (58,130 cfs) from March to August for electric power production, or 93.6% of the total river flow. The allocation for this period averaged 1,643 m^3/s (58,020 cfs). Therefore, there was an unintentional difference of 3 m^3/s (106 cfs). Usages at each plant are shown in Tables 3 and 4.

Board representatives toured various Canadian facilities and installations on 22 and 23 August to audit the water usage and measurement techniques of each agency/entity that uses and diverts water from the St. Marys River at Sault Ste. Marie. Most records were found to be in order. One entity has been over-reporting their usage by about 2 to 8 m^3/s (70 to 280 cfs) for about three decades, whereas another has been under-reporting their usage by approximately 1 to 20 m^3/s (about 35 to 700 cfs) for an undisclosed period of time (perhaps since construction was completed in the 1890s). Full summaries are expected from both entities soon. Flow estimates will then be revised as necessary. On 20 September, it was pointed out that 0.1 m^3/s is passed through a 41-cm (16”) pipe at the BREG plant from mid-May to late August each year (since 2008) to act as a sea lamprey attractant. It is believed that, in recent years, the net impact of these reporting errors would be an under-reporting of less than 10 m^3/s (350 cfs). U.S. facilities and installations will be audited in 2013.

9. Long Lac and Ogoki 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 121.0 m^3/s (4,270 cfs) and the Long Lac Diversion averaged 49.1 m^3/s (1,730 cfs) from March through August. Combined, these diversions were about 101 percent of average for the period 1944-2011.

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 1.8 m^3/s (64 cfs) during March, April, and August. Additional water was spilled northward at an average rate of 166.1 m^3/s (5,870 cfs) from May to July during a very wet period. No water was diverted southward through the Ogoki Diversion during June due to very high Lake Nipigon levels.

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. An average of 24.2 m^3/s (850 cfs) was spilled during May and June.

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 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 by the hydropower entities 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.

The Commission's guidelines were to be examined on a five-year basis by the Board, beginning in 2010. At the Spring Appearance on 21 April 2010, the Commission agreed that the Board could defer the report until after related findings of the International Upper Great Lakes Study are released.

During the reporting period, the power entities undertook peaking and ponding operations under the supervision of the Board. Ponding was permitted throughout the reporting period. No navigation problems related to peaking and ponding were called to the Board's attention.

To continue to provide timely information on expected flow variations to the users, the Corps 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. No concerns related to peaking and ponding were reported to the Board during the period.

Figures 4a-4f compare the hourly Lake Superior outflow and the hourly levels at U.S. Slip on the lower St. Marys River. U.S. Slip levels ranged from 39 cm (15 in.) below to 26 cm (10 in.) above those during the same period in 2011.

11. Sea Lamprey Control Tests

In March, the Great Lakes Fishery Commission (GLFC) requested that the Board consider a proposal to repeat their 2011 experiments in 2012, focused at the BREG plant. GLFC tested the potential for improving sea lamprey trapping efficiencies at the traps located immediately downstream of the BREG plant. It was thought that trapping efficiency may be affected by altering the temporal distribution of St. Marys River flows during the lamprey spawning season (late May through July for approximately eight weeks, depending on water temperatures). It was hypothesized that trapping of sea lamprey might be greatly improved by changing both the timing and rate of releases through the hydropower plant and possibly the rapids. Previous analyses suggested that maintaining high hydropower releases (i.e., on-peak flows) during nighttime might improve trapping efficiency.

The Board and power entities again cooperated with the proponents to vary the flow releases during the sea lamprey spawning period to facilitate experiments. By letter dated 18 April, the Board requested that the IJC approve discretionary deviations during the period from 1 June through 31 July up to the Criterion (c) flow limits. The IJC approved this request on 25 April at the semi-annual meeting in Washington, DC. The actual flow manipulations included minor increases above the Plan 1977-A flow during June only.

About 50 m^3/s above the Plan-prescribed outflow was passed in June. Criterion (c) applied in July, so no additional flow was able to be released that month. On 29 May, at the request of the GLFC, the Compensating Works gate setting was altered from the customary half gate setting of Gates 7 to 10 partially open to Gates 13 to 16 partially open in an effort to improve trapping below Gate 16 and to hopefully aid with nest surveys in the rapids. The gates were reset following the flow measurements at the Compensating Works. The flow measurement program was postponed until after nest surveys were completed in mid August.

Ms. Jessica Barber, U.S. Fish and Wildlife Service, provided a summary of the 2011 and 2012 tests and provisional findings to the Board on 20 September. The relationship between increased flows and increased daily catch success was reported to actually be rather weak, so no further flow adjustments will be sought. Water temperature offers a decent indication of expected trapping efficiency. Efficiency of the portable traps downstream of Gate 16 at the Compensating Works improved, and so there is now a standing request to switch from using Gates 7 to 10 to Gates 13 to 16 during May through July (when a ½ gate equivalent setting is indicated).

12. Annual Meeting with the Public and Public Information

The Board hosted its annual public meeting and teleconference on the evening of 21 August in Sault Ste. Marie, ON. About six members of the public and media attended the meeting at Sault College (along with several Board Members, staff, and associates), while one person participated via the teleconference line.

Canadian Member, Mr. David Fay, presented information describing the IJC, the Board, the control structures, the regulation plan, and the current and expected water levels. Mr. Gale Bravener, Department of Fisheries and Oceans, provided a summary of the sea lamprey control testing conducted in the St. Marys River this year. The meeting was then opened for public comment, questions, and concerns, with Mr. Fay chairing. The slide presentation shown at the meeting hall was made available online to callers beforehand, and callers were able to interact with the chairman and other participants during the event.

Many participants remain concerned about potential impacts due to climate change and variability. There remains significant trepidation surrounding the potential outcomes following the International Upper Great Lakes Study and IJC hearings in July, such as large, unbalanced releases to benefit downstream interests, or use of Lake Superior as a reservoir. People were urged to send their comments to the IJC prior to the 31 August deadline (which has subsequently been extended to 30 September). After the meeting, attendees had an opportunity to talk one-on-one to the Board and Commission representatives.

The date and location of its next meeting with the public will be set by the Board at its spring business meeting.

The Board continues to issue, at the beginning of each month, news releases informing the public about Lake Superior regulation and water level conditions. The Board provides monthly media releases and hydrologic update information to the Commission to maintain a Board web site. Content includes information on Board members and responsibilities as well as news releases, semi-annual reports, meeting minutes and hydrologic data summaries.

13. Board Membership and Meetings

Mr. David Fay resigned as Canadian Member effective 4 September while he undertakes an acting assignment at the Commission. Mr. Jaymie Gadal was appointed interim Canadian Member effective 4 September.

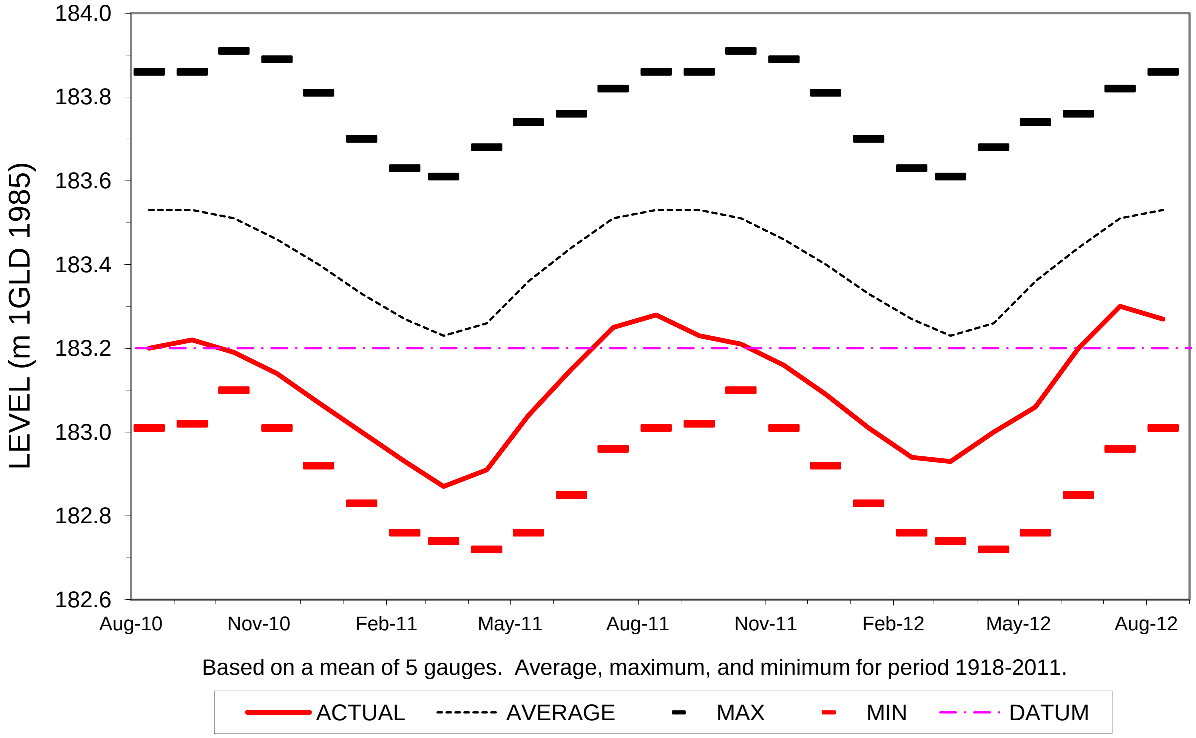
LTC Rob Ells replaced LTC Michael Derosier as U.S. Regulation Representative on 12 July 2012. COL Robert Peterson replaced COL John D. Drolet as U.S. Alternate Member on 7 September 2012.

The Board held a meeting on 20 September near Lansdowne, Ontario.

Respectfully submitted,

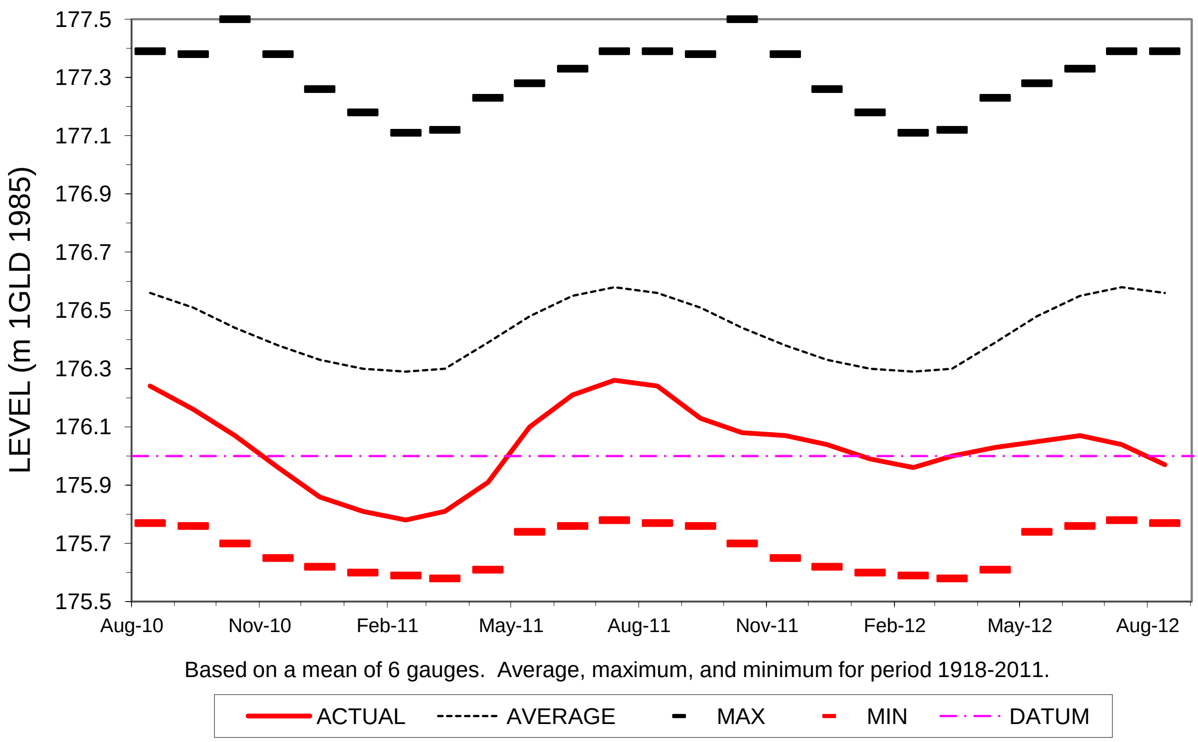
Jaymie Gadal	BG Margaret W. Burcham
Member for Canada	Member for United States

LAKE SUPERIOR MONTHLY WATER LEVELS



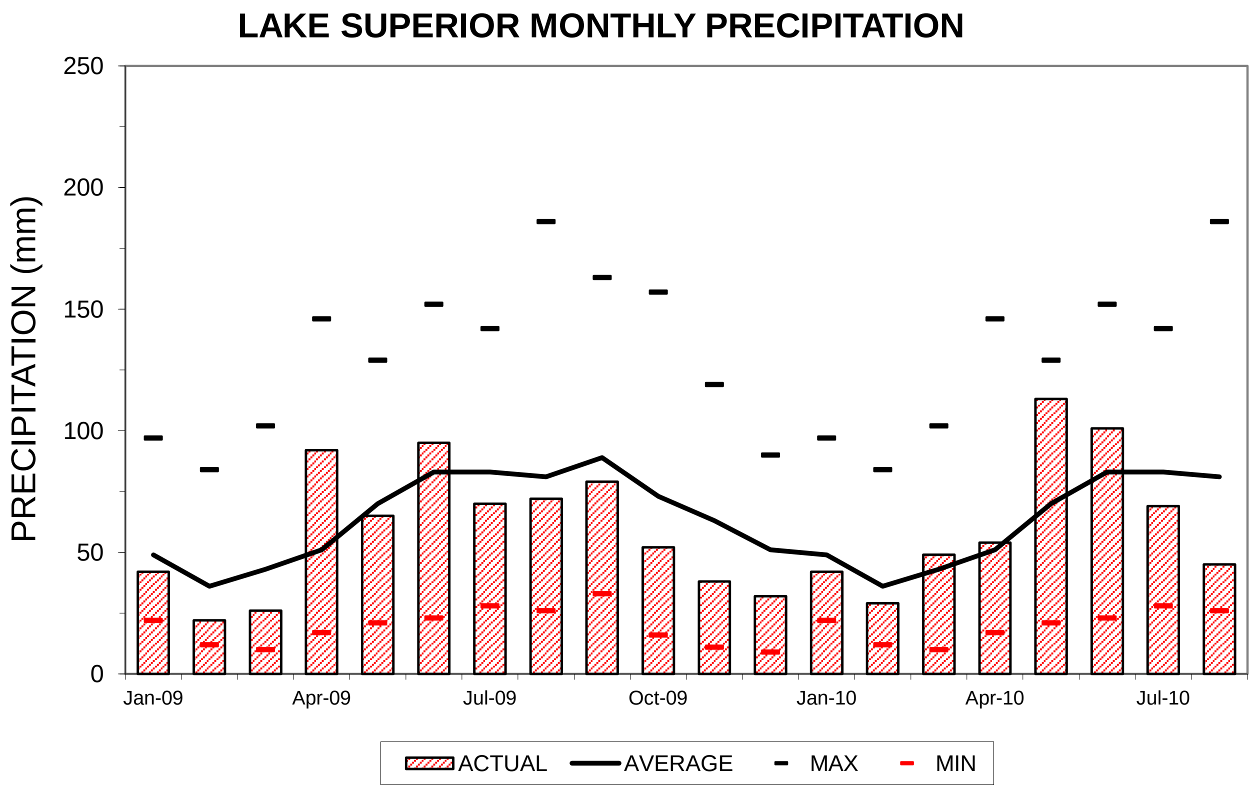
Based on a mean of 5 gauges. Average, maximum, and minimum for period 1918-2011.

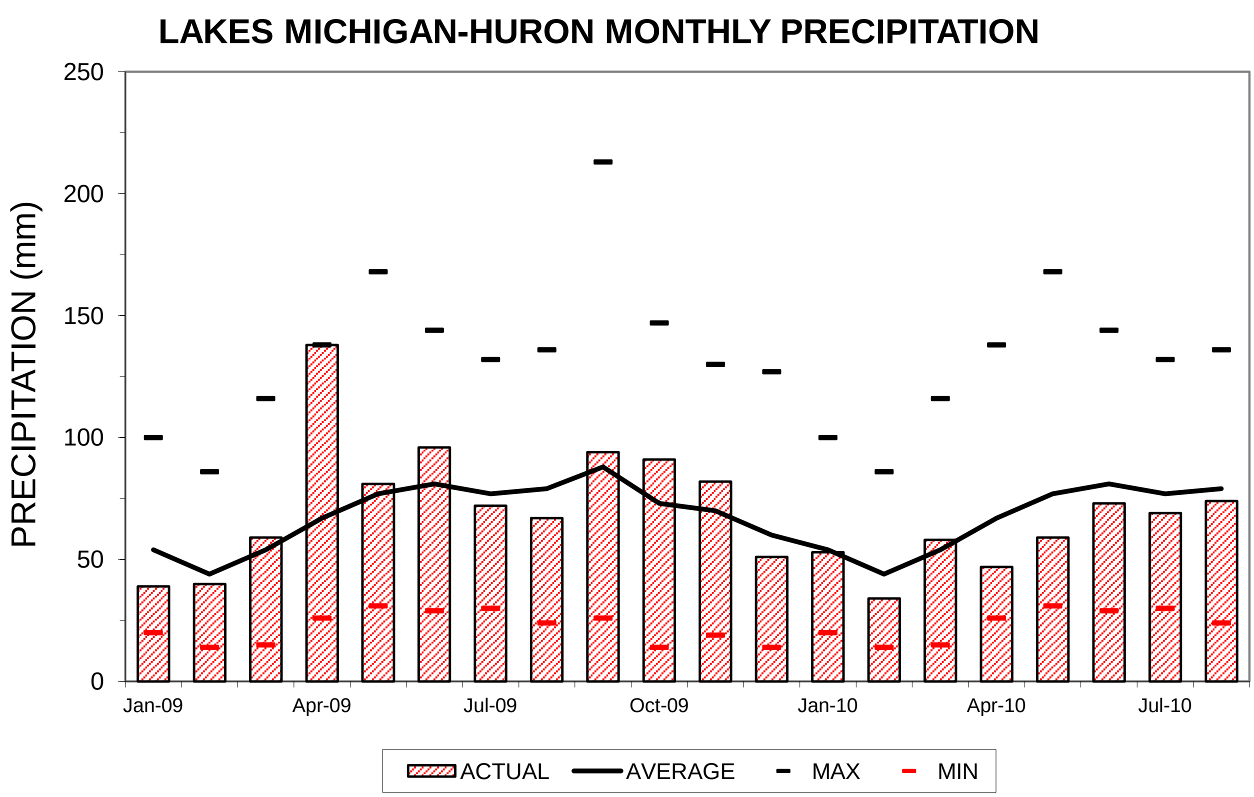
LAKES MICHIGAN-HURON MONTHLY WATER LEVELS



Based on a mean of 6 gauges. Average, maximum, and minimum for period 1918-2011.

Figure 1

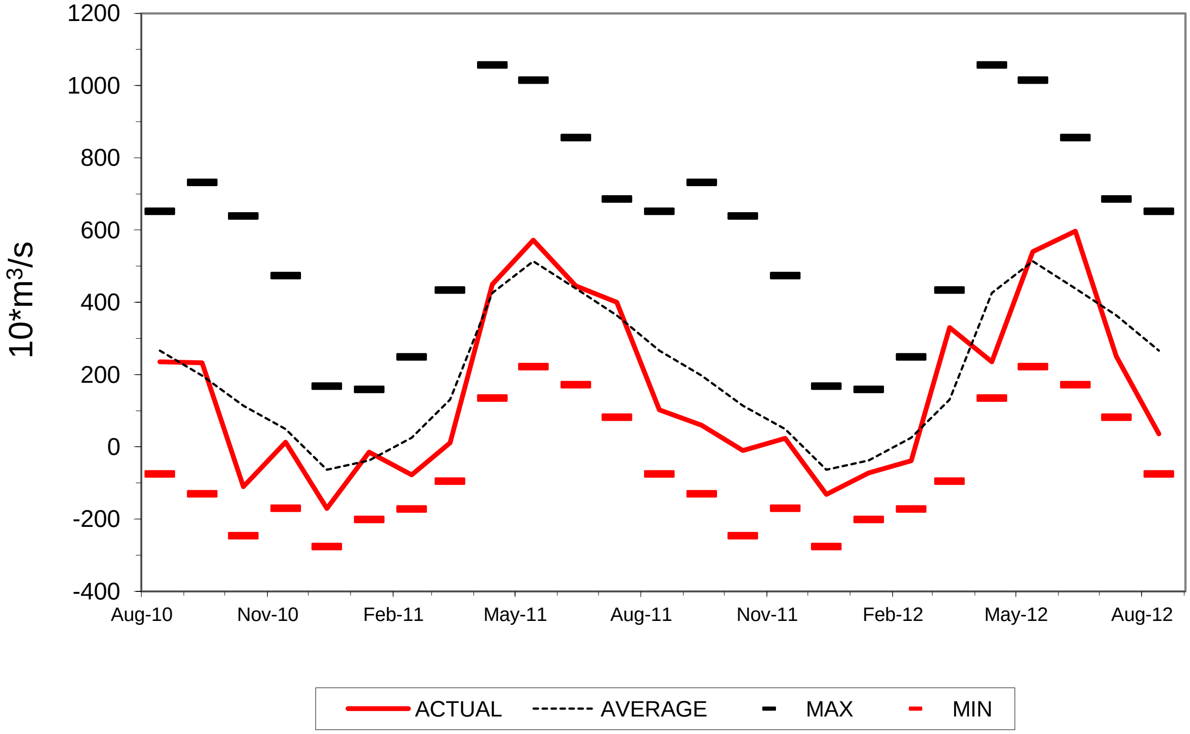




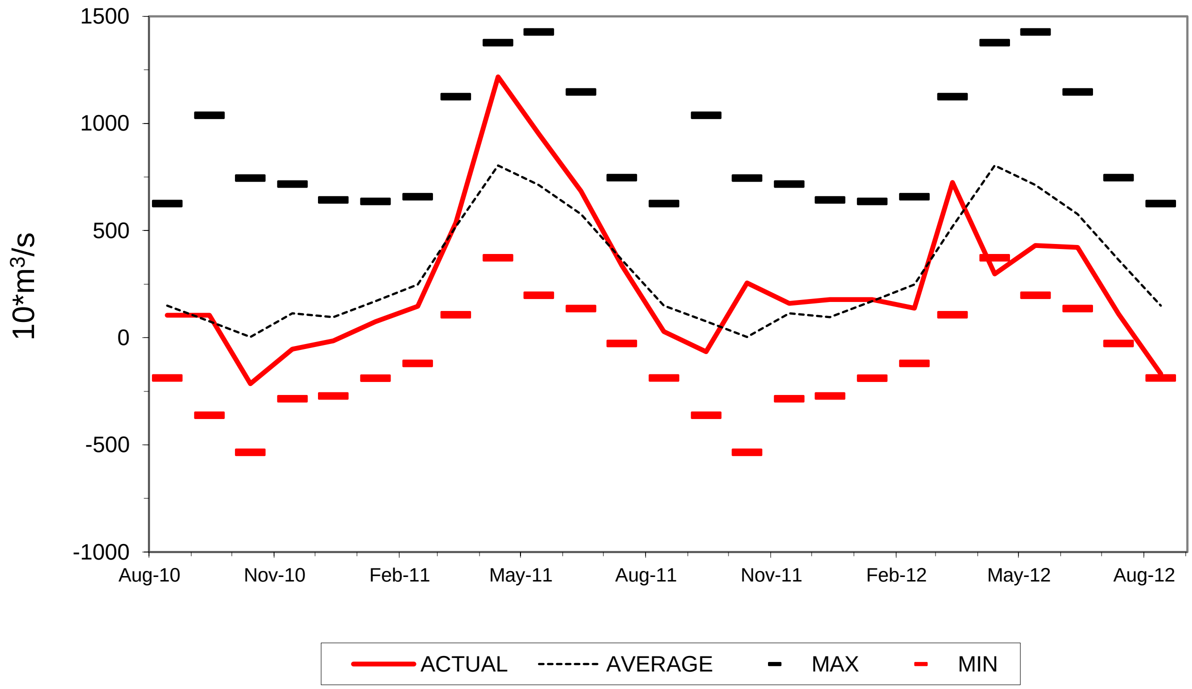
Average, maximum and minimum values based on period of record 1900-2011.

Figure 2

LAKE SUPERIOR MONTHLY NET BASIN SUPPLIES

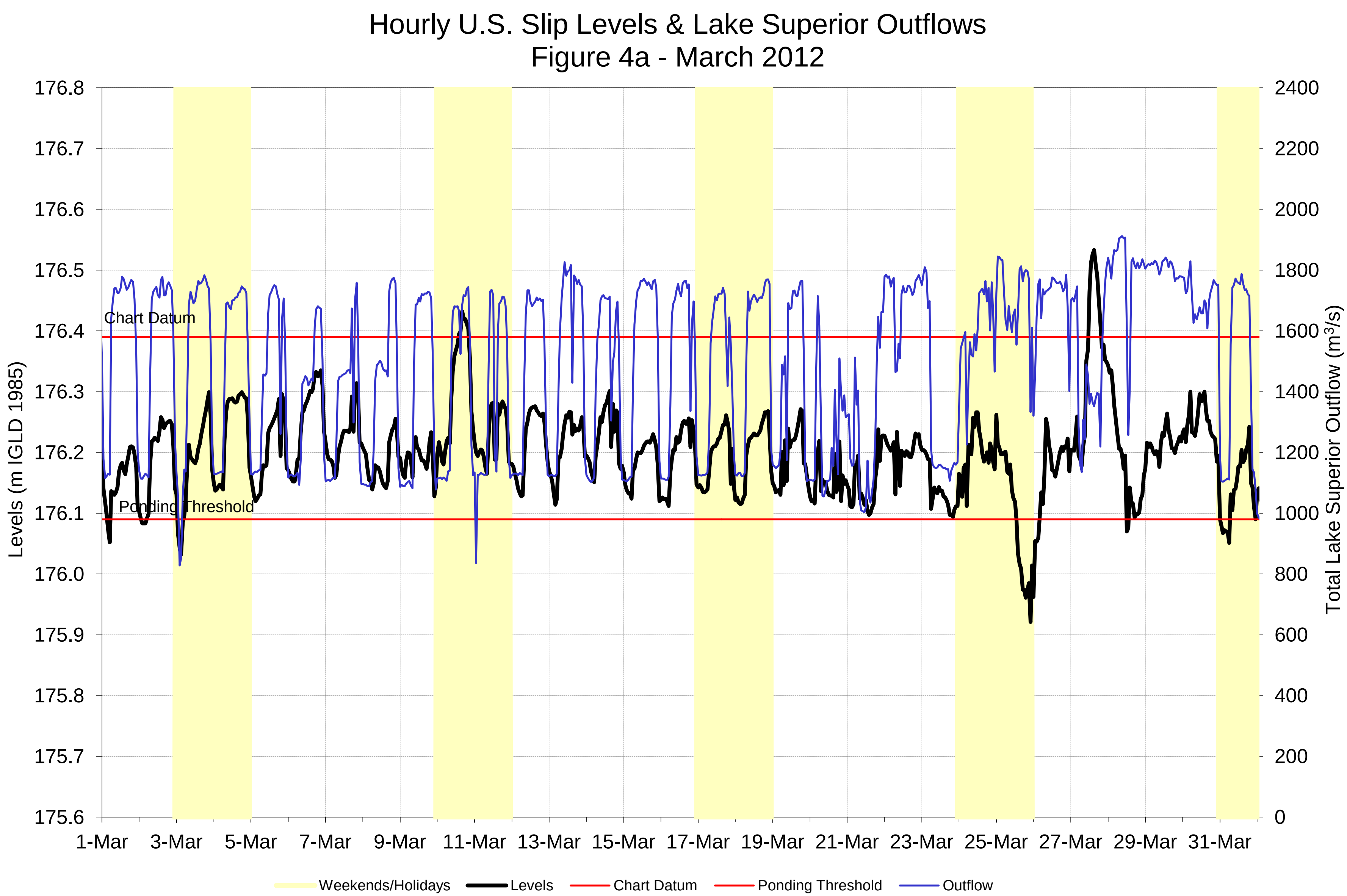


LAKES MICHIGAN-HURON MONTHLY NET BASIN SUPPLIES

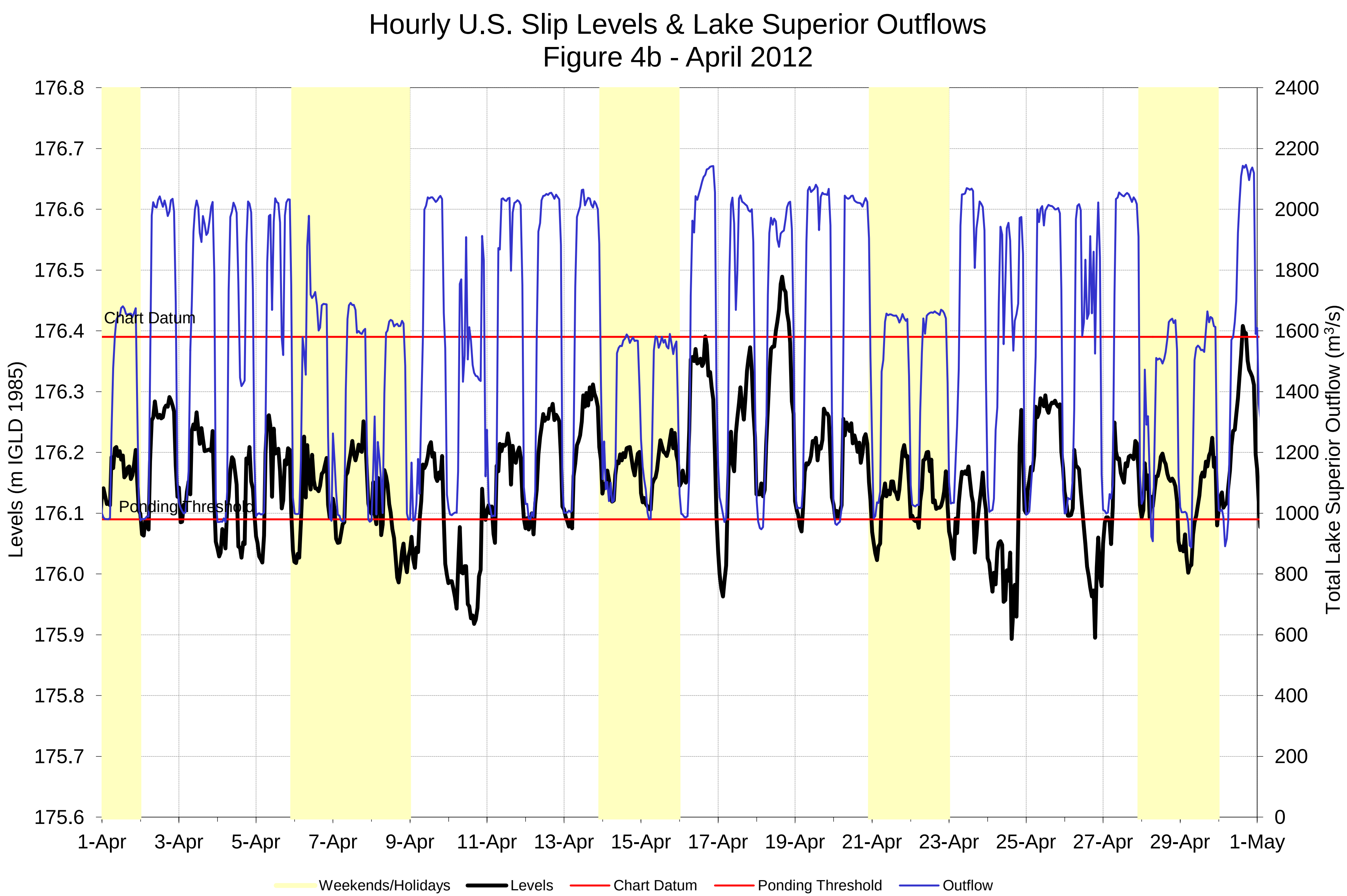


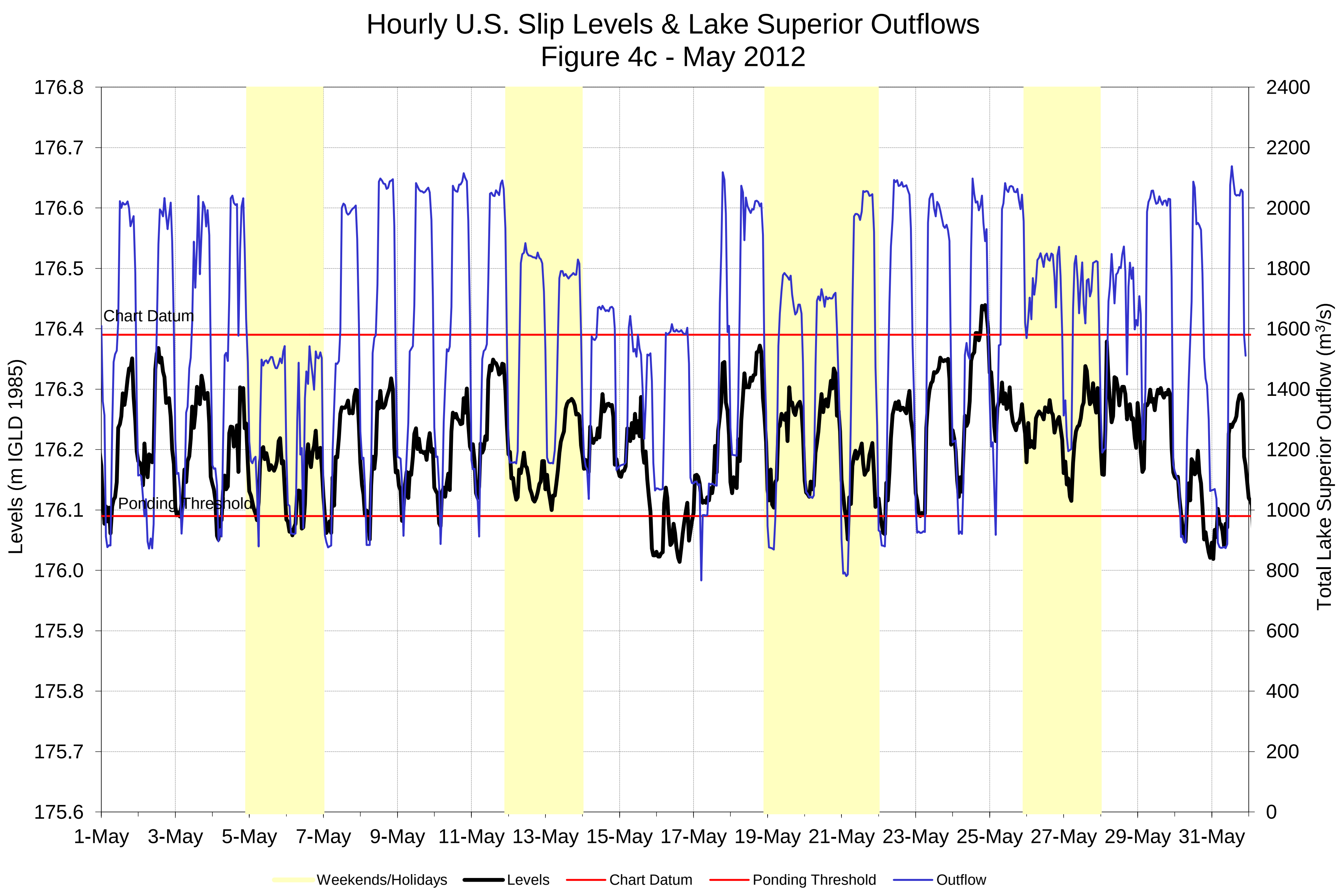
Average, maximum and minimum values based on coordinated period of record 1900-2008.

Figure 3



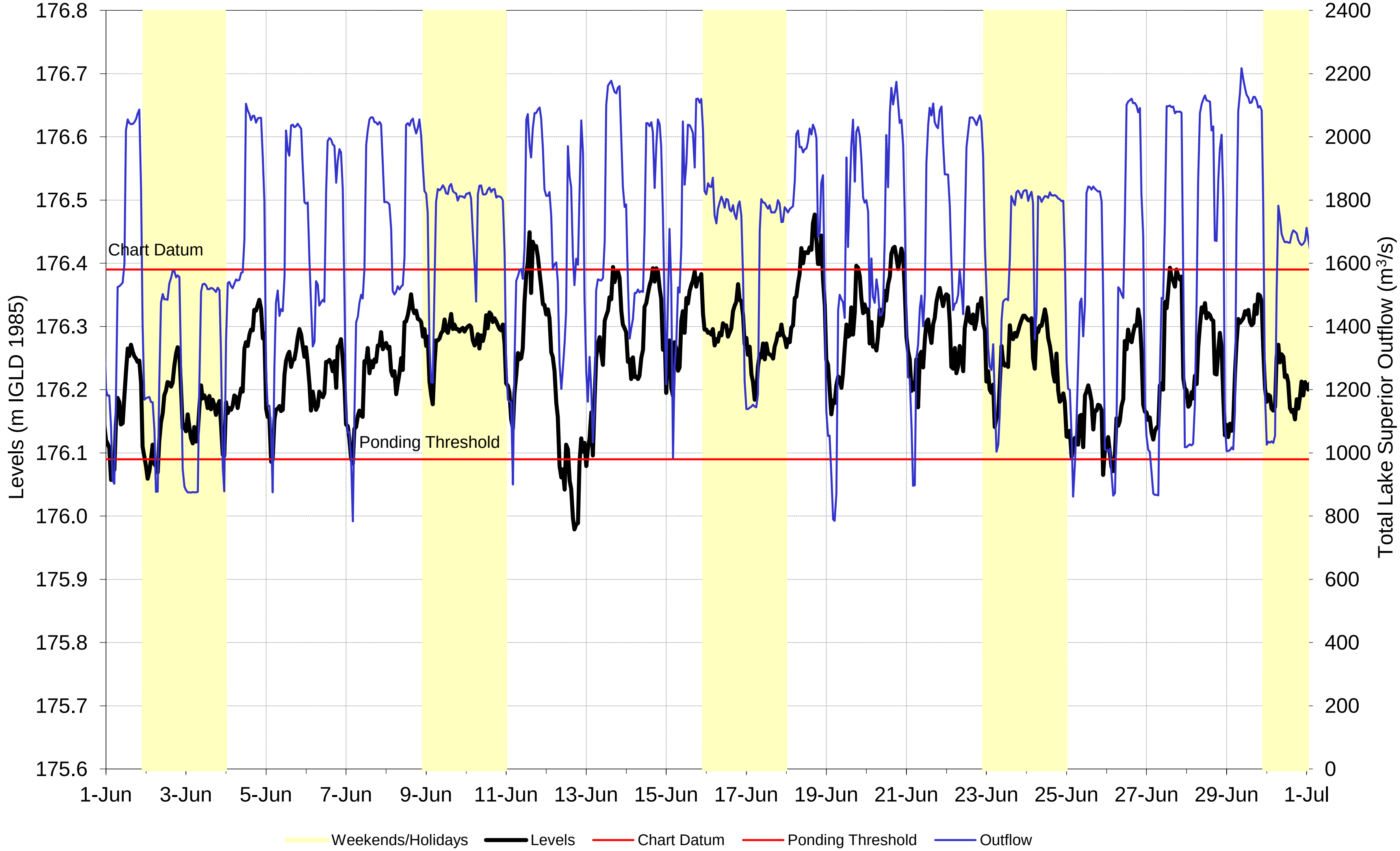
Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4a - March 2012
Levels (m IGLD 1985)
Total Lake Superior Outflow (m³/s)
176.8
176.7
176.6
176.5
176.4
176.3
176.2
176.1
176.0
175.9
175.8
175.7
175.6
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Chart Datum
Ponding Threshold
1-Mar
3-Mar
5-Mar
7-Mar
9-Mar
11-Mar
13-Mar
15-Mar
17-Mar
19-Mar
21-Mar
23-Mar
25-Mar
27-Mar
29-Mar
31-Mar
Weekends/Holidays
Levels
Chart Datum
Ponding Threshold
Outflow

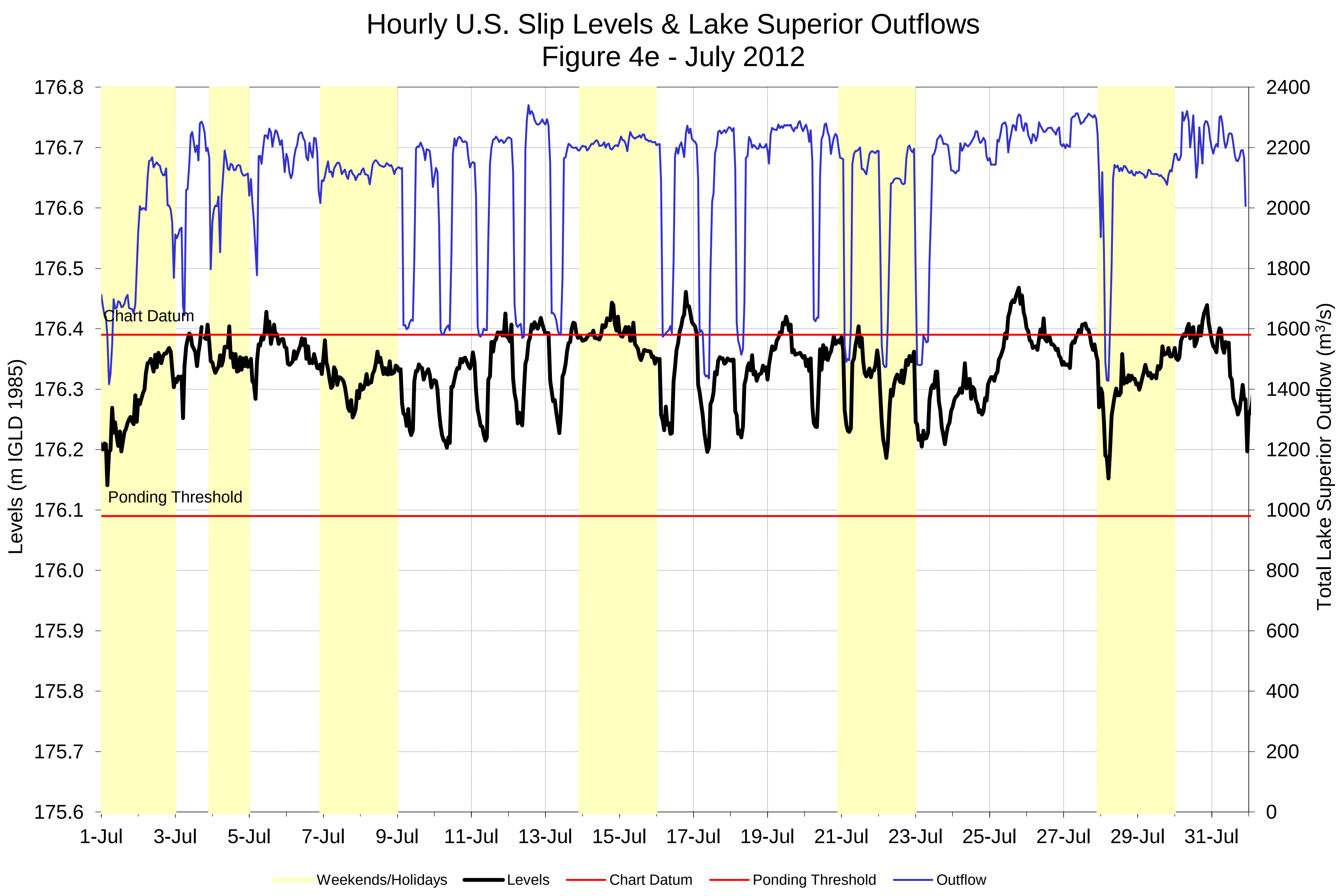

Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4b - April 2012
Levels (m IGLD 1985)
Total Lake Superior Outflow (m3/s)
Chart Datum
Ponding Threshold
176.8
176.7
176.6
176.5
176.4
176.3
176.2
176.1
176.0
175.9
175.8
175.7
175.6
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1-Apr
3-Apr
5-Apr
7-Apr
9-Apr
11-Apr
13-Apr
15-Apr
17-Apr
19-Apr
21-Apr
23-Apr
25-Apr
27-Apr
29-Apr
1-May
Weekends/Holidays
Levels
Chart Datum
Ponding Threshold
Outflow

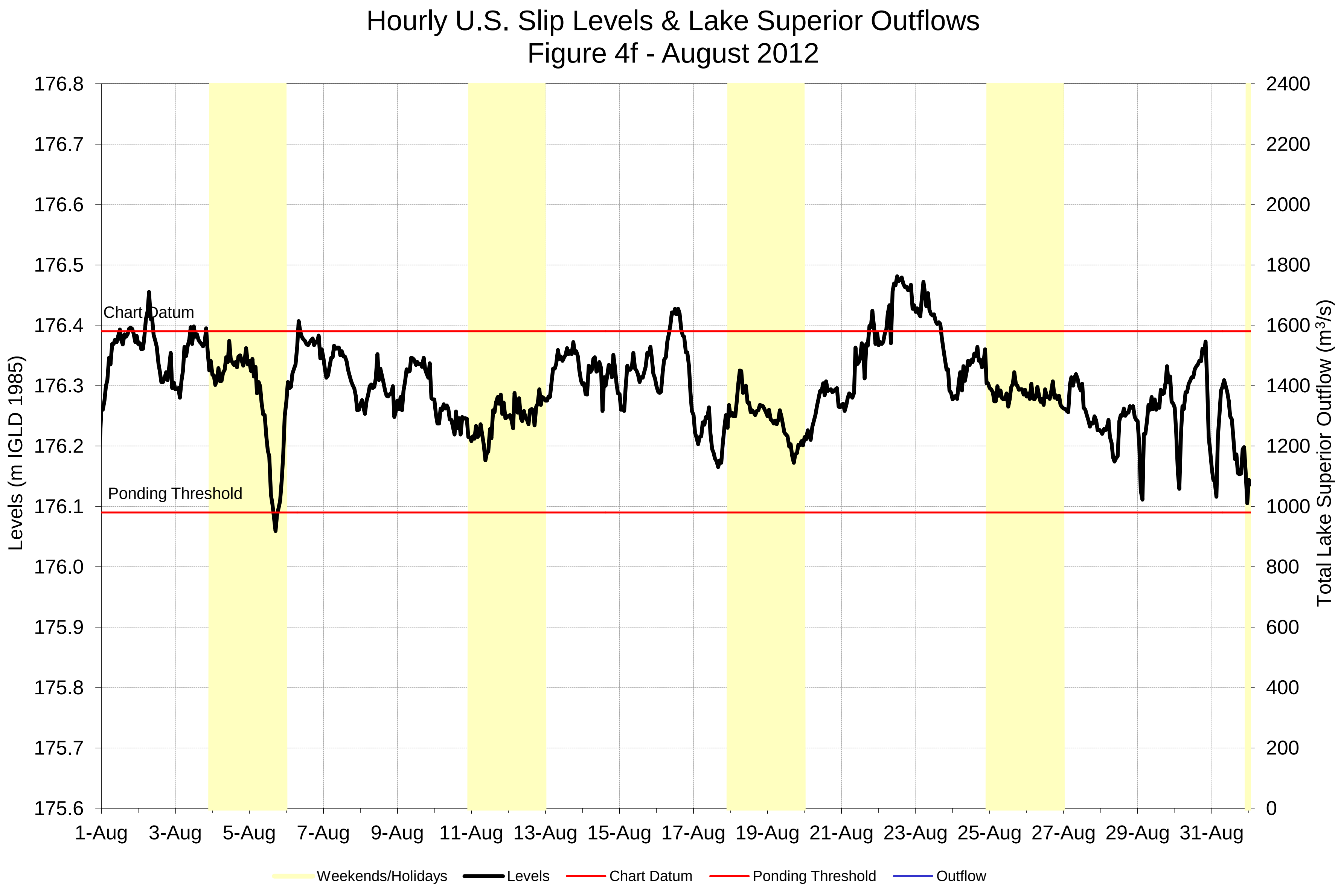


Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4c - May 2012
Levels (m IGLD 1985)
Total Lake Superior Outflow (m³/s)
Chart Datum
Ponding Threshold
176.8
176.7
176.6
176.5
176.4
176.3
176.2
176.1
176.0
175.9
175.8
175.7
175.6
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1-May
3-May
5-May
7-May
9-May
11-May
13-May
15-May
17-May
19-May
21-May
23-May
25-May
27-May
29-May
31-May
Weekends/Holidays
Levels
Chart Datum
Ponding Threshold
Outflow

Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4d - June 2012




Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4e - July 2012
Levels (m IGLD 1985)
Total Lake Superior Outflow (m3/s)
176.8
176.7
176.6
176.5
176.4
176.3
176.2
176.1
176.0
175.9
175.8
175.7
175.6
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Chart Datum
Ponding Threshold
1-Jul
3-Jul
5-Jul
7-Jul
9-Jul
11-Jul
13-Jul
15-Jul
17-Jul
19-Jul
21-Jul
23-Jul
25-Jul
27-Jul
29-Jul
31-Jul
Weekends/Holidays
Levels
Chart Datum
Ponding Threshold
Outflow



Hourly U.S. Slip Levels & Lake Superior Outflows
Figure 4f - August 2012
Levels (m IGLD 1985)
Total Lake Superior Outflow (m³/s)
176.8
176.7
176.6
176.5
176.4
176.3
176.2
176.1
176.0
175.9
175.8
175.7
175.6
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Chart Datum
Ponding Threshold
1-Aug
3-Aug
5-Aug
7-Aug
9-Aug
11-Aug
13-Aug
15-Aug
17-Aug
19-Aug
21-Aug
23-Aug
25-Aug
27-Aug
29-Aug
31-Aug
Weekends/Holidays
Levels
Chart Datum
Ponding Threshold
Outflow

TABLE 1. 2011-2012 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	m3/s	tcfs	(%)	m3/s	tcfs	
Apr-11	182.91	600.10	-0.35	-1.15	4500	159	40	1470	52	76
May-11	183.04	600.52	-0.32	-1.05	5720	202	35	1550	55	73
Jun-11	183.15	600.89	-0.29	-0.95	4450	157	46	1630	58	74
Jul-11	183.25	601.21	-0.26	-0.85	4000	141	36	1720	61	75
Aug-11	183.28	601.31	-0.25	-0.82	1020	36	90	1740	61	74
Sep-11	183.23	601.15	-0.30	-0.98	600	21	83	1650	58	71
Oct-11	183.21	601.08	-0.30	-0.98	-100	-4	82	1560	55	69
Nov-11	183.16	600.92	-0.30	-0.98	230	8	56	1560	55	70
Dec-11	183.09	600.69	-0.31	-1.02	-1320	-47	79	1560	55	76
Jan-12	183.01	600.43	-0.32	-1.05	-720	-25	68	1560	55	80
Feb-12	182.94	600.20	-0.33	-1.08	-390	-14	79	1570	55	83
Mar-12	182.93	600.16	-0.30	-0.98	3300	117	6	1500	53	80
Apr-12	183.00	600.39	-0.26	-0.85	2350	83	92	1570	55	81
May-12	183.06	600.59	-0.30	-0.98	5400	191	42	1560	55	74
Jun-12	183.20	601.05	-0.24	-0.79	5970	211	15	1660	59	76
Jul-12	183.30	601.38	-0.21	-0.69	2500	88	83	2080	73	91
Aug-12*	183.27	601.28	-0.26	-0.85	360	13	97	2180	77	93

Notes: m3/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 1918-2011, 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.

* Provisional estimates

TABLE 2. 2011-2012 Lakes 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	m3/s	tcfs	(%)	m3/s	tcfs	Average[4]
Apr-11	175.91	577.13	-0.48	-1.57	12180	430	5	4630	164	90
May-11	176.10	577.76	-0.38	-1.25	9520	336	13	4730	167	88
Jun-11	176.21	578.12	-0.34	-1.12	6840	242	27	4810	170	88
Jul-11	176.26	578.28	-0.32	-1.05	3370	119	55	5000	177	91
Aug-11	176.24	578.22	-0.32	-1.05	280	10	76	5060	179	92
Sep-11	176.13	577.85	-0.38	-1.25	-660	-23	76	4920	174	90
Oct-11	176.08	577.69	-0.36	-1.18	2560	90	10	4920	174	91
Nov-11	176.07	577.66	-0.31	-1.02	1600	57	38	4860	172	91
Dec-11	176.04	577.56	-0.29	-0.95	1780	63	32	4590	162	88
Jan-12	175.99	577.40	-0.31	-1.02	1780	63	45	4590	162	101
Feb-12	175.96	577.30	-0.33	-1.08	1370	48	78	4640	164	105
Mar-12	176.00	577.43	-0.30	-0.98	7250	256	19	4640	164	95
Apr-12	176.03	577.53	-0.36	-1.18	2970	105	>99 [5]	4900	173	95
May-12	176.05	577.59	-0.43	-1.41	4300	152	91	4880	172	91
Jun-12	176.07	577.66	-0.48	-1.57	4220	149	78	4900	173	90
Jul-12	176.04	577.56	-0.54	-1.77	1110	39	96	4900	173	89
Aug-12*	175.97	577.33	-0.59	-1.94	-1680	-59	98	4880	172	88

Notes: m3/s = cubic metres per second tcfs = 1000 cubic feet per second

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

[2] Average levels are for period 1918-2011, 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.

[5] New record low supply

* Provisional estimates

Table 3

INTERNATIONAL LAKE SUPERIOR BOARD OF CONTROL

MONTHLY DISTRIBUTION OF LAKE SUPERIOR OUTFLOW

OUTFLOW IN m^3/s THROUGH

	POWER CANALS					NAVIGATION CANALS			DOMESTIC USAGE				FISHERY	TOTAL
YEAR AND MONTH	US GOVT HYDRO	CEC	US TOTAL	BREG	TOTAL POWER CANALS	UNITED STATES	CANADA	TOTAL NAV. CANALS	S.STE MARIE US+CAN	ESSAR ALGOMA STEEL	ST MARYS PAPER	TOTAL DOM. USAGE	STE. MARY'S RAPIDS	LAKE SUPERIOR OUTFLOW m^3/s
2011														
JAN	405	362	767	697	1464	5.2	0.0	5	0.3	9.8	0.3	10	82	1561
FEB	407	318	725	717	1442	1.4	0.0	1	0.4	9.6	0.3	10	82	1535
MAR	408	282	690	687	1377	3.1	0.0	3	0.4	9.8	0.0	10	81	1471
APR	406	281	687	684	1371	8.6	0.0	9	0.4	9.9	0.0	10	81	1471
MAY	327	393	720	728	1448	10.4	0.5	11	0.4	10.3	0.0	11	83	1553
JUN	295	467	762	760	1522	11.4	1.1	12	0.3	10.9	0.0	11	84	1629
JUL	285	520	805	806	1611	12.3	2.0	14	0.3	10.5	0.0	11	85	1721
AUG	373	439	812	820	1632	12.1	1.8	14	0.3	10.9	0.0	11	85	1742
SEP	346	393	739	799	1538	10.7	1.0	12	0.3	10.4	0.0	11	85	1646
OCT	403	323	726	727	1453	9.5	0.3	10	0.3	10.1	0.0	10	85	1558
NOV	390	338	728	732	1460	9.4	0.0	9	0.3	9.8	0.0	10	84	1563
DEC	403	330	733	721	1454	8.7	0.0	9	0.3	10.3	0.0	11	84	1558
2012														
JAN	404	330	734	731	1465	4.8	0.0	5	0.3	10.2	0.0	10	83	1563
FEB	412	331	743	732	1475	2.1	0.0	2	0.3	10.0	0.0	10	82	1569
MAR	412	291	703	701	1404	4.2	0.0	4	0.3	9.6	0.0	10	82	1500
APR	411	325	736	728	1464	9.1	0.0	9	0.3	10.1	0.0	10	83	1566
MAY	396	336	732	728	1460	10.8	0.4	11	0.3	9.9	0.0	10	83	1564
JUN	398	337	735	813	1548	11.5	1.1	13	0.3	10.2	0.0	10	85	1656
JUL	412	580	992	987	1979	11.9	2.1	14	0.3	10.6	0.0	11	85	2089
AUG	405	605	1010	1010	2020	12.0	1.9	14	0.3	10.6	0.0	11	135	2180

NOTE: POWER CANALS COLUMNS INCLUDE FLOWS THROUGH POWER PLANTS AND SPILLWAYS

Table 4

INTERNATIONAL LAKE SUPERIOR BOARD OF CONTROL

MONTHLY DISTRIBUTION OF LAKE SUPERIOR OUTFLOW

OUTFLOW IN CFS THROUGH

	POWER CANALS					NAVIGATION CANALS			DOMESTIC USAGE				FISHERY	TOTAL LAKE
YEAR AND MONTH	US GOVT HYDRO	CEC	US TOTAL	BREG	TOTAL POWER CANALS	UNITED STATES	CANADA	TOTAL NAV. CANALS	S.STE MARIE US+CAN	ESSAR ALGOMA STEEL	ST MARYS PAPER	TOTAL DOM. USAGE	STE. MARY'S RAPIDS	SUPERIOR OUTFLOW CFS
2011														
JAN	14300	12800	27100	24600	51700	184	0	184	11	346	11	368	2900	55200
FEB	14400	11200	25600	25300	50900	49	0	49	14	339	11	364	2900	54200
MAR	14400	10000	24400	24300	48700	109	0	109	14	346	0	360	2860	52000
APR	14300	9900	24200	24200	48400	304	0	304	14	350	0	364	2860	51900
MAY	11500	13900	25400	25700	51100	367	18	385	14	364	0	378	2930	54800
JUN	10400	16500	26900	26800	53700	403	39	442	11	385	0	396	2970	57500
JUL	10100	18400	28500	28500	57000	434	71	505	11	371	0	382	3000	60900
AUG	13200	15500	28700	29000	57700	427	64	491	11	385	0	396	3000	61600
SEP	12200	13900	26100	28200	54300	378	35	413	11	367	0	378	3000	58100
OCT	14200	11400	25600	25700	51300	335	11	346	11	357	0	368	3000	55000
NOV	13800	11900	25700	25900	51600	332	0	332	11	346	0	357	2970	55300
DEC	14200	11700	25900	25500	51400	307	0	307	11	364	0	375	2970	55100
2012														
JAN	14300	11700	26000	25800	51800	170	0	170	11	360	0	371	2930	55300
FEB	14500	11700	26200	25900	52100	74	0	74	11	353	0	364	2900	55400
MAR	14500	10300	24800	24800	49600	148	0	148	11	339	0	350	2900	53000
APR	14500	11500	26000	25700	51700	321	0	321	11	357	0	368	2930	55300
MAY	14000	11900	25900	25700	51600	381	14	395	11	350	0	361	2930	55300
JUN	14100	11900	26000	28700	54700	406	39	445	11	360	0	371	3000	58500
JUL	14500	20500	35000	34900	69900	420	74	494	11	374	0	385	3000	73800
AUG	14300	21400	35700	35700	71400	424	67	491	11	374	0	385	4770	77000

NOTE: POWER CANALS COLUMNS INCLUDE FLOWS THROUGH POWER PLANTS AND SPILLWAYS

NOTE: Flows for individual users were originally coordinated in m3/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.