



A COMPENDIUM ON CRITICAL

WATER

LEVEL

ELEVATIONS

IN THE LAKE ONTARIO - ST. LAWRENCE RIVER SYSTEM

by the
**INTERNATIONAL ST. LAWRENCE RIVER
WORKING COMMITTEE**

December 31, 1994

*TO THE MEMORY OF JOHN HO,
MEMBER OF THE OPERATIONS ADVISORY GROUP
WHO PASSED AWAY SUDDENLY ON FEBRUARY 9, 1995.
JOHN'S 20 YEARS OF ASSOCIATION WITH THE OAG AND HIS EXPERIENCE
CONTRIBUTED MUCH TO THE WRITING OF THIS REPORT.*

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Purpose and Scope

This compendium provides hydraulic information for a number of locations in the Lake Ontario - St. Lawrence River system. It is designed to be used as a reference by the Board's Operations Advisory Group (OAG) and the Regulation Representatives (Reg Reps) to assess conditions in the system and make recommendations on flow changes in the regulation of the outflows of Lake Ontario. At its meeting in Buffalo, New York on March 25, 1993, the Working Committee decided that such a document be prepared.

Typical information in this compendium includes: water level requirements at each location such as minimum level for navigation or domestic water supply, and the potential problems associated with extreme high or low water levels. It also provides, where applicable, the alert levels where actions might be needed to alleviate potentially serious problems associated with extreme levels and flows. Where-ever possible, information related to ice and historical water level summary are also provided.

This document was prepared based on information from the Board and Working Committee documents, and past operating experience including the 1992-93 and the 1993-94 winter seasons. Because operation experience has been tied to specific gauge sites, the format of this report is on a gauge by gauge basis. Only those gauges currently in operation and used by the OAG and Reg Reps are discussed in this report.

This compendium was prepared with the assistance from members of the Working Committee and the members of the Operations Advisory Group. It will be updated periodically.

All water level elevations are in metres, International Great Lakes Datum 1985 unless stated otherwise.

LAKE ONTARIO
(average of the six gauges on the lake)

1. OPERATOR/OWNER AND ACCESS

The mean daily and monthly levels of Lake Ontario are determined by averaging the readings from six gauges on Lake Ontario. Four are located in Canada and operated by the Canadian Hydrographic Service, with some of them having voice announcing system. The two in the United States are operated by NOAA. The gauges are: Kingston (613-544 9264); Cobourg; Toronto (416-868 6026); Port Weller (905-646 9568); Rochester and Oswego.

Water level readings for all CHS gauges every 15 minutes are available on the computer system of the Marine Environmental Data Service (MEDS) of Fisheries and Oceans Canada in Ottawa. For more information on the gauges, contact Rick Sandilands of CHS in Burlington, Ontario at 905-336 4844. On questions concerning the NOAA gauges, contact Jeff Oyler of NOAA in Silver Spring, Maryland at 301-713 2902.

2. CHART DATUM 74.20 m, IGLD 1985 as defined by NOAA and Canadian Hydrographic Service. To convert water level elevations:

IGLD 1955 @ Oswego + 0.158 m = IGLD 1985 @ Oswego
USLS 1935 @ Oswego - 0.216 m = IGLD 1985 @ Oswego
For 6-Gauge Average, IGLD 1955 + 0.146 m = IGLD 1985

3. HISTORICAL SUMMARY (1918-1993)

Long-Term Average 74.75 m
Maximum Monthly 75.76 m (June 1952)
Minimum Monthly 73.74 m (December 1934)

For more information on the data, contact David Fay of Environment Canada at 613-938 5725.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Minimum for navigation 74.15 m
Flood threshold 75.37 m (IJC Criterion h)

The IJC Orders governing Lake Ontario regulation requires that the monthly mean levels of Lake Ontario be maintained below 75.37 m (Criterion h), and above 74.15 m (Criterion j). This range has been exceeded since 1960 when Lake Ontario regulation began. Levels lower than 74.15 m occurred in 1964 and 1965. Levels higher than 75.37 m occurred in 1973, 1974, 1976 and 1993.

When forecasts indicate that the levels may rise above Criterion h or fall below Criterion j, the IJC may invoke Criterion k in the regulation of the outflows of Lake Ontario. Criterion k specifies

that "In the event of supplies in excess of the supplies of the past as adjusted, the works in the International Rapids Section shall be operated to provide all possible relief to the riparian owners upstream and downstream. In the event of supplies less than the supplies of the past as adjusted, the works in the International Rapids Sections shall be operated to provide all possible relief to navigation and power interests". Since Lake Ontario regulation began in 1960, Criterion k has been invoked in 1964, 1973, 1976, 1978, 1985 and 1993.

Lake Ontario levels below chart datum affect the ports around Lake Ontario as they use this as a reference when designing dredging requirement.

Property flood damages begin to occur on some low lying areas of the Lake Ontario shoreline before the lake level exceeds 75.37 m during certain storms.

According to the Credit Valley Conservation Authority (immediately west of Toronto), flood damage begins at elevation 75.46 m, and the 100-year return period level is 75.96 m at which extensive, major damage occurs. These levels are instantaneous peaks including wind setup, therefore some reduction is necessary to arrive at corresponding mean lake levels. An analysis of wind setup on Lake Ontario by the Ontario Ministry of Natural Resources and Environment Canada indicates an average annual maximum setup of about 0.2 m and a 100-year return period setup of about 0.8 m. Assuming the average annual maximum wind setup of 0.2 m, the mean lake level at which damage begins is then 75.26 m, which is below the Criterion "h" level.

Other areas of concern are the south shore of Lake Ontario at Rochester/Greece, N.Y., Burlington-Hamilton area, and Trenton-Kingston area.

For flood information in the United States, telephone the U.S. Army Corps of Engineers in Buffalo at 716-879 4257. In Canada, telephone Environment Canada in Burlington at 905-336 4581.

KINGSTON

1. OPERATOR AND ACCESS

Owned by the Canadian Hydrographic Service, real time data can be obtained by calling the gauge directly at 613-544 9264. The voice announcing system also gives extreme levels during the past 12 hours. Hourly readings of the most recent 72 hours can be obtained by computer at the Saunders Control Room. This is one of the key gauges used by the OAG and the Reg Reps in monitoring the conditions in the system.

For more information on the gauge, contact Rick Sandilands in Burlington, Ontario at 905-336 4844. For historical data, contact Don Spear of the Department of Fisheries and Oceans in Ottawa at 613-990 0240.

2. CHART DATUM 74.20 m, IGLD 1985. To convert water level elevations:

IGLD 1955 @ Kingston + 0.176 m = IGLD 1985 @ Kingston

3. HISTORICAL SUMMARY (1909-1993)

Long-Term Average 74.78 m
Maximum Monthly 75.79 m (June 1952)
Maximum Daily 75.84 (June 9, 1952)
Maximum Instantaneous 75.94 m (June 6, 1952)
Minimum Monthly 73.78 m (December 1934)
Minimum Daily 73.73 m (January 23, 1965)
Minimum Instantaneous 73.64 m (January 2, 1965)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

See Lake Ontario.

CAPE VINCENT

1. OPERATOR/OWNER AND ACCESS

This gauge is operated by NOAA. The water level at this site is similar to that of Lake Ontario at Kingston. Because Kingston is one of the six gauges used to monitor water level fluctuations on Lake Ontario, Cape Vincent is not used in the OAG's operation. For more information on the gauge, contact Jeff Oyler at 301 713 2902.

2. CHART DATUM 74.20 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.170 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1900-1990)

Long-Term Average 74.76 m
Maximum monthly 75.78 m (June 1952)
Minimum monthly 73.78 m (November 1934)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

See Lake Ontario.

ALEXANDRIA BAY

1. OPERATOR/OWNER AND ACCESS

This gauge is operated by NOAA. The water level at this site is similar to that of Lake Ontario at Kingston. Because Kingston is one of the six gauges used to monitor water level fluctuations on Lake Ontario, Alexandria Bay is not used in the OAG's operation. For more information on the gauge, contact Jeff Oyler of NOAA at 301 713 2902.

2. CHART DATUM 74.07 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.152 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1983-1990)

Long-term average 74.71 m
Maximum monthly 75.17 m (June 1986)
Minimum monthly 74.27 m (March 1989)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

See Lake Ontario.

BROCKVILLE

1. OPERATOR/OWNER AND ACCESS

This gauge is operated by the Canadian Hydrographic Service. The historical data are available since 1980. Brockville is not used in the OAG's operation. For more information on the gauge, contact Rick Sandilands of CHS at 905-336 4844.

2. CHART DATUM not established. The gauge is being operated with gauge zero at elevation 74.100 m IGLD 1985 at this time. To convert water level elevations:

$$\text{IGLD 1955} + 0.145 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1980-1993)

Maximum Monthly 75.26 m (May 1993)
Maximum Daily 75.39 (April 25, 1993)
Maximum Instantaneous 75.46 m (April 25, 1993)
Minimum Monthly 74.14 m (November 1991)
Minimum Daily 74.00 m (November 11, 1991)
Minimum Instantaneous 73.70 m (December 3, 1991)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

None identified.

OGDENSBURG

1. OPERATOR/OWNER AND ACCESS

This gauge is operated by NOAA. The Power Entities also have instruments at the site which provide real time data to the Moses-Saunders hydropower plants. For more information on the gauge, contact Jeff Oyler at 301-713 2902. For information on the power entities' instruments, contact Bob Metcalfe at 416-592 5070.

2. CHART DATUM: 73.9 m, IGLD 1985. To convert water level elevations:

IGLD 1955 + 0.113 m = IGLD 1985 at Benchmark "A"
IGLD 1955 + 0.112 m = IGLD 1985 at Benchmark "Book"
USLS 1935 - 0.177 m = IGLD 1985

3. HISTORICAL SUMMARY (1960 - 1993)

Long-Term Average 74.50 m
Maximum Monthly 75.37 m (May 1973)
Maximum Daily 75.45 m (May 13, 1973)
Minimum Monthly 73.65 m (January 1965)
Minimum Daily 73.42 m (December 4, 1964)

Due to its close proximity to Lake Ontario, the levels are similar to that of Lake Ontario. Some backwater effects may occur due to the operation of the Iroquois Dam.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Minimum for navigation: Chart Datum (73.9 m, IGLD 1985)

Alert for navigation: See Lake Ontario, Cardinal and Eisenhower Lock. Actions probably would be taken prior to low levels at this site since other areas usually will become a problem before the level at Ogdensburg is affected. A reading of 73.86 m is currently used by SLSA and SLSDC as the alert level.

The St. Lawrence Seaway Authority and the St. Lawrence Seaway Development Corporation would notify the Ogdensburg Bridge and Port Authority Director that decreasing water levels below chart datum would impact vessels entering the port at full seaway draft.

Note that 26' (7.92 m) is the advertised draft by the St. Lawrence Seaway Authority and the St. Lawrence Seaway Development Corporation. At times with favourable water level conditions, the seaway entities have in the past increased it to 26'3" (8.00 m).

Flood threshold: According to NYPA, the Village engineer had indicated there are no problems with historic water levels.

CARDINAL

1. OPERATOR/OWNER AND ACCESS

The Cardinal gauge is operated by Ontario Hydro. It also transmits real time data to the Moses-Saunders hydropower plants.

2. CHART DATUM 73.5 m, IGLD 1985. To convert water level elevations:

IGLD 1955 + 0.127 m = IGLD 1985
USLS 1935 - 0.173 m = IGLD 1985

3. HISTORICAL SUMMARY (1960-1993)

Long-Term Average 73.98 m
Maximum Monthly 74.79 m (May 1973)
Maximum Daily 74.98 m (April 25, 1993)
Minimum Monthly 73.20 m (February 1965)
Minimum Daily 73.02 m (January 23, 1965)

Some backwater effects occur due to the operation of the Iroquois Dam and water level fluctuation on Lake St. Lawrence.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Minimum for Navigation 73.37 m
Alert for Navigation 73.45 m

When the levels are at 73.5 m (chart datum) and higher, a loaded vessel with a draft of 26'3" (8.0 metres) would have no problem at this location. The seaway entities have in the past permitted levels to fall below 73.5 m without halting navigation traffic or requesting flow changes.

Note that 26' (7.92 m) is the advertised draft by the St. Lawrence Seaway Authority and the St. Lawrence Seaway Development Corporation. At times with favourable water level conditions, the seaway entities have in the past increased it to 26'3" (8.00 m).

When the levels decline below 73.5 m, the seaway entities intensify their monitoring of the river conditions and vessel traffic requirements.

When the levels decline to 73.45 m or lower, the seaway entities may request for flow changes to prevent further lowering of the levels.

At elevation 73.37 m or below, vessel with draft of 26' (7.92 m) will be put to anchor.

Plan 12-A-9 minimum design profile 73.4 m.

IROQUOIS DAM HEADWATER

1. OPERATOR/OWNER AND ACCESS

This gauge, operated by The Power Entities, provides real time data to the Moses-Saunders hydropower plants. The data are used by the OAG and the Reg Reps to monitor conditions in the river, and are particularly valuable in the winter to assess river ice conditions.

For more information on the gauge, contact Bob Metcalfe of Ontario Hydro in Toronto at 415-592 5070. For real time data, contact the Saunders hydropower plant at 613-932 3072 extension 272.

2. CHART DATUM 73.24 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.119 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1960-1993)

Long-Term Average 73.77 m IGLD 1985
Maximum Monthly 74.58 m (May 1973)
Maximum Daily 74.83 m (April 25, 1993)
Minimum Monthly 72.91 m (February 1982)
Minimum Daily 72.51 m (February 1, 1963)

Some backwater effects may occur due to the operation of the Iroquois Dam and water level fluctuation on Lake St. Lawrence.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Minimum for Navigation: 73.18 m.

Alert for navigation: See Cardinal. Actions probably would be taken prior to low levels at this site since other areas usually will become a problem before the level here is affected. A reading 73.20 m is currently used by SLSA and SLSDC as the alert level.

IROQUOIS DAM TAILWATER

1. OPERATOR/OWNER AND ACCESS

This gauge is operated by the Power Entities. It does not provide real time data and is not used by the OAG in operation. For more information on the gauge, contact Bob Metcalfe of Ontario Hydro in Toronto at 415-592 5070.

2. CHART DATUM 73.18 m, IGLD 1985. To convert water level elevations:

IGLD 1955 + 0.119 m = IGLD 1985

USLS 1935 - 0.171 m = IGLD 1985

3. HISTORICAL SUMMARY (1960-1993)

Long-Term Average 73.72 m, IGLD 1985
Maximum Daily 74.66 m (May 13, 1973)
Minimum Daily 72.44 m (February 1, 1963)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Alert for navigation: See Cardinal and Eisenhower Lock. Actions probably would be taken prior to low levels at this site since other areas usually will become a problem before the level here is affected.

IROQUOIS LOCK ABOVE

1. OPERATOR/OWNER AND ACCESS

The gauge at Iroquois Lock Above is operated by the Canadian Hydrographic Service. Since data from the Power Entities' two near-by gauges are available, this gauge is not used by the OAG in operation. Real time data can be obtained by dialling 613-652 4426 (in voice). For more information on the gauges, contact Rick Sandilands of CHS in Burlington, Ontario at 905-336 4844.

2. CHART DATUM 73.240 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.119 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (see Iroquois Dam Headwater)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

See Iroquois Dam Headwater.

IROQUOIS LOCK BELOW

1. OPERATOR/OWNER AND ACCESS

The gauge at Iroquois Lock Below is operated by the Canadian Hydrographic Service. Since data from the Power Entities' two near-by gauges are available, this gauge is not used by the OAG in operation. For more information on the gauges, contact Rick Sandilands of CHS in Burlington, Ontario at 905-336 4844.

2. CHART DATUM 73.180 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.119 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (see Iroquois Dam Tailwater)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

See Iroquois Dam Tailwater.

MORRISBURG

1. OPERATOR/OWNER AND ACCESS

Owned by the Power Entities, the Canadian Hydrographic Service has a voice announcing gauge in the same station which can be accessed at 613-543 3361. This gauge is used by the OAG and Rep Reps to assess conditions in the river.

2. CHART DATUM 72.86 m, IGLD 1985. To convert water level elevations:

IGLD 1955 + 0.108 m = IGLD 1985
USLS 1935 - 0.182 m = IGLD 1985

3. HISTORICAL SUMMARY (1960-1993)

Long-Term Average 73.43 m IGLD 1985
Maximum Monthly 74.25 m (May 1973)
Maximum Daily 74.37 m (May 14, 1973)
Minimum Monthly 72.10 m (February 1979)
Minimum Daily 71.60 m (February 9, 1972)

Some backwater effects occur due to water level fluctuation on Lake St. Lawrence. The operation of the Iroquois Dam can reduce to some extent the very high water levels during storms or when there is a large flow reduction at the Moses-Saunders hydropower plant.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Minimum for Navigation 72.71 m
Alert for Navigation 72.79 m
Flood Threshold 74.78 m

Extremely low water levels could affect the water intake for the Town of Morrisburg. The consultant for the town advised that levels should not fall below 71.96 m. Levels similar to this occurred on January 25, 1994 and on March 4, 1993, both caused by a combination of high Lake Ontario outflows and ice roughness in the river.

LONG SAULT DAM HEADWATER

1. OPERATOR/OWNER AND ACCESS

This gauge, owned by the Power Entities, provides real time data to the Moses-Saunders hydropower plants. It is an important gauge used by the OAG and the Reg Reps to assess conditions on the eastern end of Lake St. Lawrence.

2. CHART DATUM 72.495 m, IGLD 1985. To convert water level elevations:

IGLD 1955 + 0.105 m = IGLD 1985

USLS 1935 - 0.185 m = IGLD 1985

3. HISTORICAL SUMMARY (1960-1993)

Long-Term Average 73.18 m IGLD 1985
Maximum Monthly 73.99 m (May 1973)
Maximum Daily 74.25 m (January 24, 1987)
Minimum Monthly 71.38 m (February 1978)
Minimum Daily 71.06 m (February 9, 1972)

Water levels are representative of Lake St. Lawrence water levels which are dependent on the Lake Ontario outflows and conditions in the international reach of the river. The operation of the Iroquois Dam can reduce to some extent the very high water levels during storms or when there is a large flow reduction at the Moses-Saunders hydropower plant.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Minimum for navigation: 72.5 m, IGLD 1985

Alert for navigation: 72.7 m, IGLD 1985

When water levels decline to 72.7 m, the seaway entities intensify their monitoring of the water level conditions and vessel traffic.

When water levels decline to 72.6 m, the seaway entities may request for flow changes to prevent a further decline in the levels. Decisions concerning flow changes would be made after consultation with the OAG members taking into consideration the factors including traffic, weather forecast, time of day and operations at the hydro plants.

Elevation 72.5 m is chart datum and is also the minimum level considered by the seaway entities for 26' (7.92 m) draft vessels. When levels are below 72.5 m, the seaway entities would initiate actions including speed control or putting ships to anchor.

Note that 26' (7.92 m) is the advertised draft by the St. Lawrence Seaway Authority and the St. Lawrence Seaway Development

Corporation. At times with favourable water level conditions, the seaway entities have in the past increased it to 26'3" (8.00 m).

Plan 12-A-9 minimum design profile at this site is 72.04 m IGLD 1985. This value is below chart datum and is considered to be invalid by the seaway entities. The 12-A-9 plan was for design purposes of calculating critical profiles and the design of channel excavations only.

SAUNDERS HEADWATER

1. OPERATOR/OWNER AND ACCESS

Both the Saunders and the Moses plants have their own gauges, but to maintain consistency, the Saunders Headwater gauge was selected for monitoring purpose. There are very small variations in the readings from the two sites.

2. CHART DATUM (not available). To convert water level elevations:

IGLD 1955 + 0.108 m = IGLD 1985
USLS 1935 - 0.182 m = IGLD 1985

3. HISTORICAL SUMMARY (1960-1993)

Long-Term Average 73.11 m
Maximum Monthly 73.96 m (May 1962)
Maximum Daily 74.21 m (April 11, 1991)
Minimum Monthly 71.21 m (February 1978)
Minimum Daily 70.91 m (February 9, 1972)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

See also Long Sault Dam Headwater.

To allow for seiches on Lake Ontario that affect the forebay level the Power Entities requested the Iroquois Dam be operated to keep a calm daily level below 73.87 m in the forebay. Because peaking can add an additional 0.15 m in the forebay, the maximum hourly value would be 74.02 m. When the hourly value exceeds 73.87 m, decisions on the operations of the Iroquois Dam will be made in consultation with OAG members and the Reg Reps. Elevation 74.12 m is the alert for further action including flow changes.

The Power Entities have also established a flood threshold figure of 74.48 m and a corresponding alert value of 74.33 m.

Elevation 71.43 m is the alert for low levels. At 71.28 m, decisions on flow reductions will be made to prevent excessive lowering of the water levels.

71.1 m is the minimum that can be tolerated at the Ingleside Water Treatment Plant Pumping Station. For up-to-date information at the Ingleside Water Treatment Pumping Station, telephone Bart Whitton at 613-537 2362.

INTERNATIONAL TAILWATER

1. OPERATOR/OWNER AND ACCESS

This gauge is operated by the Power Entities.

2. CHART DATUM (not available). To convert water level elevations:

IGLD 1955 + 0.114 m = IGLD 1985
USLS 1935 - 0.176 m = IGLD 1985

3. HISTORICAL SUMMARY

Long-Term Average 48.29 m IGLD 1985
Maximum Monthly 49.05 m (July 1973)
Maximum Daily 49.15 m (June 11, 1993)
Minimum Monthly 47.33 m (May 1965)
Minimum Daily 47.17 m (April 5, 1964)

Water levels fluctuate according to Lake Ontario outflows, and could be significantly affected by downstream ice conditions in the winter.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

The International Tailwater gauge is used to monitor conditions at the Cornwall's Storm Sewer Overflow (at the foot of Brookdale Avenue), and the Sewage Treatment Pumping Station (at the east end of the city). Beginning with the winter of 1992-93, the Cornwall gauge is also being used as its readings are more indicative of the conditions at the two sites.

Available freeboard at the Brookdale Avenue facility, as observed during a visit on February 26, 1991, is as follows:

<u>Date</u>	<u>ITW</u>	<u>Cornwall</u>	<u>Freeboard</u>
Feb 26, 1991	48.74 m	47.35 m	33 cm

In addition to the above and that for Cornwall, the Power Entities have alert levels to identify when high or low water may begin to cause problems further downstream on Lake St. Francis. When alerted, the levels downstream can be checked for problems. For this purpose, the Power Entities use the following levels:

Alert Minimum 46.74 m
Alert Maximum 49.01 m Open Water; 48.75 m (Ice Condition)

EISENHOWER LOCK

1. OPERATOR/OWNER AND ACCESS

The two Eisenhower Lock gauges, located in a well at the ends of the upstream and downstream guide walls at the lock, transmit data to a computer/recorder located in the upstream control houses. The computers continuously monitor the water levels and record the average water levels every hour on the hour. The information is used for the weekly "Water Use Computation Report" as required by the Board; and equally as important, is used by the Seaway Entities to assess water level conditions in the lock approach areas.

Information on the gauges and data can be obtained by calling the St. Lawrence Seaway Development Corporation at 315-764 3233.

2. CHART DATUM (not available)

3. HISTORICAL SUMMARY (not available)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

See Long Sault Dam Headwater.

SNELL LOCK

1. OPERATOR/OWNER AND ACCESS

The two Snell Lock gauges, located in a well at the ends of the upstream and downstream guide walls at the lock, transmit data to a computer/recorder located in the upstream control houses. The computers continuously monitor the water levels and record the average water levels every hour on the hour. The information is used for the weekly "Water Use Computation Report" as required by the Board; and equally as important, is used by the Seaway Entities to assess water level conditions in the lock approach areas.

Information on the gauges and data can be obtained by calling the St. Lawrence Seaway Development Corporation at 315-764 3233.

2. CHART DATUM (not available)

3. HISTORICAL SUMMARY (not available)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

See Long Sault Dam Headwater.

POLLYS GUT

1. OPERATOR/OWNER AND ACCESS

This gauge is owned and operated by the Power Entities and is used to monitor the effects of peaking on navigation in the vicinity of Snell Lock.

2. CHART DATUM : 46.68 m, IGLD 1985. To convert water level elevations:

IGLD 1955 + 0.107 m = IGLD 1985

USLS 1935 - 0.183 m = IGLD 1985

3. HISTORICAL SUMMARY (April to December 1960-1993)

Long-Term Average 47.22 m IGLD 1985
Maximum Monthly 47.60 m (July 1973)
Maximum Daily 48.07 m (April 1, 1993)
Minimum Monthly 46.73 m (May 1964)
Minimum Daily 46.55 m (May 9, 1964)

Water level fluctuation depends on Lake Ontario outflows, local inflows and ice conditions.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

None identified.

CORNWALL

1. OPERATOR/OWNER AND ACCESS

This gauge is operated by the Canadian Hydrographic Service (CHS). For more information, contact Rick Sandilands at 905-336 4844.

2. CHART DATUM: 46.400 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.091 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1960-1993)

Long-Term Average 46.97 m IGLD 1985
 Maximum Monthly 47.55 m (March 1978)
 Maximum Daily 47.70 m (January 23, 1976)
 Maximum Instantaneous 47.87 m (January 10, 1977)
 Minimum Monthly 46.49 m (May 1964)
 Minimum Daily 46.33 m (May 9, 1964)
 Minimum Instantaneous 46.08 m (May 9, 1964)

Water levels fluctuate according to the river flows at Cornwall, and could be significantly affected by ice and winds.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Open-Water conditions: Maximum for riparian 47.58 m. See also Summerstown. Excessively high river water levels would overtop the weir and flood the sump at the Cornwall sewage treatment pumping station. A minimum of 3 cm freeboard should be provided at all time. On March 22, 1993, the city increased the free-board by about 10 cm by installing a metal plate measuring 4"x10'6". The following are some of the recent measured freeboards at this site:

Date	Int TW	Cornwall	Summerstown	FB	Condition
Mar 25,93	48.97 m	47.51 m	46.98 m	18 cm	ice
May 20,93	49.11 m	47.15 m	46.78 m	46 cm	open water
Jan 19,94	48.91 m	47.75 m	46.91 m	25 cm	ice
Feb 23,94	48.50 m	47.31 m	46.89 m	36 cm	ice
Mar 18,94	48.41	47.28 m	46.86 m	33 cm	ice
Mar 28,94	48.55 m	47.32 m	46.92 m	28 cm	open water

Available freeboard varies in the winter depending on the ice conditions. For up-to-date information, telephone Mr. Bill Girard of the Cornwall Sewage Pumping Station at 613-933 5157.

SUMMERSTOWN

1. OPERATOR/OWNER AND ACCESS

Operated by the Canadian Hydrographic Service, the voice announcing gauge can be accessed at 613-931 2089. For more information, contact Rick Sandilands at 905-336 4844.

2. CHART DATUM: 46.240 m IGLD 1985 defined by Canadian Hydrographic Service.

$$\text{IGLD 1955} + 0.093 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1960-1993)

Long-Term Average

Maximum Monthly 47.01 m (March 1978)
Maximum Daily 47.13 m (January 4, 1978)
Maximum Instantaneous 47.19 m (December 26, 1955)
Minimum Monthly 46.43 m (November 1960)
Minimum Daily 46.31 m (December 10, 1960)
Minimum Instantaneous 46.15 m (May 9, 1964)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Flood threshold 47.00 m with an alert (high) for riparian 46.95 m under ice conditions.

Alert for Navigation 46.58 m
Minimum for navigation 46.50 m

Areas vulnerable to flooding are communities at Glen Walter and at Summerstown.

On March 31, 1993, the Summerstown levels rose to 47.13 m with levels at the Cornwall gauge of 47.57 m. About 10 houses in the Glen Walter area were affected by the high water levels. The absence of storm and ice actions on the shore kept the damage to a minimum. It is estimated that flooding begins at the lowest houses in Glen Walter at 47.00 m under ice conditions.

COTEAU-LANDING

1. OPERATOR/OWNER AND ACCESS

The Côtéau Landing gauge is operated by the Quebec Region of the Canadian Hydrographic Service. For more information on the gauge, contact Bernard Labrecque at 418-775 0600. Real time data can be obtained by calling Hydro Quebec's control room at 514-289 3800.

2. CHART DATUM: 46.011 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.078 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1960-1992)

Long-Term Average 46.48 m IGLD 1985
Maximum Monthly 46.63 m (February 1960)
Maximum Daily 46.68 m (February 12, 1980)
Maximum Instantaneous 46.81 m (November 13, 1992)
Minimum Monthly 46.34 m (November 1960)
Minimum Daily 46.13 m (December 30, 1979)
Minimum Instantaneous 46.11 m (January 3, 1982)

Water levels on Lake St. Francis are regulated by Hydro Quebec.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Alert for Navigation: See Summerstown, Valleyfield Bridge and Upper Beauharnois (Lock 4) which are the gauges used by the seaway entities. A reading of 46.48 m is currently being used by SLSA and SLSDC as the alert level.

According to a discussion paper dated June 20, 1974 by M.A. Hanson of the St. Lawrence Seaway Authority, an order in council P.C. 9439 dated December 6, 1941, permitted regulation of low water level on Lake St. Francis at elevation 152.0 feet (G.S.C.D.), which is equivalent to 46.33 m IGLD 1985. In each year up to 1944, an order in council permitted the Beauharnois Light, Heat and Power Company to extend this minimum regulation level on Lake St. Francis. In 1944 under P.C. 36364 dated October 31, 1944, the minimum low water level of 152.0 feet (G.S.C.D.), or 46.33 m IGLD 1985, was extended to October 1, 1945 and thereafter from year to year.

According to Hydro Quebec which based on past operation experience, levels in the range of 46.33 - 46.36 m IGLD 1985 may be too low and in some circumstances may generate complaints. The normal minimal operating level is about 46.45 m with governing factors at Lock 4 and Summerstown. The summer maximum is 46.58 m and the winter maximum is 46.63 m.

According to a report by R.A. Walker of Ontario Hydro and entitled

"Effect of Regulation of Lake St. Francis on Power Output at Barnhart Island and Beauharnois Generating Stations", the range of water level fluctuation on Lake St. Francis is 30 cm from 46.33 m to 46.63 m. This 30 cm comprises:

5 cm on top that is used for wind setup on the lake during open water, hence the 46.58 m maximum in the summer;

13 cm due to peaking operation at the Moses-Saunders plants;

9 cm for Hydro Quebec system and marketing need, and

3 cm designated for minimum navigation level.

VALLEYFIELD BRIDGE

1. OPERATOR/OWNER AND ACCESS

The Valleyfield Bridge water level gauge is operated by the St. Lawrence Seaway Authority to monitor water levels in the Beauharnois Canal. For more information on the gauge, contact Guy Yelle at 613-932 5170.

2. CHART DATUM 45.719 m IGLD 1985

3. HISTORICAL SUMMARY (Not available)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Alert for navigation 46.27 m

Minimum for navigation 46.19 m

BEAUHARNOIS AMONT (UPSTREAM)

1. OPERATOR/OWNER AND ACCESS

Beauharnois Amont (upstream, also called Lock 4) and Beauharnois Aval (downstream) are operated by the Quebec Region of Canadian Hydrographic Service (CHS). For more information on the gauge, contact Bernard Labrecque at 418-775 0600. The upstream gauge is essential to monitor the water levels in the canal, especially during winter when ice restrictions can cause large headlosses in the canal.

2. CHART DATUM: 44.662 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.070 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1960-1992)

Maximum Monthly 46.10 m (April 1989)
Maximum Daily 46.36 m (December 25, 1977)
Maximum Instantaneous 46.69 m (December 14, 1982)
Minimum Monthly 45.09 m (March 1971)
Minimum Daily 44.84 m (December 25, 1976)
Minimum Instantaneous 44.79 m (April 7, 1972)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Alert for navigation 45.52 m which is also the minimum requirement for navigation. Elevation 45.61 m would provide sufficient draft for the entire Beauharnois Canal.

The gauge is monitored by the seaway officials to determine available draft for navigation. Hydro Quebec agreed to maintain the level above 45.61 m to ensure adequate depth for the entire reach of the canal.

BEAUHARNOIS AVAL (DOWNSTREAM)

1. OPERATOR/OWNER AND ACCESS

Beauharnois Aval (downstream) is operated by the Canadian Hydrographic Service (CHS). The upstream gauge is essential to monitor the water levels in the canal, especially during winter when ice restrictions can cause large headlosses in the canal. For more information on the gauge, contact Bernard Labrecque at 418-775 0600.

2. CHART DATUM: 20.741 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.073 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1960-1992)

Maximum Monthly 22.64 m (May 1974)
Maximum Daily 23.04 m (April 2, 1976)
Maximum Instantaneous 23.13 m (April 2, 1976)
Minimum Monthly 20.49 m (June 1965)
Minimum Daily 20.20 m (April 4, 1965)
Minimum Instantaneous 20.11 m (April 4, 1965)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

None identified.

SAINTE-ANNE-DE-BELLEVUE

1. OPERATOR/OWNER AND ACCESS

This gauge is operated by the Canadian Hydrographic Service, Quebec Region, and can be accessed at 514-457 5242. It is used to determine the outflows of Lake of Two Mountains into Lake St. Louis. Ice effects can significantly affect the accuracy of the rating in the winter. For more information on the gauge, contact Bernard Labrecque at 418-775 0600.

2. CHART DATUM 21.336 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.091 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1919-1992)

Monthly Maximum 23.90 m (May 1947)
Daily Maximum 24.36 m (April 4, 1976)
Instantaneous Maximum 24.39 m (April 5, 1976)
Monthly Minimum 21.20 m (September 1921)
Daily Minimum 21.10 m (September 27, 1921)
Instantaneous Minimum 21.06 m (September 25, 1921)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

None identified.

POINTE CLAIRE

1. OPERATOR/OWNER AND ACCESS

The Pointe Claire gauge is operated by the Quebec Region of the Canadian Hydrographic Service. For more information on the gauge, contact Bernard Labrecque at 418-775 0600. During the spring freshet in the Ottawa River basin and Lake Ontario basin, conditions on Lake St. Louis are monitored closely by the OAG and the Reg Reps when determining changes in the Lake Ontario outflows. The gauge can be accessed by calling 514-694 7141.

2. CHART DATUM: 20.351 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.082 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1915-1993)

Long-Term Average 21.17 m IGLD 1985
Maximum Monthly 22.55 m (May 1974)
Maximum Daily 22.85 m (May 14, 1943)
Maximum Instantaneous 22.90 m (May 13, 1943)
Minimum Monthly 20.07 m (November 1934)
Minimum Daily 19.97 m (November 11, 1934)
Minimum Instantaneous 19.94 m (November 11, 1934)

Water levels at Pointe Claire are affected by flows in the St. Lawrence River, the Ottawa River, local inflows and ice effects.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Alert (high) level for riparian 22.10 m
Flood Threshold 22.33 m
Alert for Navigation 20.68 m
Minimum for navigation 20.60 m

Because of its relatively small size, Lake St. Louis levels react quickly to changes in inflows from Cornwall and from the Ottawa River. Hence, flow reductions are made in advance to anticipate the high water level problems. In the Winter of 1992-93 when Lake Ontario levels were critically high, the Board directed maximum possible Lake Ontario outflows while maintaining a range of 22.33 m and 22.40 m at Pointe Claire during the Ottawa River freshet.

Areas vulnerable to flooding are the north shore of Lake St. Louis from Beaconsfield to Lachine, and on the south shore Maple Grove and Châteauguay.

For more information concerning flooding on Lake St. Louis and downstream, telephone André Carpentier of Environnement Quebec at 418-644 3430, or Quebec's Sécurité Civile at 514-873 1320.



LASALLE

1. OPERATOR/OWNER AND ACCESS

Operated by the Quebec Region of Environment Canada, the gauge can be accessed by calling 514-363 3781. A rating is used for this site to determine the outflows of Lake St. Louis.

2. CHART DATUM 17.748 m IGLD 1985.

3. HISTORICAL SUMMARY (not available)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

None identified.

MONTREAL HARBOUR AT JETTY 1

1. OPERATOR/OWNER AND ACCESS

The gauge is operated by the Quebec Region of Canadian Hydrographic Service and can be accessed by computers. CHS is operating this gauge on a year by year basis, and is considering removing this station since there is also another gauge (Frontenac Street, chart datum: 5.349 m) operating close by. For more information on the gauges, contact Bernard Labrecque at 418-775 0600.

2. CHART DATUM: 5.553 m, IGLD 1985. To convert level elevations:

$$\text{IGLD 1955} + 0.060 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1967-1993)

Long-Term Average 6.87 m IGLD 1985
Maximum Monthly 9.04 m (February 1967)
Minimum Monthly 5.64 m (November 1991)

Water levels are affected by the flows in the St. Lawrence River, the Ottawa River, local inflows and in the winter by ice effects.

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Flood Threshold 8.57 m
Minimum for Navigation: See below

The Port of Montréal is not limited by structures (such as locks) like the St. Lawrence Seaway, which restricts the draught to a certain limit. According to the Coast Guard and Port official, there could be ships all year round, which would benefit from higher water levels which may permit vessels to load to deeper draught and, therefore, improve their operational efficiency. The port also has lines that call regularly and may have a draught of as much as 34'10" (10.62 m). Furthermore, the traffic to the Port fluctuates seasonally, with the peak being usually in the months of September, October, November and most of December, depending on market, weather, etc. As a result, for deep sea commercial navigation in the St. Lawrence Ports, the seasonal water levels should attempt to reflect the ideal levels required by the traffic. The minimum ideal water levels vary during the year from 0.61 m above chart datum for June through August, 0.76 m above chart datum for September and December through February, and finally 0.91 m above chart datum for March through May, October and November.

The water level rose to 9.09 m on February 14, 1993, due to an ice jam between Montréal and Sorel, resulted in flooding of 77 houses and some evacuations at Repentigny, Lanoraie, Contrecoeur, D'Autray and St. Sulpice. Elevation 8.8 m caused some flooding of dock facilities in the harbour in the winter of 1992-93.

SOREL

1. OPERATOR/OWNER AND ACCESS

The Sorel gauge is operated by the Quebec Region of the Canadian Hydrographic Service. The gauge can be accessed by calling 514-743 8057. For more information on the gauge, contact Bernard Labrecque at 418-775 0600.

2. CHART DATUM 3.775 m, IGLD 1985. To convert water level elevations:

$$\text{IGLD 1955} + 0.056 \text{ m} = \text{IGLD 1985}$$

3. HISTORICAL SUMMARY (1984-1993)

Long Term Average 4.97 m.
Maximum Monthly 6.44 m (April 1993)
Minimum Monthly 4.19 m (July 1988)

4. ALERT, FLOOD THRESHOLD AND OTHER CRITICAL ELEVATIONS

Flood Threshold is 5.76 m in winter. From late spring on, the flood threshold is lower, at 5.2 m, due to flooding of farmland on the north shore of Lake St. Pierre.

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IGLD 1955 + 0.060 m = IGLD 1985

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Long-Term Average 6.87 m IGLD 1985
Maximum Monthly 9.04 m (February 1967)
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Water levels are affected by the flows in the St. Lawrence River, the Ottawa River, local inflows and in the winter by ice effects.

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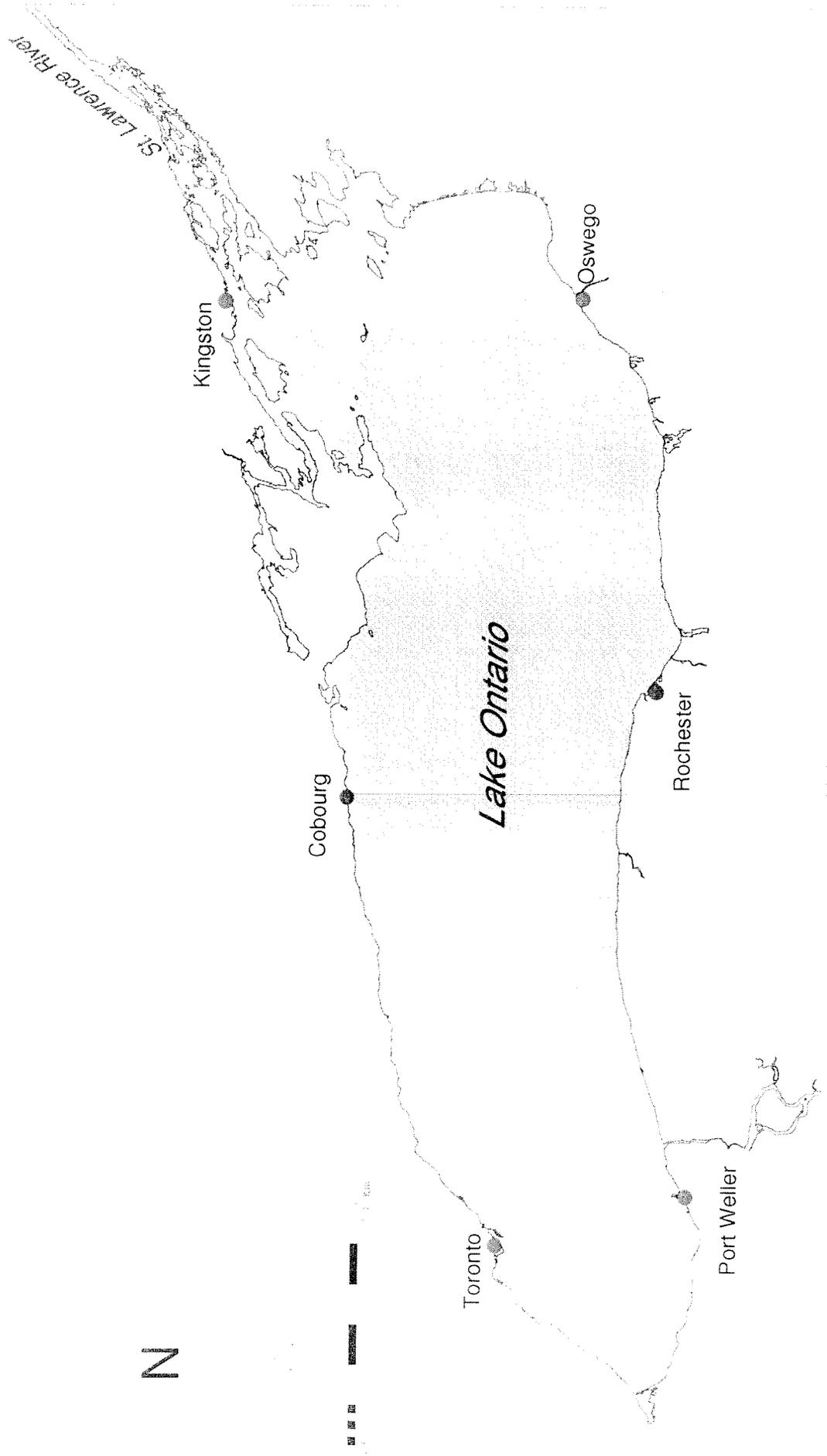
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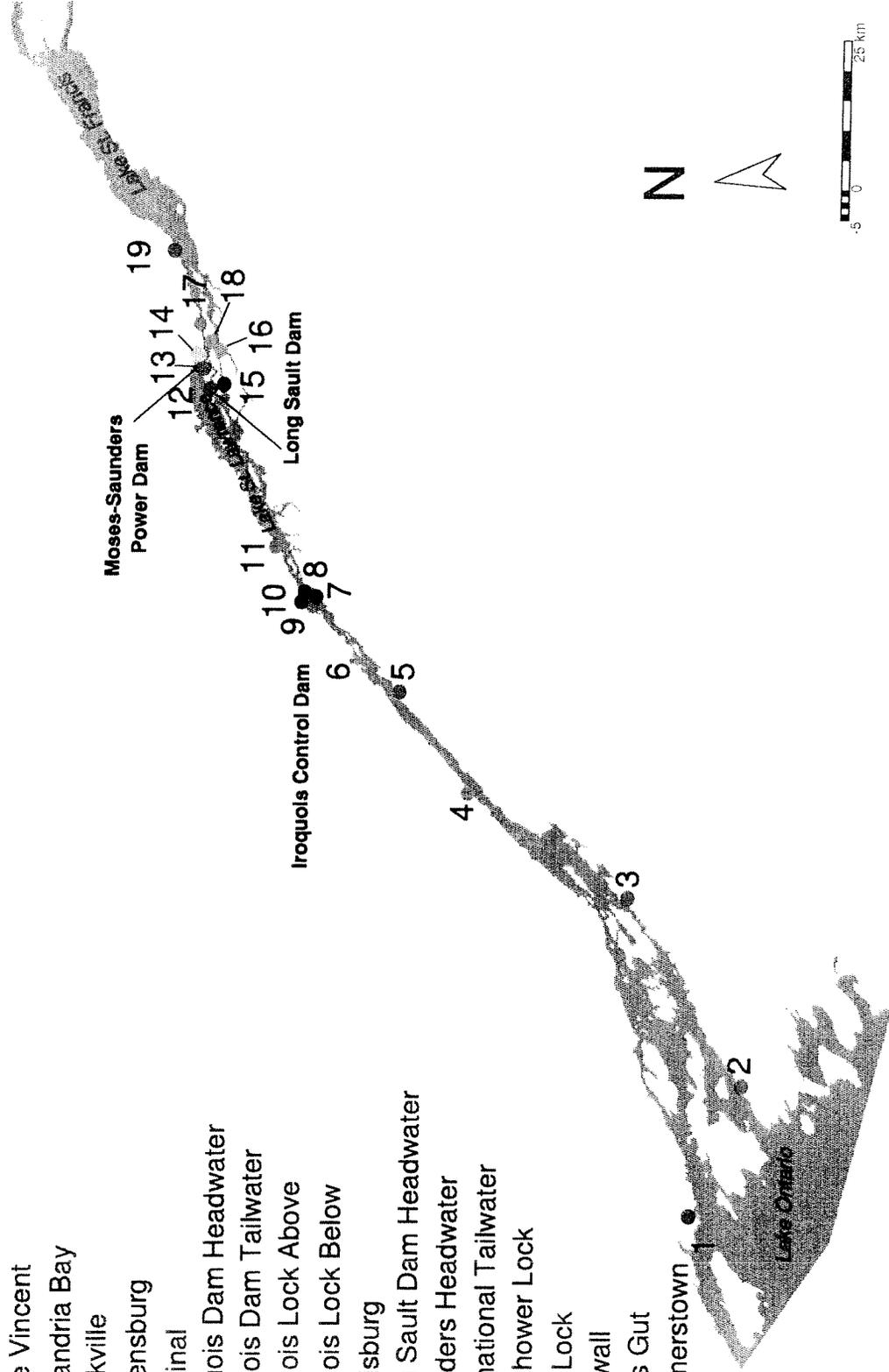
Location of Water Level Gauging Stations



St. Lawrence River International Rapids Section

Gauges

- 1 ● Kingston
- 2 ● Cape Vincent
- 3 ● Alexandria Bay
- 4 ● Brockville
- 5 ● Ogdensburg
- 6 ● Cardinal
- 7 ● Iroquois Dam Headwater
- 8 ● Iroquois Dam Tailwater
- 9 ● Iroquois Lock Above
- 10 ● Iroquois Lock Below
- 11 ● Morrisburg
- 12 ● Long Sault Dam Headwater
- 13 ● Saunders Headwater
- 14 ● International Tailwater
- 15 ● Eisenhower Lock
- 16 ● Snell Lock
- 17 ● Cornwall
- 18 ● Pollys Gut
- 19 ● Summerstown



St. Lawrence River - Canadian Reach

