

Documentation for the coordinated Lake Michigan-Huron beginning-of-month (BOM) lake-wide average water levels

(1918-2024) IGLD 1985

Last updated: October 2025

Title	Lake Michigan-Huron beginning-of-month (BOM) lake-wide average water level
Source	Coordinated using data computed by Environment and Climate Change Canada (ECCC) and the United States Army Corps of Engineers (USACE) from hydrometric observations collected by the Canadian Hydrographic Service (CHS) and the National Oceanic and Atmospheric Administration (NOAA).
Institution	The Coordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data (Coordinating Committee, for short)
Summary	The Lake Michigan-Huron BOM water level is computed by ECCC and USACE from daily mean water level observations on the first day of the month and last day of the previous month. The observations are collected from gauges located around the lake and subsequently coordinated by the Coordinating Committee. The data are in meters with reference to IGLD 1985.
Detailed Description	<p>The Beginning of Month water level for Lake Michigan-Huron is calculated by averaging the daily mean lake-wide average water level from the first day of the month and the last day of the previous month. For example, the September BOM lake-wide average water level is computed using the daily mean lake-wide average water level from September 1 and August 31. Daily mean water levels are also computed by USACE and ECCC using hydrometric observations from six gauges located around the lake. Gauge locations have been selected based on their data quality, period and record, and their location around the lake to best capture the average water level for the entire lake surface. In other words, water level measured at a single gauge may not be representative of the level across the lake surface owing to local rises or falls in water level due to meteorological factors (e.g., wind setup). The names, agency, and gauge ID for the six gauges are:</p> <ul style="list-style-type: none">• Harbor Beach, MI, NOAA, 9075014• Mackinaw City, MI, NOAA, 9075080• Milwaukee, WI, NOAA, 9087057• Ludington, MI, NOAA, 9087023• Thessalon, CHS, 11070• Tobermory, CHS, 11690

The method for computing the BOM water level is as follows:

1. Daily mean water level data for each gauge is collected from CHS and NOAA. The water levels are provided to the nearest millimeter with respect to IGLD 1985.
2. The daily mean water levels from each gauge are then averaged to the nearest centimeter using engineering rounding*.
3. The rounded daily means from each of the six gauges are then averaged to the nearest centimeter using engineering rounding to compute the lake-wide average daily mean water level†.
4. The BOM water level is computed by averaging the daily mean lake-wide average water level from the first day of the month and the last day of the previous month.
5. Each agency, ECCC and USACE, follows the above procedure to compute the BOM water level. Annually, the Coordinating Committee compares the most recent year of data to verify that their calculations were consistent. The annual verification process uses finalized data from CHS and NOAA that at times may have been updated from the provisional data available in near real time.

*In this dataset, levels are rounded to the thousandth decimal place. Engineering rounding, or rounding half to even, is used to avoid the bias given to larger values due to conventional rounding (rounding half up). For example, the value of 176.555 would be rounded to 176.56 in both conventional rounding and engineering rounding. The value of 176.565 would be rounded to 176.56 using engineering rounding and 176.57 using conventional rounding. The key digit in these examples is the thousandth decimal place. If the thousandth decimal place is 0-4, no rounding is performed on the value in the hundredth decimal place. For values 6-9 in the thousandth decimal place, the value in the hundredth place is rounded up. If the thousandth place is a 5 the value for the hundredth place is always rounded to the even value.

†If data is missing from a gauge for a given day, then the data from that gauge is excluded from the lake-wide average daily mean water level calculation. In addition, only a subset of the six gauges is used to compute the lake-wide average daily mean water level. The logic used to determine the gauge subset in the event of missing data is:

- Missing Harbor Beach: Average Mackinaw City, Milwaukee, Ludington and Tobermory
- Missing Mackinaw City: Average Harbor Beach, Thessalon, Milwaukee and Ludington
- Missing Thessalon: Average Mackinaw City, Milwaukee, Ludington and Tobermory
- Missing Milwaukee: Average Harbor Beach, Mackinaw City, Thessalon and Ludington
- Missing Ludington: Average Harbor Beach, Mackinaw City Thessalon and Milwaukee

	<ul style="list-style-type: none"> Missing Tobermory: Average Harbor Beach, Mackinaw City, Thessalon and Ludington <p>Missing two or more gauges: Average remaining gauges</p>		
Revision History	The Coordinating Committee first published this dataset on its website in 2017.		
Notes	<p>A provisional version of this dataset is available on the Coordinating Committee website:</p> <p>Coordinating Committee Products and Datasets: https://www.greatlakescc.org/en/coordinating-committee-products-and-datasets/</p> <p>These data are available starting in 1918 because before that time, there were too few gauges to compute a reasonable lake-wide average. Starting around 1918, each lake had one water level station that was designated as the “master gauge” based on length of record and minimal vertical crustal movement. Over the years, the gauges included in the network for each lake has been expanded and modified. As a result, there is some uncertainty regarding the accuracy of some older data due to changes in the gauge network over time.</p>		
Historic Gauge Network Variations	Missing Gauges	Time Periods	Gauges Used for Computation
	Mackinaw City, MI	Apr 1926 May 1926 Feb 1971	Harbor Beach, MI Ludington, MI Milwaukee, WI Thessalon Tobermory
	Thessalon	Jan 1918 to Jun 1926 Jan to Jul 1962 Nov 1962 Mar 1963 Apr 1963 Jan 1973 Dec 1975 Sep 1979	Harbor Beach, MI Mackinaw City, MI Collingwood Tobermory
	Milwaukee, WI	Dec 1967 to Jan 1968 Feb 1969 Aug 1971	Harbor Beach, MI Mackinaw City, MI Ludington, MI Collingwood Tobermory
	Ludington	Jan 1918 to Jul 1950	Drop Tobermory, average of: Harbor Beach, MI Mackinaw City, MI Thessalon Collingwood
	Tobermory	Apr 1976	Harbor Beach, MI

		Apr 1978 Jun 1986 Dec 1986 Apr 1991	Mackinaw City, MI Milwaukee, WI Thessalon
	Missing more than one gauge (Thessalon and Mackinaw City)	Apr 1926 May 1926	Harbor Beach, MI Ludington, MI Milwaukee, WI Collingwood Tobermory