

Section I – Items for Board of Directors Action

TO: Chair and Members of the Board of Directors
Meeting #3/20, Friday, April 24, 2020

FROM: Sameer Dhalla, Director, Development and Engineering Services
Moranne McDonnell, Director, Restoration and Infrastructure

RE: **LAKE ONTARIO RESILIENCE**
Update on water levels and proactive mitigation work

KEY ISSUE

This report outlines the factors that influence Lake Ontario water levels, reviews impacts and procedures developed through previous high water level events, summarizes the current activities and forecast for 2020, and provides an update on the ongoing mitigation and long-term resilience work across the Lake Ontario shoreline within the Toronto and Region Conservation Authority jurisdiction including efforts with partners to secure funding to advance resiliency initiatives in Toronto, Pickering and Ajax.

RECOMMENDATION

THAT staff be directed to continue to work with and assist the City of Toronto and Durham municipal partners with the implementation of the flood resilience alternatives identified in the Toronto Islands Flood Characterization, Risk Assessment Project and local waterfront projects, as well as the construction of proactive works to mitigate impacts from the high water levels anticipated for 2020;

THAT staff be directed to continue working with the City of Toronto and Durham Region/ Ajax and Pickering on the planning and implementation of flood and erosion mitigation projects along the Lake Ontario waterfront related to the 2017 and 2019 high lake events and 2018 windstorm event, as supported by Infrastructure Canada through the Disaster Mitigation and Adaptation Fund and any available municipal funds;

THAT staff be directed to continue to plan and implement flood and erosion mitigation projects as part of the Toronto and Region Conservation Authority's Toronto Waterfront Erosion Hazard Mitigation Project, as supported by the Disaster Mitigation and Adaptation Fund;

THAT staff be directed to continue to liaise with the Great Lakes Adaptive Management Committee, the International Lake Ontario-St. Lawrence River Board, and the International Joint Commission to share high water level flood and erosion impacts across all of TRCA's jurisdiction in order to inform regulation decisions and the assessment of regulation plans; and

THAT staff be directed to continue participation in the Lake Ontario Resiliency Working Group as identified in the Toronto City Council Report MM12.6 Promoting effective 21st Century Flood Mitigation and Resilience.

AND FURTHER THAT staff be directed to continue to send correspondence to senior levels of government to advise them of TRCA and municipal shovel worthy flood mitigation and resilience projects on the Lake Ontario shoreline that would benefit from

senior government investments.

BACKGROUND

At Board of Directors Meeting #6/19, held on June 21, 2019, Resolution #A108/19 was approved as follows:

THAT the Toronto Islands Flood Characterization and Risk Assessment Project report (May 2019) prepared by W.F. Baird & Associates Coastal Engineers Ltd. be received; and

THAT staff be directed to work with the City of Toronto to secure funding, regulatory approvals, and assist the City with the implementation of the flood mitigation alternatives identified in the Toronto Islands Flood Characterization and Risk Assessment Project including advancing a Class EA to facilitate implementation of flood protection works.

In the spring of 2017, water levels in Lake Ontario reached levels higher than had been measured since record keeping began in 1918. The effect of this flooding was significant on the Toronto Islands where over 800 residents, almost 30 businesses, and two schools were forced to adapt to rising waters and service disruptions. In addition to Toronto Islands, much of the Lake Ontario shoreline parks also experienced significant shoreline erosion, damage and debris accumulation over the spring and summer of 2017.

In response to the 2017 flood conditions the Toronto and Region Conservation Authority (TRCA) assisted municipal partners with flood forecasting, warning, and mapping products. TRCA also assisted the City of Toronto with the operational response, deploying thousands of sandbags, meter bags, and pumps.

In 2018, TRCA worked with the City of Toronto to repair damaged areas and install naturalized berms and sumps to protect strategic areas from potential future flooding. On Toronto Islands, sand from sandbags was left in place, forming berms that were planted with native grasses. The installation of nine sumps was completed to collect surface flooding and drain low lying and saturated areas with a series of weeper tiles. The City also made significant alterations to the ferry docks, allowing for safe passenger embarkation/debarkation for a wider range of lake levels.

In 2019, water levels on Lake Ontario set new records. The operational frameworks and mitigation measures that were conceived in 2017 and installed in 2018 allowed for an effective response; parts of Toronto Islands remained open to the public in 2019, despite the persistence of even higher water levels.

In 2018, TRCA in collaboration with the City of Toronto, successfully secured \$150,000 in grant funding from the federal National Disaster Mitigation Program (NDMP), with the City of Toronto matching \$150,000 for a total of \$300,000 for the Toronto Islands Flood Characterization and Risk Assessment Project. The resulting study was received by the Board of Directors at Meeting #6/19, held on June 21, 2019, through the passing of Resolution #A108/19 noted above. Amongst the outputs from this project was a Toronto Islands-specific flood characterization, which assessed the existing flood level values specified for Lake Ontario: a task whose extension to all the Great-Lakes has been identified as part of the Provincial Flood Strategy. Through TRCA's technical plan review function, staff leveraged the best available information in order to assess risks to new development and infrastructure.

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In 2019, the federal government announced \$11.9 million in funding for repair and enhancement projects through the Disaster Mitigation and Adaptation Fund (DMAF), with the City of Toronto contributing more than \$17.9 million. TRCA and City of Toronto Parks, Forestry, and Recreation are partnering in undertaking this work, with approximately \$20 million flagged for TRCA project delivery. To date, three projects have been completed as part of this work at Bluffers Park, Colonel Samuel Smith Park and Humber Bay Shores, and another four are expected to be completed at Bluffers Park, Sunnyside Park, Ashbridges Bay Park and Palace Pier in 2020.

Also in 2019, the federal government announced \$33.8 million in funding, with the City of Toronto contributing \$50.7 million, in support of the Toronto Waterfront Erosion Hazard Mitigation Project which involves the monitoring, prioritization, planning and implementation of maintenance work along an extensive network of 231 TRCA owned shoreline flood and erosion control structural assets.

As a Conservation Authority located in Canada's highest populated and most heavily urbanized city, TRCA has been given a unique opportunity to become leaders in natural infrastructure design by finding innovative solutions that balance the needs between the built and natural environment, while considering the implications of climate change. TRCA's flood and erosion mitigation efforts are designed with this vision in mind, representing solutions that provide robust physical protection while at the same time enhancing the natural environment. For example, many of TRCA's current shoreline protection projects are utilizing unique natural infrastructure designs, including offshore reefs and dynamic cobble beaches, which provide aquatic habitat improvements and enhance the capacity of the natural environment to better adapt to hazards.

RATIONALE

Lake Ontario water levels depend primarily on three factors:

- 1) Inflows from Lake Erie, which are unregulated and account for approximately 85% of inflows into Lake Ontario. Lake Erie water levels are well above record high levels for this time of year and are projected to continue to be above previous record levels through the spring;
- 2) The runoff from watersheds, like those in TRCA's jurisdiction, that drain directly into Lake Ontario, and;
- 3) The outflow from Lake Ontario, which is regulated at the Moses-Saunders Dam by the International Lake Ontario St. Lawrence River Board (ILOSRLB) of the International Joint Commission (IJC). Outflows are influenced by the spring peak flow of the Ottawa River as the ILOSRLB is charged with regulating flows to balance both upstream and downstream risks.

As outlined by the IJC, the levels observed in 2019 were the result of several separate extreme weather conditions occurring in the same year:

- a) Persistently high flows from Lake Erie into Lake Ontario, eventually exceeding record-highs by spring 2019
- b) Above-average precipitation within the Lake Ontario-St. Lawrence basin from late-fall through spring, and;
- c) A record-setting flood event on the Ottawa River that joins the St. Lawrence River near Montreal, the second in three years

Analysis by the IJC concluded that the ILOSRLB "managed outflows during the unusual and extreme weather conditions from November 2018 through late-May 2019 according to Plan 2014 rules that were based on Board operations under the previous regulation plan, Plan 1958-D. During this entire period, water supplies coming into Lake Ontario were consistently high,

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reaching record-breaking levels in May, and neither regulation plan would have been able to take significantly more water off Lake Ontario quickly enough to make a meaningful difference in water levels and prevent the flooding in 2019.

Throughout the high-level events of 2017 and 2019, TRCA staff pro-actively shared impact reports with the ILOSRB and the Great Lakes Adaptive Management (GLAM) Committee. These reports were shared via GIS impact tracking maps, in-person meetings, and most recently, a summary document of impacts and critical thresholds (Attachment 2). On March 3, 2020, the IJC announced that the GLAM committee would undertake an expedited review of Plan 2014. TRCA staff continue to engage with ILOSRB and GLAM staff to highlight impacts and risks to the shorelines within TRCA's jurisdiction, in order to help inform both outflow decisions and regulation plan updates. This is in-line with the intent in the Ontario Flood Strategy facilitate dialogues with water management partners, including the IJC, to provide opportunities to evaluate current policies.

As with riverine flood forecasting and warning activities, TRCA issues public flood messages based on local interpretation of forecasts. Lake Ontario water level forecasts are issued by the ILOSRB, while wave forecasts are produced by both Environment Canada and the Ontario Ministry of Natural Resources and Forestry. For reference TRCA issues Shoreline Hazard Watches and Warnings based on the following criteria:

- a. Shoreline hazard **watch** at combined water level of 75.1 m AND forecast offshore waves of >2.0m (related to public safety and erosion risks)
- b. Shoreline hazard **watch** for static water level between 75.5m – 75.7m
- c. Shoreline hazard **warning** for static water level of >75.7m

The most recent water level forecast issued by the ILOSRB is provided in Attachment 1.

Since 2017, in addition to the short-term and long-term mitigation measures outlined below, TRCA staff have been supporting all municipal partners with mapping, technical information, local forecast updates, and impact tracking throughout the shoreline within our jurisdiction. While flood response activities will continue to assist in the short-term, the simultaneous advancement of long-term mitigation measures is paramount.

Long-term mitigation measures take into consideration general climate change implications and site-specific conditions including the infrastructure at risk, the primary hazard (flood and/or erosion), existing protection (if any), the physical shoreline characteristics and the coastal environment (wave action, nearshore substrate, etc.). Mitigation solutions are being designed to be resilient, with a projected lifespan of 50 years. In order to achieve this, structures are being built to higher elevations, rock “splash-pads” are being built in-land of the structure to prevent erosion from overtopping, heavier armourstone material is being used and multiple layers of armourstone are being implemented. This approach aligns with the Principles of Effective Flood Management outlined in Ontario's Flooding Strategy, which highlights the need to ‘build back better’ – implementing post-disaster recovery that reduces vulnerability to future disasters and builds community resilience.

Relationship to Building the Living City, the TRCA 2013-2022 Strategic Plan

This report supports the following strategies set forth in the TRCA 2013-2022 Strategic Plan:

Strategy 2 – Manage our regional water resources for current and future generations

Strategy 4 – Create complete communities that integrate nature and the built environment

FINANCIAL DETAILS

- Flood forecasting and warning related services are funded from account code 115-60.
- Planning and implementation of flood and erosion mitigation projects are funded by the City of Toronto, Infrastructure Canada and TRCA Capital funding and are tracked under 241-01 (Toronto Island), 186-01 (projects recoverable from City of Toronto), 241-01 (TRCA Capital funds).

DETAILS OF WORK TO BE DONE

TRCA has activated its Incident Management System (IMS) structure for high water levels on Lake Ontario, and is providing regular updates to all partner municipalities who have shoreline within our jurisdiction; this activity will continue until water levels begin receding and cross below the Shoreline Hazard Watch threshold for static water level.

TRCA is in the process of planning and implementing numerous flood and erosion control mitigation projects across our jurisdiction. Projects that have been completed, are currently in construction, or will have construction initiated within 2020, are outlined below:

- Ashbridges Bay Park Major Maintenance Project
- Bluffer's Park South Headland and Beach Major Maintenance Project
- Bluffer's Park Marina – West Shore Project
- Eastern Beaches Natural Beach Barrier Restoration and Beach Curb Repair Project
- Long Branch Park Major Maintenance Project
- Palace Pier Court Headland Maintenance Project
- Sunnyside Park Revetment Maintenance Project
- Toronto Island accelerated flood mitigation works:
 - Construction of 125m of beach curbs at Wards Island ferry dock
 - Raising of approximately 300m of road along Lakeshore Avenue and 200m of road along Cibola Avenue
 - Flood mitigation along the north shore of Algonquin Island
- Toronto Island Class Environmental Assessment to determine the long-term solutions for areas of this Island not covered by the accelerated works

TRCA also continues to work with its municipal partners of the City of Pickering and Town of Ajax on a number of shoreline resiliency initiatives. In 2019, TRCA leveraged funding from Ontario Power Generation (OPG) to repair and extend the beach dune protection fencing at the Frenchman's Bay West Spit in the City of Pickering, which has contributed significantly to the resilience of the area during high water events. TRCA has also provided the City of Pickering with a proposal for a shoreline erosion monitoring and harbour entrance channel assessment, to establish an existing conditions baseline from which to monitor future shoreline changes as a result of severe weather; and to inform maintenance dredging requirements to maintain safe navigation for marine vessels, respectively. TRCA is also interested in working with the City of Pickering on the West Spit of Frenchman's Bay to address failed infrastructure and to ensure that new infrastructure is protected against high lake levels and wave uprush from high wind events, pending confirmation of additional approximately \$450,000 in funding.

In the Town of Ajax, TRCA installed post and paddle fencing along a section of the Waterfront Trail in 2018 to keep park users from the edge of severely eroded bluffs following the 2017 high water event; and completed stormwater management control and local hydrology improvements at the Paradise Park wetland in 2019. Ajax is currently revisiting a trail design for a section of the Waterfront Trail that was undermined as a result of the high lake levels, with TRCA assisting

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with the permitting and design phases of the project. TRCA is also assisting the Town of Ajax with the review of the existing bridge at Duffins Creek and proposed infrastructure associated with the Lake Ontario Waterfront trail.

TRCA are coordinating these projects with our municipal partners and are engaging stakeholders and the public directly through formal Environmental Assessment consultation, where necessary, standard email, project specific websites and on-site signage. Lastly, the well-being of our employees and members of the public continues to be the top priority for TRCA, all work is being undertaken following all precautions outlined in TRCA's Pandemic Incident Management System (IMS) Procedures for Field Work.

Report prepared by: Rehana Rajabali, extension 5220; Jet Taylor, extension 5526

Emails: rehana.rajabali@trca.ca; jet.taylor@trca.ca

For Information contact: Rehana Rajabail, extension 5220, Jet Taylor, extension 5526

Emails: rehana.rajabali@trca.ca; jet.taylor@trca.ca

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Attachments: 2

Attachment 1: Lake Ontario Water Level Forecast from International Lake Ontario-St. Lawrence River Board

Attachment 2: Summary of high water level impacts shared with Great Lakes Adaptive Management Committee, International Lake Ontario-St. Lawrence River Board, and International Joint Commission