

## Item 8.2.

### Section I – Items for Board of Directors Action

**TO:** Chair and Members of the Board of Directors  
Meeting #6/19, Friday, June 21, 2019

**FROM:** Sameer Dhalla, Director, Development and Engineering Services

**RE:** **FLOOD RISK MANAGEMENT UPDATE**

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#### **KEY ISSUE**

Summary of current and future initiatives to improve flood risk management, overview of projects funded by the National Disaster Mitigation Program (NDMP), and reporting as requested by the Board of Directors on TRCA's response to the August 7, 2018 storm.

#### **RECOMMENDATION**

**WHEREAS TRCA received approval to pursue funding for flood risk mitigation projects through the National Disaster Mitigation Program (NDMP) at meeting #6/16, held on July 22, 2016;**

**WHEREAS TRCA provided an overview of the Flood Risk Management Program at meeting #5/17 held on June 23 2017;**

**WHEREAS TRCA reported on flood risk in the Black Creek Rockcliffe area including next steps in pursuing flood remediation at meeting #2/18 held on March 23 2018;**

**WHEREAS TRCA provided a summary of the Flood Forecasting and Warning Program including a website demonstration at meeting #4/18 held on June 8 2018;**

**WHEREAS TRCA staff were requested report back to the Authority in 2018 and 2020 to provide a summary of the work that has been completed with funding from the NDMP.**

**THEREFORE LET IT BE RESOLVED THAT TRCA staff, in partnership with TRCA's municipal partners, continue to implement and advance flood risk management projects;**

**AND THAT TRCA staff be directed to continue to work with municipal staff and the insurance industry to share information from NDMP projects to advance and improve flood communications;**

**AND FURTHER THAT staff provide an annual summary of flood risk management work that has been completed.**

#### **BACKGROUND**

One of the core mandates of TRCA is to provide services to partner municipalities to reduce flood risk. Activities within this realm include flood forecasting, issuing flood warning messages, operating flood infrastructure, implementing flood mitigation projects, and the regulation of development in floodplains. TRCA has continued to invest in all aspects of flood risk management, and this work has been accelerated since 2015 by successfully securing over \$3.9 Million in matching funds through the National Disaster Mitigation Program (NDMP).

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The roles and responsibilities for ensuring public safety during flood events are shared between various levels of government, conservation authorities, and individuals. Municipalities are legislated, through the Provincial Emergency Management and Civil Protection Act, to develop emergency plans and undertake response actions, including road closures and evacuations. In order to provide support to our municipal partners to meet their obligations for emergency management, the TRCA operates a Flood Forecasting and Warning Program in accordance with the Ministry of Natural Resources and Forestry (MNRF) *Provincial Flood Forecasting and Warning Guidelines*. The program is designed to:

- Support municipal flood emergency planning,
- Monitor weather and watershed conditions daily and maintain a local data collection network,
- Issue flood messages to municipalities, applicable agencies, media and the public, to advise of potential flooding when appropriate,
- Operate TRCA dams and flood control structures to reduce the effects of flooding when appropriate,
- Maintain communications with municipalities and the MNRF Surface Water Monitoring Centre during a flood event.

In order to fulfil this role, TRCA works closely with partner municipalities, and with meteorological authorities such as the Ontario Storm Prediction Centre (OSPC) operated by Environment Canada and Climate Change (ECCC).

This mandate was tested on August 7, 2018 when an unexpected storm hit the Black Creek watershed and portions of the Don and Lake Ontario watershed in Toronto. The sudden appearance of a storm that caused flooding raised questions regarding responsibilities and communication protocols in responding to these type of events. At TRCA Executive Meeting #6/18, held on August 10, 2018, the following resolution was approved:

*THAT Toronto and Region Conservation Authority (TRCA) in response to the August 7 2018 storm event prepare a preliminary report regarding potential improvements to responses to flooding issues within the TRCA municipalities, including suggestions for improving the municipal planning process including consideration of how to better involve TRCA in the review of Committee of Adjustment and other planning applications in flood prone areas; explore installation of additional gauges in flood prone systems where gaps may exist; working with municipalities to improve the dispatch and communication protocols; engagement with municipal members, provincial and federal governments for additional resources; improved public alert systems and coordination with media, and emergency management training.*

While this report will summarize TRCA's response to the August 7, 2018 flood event, it is primarily meant to outline the work that has long been underway to improve TRCA's flood risk management program. In addition, this report will provide an update on NDMP projects that TRCA has been undertaking to strengthen the program and fulfil Resolution #A109/16 approved at Authority Meeting #6/16, held on July 22, 2016.

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### **RATIONALE**

TRCA's Flood Risk Management program plays a keystone role in fulfilling our Strategic Plan objectives to reduce flood risks and protect communities. The program spans the full spectrum of emergency management: from risk assessment, support of preventative measures, preparedness planning, outreach with municipal partners, Flood Forecasting and Warning during flood events, to flood event documentation and analysis after the storm. TRCA's flood management program is one of the most advanced in Canada, incorporating state of the art technologies in real-time gauging, hydrology and hydraulic modeling and multi-mode communications. The program is staffed by a complement of Flood Duty Officers (FDOs) and Chief Flood Duty Officers (CFDOs) who are on-call 24/7. During flood events, the information provided by TRCA plays a critical role assisting municipal partners in making decisions for emergency response.

The characteristics of TRCA's watersheds, however, present unique challenges. Many of the catchments in TRCA's jurisdiction are small, steep, and highly urbanized. Intense rainfall thus quickly accumulates in rivers and streams, leaving little lead-time before flooding actually occurs. Flooding in the TRCA jurisdiction can happen at any time of year; fall storms can draw on tropical moisture from Atlantic hurricanes, mid-winter thaws present the risk of ice jams, spring warm-ups melt the seasonal snowpack, and summer brings the risk of thunderstorms. These summer storms present particular challenges because they are highly unpredictable from a meteorological perspective. The potential energy and moisture for a serious convective storm may exist on many summer days, but determining exactly where, and if, they will form, remains challenging.

In addition to utilizing weather forecasts and warnings from our partners in weather science, TRCA operates a network of telemetered rainfall and stream gauges to provide real-time situational awareness throughout our watersheds. As an additional layer of precaution, the real-time gauges are assigned thresholds, and notification alarms are enabled to alert FDOs when these thresholds are exceeded.

The August 7, 2018 event, an unexpected tropical rainstorm formed over portions of North York and moved slowly south across downtown Toronto. This very localized storm inundated the Black Creek watershed and western parts of the Don River catchment. It caused flooding in low-lying areas, specifically in the historically flood vulnerable community adjacent to Black Creek between Rockcliffe Blvd. and Weston Rd. This storm was unusual in the following ways:

- It was unexpected – heavy rainfall was not forecast by the Ontario Storm Prediction Centre and no weather warnings were issued prior to the event.
- It was highly localized and intense – only small portions of TRCA's jurisdiction were impacted, but those areas received an extremely high amount of rainfall in a very short period of time.
- It followed a track that evaded detection by TRCA's network of real-time rain gauges. Rain gauges can provide warning for unexpected severe storms, as they trigger alarms when unusually high rain is detected, well before river levels respond. Typically, this allows for longer lead-time for FDOs to issue messages and contact municipal partners.
- The first indication of a storm event that the FDO received was a stream gauge alarm indicating a high water level for Black Creek at Highway 401.

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Upon receipt of this alarm and subsequent review of radar information (since there was no significant precipitation at TRCA rain gauges), the FDO contacted OSPC to obtain information on the storm. The FDO then proceeded to release a Flood Watch message, indicating that flooding was possible in the vicinity of Black Creek and Lower Don River. Flood messages are issued to TRCA's website, to an e-mail and text distribution list which includes media as well as emergency management/first responder staff at all partner municipalities, and via Twitter (@TRCA\_Flood). The CFDO also contacted City of Toronto Transportation Central Dispatch staff to advise of possible road closures in the affected area. In the case of the August 7 storm, all protocols of TRCA's flood forecasting and warning responsibilities were met; however, the storm being so localized as to not be detected by the rain gauge network delayed the issuance of the Flood Watch message.

Although the nature of certain storms and our watershed characteristics make it difficult to increase the lead-time in identifying a flood threat, TRCA has been working to develop a decision support system for FDOs that incorporates the next generation of flood forecasting models. In addition to this, TRCA has been continuously pursuing initiatives to facilitate a faster dissemination of flood warnings, and quicken corresponding action by affected municipalities. To fulfill the request in resolution #B70/18, the following sections of this report will summarize specifically how TRCA is expanding its flood gauging network, enhancing flood outreach and communication, informing emergency management, and improving flood alert systems, and provide suggestions for improving the municipal planning process.

### **National Disaster Mitigation Program**

In 2016, TRCA's Board of Directors approved a 5-year plan to enhance TRCA's flood risk management program with funding from the National Disaster Mitigation Program (NDMP). Projects included updating TRCA's flood risk assessment, developing new state of the art flood modeling and mapping, installing additional flood monitoring gauges, undertaking flood infrastructure optimization studies, and improving flood communication and outreach programs. As an early adopter of this program, TRCA is completing numerous projects and has provided guidance and leadership to other conservation authorities pursuing similar studies. Through this program over \$3.9 Million has been secured for projects specifically dedicated to reducing flood risk. Attachment 1 includes a full list of the NDMP projects, and an update on their current status. In many cases, outputs and processes developed specifically for one project have found myriad uses in other flood risk reduction activities, such as the inundation mapping used for the Lake Ontario High Water Level events this year and in 2017, as well as the Bolton Ice Jam in March 2019.

### **Flood Risk Assessment and Ranking**

While the application of appropriate planning and development regulations remains a primary tool to prevent flood risk, there are many areas that were developed prior to hazard management policies. These communities, where there is a high concentration of structures within the regulatory floodplain, are TRCA's Flood Vulnerable Clusters, and represent areas of historic flood risk to people and property. Currently, 41 such Clusters have been identified across TRCA's jurisdiction as priority areas. Leveraging funding from the NDMP, TRCA recently completed the Flood Risk Assessment and Ranking project. The purpose of this project was to combine current riverine flood hazard information with an updated database of exposure information, and utilize the latest flood vulnerability functions in order to quantify flood risk at a granular level. The overlaying of this information, together with expert research and stakeholder input, was used to develop data-driven risk rankings of the 41 Flood Vulnerable Clusters. The data generated through this project includes detailed information of exactly what is at risk with rising flood levels. With the resulting information, staff continue to work in partnership with

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municipalities to develop flood mitigation strategies for the priority areas, including enhanced warning and emergency management tools, flood remediation capital works, and the appropriate application of planning and development policies.

### **Installation of Additional Gauges**

TRCA has constructed an extensive network of real-time stream and rain gauges to provide the most up to date and accurate data to the Flood Forecasting and Warning Program. The network of real-time water level and stream gauges provides critical information to FDOs. Stream gauges provide water level readings, and corresponding alarm notifications, every 15 minutes. Rain gauges provide readings every 5 minutes. These gauges have been strategically placed throughout TRCA's jurisdiction in locations with known flood risk.

In 2006, the network consisted of four stream gauges. The network has expanded significantly since then, and now comprises 15 real-time stream gauges and 20 real-time precipitation gauges. In 2018, TRCA obtained NDMP funding to expand the real-time stream gauging network to 17 and the real-time precipitation gauges to 22. Increasing the density of the real-time network reduces "blind spots" and the probability of undetected storms. Future network expansion is being considered as TRCA is currently investigating a flood forecasting tool that will incorporate real-time data with weather radar data to provide site-specific flood forecasts. In order to meet the gauge density requirements to make this tool as accurate as possible, TRCA will have to expand the network substantially, and it is the maintenance of such a network that presents logistical challenges. To reduce the number of new gauges that would need to be installed, TRCA is investigating the possibility of incorporating existing networks owned by other municipalities and agencies. City of Toronto, Region of Peel, ECCC and others operate networks that could be incorporated into TRCA's network, thus reducing costs. Staff are currently exploring solutions to overcome technical challenges associated with using external networks.

TRCA will continue to identify feasible expansions to the real-time network to increase warning times for flood messages, and has most recently upgraded the existing gauge at Westmount Park into a real-time gauge to provide precipitation information in the Rockcliffe neighborhood.

### **Communications with Municipal Partners and Emergency Management Training**

TRCA is continually communicating with municipal partners and improving processes through engagement and training. Flood Risk Management staff attend working group meetings, preparedness workshops, outreach events, and collaborate on annual exercises with the various emergency management departments of our local partners. Some recent examples include:

#### **Toronto:**

- TRCA is part of the City of Toronto Emergency Management Working Group (EMWG), which includes representatives from Toronto Police, Toronto Fire, Toronto Transit Commission, Toronto Hydro and all major City of Toronto divisions. Risk specific plans for flooding are co-ordinated through EMWG and TRCA participates in emergency management exercises to test emergency plans and response protocols. Additionally, the CEO of TRCA sits on the Toronto Emergency Management Program Committee.

#### **Durham:**

- TRCA provided leadership and input in the Durham Flood Response Plan, and

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annually attends the Durham Emergency Management Office P3 Symposium

### **Peel:**

- TRCA and CVC have jointly presented at CEMC meetings in Peel Region
- TRCA collaborated on the 2018 table-top exercise with Brampton Emergency Management, and routinely attends their annual workshop
- TRCA has provided input into Mississauga's severe weather response procedures

### **York:**

- TRCA has been a content partner for the York Emergency Management fair and Markham's Master of Disaster summer camp
- TRCA staff have attended training with Vaughan Emergency Management, who is also circulated on relevant development applications in flood vulnerable areas

TRCA, in conjunction with other GTA Conservation Authorities and the Ministry of Natural Resources and Forestry (MNRF), hosts both the Floods Happen Workshop and the Provincial Flood Forecasting and Warning Committee workshop annually. Municipal partners, emergency management staff, first responders and water resource agencies are invited to discuss the latest issues in flood risk management.

In 2018, TRCA also finalized the G. Ross Lord Dam Emergency Preparedness Plan that involved participation and coordination with numerous responding partners, such as Toronto's Office of Emergency Management, Police and Fire Services. A public information session was also held in early 2018 for communities downstream of the dam to increase the awareness of the risk of the dam, information about the emergency plan and describe the actions to undertake in the event of an emergency directly related to dam failure or operations of the dam.

TRCA has also implemented the Incident Management System (IMS), an industry standard organizational tool for coordinating a response for emergencies and is used by all response agencies. IMS allows for seamless coordination between different stakeholders in order to coordinate emergency response efficiently.

TRCA will continue to engage with stakeholders to ensure that all parties understand their role during flood emergencies. The streamlining of communications through the embedding of TRCA warnings and real-time flood monitoring information within municipal websites will be specifically pursued. In conjunction with municipal partners, TRCA is also working to create public outreach strategies to inform flood vulnerable communities about their risk and individual preparedness responsibilities. Most notably, NDMP funding approval has been received for the development of site-specific flood emergency plans. These plans, to be developed in conjunction with municipal partners will utilize the updated flood risk mapping to allow better communication and resource deployment for road closures and evacuations during flood emergencies. TRCA has already convened a working group for the Rockcliffe site-specific response plan, which will form a template for the remainder of plans in our jurisdiction. This work will be completed by March 2020.

### **Alert Systems and Media Coordination**

Coordination with media is managed by Flood Risk staff with assistance from TRCA's Marketing team. TRCA sends all flood messages to media contacts in the FFW distribution list. Media requests regarding storms and flooding are answered by Flood Risk Management staff with the assistance, coordination and oversight of TRCA's marketing personnel. Occasionally the opportunity is presented for TRCA to provide a more in-depth and educational perspective on flood risk. For example, in April 2018, CTV News did a live broadcast at G. Ross Lord Dam to

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provide information about the structure and various hydrometric tools used by TRCA.

It is important to underscore the utility of social media, particularly Twitter, in disseminating information to the public. Members of the public, and even traditional media, are known to seek information from Twitter on emerging situations. The expanded use of the @TRCA\_Flood account as a source of flood risk and response information is critical.

In 2018, federal and provincial emergency management officials introduced Alert Ready messages for mobile devices. In the past, these messages could only be sent through television and radio. The new mobile device Alert Ready system will now automatically push critical public safety information to all cell phones within the area of risk. TRCA has an agreement with the Provincial Emergency Operations Centre to push Alert Ready messages to residents during activation of the G. Ross Lord Dam Emergency Preparedness Plan.

### **Planning and Development Considerations**

TRCA follows a process for receiving planning applications for all properties mapped within TRCA's regulated areas. These regulated areas include lands that are prone to riverine flooding, but do not specifically include properties that may be subject to flooding from municipal storm sewer infrastructure, as this is the responsibility of the municipality. This process is established either through Memorandums of Understanding (MOU) with our municipal partners, or through long-established protocols with municipal staff. The applications TRCA staff review include everything from large subdivisions down to minor variance and land division applications. TRCA also works with municipal building departments to ensure that they notify applicants under applicable law provisions when a TRCA permit is required prior to the release of a building permit. Applications within TRCA's mapped regulated area are circulated to TRCA and our staff communicate issues related to natural hazards back to the municipality and the landowner.

There are a number of processes that our municipal partners could improve upon to ensure natural hazard issues are addressed, with the first being clear early engagement with the landowner. For Committee of Adjustment applications in particular, the first time TRCA typically sees any problematic applications is after the hearing is scheduled on the committee agenda. This leaves very little time for staff to review and engage the landowner and advise the committee prior to a decision being made. In some cases, municipal planning staff may be unaware that approval of certain applications will be inconsistent with the natural hazard policies of the Provincial Policy Statement, Official Plan or TRCA's Living City Policies. Additional awareness of input on applications in flood vulnerable or hazard areas from municipal planning staff would be of assistance in identifying issues earlier in the planning process. Secondly, Councillors and Committee members change over time, and incorporating watershed management and awareness of Provincial policy considerations in flood vulnerable areas in their jurisdiction into their orientation could help avoid inappropriate decisions being made on hazard-prone lands. Finally, staff encourage both the upper and lower tier municipalities to include clear policies and processes for natural hazard and natural heritage management in up to date Official Plans, Zoning By-laws, Procedural manuals and Memorandums of Understanding with TRCA.

### CONCLUSION

TRCA manages a multi-disciplinary approach to the reduction of flood risk. Watershed monitoring with real-time gauges, flood plain regulation, stakeholder engagement, public education and communication all have a role in the reduction of flood risk. TRCA's urbanized watersheds and the increasing threat from extreme events require advanced technology and robust response protocols to manage flood events efficiently. TRCA is consistently improving the flood management program, leveraging best-available technologies and processes to mitigate risk for priority areas. These improvements include updating flood mapping/modeling, expanding the real time flood gauging system and improving communications with municipal partners in emergency management and land use planning.

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

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

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

### FINANCIAL DETAILS

Funds for general FFW operations are available in operating account 115-60 (Flood Warning Program) and 115-62 (Flood Risk Management and Communications). Gauging is funded through capital account 107-01 (Flood Forecasting and Warning System). NDMP projects are funded through various capital accounts. A list of NDMP projects is available in Attachment 1. These accounts are funded by City of Toronto, York, Peel and Durham Region. Funds for Planning and Development operations are available in operating account 110-01 and 110-05. These accounts are funded through planning and development application fees.

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**Date: April 8, 2019**

**Attachments: 1**

Attachment 1: National Disaster Mitigation Program (NDMP) Project Summary