

Section III – Items for the Information of the Board

TO: Chair and Members of the Board of Directors
Friday, May 28, 2021 Meeting

FROM: Sameer Dhalla, Director, Development and Engineering Services

RE: **EMERGENCY PREPAREDNESS PLANS FOR TRCA DAMS**
Emergency Preparedness Plans for Dam Emergencies at Claireville Dam,
Stouffville Dam, Milne Dam and Palgrave Dam

KEY ISSUE

Overview of the Emergency Preparedness Plans developed to assist municipal response during dam emergencies at Claireville Dam, Stouffville Dam, Milne Dam and Palgrave Dam.

RECOMMENDATION

IT IS RECOMMENDED THAT this Emergency Preparedness Plans for Toronto and Region Conservation Authority (TRCA) Dams report be received.

BACKGROUND

TRCA owns and operates numerous flood control assets including dams, flood control channels and dykes. TRCA's dam inventory consists of 12 dams, of which 5 were specifically built to provide flood protection. The other dams are historical mill, recreational, and industrial dams inherited through various TRCA land acquisition programs. Dams can provide society with many benefits, including flood protection, hydroelectricity, irrigation, and recreation. Conversely, reservoirs behind dams carry immense energy potential that, if released uncontrolled, could cause threat to life and widespread damage to property. Recent dam failures around the world have resulted in loss of life, billions of dollars in property damage, and irreversible environmental losses. Dam regulatory agencies in Canada, and around the world, are continually upgrading guidance criteria to ensure the safe operation and management of dams. Over the last 15 years, TRCA has invested significant resources towards increasing dam safety measures. Many of these initiatives are directed towards upgrading or repairing the physical condition of dams, however, preparing for the unlikely event of a dam failure has also been a priority. A critical component of dam safety is the development of an emergency management program to reduce the impact of a dam failure on the communities downstream of the dam. The primary document of a dam's emergency management program is the Emergency Preparedness Plan (EPP). The EPP consolidates all available information that may be required by municipalities and first responders to carry out response actions, including evacuation, in the unlikely event of a dam failure.

TRCA's two largest dams, G. Ross Lord Dam and Claireville Dam, have had EPPs in place since 2009. Additionally, G. Ross Lord Dam, Claireville Dam, Milne Dam and Stouffville Dam have had dam break mapping in place to assist emergency response since 2004. In recent years, dam industry guidelines have been developed to formalize the requirements and contents of EPPs to ensure consistency across Canada. TRCA's first dam to have an EPP in place using the new guidelines was G. Ross Lord Dam in 2018. This dam was a priority because of the extreme risk to life and property in the downstream community.

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At Authority Meeting #5/18, held on June 22, 2018, Resolution #A103/18 was approved as follows:

THAT Toronto and Region Conservation Authority's (TRCA) Emergency Preparedness Plan for G. Ross Lord Dam be received.

After the Board received the report, TRCA engaged with City of Toronto staff and first responder agencies to conduct training in the interpretation and use of the EPP. Concurrent to the finalization of the G. Ross Lord Dam EPP, TRCA's Engineering Services began working on EPPs for other dams that pose a risk to life and property. Through analysis of various studies, it was determined that Claireville Dam, Stouffville Dam, Milne Dam and Palgrave Dam also required EPPs. Using the approved G. Ross Lord Dam EPP as a template, EPPs were developed for each of these dams. The format of the EPPs remain the same, however, specific contact information and notification flow charts are modified to meet the requirements of the municipality responding to the dam emergency. TRCA's seven other dams do not require EPPs at this point because their risk is much lower. The seven other dams include:

- Black Creek Dam
- Osler Dam
- Secord Dam
- Glen Haffy East Dam/Glen Haffy West Dam (2)
- Glen Haffy Extension Property Upper Dam and Lower Dam (2)

These dams will be monitored for changes in risk, and if required, TRCA will develop EPPs.

RATIONALE

Dam failures and accidents are potential hazards that dam owners must manage to reduce the risk to life and property. TRCA's dam safety program includes regular inspections, maintenance, and repairs. However, weather, human error and sudden structure failure can lead to a catastrophic release of water that can severely impact downstream communities.

Internationally, there have been several recent major dam incidents that demonstrate the need for robust emergency management plans. One specific incident where emergency plans were implemented was the Oroville Dam near-failure in 2017. Located in California, the dam is one of the largest in North America. Extreme rainfall caused the main spillway to erode, and the dam was at extreme risk of failure. Dam officials initiated the emergency plans and over 180,000 people were evacuated from the downstream areas at risk. Although the dam did not fail, the implementation of the emergency plans and the successful evacuation of downstream communities is regarded as a success. A critical component of the Oroville Dam emergency plans was the inundation mapping that allowed first responders to target the areas at risk from the dam's potential failure. Inundation maps have been developed for Claireville Dam, Milne Dam, Stouffville Dam and Palgrave Dam, and are the most important tool in TRCA's EPPs.

There are currently two agencies that regulate and provide guidance for dam owners. Dam safety in Ontario is regulated by the Ministry of Natural Resources and Forestry (MNRF) under the Lakes and Rivers Improvement Act (LRIA). They are responsible for developing the criteria that dams must meet, and for regulating dam owners in the safe operation and maintenance of dams. The Canadian Dam Association (CDA) is an advisory body comprised of voluntary dam safety experts supported by dam owners in Canada, including TRCA. The CDA provides technical and management guidance for dam owners using internationally recognized best practices. TRCA uses a combination of both MNRF and CDA guidelines for managing

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structures. This is because there are cases where one set of guidelines do not cover specific topics. For example, LRIA guidelines do not address emergency management of dams and therefore TRCA uses the CDA Draft Emergency Management for Dam Safety technical bulletin. The Draft Emergency Management for Dam Safety technical bulletin has been under development since 2015. TRCA has helped inform the development of this bulletin by attending two workshops to get input from dam owners across Canada. At the 2018 CDA conference, the draft technical bulletin was released for review. The technical bulletin remains in draft form, but it is expected that it will be finalized within the next year or so. Even though it is still in draft, it is the only Canadian document that speaks to emergency management and dams and therefore TRCA has chosen to use it for guidance when developing EPP's. In addition, TRCA has adopted the Ontario Power Generation's (OPG) organization and contents format for the layout of the EPP. OPG is Ontario's largest dam owner with over 240 dams in its inventory. OPG has significant resources for emergency management development and has been a leader in sharing this information with other dam owners in Canada and around the world.

The naming conventions for dam emergency documentation varies across the industry. For TRCA, there are two specific documents that make up the emergency management plans. The Emergency Response Plan (ERP) is the internal document containing all the information that TRCA would need to know internally to respond to a dam safety situation. The ERP contains internal and external contact information, emergency identification descriptions, site specific response and other information that would only benefit TRCA in an emergency. The EPP is the document tailored for external agencies to help them respond to dam emergencies to mitigate risk to life and property. Information found in the EPP includes TRCA contact information, notification charts and inundation mapping showing the areas at risk should a dam fail. This information helps municipal responders understand the emergency and where the hazard will impact communities. Ultimately it is up to municipalities to order and undertake evacuations; the EPP delineates the area that is threatened by a dam emergency.

EPPs are comprised of several critical sections that provide the information necessary for first responders and municipal staff to understand and delineate the area of risk. These sections include:

- **Purpose of the EPP:** This section provides a brief description of the dam and location. It also provides dam access information with location maps.
- **Emergency Conditions:** This section provides a description of the types of emergencies that could be expected at the dam. Scenarios may include dam failure or gate operations resulting in downstream flooding.
- **Downstream Flood Vulnerability:** This section provides a description of the locations downstream of the dam that could be affected by a dam emergency. These locations include road crossings, critical infrastructure, high consequence buildings (schools, long-term care homes, etc.).
- **TRCA Contacts:** Contact information for TRCA's Flood Duty Officer and radio communications is provided.
- **Roles and Responsibilities:** This section clearly describes the roles and responsibilities of the various agencies who would be involved in responding to a dam emergency. Agencies include TRCA, municipal emergency management staff, police, fire, transportation/road crews, MNR and Office of the Fire Marshall and Emergency Management. This section also describes the Incident Management System (IMS) structure for dam emergencies. The IMS provides a framework for organizing agencies to better manage emergencies. The IMS structure divides responding agencies into sections:

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- **Command Section:** The Command Section is responsible for carrying out the corporate objectives, strategies, and tactics during a major flooding event through continued communications with municipalities, emergency responders and internal staff.
- **Operations Section:** This Operations Section is responsible for field activities including dam security, coordination of repairs/mitigation at the dam, and setting up the incident command post onsite.
- **Planning Section:** The Planning Section will be responsible for collecting, evaluating, analyzing, and disseminating incident information. This includes the gathering of situational information that will be used for current and future action plans.
- **Logistics Section:** The Logistics Section coordinates the provision of all resources. Major activities of this section include obtaining, maintaining and accounting for essential personnel, equipment and supplies beyond those immediately accessible to the Operations Section.
- **Finance and Administration:** The Finance and Administration Section provides financial and cost analysis support to an incident. Major activities of this section include monitoring of sources of funding, tracking and reporting financial usage, tracking timesheets for incident personnel and equipment.
- **Inundation Maps:** Inundation maps are the most critical part of the EPP. These maps delineate the area that would flood during a dam incident. First responders would use these maps to plan evacuations, road closures and safe ingress and egress routes. Maps are designed to be easy to interpret as there could be a variety of municipal services using the map during an emergency.

The CDA is the lead technical dam safety agency providing guidance for emergency management for dam owners. The CDA Dam Safety Guidelines 2007 contains the requirements for developing and maintaining EPP's. Principle 3c) of the CDA's Dam Safety Guidelines 2007 state that:

"The emergency management process shall ensure that effective emergency preparedness procedures are in place for use by external response agencies with responsibilities for public safety within the floodplain".

Additionally, the CDA Dam Safety Guidelines 2007 Section 4.1 state that:

"EPPs should be in place for all dams where lives are at risk or if implementation of emergency procedures could significantly reduce the consequence of failure".

Using the criteria for emergency management from the CDA, Flood Infrastructure and Hydrometric staff determined that four dams, in addition to G. Ross Lord Dam, require the development of EPP's. Using previous Dam Safety Reviews (DSR) conducted on these dams, staff determined that Claireville Dam, Stouffville Dam, Milne Dam and Palgrave Dam require EPP's based on risk to life.

Risk to life is based on the Hazard Potential Classification (HPC) assigned to a dam during a DSR. Engineering consultants create a model of the worst-case scenario dam breach, which is based on the most severe possible flood (greater than Hurricane Hazel) plus the failure of the dam. Maps are created of the expected flooded area downstream of the dam for this scenario, and the potential number of people affected by the dam breach flood are counted. DSRs conducted on Claireville Dam, Stouffville Dam, Milne Dam and Palgrave Dam determined that at

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least one person was at risk should the dam fail. Table 1 summarizes the persons at risk during a severe flood event plus dam breach. The location of each dam is provided in **Attachment 1**. Photos for each dam are provided in **Attachment 2**.

Table 1

Dam	Hazard Potential Classification – Flood plus Failure	Persons at Risk
Claireville Dam	Very High	247
Stouffville Dam	Very High	>100
Milne Dam	Very High	101
Palgrave Dam	Very High	68

As these dams pose a risk to life, TRCA's Flood Infrastructure and Hydrometric and Flood Risk Management staff developed EPPs for each structure that are tailored for each dam's unique risks. Specific communication information is included in each EPP for the different municipalities at risk from a dam emergency. Draft confidential EPPs will be circulated to Board Members separately (**Attachments 3-6**).

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

Funding for the development of the EPPs was provided by operational accounts 108-01 (Flood Infrastructure Operation and Maintenance Supervision) and 115-62 (Flood Risk Management and Communications). Future EPP roll out and testing will also use funding from these accounts.

DETAILS OF WORK TO BE DONE

TRCA, through the Flood Risk Management section, will introduce the EPPs to partner municipalities affected by potential dam emergencies. EPPs will be presented to municipal emergency management and first response staff to ensure these agencies fully understand the risk and impacts of dam emergencies. The primary objective is to reduce the threat to life, and thereafter to infrastructure and property to the fullest extent possible.

TRCA will also request partner municipalities to consider using dam emergencies presented in the EPPs as possible scenarios for tabletop and full functional emergency management testing and training exercises for first responders and emergency response staff. TRCA will work closely to ensure inter-agency cooperation and communications are practiced during these exercises.

Dam EPPs are a key document supporting emergency management within TRCA's dam safety program. Simultaneously, continued investment in regular inspections, maintenance, and major repairs is critical to avoiding scenarios that would necessitate the activation of the EPPs.

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Attachments: 6

Attachment 1: Map of Dam Locations

Attachment 2: Photographs of TRCA Dams Requiring Emergency Preparedness Plans

Attachment 3: Claireville Dam EPP

Attachment 4: Stouffville Dam EPP

Attachment 5: Milne Dam EPP

Attachment 6: Palgrave Dam EPP

Attachments 3-6 are confidential attachments, which will be circulated to Board Members separately, pursuant to subsection C.4.(2)(h) of TRCA's Board of Directors Administrative By-Law, as the subject matter may be discussed in closed session under subsection 2.1(7) of the *Emergency Management and Civil Protection Act*.