City of Toronto Emergency Plan

Risk Specific Plan: Flooding

Toronto and Region Conservation Authority
Office of Emergency Management

October 2014
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Risk Specific Plan: Flooding

Primary / Lead Agency(ies):
- Toronto Office of Emergency Management
- Toronto and Region Conservation Authority

Supporting Agencies:
- Solid Waste Management Services
- Strategic Communications
- Toronto Fire Services
- Toronto Paramedic Services
- Toronto Parks, Forestry and Recreation
- Toronto Police Service
- Toronto Public Health
- Toronto Water
- Transportation Services

1.0 Introduction / Background
Responding to flood emergencies in the City of Toronto is shared by various City Divisions, the Toronto and Region Conservation Authority and the Ministry of Natural Resources. City of Toronto Divisions and Agencies are responsible for the welfare of City of Toronto residents and consider flood emergency response in municipal emergency planning. The Conservation Authority, as delegated from the Ministry of Natural Resources, is the primary agency responsible for providing flood related information to the City of Toronto. If requested, the Province may assist and support the City in the coordination of a response to a flood related emergency.

The Flood Management Service at Toronto and Region Conservation Authority (TRCA) operates a flood forecasting and warning system. TRCA and the surrounding GTA Conservation Authorities, operate under the guidance of the 2008 Provincial Flood Forecasting and Warning Implementation Guidelines, to reduce the risk to life and damage to property due to flooding. TRCA provides local agencies and the public with notice, technical information and advice so that they can respond to potential flooding and flood emergencies.

1.1. Purpose
The purpose of this document is to provide a framework for the coordination of the City of Toronto’s response to ensure public safety and to minimize damage to property in the event of a major flood event.

This document identifies the major response and recovery activities undertaken by the City of Toronto and its partner agencies during a flood event, with details as to specific actions each partner agency would undertake during a flood event.
1.2. Hazard Specific Information – Flood

1.2.1. Definition
Floods are a common and widespread natural hazard across Canada. In Ontario, policies were established after the 1954 Hurricane Hazel storm which have greatly restricted the amount of allowable development within a floodplain. However, many historical structures still exist within the floodplain and are at risk due to flooding.

1.2.2. Riverine Flooding
Flooding along rivers is a natural and inevitable part of life. A riverine flood is defined as a condition where water levels in a watercourse exceed the channel bank elevation. This type of flooding typically results from large-scale weather systems generating prolonged rainfall. Other causes of riverine flooding include locally intense thunderstorms, rain on snowmelt, ice jams, and dam failures. Coastal flooding (from Lake Ontario) is less common within the City of Toronto, however there is potential for this type of flooding within the City as well.

Water that falls on the ground as precipitation needs to go somewhere. Most of it finds its’ way to the rivers. In Toronto, the valley systems are quite steep and well defined and are able to convey water quite quickly and efficiently through the watershed to the Lake. This means that water levels do not remain high for prolonged periods of time during routine storms. In contrast to other geographic regions, where the floodplain is less defined i.e. wide and flat, such as (Northern Ontario and Manitoba), where flooding can persist for weeks to even months; Toronto’s typical severe weather events cause flooding for hours to days. Only a Hurricane type of event would likely cause prolonged high water levels.

There are inherent risks associated with high riverine water levels. It is important to note the powerful forces that are associated with fast flowing water, as well as the potential for slippery and unstable banks. Flooding during winter and early spring months is coupled with the added risk of extremely cold water temperatures, unstable ice, and the potential for ice jamming. Flood water may also contain dangerous debris, or contaminants from stormwater/sanitary sewers.

1.2.3. Urban Flooding
When land is converted from natural cover to an urban environment (concrete), it loses its natural ability to absorb rainfall. There are many factors which affect the potential for urban flooding. These include: limited or nonexistent stormwater controls, aging infrastructure, design storm criteria i.e. limited infrastructure capacity, and upstream drainage areas. Many areas within the City are subject to some of these factors, and are therefore at risk of urban flooding. When urban flooding occurs it is
streets and boulevards can become swift moving rivers, and structures may be at risk of basement flooding.

1.2.4. **Flash Flooding**

Flash floods can result in raging waters in matter of minutes. Even very small streams that may appear harmless in dry weather can flood. Flash floods, which are characterized by rapid on-set and high velocity waters, can carry large amounts of debris.

Several factors contribute to flash flooding. The three key elements are rainfall intensity, location, and duration. In Toronto, flash floods occur within a few minutes of excessive rainfall, or a sudden release of water held by an ice jam. Most flash flooding is caused by thunderstorms which are extremely difficult to predict with adequate lead time for preventative action. Occasionally, floating debris or ice can accumulate at a natural or man-made obstruction and restrict the flow of water. Water held back by the ice jam or debris dam can cause flooding upstream. Subsequent flash flooding can occur downstream if the obstruction should suddenly release. It is important to note that this type of flooding can occur as a result of riverine, or urban flooding, or a combination of both.

1.2.5. **Flooding due to Dam Break/Failure**

Due to the shift in thinking from flood control to floodplain management in the mid 1960's and 70's, plans for major flood control structures in the Toronto area were abandoned. Two large dams assist in attenuating flood flows in the Greater Toronto Area. Within the City of Toronto on the Don River, G. Ross Lord Dam (Dufferin Road and Finch Ave) controls flooding along the West Don River from Finch Ave. south to the East Don River at Don Mills Road and provides limited protection to Hogg’s Hollow at Yonge St and York Mills Road. Just outside of the City of Toronto on the West Humber River, Claireville Dam (Finch Ave and Hwy 427), provides limited flood protection at Albion Road and the West Humber River. Several flood control channels exist throughout the city, which essentially convey water through the valleys quickly. These channels are not, however, structures that can be operated to alter flow during flood events and serve primarily to reduce the impacts of flooding during small events.

As the owners of flood infrastructure, TRCA must conform to the requirements of the Lakes and Rivers Improvement Act (LRIA) Administrative Guide and Technical Bulletins (MNR, 2011) and the Canadian Dam Safety Guidelines (2013). This includes the completion of a Dam Safety Review, which contains a dam break analysis and flood inundation maps. It is important to note that although the greatest impact associated with a dam failure would be during a rain event; the greatest risk associated with a dam failure often is a “sunny day failure”, when a structural failure of the dam occurs outside of a major storm event. Each
dam is required to have an Emergency Preparedness Plan (EPP) which is shared with the City of Toronto.

1.2.6. Effects
Floods are dangerous, life-threatening, and destructive. Rapidly rising water can reach heights of 5 metres or more. Advanced warning that flooding may occur is not always possible. In addition to causing loss of life and property, floods can also have complex economic, social, and political impacts. Some of them result from the uneven distribution of risk of losses between public and private interests.

The floods experienced in the past have heightened the awareness of the destruction that flooding will impose upon society and the environment. They have also made us keenly aware that extreme events will continue to occur. Furthermore, structural modifications to the river environment and flood proofing of flood prone areas are not always viable solutions. The City of Toronto must adapt to threat of potential flooding as there is little opportunity to avoid flood prone areas such as the Don River Valley. As a result, there is an ever increasing need to educate the public on flood-related hazards. As such, the TRCA has initiated a public outreach campaign to inform people of the risks related to flooding and to provide guidance on how to remain safe during a flood event.

1.2.7. Territory at Risk
The areas that are susceptible to riverine flooding are documented and routinely updated by the TRCA through their Flood Protection and Remedial Capital Works Strategy. The TRCA maintains a database of each flood vulnerable building and road (i.e. areas within the floodplain). In Toronto, over 2,400 flood susceptible structures and 500 roads documented, which equates to approximately 14,000 people who live and/or work within the floodplain. Most notable areas for potential flooding are clustered in the Upper Humber, Upper and Lower Don and the Upper Highland watersheds, refer to map in Appendix A - TRCA's Flood Vulnerable Areas. These areas at risk do not include areas at risk of urban flooding, which have not been formally documented by the City of Toronto to date.

1.2.8. Predictability
The Surface Water Monitoring Centre of the Ministry of Natural Resources provides continual weather monitoring and forecasting (primarily focusing on northern Ontario) which is also made available to the TRCA. Environment Canada issues weather forecasts and warnings for the GTA. The TRCA operates a flood forecasting and warning system with Flood Duty Officers on call 24 hours per day, 365 days per year. They utilize Environment Canada weather forecasts and warnings, along with additional meteorological sources and translate precipitation forecasts into
predicted flood potential within the GTA. Based this analysis, TRCA will issue Flood Messages to provide advanced notice to municipalities and the public when flooding is anticipated. TRCA has developed a radar based forecasting system that will allow for “now-casting” which has the potential to predict flood areas with a one to two hour lead time in specific locations.

1.2.9 Real-time Flood Forecasting and Warning
The TRCA’s flood monitoring gauge network spans the GTA, continually monitoring in-stream water levels at TRCA dams and river stations. Real time stream flow, water level, and precipitation information is available. The Lower Don River, where we experience flooding of the Bayview Avenue Extension and the Don Valley Parkway, is well monitored for signs of flooding using a real-time camera and 2 gauges (Don at Todmorden and Dundas). This information is readily available at www.trcagauging.ca.

2.0 Policies
- Procedures in this document will be implemented as outlined in the City of Toronto Emergency Plan and associated Emergency Support Functions (ESFs).
- Procedures in this document may be implemented under the following conditions, at the direction of the Office of Emergency Management:
  - Severe Weather watches or warnings issued by Environment Canada that could bring flooding and/or Flood Watches/Flood Warnings issued by the TRCA that anticipate flooding.
  - When reports of infrastructure failure such as sewers and dams that are likely to cause flooding are received;
  - During a flooding incident;
  - As directed by the Director, OEM.

3.0 Situation and Assumptions

3.1. Considerations
- All parts of the City of Toronto can be affected by flooding.
- There may be little or no advanced warning that flooding is imminent.
- Flooding is most likely to occur in areas that have historically experienced frequent flooding such as the Don River Valley, eastern beaches (lakefront/shoreline). See map of Flood Vulnerable Areas (Riverine), Appendix 1.

3.2. Planning Assumptions
- This plan assumes a hazardous flooding event has occurred or is occurring.
- Information pertaining to weather changes or systems that could result in flooding will continue to be available.
- Local resources may be rendered ineffective or severely compromised as the result of a flood.
• Public utilities and private infrastructure (such as power, water, sewer, natural gas networks, and phone lines) may be damaged and unusable during a flood.
• Roads, bridges, underpasses, subway stations and highways may become impassible during and following a flood event.
• Large numbers of flood evacuees requiring emergency human services are possible.
• Flood-related hazmat spills are common and pose an imminent threat to public safety.
• Flooding may impact the ability to treat and/or supply water meeting drinking water quality standards, as a result supply shortages and water quality advisories may be experienced.
• Stormwater and/or sewer system breaches and backups result in environmental and public health hazards.
• Flooding may impact the ability to effectively and fully treat wastewater and may result in wastewater treatment plant partial or full bypass incidents to receiving waters.
• Erosion in river valleys may threaten infrastructure and private property.
• Debris removal will be required to facilitate response and recovery efforts.
• Recovery of pets and livestock may be required (either living or deceased) to ensure both public and animal health.
• Public safety resources (including personnel) may suffer damage, injury or death causing a shortage of resources to assist with response and recovery efforts.
• Health care facilities may be damaged, potentially limiting the number of hospital beds and supplies that are available immediately following a severe flood.
• The number of health care professionals available may also be limited in the aftermath of a flood because some professionals may be isolated from their work places, as well as among any dead or injured.
• The first few hours following a flood are critical in saving the lives of people trapped in vehicles, trees, atop structures, etc. Therefore, the use of local resources during the initial response period will be essential until Provincial and/or Federal assistance is available.
• It may be several hours before personnel and equipment can be mobilized and initial teams deployed to affected areas. Therefore, municipal and local resources will be relied upon heavily in the period immediately following the flood.
• Following a flood, the affected area may be isolated from surrounding areas. Therefore, planning and coordination among communities in the affected area is essential for effective emergency response.
• Flooding may impact all forms of transportation. Civilians may be stranded at locations they were at when the flooding occurred. Emergency personnel will be overwhelmed with calls and response times will increase if a response is possible at all.
• Not all staff will be able to report for duty during off time periods resulting in resource shortages.

4.0 Concept of Operations
• In accordance with the City of Toronto Emergency Plan, the Emergency Operations Centre (EOC) may be activated.
• When activated, the EOC will have the lead in coordinating resources requested from city divisions and local agencies involved in responding to the emergency in progress.
• Emergency responsibilities assigned to city divisions for power disruption response parallel those assigned for other disaster operations. Participating city divisions will operate under Incident Management System structure to exercise command and control during incident operations.
• Toronto Office of Emergency Management will have the lead on coordination of resources requested from city divisions and local agencies involved in responding to the emergency in progress.
• Requested equipment, materials, supplies and personnel will be secured through City of Toronto resources and/or mutual aid agreements, or purchasing.
• Supporting agencies will respond to the EOC as required to provide response and recovery resources to local governments.
• Emergency operations will begin with the occurrence of a damaging flood and continue until no longer required. Continuance must include all recovery operations including cleanup and restoration of essential services.
• Operations and missions required as a result of a flood will be carried out during the response and recovery phases.

4.1. Response Phase
• The Response Phase occurs prior to or from the onset of the flood and lasts until lifeline systems are at least partially restored. During this phase, functions which are critical to lifesaving, protection of the populace, meeting basic human needs, securing critical infrastructure, and safeguarding municipal assets are performed.

4.2. Recovery Phase
• There are usually no clear distinctions between when the Response Phase ends and the Recovery Phase begins. There is typically a time period after the flood in which both phases are in effect simultaneously. The Recovery Phase begins a few days after the flood and can last two years or longer (under severe conditions).
• Long-term recovery includes restoration of affected areas to their pre-flood condition. Includes: federal, provincial, municipal assistance and potential mitigation projects.
5.0 Roles and Responsibilities

Lead Agencies

5.1. Toronto Region and Conservation Authority (TRCA)

- Monitor watershed and weather conditions and operate a flood forecasting system in order to provide warning of anticipated or actual flood conditions.
- Issue Watershed Conditions Statements (Water Safety or Flood Outlook), Flood Watches and Flood Warnings to all key contacts within the jurisdiction, including upper and lower tier municipalities, emergency services, school boards, weather network, MNR, CNR, and media outlets (via email and text message).
- Notify appropriate City of Toronto divisions, including the OEM, Toronto Police Service, Fire, Toronto Paramedic Service, Water, Parks, Transportation, Forestry and Recreation, Strategic Communications and 311 (information to be further distributed by city divisions to other applicable City Divisions).
- Operate Conservation Authority flood control structures (dams) to reduce the effects of flooding.
- Maintain communications with key City of Toronto staff and the Surface Water Monitoring Centre of the Ministry of Natural Resources during a flood.
- Attend the Office of Emergency Management, Emergency Operations Centre if requested.
- Operate as outlined in the TRCA Flood Contingency Plan (January 2014) which provides general information on the TRCA Flood Forecasting and Warning System, as well as specific information and contacts for municipalities within the TRCA’s jurisdiction.

5.2. Toronto Office of Emergency Management

- Activation and setup of the EOC during a large scale flooding incident, in accordance with the City’s Emergency Operations Plan (EOP);
- Determine the nature and scope of the disaster/emergency and provide ongoing assessment of identifiable resources needed;
- Establish and maintain contact with TRCA, EMO, city divisions, support and adjunct agencies as appropriate;
- Establish and maintain contact with GTA emergency managers and/or other local officials;
- Coordinate an integrated, citywide effort to provide assistance to the affected area(s);
- Provide situation reports to the DCM, Mayor and other municipal officials;
- Present coordinated and accurate information to the public via the OEMs Public Information Officer (PIO);
- Coordinating the acquisition and distribution of resources to support response.
• Coordinate with the Federal, Provincial agencies regarding supplemental
disaster assistance necessary to preserve life and property, and on
recovery assistance.
• Emergency Social Services (ESS)
  - Assess the situation and determine the level of response required.
  - Work with other supporting divisions, as outlined in the Emergency
Support Function (ESF) for Emergency Social Services.

Supporting Agencies

5.3. Solid Waste Management Services
• Participates in recovery phase as outlined in the ESF for Debris
  Management.

5.4. Strategic Communications
  Goal:
• To ensure residents and stakeholders are kept informed of the
developments and the impacts of the situation, in a timely manner that is
understood by all, without causing panic.

Objectives:
• In consultation with the lead and supporting agencies, provide context for
the community, the public, stakeholders and Members of Council so all
parties understand what we are doing, why and what it means for
residents and stakeholders.
• Explain any health concerns in a timely manner that is easily understood,
and does not cause panic.
• Ensure that affected residents are well-informed and hear information from
the City first, through a variety of appropriate and available communication
vehicles and tools
• Create separate communications for the public at large, those residents
who are directly affected, and Members of Council, as needed.
• Provide regular media updates, as needed.
• Control when and how information is passed along
• Provide residents, stakeholders, Members of Council and media with
ongoing, timely updates and consistent messaging for the duration of the
flood event.

5.5. Toronto Fire Services
• Toronto Fire Services, under the terms of this guideline, will work in
coordination with other supporting agencies by providing high quality, safe,
efficient, effective and caring emergency response services.
• Respond as required to protect life, property and the environment from the
effects of fires, illness, accidents, natural disasters, and all other
hazards.
5.6. **Toronto Paramedic Service**

Toronto Paramedic Service, under the terms of this guideline, is recognized to have the responsibility for coordinating and providing pre-hospital emergency medical care for team members, within the limitations under which emergency medical responders can perform these functions. Toronto Paramedic Service would also support community members through the provision of community medicine program staff to support ongoing medical issues of the public, as necessary.

Toronto Paramedic Service will assume responsibility for:
- Staffing the appropriate Team Members as instructed by the lead agency / incident commander.
- Providing on-scene, pre-hospital emergency medical care for team members and community support for ongoing medical issues, as necessary.

5.7. **Toronto Parks, Forestry and Recreation**

- Provides resources as outlined in the ESF for Emergency Social Services.
- Participates in recovery phase as outlined in the ESF for Debris Management.

5.8. **Toronto Police Service**

Toronto Police Service, under the terms of this guideline, is recognized to have the responsibility for coordinating and providing incident command on site, as prescribed below:
- Provide traffic duty to direct traffic away from or around specific disaster areas.
- Provide security at the site during the emergency event - until immediate danger has subsided and city divisions are able to assume site management responsibilities.
- Coordinate response procedures with the other emergency services.
- Send a Traffic Services Unit liaison to 703 Don Mills Road, Traffic Management Centre.

5.9. **Toronto Public Health**

- Provide inspection activities at affected commercial food storage and/preparation facilities to ensure that potentially contaminated foodstuffs are discarded.
- Work with other divisions and agencies to provide health protection advice during the restoration of homes, businesses and the environment.
- Provides resources as outlined in the ESF for Emergency Social Services.

5.10. **Toronto Water**

- Provide resources as outlined in the ESF for Transportation and assist Solid Waste with Debris Management. Toronto Water will also be assisting...
with restoration of any road crossings/culverts that may have been washed out during a flooding event.

- Water and Wastewater facilities may experience flooding, or at a minimum bypass situations to the nearest receiving waters. Toronto Water will assess the damage and work to restore first basic and then normal operations.
- The design capacity for Toronto Water infrastructure to collect and store stormwater may become overwhelmed resulting in by-passing of sewage treatment plants, backing up and surcharging of storm and combined sanitary sewers, and basement flooding. TW will provide resources to respond to these events.
- Toronto Water will deploy any staff as required to inspect water/wastewater system critical infrastructure and assess for damages, assist operation and maintenance personnel in response and recovery operations.
- Erosion, debris and surcharging could lead to blockages, collapse and subsidence of underground infrastructure which may result in the formation of sink holes. TW will provide resources to respond to such events.
- Flooding may result in interruption of other critical services such as power and communications and transportation. TW will rely on redundancy, backup generation where available, system storage and manual operations to cope in interruptions of critical services.

5.11. Transportation Services

- Provide resources as outlined in the ESF for Transportation and assist Solid Waste with Debris Management.
- Address all low lying roadways to ensure drainage systems (Catch basins) are free and clear from debris.
- Arrange for Roadway closures (with police assistance) where water levels pose risk to vehicular traffic (i.e. South Don Valley Parkway, Bayview / Bridge)
- Circulate notifications, by forwarding email, of all Watershed Conditions Statements (water safety or flood outlook), Flood Watch or Flood Warnings to the Mayor’s office, City Councillors and Transportation District Management staff.
- Generate road closure and reopening notices and circulate via email to members that include city staff, affected internal and external ABC’s
## Revisions

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<td>Eugene Kelly</td>
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## Approvals

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<td>November 2, 2014</td>
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APPENDIX B – TRCA Flood Management Infrastructure within the City of Toronto

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