

## **FLOOD MITIGATION MEASURES ASSESSMENT REPORT AND 2016 FLOOD RESILIENCY UPDATE**

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### **EXECUTIVE SUMMARY**

This report provides the 2016 update for the Flood Mitigation and Resiliency program, based on the Expert Management Panel on River Flood Mitigation's 27 recommendations. As of 2016 December, 11 of the Expert Management Panel recommendations are completed and the remaining recommendations are in progress.

This report also summarizes Administration's Flood Mitigation Measures Assessment project (the Assessment). The Assessment evaluated potential watershed, community, and property level flood mitigation measures for Calgary. It included a sustainability analysis of mitigation measures using triple bottom line criteria and comprehensive public engagement.

With commitments in place for Elbow River mitigation, a combination of watershed and community level structural mitigation should be pursued to provide equitable protection on the Bow River. Additional actions on property level mitigation should be pursued, and new policy-based measures should be explored further to complement a flexible and adaptable approach to manage Calgary's flood risk.

### **ADMINISTRATION RECOMMENDATIONS**

That the SPC on Utilities and Corporate Services recommends that Council direct Administration to:

1. Work with Council to advocate for an upstream reservoir and continuation of the Provincial-TransAlta operational agreement for the Bow River;
2. Continue supporting the development of the Springbank Off-stream Reservoir on the Elbow River by the Province;
3. Develop an implementation and funding plan for community level flood mitigation;
4. Explore the development of a property level mitigation program; and
5. In alignment with Provincial mapping and policy updates, conduct further investigation on land use policy and building regulations for areas prone to flooding.

### **PREVIOUS COUNCIL DIRECTION / POLICY**

On 2014 December 02, Council approved Administration's Implementation Plan for River Flood Mitigation and Establishing Corporate Resiliency (PFC 2014-0777).

On 2015 May 27, The SPC on Utilities and Corporate Services received the Flood Resiliency and Mitigation 2014 Annual Report (UCS2015-0082) for information.

On 2016 April 27 the SPC on Utilities and Corporate Services received the Flood Resiliency and Mitigation 2015 Update (UCS2015-0168) for information.

### **BACKGROUND**

In 2014 June, the Expert Management Panel on River Flood Mitigation delivered 27 recommendations to Council aimed at achieving a safer, more flood resilient Calgary. The 2016 Flood Resiliency and Mitigation Update shows progress made on the 27 recommendations (Attachment 1). In 2016, The City focused on the Panel's recommendation to evaluate the social, economic, and environmental impacts of flood mitigation options through the Flood

## FLOOD MITIGATION MEASURES ASSESSMENT REPORT AND 2016 FLOOD RESILIENCY UPDATE

---

Mitigation Measures Assessment (Attachment 2), as well as the remaining related recommendations. The Assessment examined watershed, community and property level options for both the Bow and Elbow rivers to reduce Calgary's flood risk.

In 2015 October, the Province confirmed its intention to proceed with design and environmental assessment of the Springbank Off-stream Reservoir for flood mitigation on the Elbow River. The Province also initiated the Bow River Working Group and Advisory Committee with The City of Calgary and other stakeholders to assess structural storage and operations refinement options in existing TransAlta facilities for flood and drought mitigation on the Bow River. The Province entered a five-year agreement with TransAlta to manage its reservoirs in case of flooding, and also committed \$150 million to The City to deliver community level flood mitigation infrastructure through the Alberta Community Resilience Program (ACRP) over ten years.

### INVESTIGATION: ALTERNATIVES AND ANALYSIS

#### *Flood Mitigation Measures Assessment*

The first stage of the Assessment included an update to the Provincial Flood Damage Assessment Study. The Assessment determined that without any mitigation in place, the annual flood damage costs in Calgary would average \$170M per year. Since 2013, investments in flood mitigation, such as local barriers and the installation of higher gates at the Glenmore Reservoir (once completed), will reduce the average damages by 30 per cent, to approximately \$115M per year. The Assessment included a technical study, a sustainability analysis and community engagement.

The Assessment examined:

- Watershed level structural flood mitigation measures – operational management and new reservoirs upstream of Calgary on the Bow and Elbow rivers
- Community level structural mitigation – operations and barriers located within Calgary
- Property level and policy-based mitigation measures.

The Assessment determined that a combination of upstream mitigation, barriers, and property level measures is the best approach to reduce Calgary's flood risk. New upstream reservoirs in the Elbow and Bow Watersheds have a positive benefit-cost ratio, reduce community disruption, and provide climate adaptability, including the potential for water storage for communities in the Bow Watershed.

Administration's recommended direction was developed considering The City's principles and priorities regarding building flood resiliency for Calgary: public safety, sustainable watershed management, cost-beneficial, adaptability/flexibility, equitable protection on both rivers, as well as community receptivity and shared responsibility.

#### *Elbow River mitigation*

The Springbank Off-stream Reservoir, when it is completed and operated in tandem with the Glenmore gates, will provide flood mitigation protection on the Elbow River for an event similar to 2013. As part of The City's ongoing work, two gravel bars located in the community of

## FLOOD MITIGATION MEASURES ASSESSMENT REPORT AND 2016 FLOOD RESILIENCY UPDATE

---

Mission have been identified that, if removed, will ensure that the Springbank Off-stream reservoir and Glenmore gates continue to provide the expected level of mitigation on the Elbow River. The City will continue to provide technical support and advocacy for the Springbank Off-stream Reservoir.

### ***Bow River mitigation***

#### Watershed level mitigation – upstream on the Bow River

The Assessment concluded that a new reservoir on the Bow River upstream of Calgary should be pursued, and will require current TransAlta operations and complementary barriers in Calgary to provide mitigation for events similar to 2013 on the Bow River. Complementary barriers in key locations in Calgary will reduce flood damage risk for more frequent smaller flood events, and will enhance the effectiveness and operational flexibility of a new reservoir on the Bow River. A continuation of the Provincial agreement with TransAlta is also critical to flood mitigation on the Bow River.

#### Community level mitigation – Bow River

Low-height barriers to complement a proposed Bow River reservoir are recommended in the communities of Bowness, Downtown, Sunnyside, and Pearce Estates-Inglewood. These barriers are in areas with high risk of flood damage and/or that flood the most frequently. Barriers can be implemented in a staged manner. While most of the barriers will be located on City-owned land, negotiation of easements with approximately 90 or more privately owned properties will be required in Bowness. Public engagement will be undertaken to gather input on the design of the barriers and how to minimize community disruption. In situations where negotiating easements on private property is required, construction timelines for barriers will be longer. Other projects such as gravel bar removals will provide further flood mitigation in conjunction with the low-height barriers, as will the separation of the Hillhurst-Sunnyside stormwater system from communities at a higher elevation (the upper plateau). The communities of Sunnyside and Hillhurst currently experience river flood risk due to the existing stormwater system.

### ***Property level and policy based mitigation for the Elbow and Bow rivers***

Property level measures to help protect public safety and reduce property damage are ongoing. The Assessment recommended that The City pursue a new property level mitigation program for Calgarians. The feasibility of an incentive program for residential sump pumps and backflow valves is being explored to complement an education program for property owners.

Land use policy and best practices for building in the floodplain should be designed to complement the structural mitigation that protects a community. As local policies are dependent on Provincial decisions, further refinements must also align with future provincial floodplain policy. Land use policies for further analysis include, but are not limited to:

- Restricting certain sensitive uses within the flood fringe (e.g. daycares, assisted living facilities, protective and emergency services, basement secondary suites etc.).
- Strategic acquisition of some buildings in the floodway and/or flood fringe to allow river water to move unimpeded.

## **FLOOD MITIGATION MEASURES ASSESSMENT REPORT AND 2016 FLOOD RESILIENCY UPDATE**

---

- Examining the way basements in high risk areas are developed, including exploring the use of flood-resistant materials and elevating mechanical/electrical systems.
- Exploring appropriate development techniques in Greenfield flood fringe areas.

### **Stakeholder Engagement, Research and Communication**

Protecting communities and building flood resiliency is a shared responsibility of all orders of government as well as Calgarians. The City has developed strong relationships with the Province, TransAlta, businesses, community leaders, and citizens to make Calgary more resilient to future flooding. Administration meets regularly with the Province to share information, provide technical input to the Springbank Off-Stream Reservoir process, co-chair the Bow River Advisory Committee and participate on the Bow River Working Group.

The City undertook public engagement throughout 2016 to gather input on the potential flood mitigation measures and to inform Administration's recommendations. Engagement included a Community Advisory Group, a survey, community workshops, open houses and online engagement. Details on engagement activities are in Attachment 2. The City also reconvened with the Expert Management Panel on River Flood Mitigation to gather their perspectives on how the recommended approach aligned with their original vision.

### **Strategic Alignment**

Moving forward on flood mitigation and resiliency strongly supports and contributes to a number of Strategic Action areas in Council's Priorities for 2015-2018:

- A city of inspiring neighbourhoods (N2 - Build resiliency to flooding, N3 - Enhance The City's capacity and resiliency to prepare for and respond to pandemics, natural disasters and emergency situations).
- A healthy and green city (H3 - Manage the interrelationships between flood protection, water quality and quantity, and land use, H4 - Work with our regional partners and the Government of Alberta on an integrated approach to the watershed).

### **Social, Environmental, Economic (External)**

Administration conducted a comprehensive sustainability analysis based on The City's Triple Bottom Line Policy, Sustainability Direction and watershed protection goals. Input from the Community Advisory Group and citizens was considered alongside subject matter expertise to assess potential social, environmental, and economic impacts, and the ease of implementing the various flood mitigation measures. Details on the process are in Attachment 2.

### **Financial Capacity**

#### **Current and Future Operating Budget:**

The City is currently examining its existing operational resources and the ability to deliver projects identified. Availability of external capital funding may impact the prioritization of projects and could require reallocation of existing operational resources. Further details will be included as part of a detailed funding and implementation plan.

## FLOOD MITIGATION MEASURES ASSESSMENT REPORT AND 2016 FLOOD RESILIENCY UPDATE

---

### **Current and Future Capital Budget:**

The estimated cost for the complementary barrier package is between \$30M to \$75M. If the required level of protection from barriers is higher, the cost estimate and list of barriers will increase. It is estimated that the Upper Plateau separation project would cost an estimated additional \$37M to complete. Gravel bar removals are an estimated \$15M to \$20M and are not eligible for ACRP funding.

The City has identified funding opportunities from the Provincial government through ACRP. \$105M of the Province's \$150M allocation through the ACRP remains for Calgary's flood mitigation work, and is allocated at \$15M per year. Funds are available until 2024 and must be allocated annually by The City or will become unavailable.

The Federal Government has previously indicated support for flood mitigation work in Calgary, though details about funding opportunities are still pending. Administration continues to monitor funding opportunities from the Federal government to support flood resilience and mitigation work. Any funding commitments from the Province or the Federal Government will require up to a 60 per cent cost share by The City to be approved. The City's estimated cost share for ACRP eligible projects, assuming no federal funding is available, is approximately \$30M and could be available through the Reserve for Future Capital.

### **Risk Assessment**

Another major flood in Calgary is likely to occur, and would cause significant disruption to critical systems and services, Calgarians, businesses, and cause damage to public and private property. Another flood also poses business continuity, environmental, and health and safety risks to The City's Corporate operations. The approach to flood mitigation described in this report has been designed to mitigate the risks associated with a major flood.

A number of risks also remain for implementing Calgary's flood mitigation. Key risks include:

- A new reservoir on the Bow River may not be built, despite the best efforts of The City, leaving significant flood risk for Calgary. Provincial commitment to a new reservoir is uncertain and details including location, costs, and timelines have been considered but also remain uncertain. The City continues to support this work through the Bow River Working Group process.
- There is a possibility that the Springbank Off-Stream Reservoir may not be built, leaving significant flood risk on the Elbow River for Calgary. The Province remains committed to this project, despite the objection of some groups and The City continues to support the development of the reservoir.
- Although The City is increasing the heights of the Glenmore dam gates on the Elbow River and building flood barriers on the Bow River, a significant flood risk remains for Calgary until structural mitigation is built on both rivers.
- The Province and TransAlta may not continue their agreement for managing the Ghost Reservoir for flood control after the agreement ends in 2021. This agreement provides a significant contribution to flood risk reduction on the Bow River.
- Barriers may disrupt communities, and require land access negotiation in some cases.

## **FLOOD MITIGATION MEASURES ASSESSMENT REPORT AND 2016 FLOOD RESILIENCY UPDATE**

---

- Provincial Flood Hazard Area mapping has not yet been released, creating uncertainty over how future Provincial policy could impact The City's potential policies. There is a risk that The City will have to review policies again once the Provincial maps and policies are released.

Administration is actively working with the Province and stakeholders to mitigate all of these risks.

### **REASON FOR RECOMMENDATION:**

The proposed approach uses a combination of watershed, community, and property level solutions to create a flexible and adaptable flood mitigation program. The recommended direction was developed considering The City's principles and priorities regarding flood resiliency for Calgary: public safety, sustainable watershed management, cost-beneficial investments, adaptability/flexibility, equitable protection on both rivers, as well as community receptivity and shared responsibility. While The City of Calgary can implement some mitigation measures within its jurisdiction, it is essential that timely upstream watershed level mitigation is in place to provide a higher level of protection needed for Calgary.

### **ATTACHMENTS**

1. 2016 Flood Resiliency and Mitigation Update
2. Flood Mitigation Measures Assessment Report