Calgary

Bowness flood barrier: Feasibility study

Community information booklet

Following the 2013 flood, building community resilience and mitigating the risk from flooding has been one of our top priorities. In other communities, such as Inglewood, flood barriers have proven to be an effective way to help reduce the risk from overland flooding.

After conducting studies and listening to the community, this booklet explores this option for Bowness in more detail. As part of our ongoing conversation with the community, we're sharing this with you to collect your initial feedback through virtual conversations and/or an online survey.

Your feedback is vital. No decisions have been made yet, so your voice will help shape our recommendation to Council in 2021 on the future direction of this project.

Learn more. Share your feedback.

1. **Read this booklet for an overview of the proposed flood barrier design**
   Learn how the proposed barrier would help reduce the risk of overland flooding in Bowness and how the technical studies and community feedback influenced the design.

2. **Participate in an upcoming virtual Q&A session**
   This is your chance to connect with the project team to ask questions about the studies and learn more about the proposed flood barrier.

   Virtual information sessions are taking place in January. For more details, a complete schedule and to register, visit **engage.calgary.ca/bowness-flood-barrier-project**.

   Separate one-on-one virtual meetings with riverfront property owners will also be available to discuss the flood barrier design. Details are available in the riverfront property owner booklets.

3. **Provide your input**
   Visit **engage.calgary.ca/bowness-flood-barrier-project** to share your perspective on how the proposed flood barrier would impact your community. Don't have online access? Please call **403-509-0253** to discuss alternative ways to share your feedback.

What's inside

Remembering the 2013 flood

When the waters, suddenly and with little warning, spilled over the banks of the Bow and Elbow rivers in June 2013, the flood sadly claimed the life of one Calgarian and forced thousands to flee their homes. Bowness was one of the worst hit communities in the city.

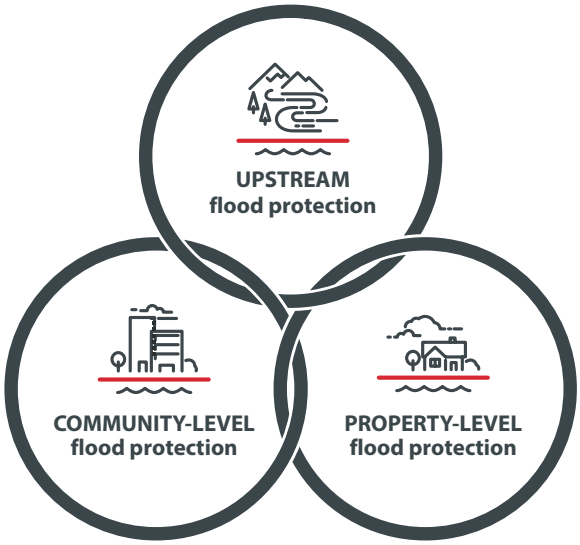
Many residents faced significant property damage or the permanent loss of their home, and long-term impacts to their mental health. In the years since, many Bownesians have shared how they continue to experience stress and anxiety every spring as the snowpack in the mountains begins to melt and heavy rainfalls hit Calgary.

No one wants a flood to happen in Bowness again. We are working to explore and invest in measures that will help keep your community safe, vibrant and more resilient, so that if another flood happens we've taken steps that will help protect the community and people who live there.

The 2013 flood remains one of Canada's costliest disasters with an estimated $5 billion in damages across Alberta and an estimated $400 million to City of Calgary infrastructure alone.

A plan for improving flood resilience in Bowness

The City's Flood Resilience Plan uses a three-layered approach. Each element works together and builds upon one another to manage our flood risk in Calgary and protect vulnerable areas from a future 2013-level flood. The main elements of the plan include:



UPSTREAM flood protection

Modified operations at TransAlta's Ghost Reservoir: Keeping this reservoir low during flood season also helps control the flow of water and significantly reduces the risk of flood damage.

Status: An agreement between the Province and TransAlta runs through 2021 with plans to extend.

New upstream reservoir on the Bow River: This Government of Alberta project would capture water from large floods and reduce the river flow through Calgary to the target of 1,200 m^3/s during a 2013-level flood event. It would also help manage the risk of drought.

Status: The Province is examining three storage options for a reservoir on the Bow River. It is expected to be 12+ years before this reservoir is operational.

For details on the project, visit **alberta.ca/bow-basin-water-management-options**

COMMUNITY-LEVEL flood protection

Permanent flood barrier: The foothills west of Calgary make it unlikely that a large enough reservoir could be built to reduce the river flow of a 2013-level flood enough to avoid overland flooding in Bowness. The City is studying whether a permanent flood barrier would help mitigate and reduce the risk of overland flood water from damaging the community.

Until a new upstream reservoir is built on the Bow River, a permanent flood barrier could also work with the TransAlta modified operations to help protect Bowness from smaller floods.

Status: A feasibility study is in progress. This phase will continue into early 2021 and will conclude with a recommendation to Council on the next steps.

PROPERTY-LEVEL flood protection

Updates to building regulations, flood proofing, limiting types of development in flood prone areas and personal flood preparedness are an important part of making communities flood resilient.

These measures can effectively reduce flood risk in existing communities over time and limit new flood risk caused by growth and development.

An example of this is the recommendation of main floor elevations during the development approval process to ensure new buildings are using the most up-to-date flood risk information.

Status: Over the next two years, The City will be exploring potential city-wide property-level flood mitigation options and engaging with communities on these elements.

Exploring the feasibility of a flood barrier

To understand whether an overland flood barrier is a feasible part of the solution for Bowness, we've worked with community members to expand our knowledge of the area.

Since 2018, we've conducted several detailed groundwater, stormwater, river modelling and environmental studies to determine which alignments were technically feasible and to understand the implications of a flood barrier. Full study results are available at **calgary.ca/bownessbarrier**

Listening to the community

We are committed to listening and working extensively with the community to explore options. In addition to meeting individually with residents, we appreciate the input and guidance we've received from the Bowness Flood Mitigation Working Group, which is made up of representatives from various community groups and individuals in the area. They ensured the local context is reflected in study reports, provided us with local insights and have advised the engagement process and communications to ensure the interests of the community are considered in determining the best flood mitigation solution for Bowness.

Learn more about the Bowness Flood Mitigation working group at **bownessfloodmitigationworkinggroup.ca**

Since fall 2018

100+ **INDIVIDUAL MEETINGS** WITH RIVERFRONT PROPERTY OWNERS

200+ **DOOR KNOCKING VISITS**

22 **MEETINGS** WITH THE BOWNESS FLOOD MITIGATION WORKING GROUP

3 **OPEN HOUSES**

4 AND **POP-UP BOOTHS**

Bowness today

Like many other riverside communities, Bowness faces two main flooding challenges: overland and groundwater flooding. Approximately 160 to180 properties are at risk of overland flooding when the river is flowing at 1,230 m^3/s.

The results of river modelling studies illustrated in the map below show two key low-lying areas along the river in Bowness (labelled as Area #1 and Area #2) that are the source of overland flooding in the community. These are the areas where we need to prevent water from overflowing the riverbanks.

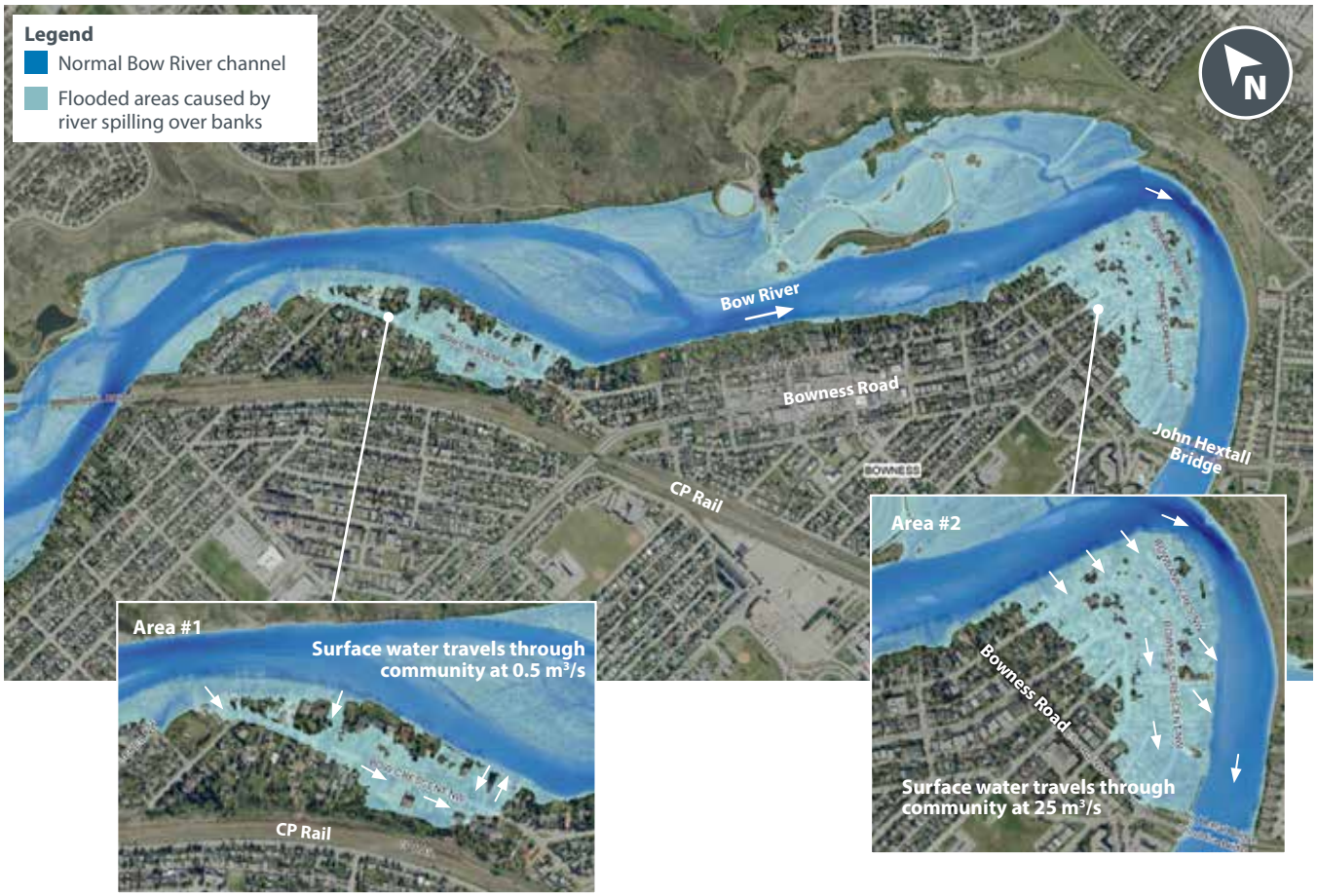
Area #1 (East of Bow Crescent to 67th Street): A few riverfront property elevations in this area are quite low. When the river is flowing at 690 – 800 m^3/s, the arrows show where the river begins to enter the community and how the waters spread down Bow Crescent flooding several homes before exiting back into the Bow River.

Area #2 (East of 60th Street ending at the Hextall Bridge): Most of the property elevations in this area are lower. When river flows reach levels of 830 m^3/s the water spreads more quickly through the community, impacting many homes, buildings and other infrastructure.

You will also notice that significant overland flooding takes place on the north side of the Bow River in Dale Hodges Park. This open space provides additional room for the river during floods, without compromising the safety of Calgarians or critical infrastructure.

River flooding in Bowness – Key low-lying areas

Flooding extents at 1,230 m^3/s

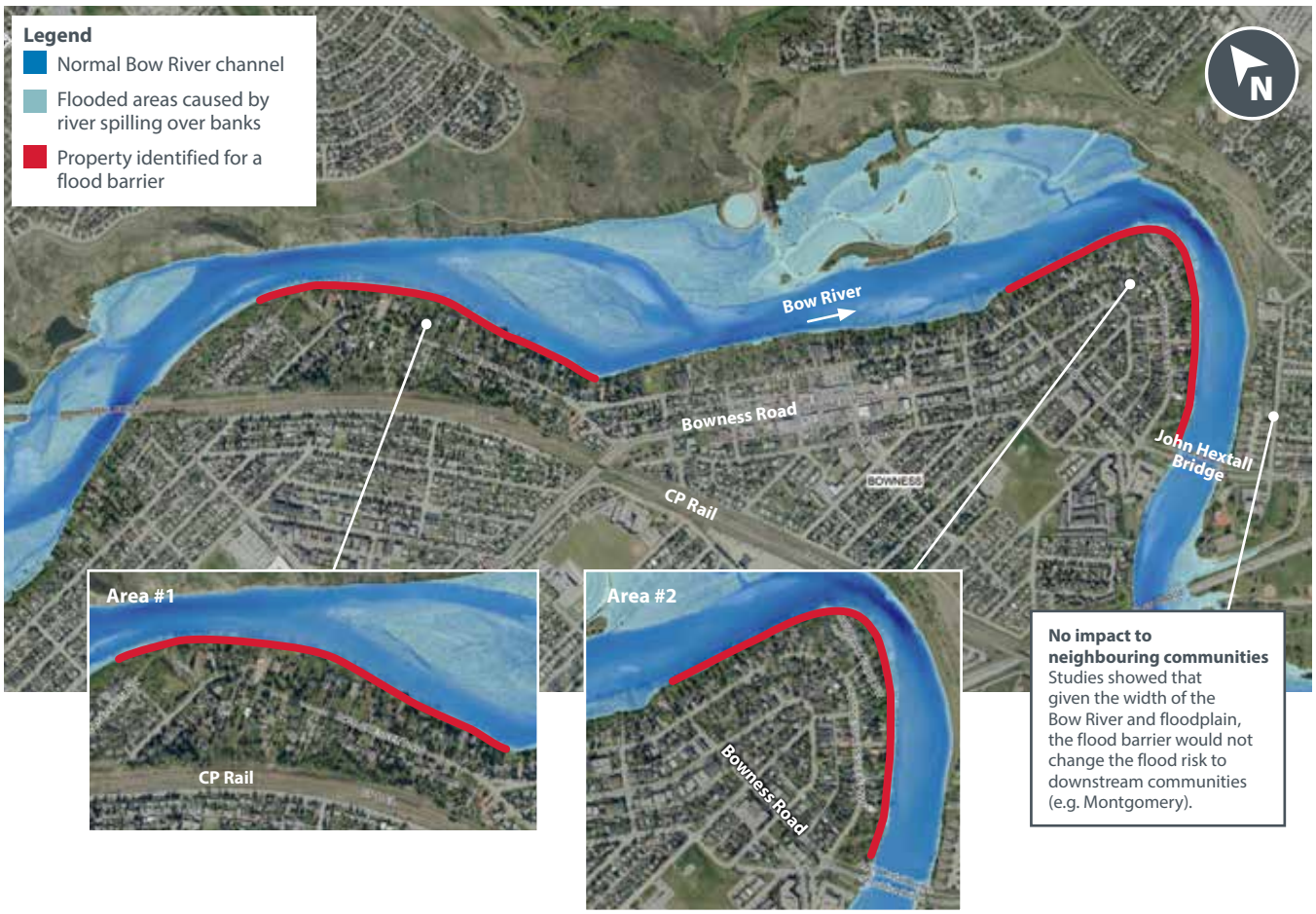


Bowness with the proposed riverfront flood barrier

Using the results of the river modeling studies, the red line illustrated in the map below shows the potential for a barrier alignment that targets the key low-lying areas. This alignment would help prevent flooding of both riverfront properties and the broader community. Since most of the barrier alignment is located on private property, negotiated easements with property owners would be required to proceed with construction.

Proposed flood barrier alignment

Note: The exact location of the riverbank flood barrier on individual properties is not shown as it relies on property-owner input.



1.9 km
TOTAL LENGTH of the flood barrier, divided over two sections

75
NUMBER OF RIVERFRONT PROPERTIES in Bowness identified for a flood barrier

The value of overland flood protection

The City believes a flood barrier is a worthwhile investment to help protect the safety and well-being of the residents who call Bowness home, and to help ensure the long-term vibrancy of the community.

- **Improves public safety** by delaying or avoiding the need for emergency evacuations during floods and better protecting evacuation routes.
- **Helps reduce the cost of flood damages.**
  - Overland flooding is a costly form of flooding. In addition to water damage, dirt and debris also flow overland, which can damage buildings and landscaping.
- **Protects public infrastructure** including roads and park spaces.
- **Helps reduce storm and sanitary backup** by keeping water off the street where it drains into the sewer systems and can overwhelm them.

Illustration of a grass berm flood barrier in Bowness

This artistic rendering depicts a grass berm. It shows how an average flood barrier (approximately one metre high) can be integrated into the landscape of the property.

Please note this diagram is an example of a more advanced stage of design and is for illustrative purposes only. For privacy considerations it does not depict a Bowness property.

60%
APPROXIMATE PERCENTAGE OF PROPERTIES that would require a barrier one metre high or less

$25-35 MILLION
Estimated cost of the flood barrier depending on barrier alignment and land costs

Design features

At this stage, the design is conceptual and is intended to be a starting point for discussion with the property owner. If this project continued to the next phase, we would continue to collaborate with the property owner to advance the design in a way that minimizes disturbances to their property and integrates into their backyard.

- The barrier may include a combination of flood walls, retaining walls and earth berms, depending on alignment and property owner preference. Aesthetics and materials would be considered further if the barrier were to proceed to the next phase of design.
- The barrier height ranges from 0.4 to 1.7 metres depending on the ground elevation and location on the property.
- The barrier design **does not**, and **will not**, incorporate any designs for public access or an access road to respect the privacy and security of riverfront property owners.

Illustration of a retaining wall flood barrier in Bowness

This artistic rendering depicts a retaining wall style barrier. It shows how an average flood barrier (approximately one metre high) can be integrated into the landscape of the property.

Please note this diagram is an example of a more advanced stage of design and is for illustrative purposes only. For privacy considerations it does not depict a Bowness property.

Groundwater in Bowness

Like other riverside communities in Calgary, Bowness faces a risk of basement flooding when there are changes in the groundwater table caused by heavy rainfall or higher river levels. Our studies revealed the groundwater conditions in Bowness are similar to downtown and Sunnyside where the groundwater table also fluctuates.

What can be done to help?

As with all riverside communities in Calgary, managing the risk of basement flooding can be best achieved through a combined approach – controlling the river flow through upstream reservoirs to keep groundwater levels low; community flood barriers to prevent community flooding; property-level flood protection to limit risk exposure.

Actions you can take at home

When river flows cannot be maintained below basement levels, or when the water table rises due to heavy rainfall, an effective way to reduce basement flood risk is taking the appropriate steps at home. This includes:

- Install a sump pump with a back-up power source.
- Install sanitary sewer backflow preventer valves.
- Ensure downspouts drain onto the ground at least two metres away from your home.
- Improve your lot grading so that it slopes away from the house foundation.
- Repair cracks in the basement foundation.
- Finish basements with easily washable materials, such as concrete floors and walls.
- Install water alarms in the basement to alert you if water is backing up.
- Avoid building living spaces below grade.

Understanding a flood barrier's impact on groundwater

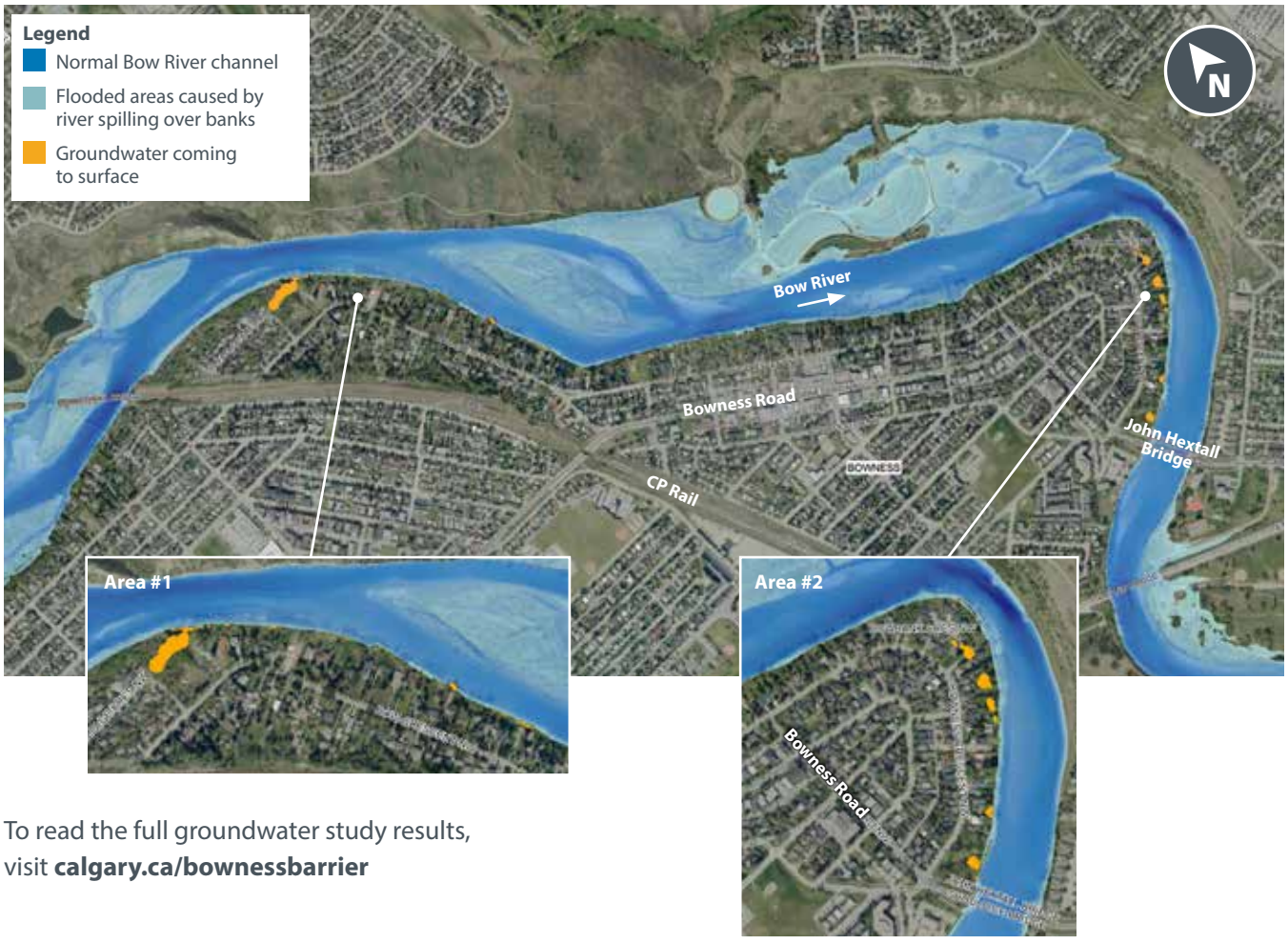
We follow a consistent design process for all flood mitigation projects for managing groundwater. We conduct studies to understand the existing groundwater conditions and determine how they would change if a flood barrier is constructed.

In Bowness, our studies showed two outcomes:

- **Slightly lower groundwater table.** Study results showed that removing overland flow typically resulted in lowering of the groundwater table, on average by 0.4 m.
- **Localized pockets of groundwater flooding to surface can be addressed by pumping wells.** Our studies showed that when the overland flow is held back by a barrier, during a flood we may still see a few localized pockets of groundwater coming to the surface in small areas. This is depicted in yellow in the map below.

To mitigate groundwater coming to surface in these areas, localized pumping wells are proposed to lower groundwater levels. The exact location of these pumping wells would be determined in consideration with the final barrier placement and would be addressed if the project proceeded to the next phase.

Groundwater coming to surface



To read the full groundwater study results, visit **calgary.ca/bownessbarrier**

Questions from the community

Over the past two years, we've been listening and noting your questions about a potential flood barrier. With studies complete and a proposed barrier design available, this section addresses some of these questions here. Further FAQ's are available at **engage.calgary.ca/bowness-flood-barrier-project**

What other alignments for a flood barrier were considered?
We listened to the community and explored the feasibility of an alternative barrier alignment on public property – along Bow Crescent. This option was not pursued further for this feasibility phase as it does not align with The City's Flood Resilience plan to reduce the flood risk for the entire community. It could also compromise their safety and may impact the emergency response delivered by The City.

What preventative measures may be necessary if the river overtops the barrier?
The flood barrier is designed to protect against river flows of 1,230 m^3/s. If an upstream reservoir (current TransAlta or future upstream reservoir) were not able to mitigate a larger flood event resulting in the barrier being overtopped, flood waters would be returned to the river through a combination of improvements to local lot drainage and pumping water trapped in other areas.

Are any improvements needed to the existing stormwater system in Bowness?
The ongoing stormwater study revealed that some modifications to the stormwater system in Bowness would be needed with a barrier in place. Additional outfall gates will be required to prevent the river from back-flooding into the community during floods. Some lots will require a change to their local drainage to ensure runoff does not build up on their property with the barrier in place. Lot-specific solutions would be explored further if the project proceeded to the next phase of design.

What construction impacts are expected?
If the project proceeded to future phases and was later approved by Council to move forward into construction, it would be completed in stages. Full construction of the entire barrier length is anticipated to be two to three years with construction on each property planned to be completed within four to six months. A more detailed construction and access plan would be developed during a subsequent design phase.

During construction, impacts may include:

- On-site construction activity, including construction crews, vehicles and heavy equipment accessing private properties and surrounding areas.
- An increase in noise throughout construction.
- Soil disturbance and dust emissions.
- Temporary utility shut-downs may be required.

How would trees be impacted with construction of a flood barrier?
Minimizing the impact on trees is an important consideration in design, but the loss of some trees would be unavoidable. The number of trees lost would be determined if the project proceeded to the next phase of design once an alignment was confirmed with the property owner.

At this point, using the feedback we gathered from property owners, we've tried to propose alignments that minimize the impact on existing trees as much as possible. The alignments aim to protect trees that have a special significance to property owners and select trees for removal that are at the end of life or otherwise unhealthy.

As part of our restoration of the natural environment we would work with homeowners to plant as many replacement trees as possible on the site.

What is the impact to the natural environment?
During this phase, the purpose of the environmental study was to get a baseline understanding of the area by building an inventory of what exists (e.g. amphibians, reptiles, birds, mammals, vegetation, rare plants and wetlands, soils, fish and fish habitats).

If the project were to proceed to the next phase, a full environmental impact assessment would be completed once an alignment was confirmed. This final assessment would provide information on potential impacts to existing habitat features, fish, wildlife and vegetation and how to mitigate those impacts during construction.

What alternatives exist if a flood barrier doesn't proceed?
If a flood barrier does not proceed, we are eliminating one of the fundamental building blocks of the plan that would help deliver a timely, effective solution for Bowness.

Bowness would need to rely more heavily on other longer-term elements of the plan to achieve flood resiliency, such as the upstream reservoir. As well, more private property-level solutions such as property-level floodproofing and changes to permissible development and land use may be necessary.

Here are some considerations to keep in mind:

- **Time:** A new upstream reservoir and property-level measures are both long range solutions. An upstream reservoir could take at least 12 years for design, consultation, regulatory approvals and construction. Changes to development/redevelopment regulations can take many decades to improve the overall flood resiliency of the whole community, as buildings in Bowness are redeveloped.
- **Lower level of flood protection:** Without a flood barrier in place, during a large flood, like what we experienced in 2013, a new upstream reservoir on the Bow River may need to release flows that would still cause overland flooding in Bowness. A flood barrier working hand in hand with an upstream reservoir would help reduce the likelihood of this happening.
- **Deployment of temporary response measures are not guaranteed:** Floods happen quickly and with little warning in Calgary. Constructing kilometres of temporary flood barriers in Bowness may not be achievable.

We want your feedback

Community engagement is open until February 28, 2021

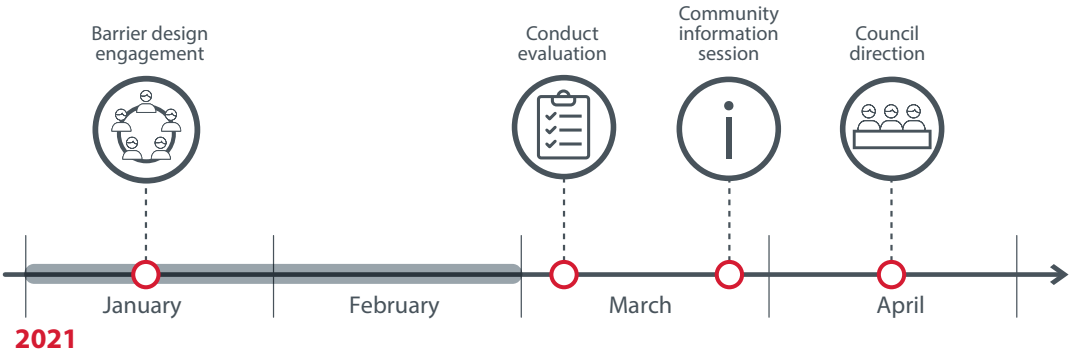
Go to **engage.calgary.ca/bowness-flood-barrier-project** to complete an online feedback survey.

The project team will complete an evaluation of the feasibility of the overland flood barrier using criteria that explores the economic, environmental and social impacts.

As part of the online evaluation we're asking you, the community, to help rank the importance of each social criteria and to comment on the benefits and concerns you have with a flood barrier. The full evaluation criteria and a summary of your feedback will be posted on the project's webpage.

Your feedback, along with an economic and environmental evaluation, will help determine the feasibility of an overland flood barrier and inform our recommendation to Council on the next steps.

Next steps



Phase 1 Feasibility Study

If the flood barrier is considered feasible, Administration will recommend proceeding to the next phase of design of the riverfront barrier. This next phase would include further dialogue with riverfront property owners to advance the design and understand potential land impacts. This would lead to more refined cost estimates that would be presented to Council for approval before proceeding to a construction phase.

If the flood barrier isn't feasible, we'll explore other strategies to mitigate the impacts of flooding in Bowness, which may include policy changes, such as future land use changes or building regulations for flood risk areas.

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Sign up for our e-newsletter at
calgary.ca/bownessbarrier

Email the project team

Send your questions to
bownessbarrier@calgary.ca

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