



Bowness Flood Barrier Project - Meeting Minutes

Location: Water Centre
 Date: December 11, 2018
 Time: 1:00 – 2:30 p.m.

Meeting Chair: Denise Nogueira
 Minutes Taken by: City of Calgary

In attendance: BRFM – Jean Woeller (JW), David Burton (DB), Hank Vrielink (HV), David Chalack (DC), Jason New (JN)

The City of Calgary – Denise Nogueira (DN), Vania Chivers (VC), Lauren Minuk (LM), Ralph Smith (RS), Frank Frigo (FF), Sandra Davis (SD), Gregory Kozhushner (GK)

Klohn Crippen Berger – Chuck Slack (CS)

Item #	Topic	Discussion/Summary	Decision/Assigned Action:
1.	Last Meeting/ Current Meeting Agenda	<ul style="list-style-type: none"> • Previous meeting: Meeting summary from the last meeting have not been finalized. City to review comments from BRFM and finalize. • The City therefore sent responses to the BRFM memo on November 26, 2018 so that BRFM could come back with questions from that. • BRFM - erosion answers have been received and will provide feedback. The one question that wasn't really answered about land that may erode as a result of the barrier. BRFM will be seeking confirmation from The City as to what warrantee and financial liability they will accept in development of this infrastructure. • BRFM would like to discuss land acquisition at a later date • For meeting summaries, action items should be identified with names attached to each action with target date for completion. 	
2.	Groundwater protection	<p>BRFM: Would like to better understand the objective and design criteria for the barrier with respect to groundwater, and how the sub-surface barrier will work with respect to groundwater. More specifically, BRFM would like to know the requirements or design specification that has been given to Klohn Crippen Berger with respect to the degree to which groundwater mitigation is included in the preliminary design.</p> <p>City is studying what depth of sub-surface core is required to reduce groundwater risk. There are three pieces to the intent of the barrier with respect to groundwater:</p> <ul style="list-style-type: none"> ○ 1. Structural stability of barrier – must be designed to prevent fine material in the soil from seeping out with groundwater flow and causing the barrier to become unstable (standard practice) ○ 2. Averting damage – the current studies will provide 	



an understanding of what groundwater damages may be averted and what depth of core is required. Likely cannot prevent all groundwater damages, but can reduce potential damages. Current studies will confirm.

- 3. The barrier keeps water off streets and yards, reducing infiltration that can increase groundwater and backup sanitary and storm systems.

The City has implemented similar designs (e.g. Quarry Park, Inglewood) in which have improved groundwater conditions. The City will not know for sure what design is required in Bowness until the detailed study looks at this aspect.

BRFM - can you quantify how much abatement there was in Inglewood or Quarry Park?

City - only based on anecdotal information. We do know that some properties were not damaged, so it has provided some benefit.

Discussion on the depth to bedrock in Bowness. City is studying sub-surface conditions and how the barrier will affect groundwater in Bowness.

City: The benefit in Bowness will depend on the findings of the studies. In a small event some form of barrier would be more protective than no form of barrier. The longer the flow path is will provide additional protection.

BRFM – this conclusion was not supported by the Hydrogeological expert retained by us, nor is it supported by University of Calgary academics

BRFM – in BRFM’s opinion, there are concerns with the information that is communicated in the Groundwater 101 video posted on the project website

BRFM – stated that there are concerns if water overtops the barrier and the impact on the drainage side. Along with balance in the environmental cost and social cost.

City – this is being studied.

BRFM – Understand that the cost-benefit ratio will determine whether groundwater protection is designed into the barrier. Based on groundwater what we’re afraid of as Bowness residents is that analysis will demonstrate that no groundwater



mitigation is economical.

BRFM - we believe that even without groundwater mitigation the barrier will not have a benefit cost ratio (BCR) above 1.0 when accurately evaluating benefit to Bowness.

City – decision to build will be based on benefits to The City and not just to Bowness

BRFM – we conclude that the additional cost to include groundwater mitigation in the barrier will further reduce the overall BCR for City-wide flood mitigation projects; Bowness appears to be collateral damage for an overall mitigation scheme that might benefit other areas of Calgary

Klohn – The studies need to be complete to determine this.

BRFM - asked for a commitment on the cost benefit ratio criteria for moving forward.

City - Benefits beyond the local cost benefit will be measured and considered. Currently, the studies are being completed to get an understanding of existing conditions. This is important in order to be able to evaluate conditions and what changes can be made. Generally with a cost-benefit ratio we aim for 1, but it might be considered viable at less than 1, thinking of other benefits beyond what can be monetized into the cost-benefit ratio, thinking long term like what the impact might be on residents’ insurance rates of having flood protection.

City - We know that the province will change the land use and I think it’ll be more stringent but we don’t know what the impact is going to be yet for Bowness.

BRFM - We want you to design an effective barrier that’s going to protect our properties. Under the FMMA the statement is made that all riverfront communities will be treated equitably. Mitigation planned on the Elbow is such that their basements won’t get flooded. In Sunnyside with the pumps. We expect the same. In Bowness design an effective barrier that will go to the same standard as the rest of the City of Calgary

City - by doing the studies currently underway, The City will have information to make decisions on what things can be done in Bowness. This is the work being executed right now. There is currently not enough data for Bowness so that’s what we’re studying right now.

The City is aiming for 1:200 level river flood protection for



everyone in Calgary. Equitable service level will depend on what kind of tools will be required to achieve this. The available and appropriate tools might be different to achieve this in every area. The tools are structural, non-structural and regional. What The City thinks is the best solution is to build an upstream reservoir, some barriers where still required, and then other measures like building flood proofing. The City is unable to configure all the components for every community without understanding conditions and knowing the residual risk. The biggest risk is the upstream mitigation. The problem is finding a location for over 10,000 sq.m. of reservoir area on the Bow River.

BRFM – There is concern that the City is moving forward with part of the strategy without commitment on upstream mitigation. Without an identified and selected/approved upstream mitigation option in place, the appropriate and optimized design of the community barrier will not be possible. From an overall flood mitigation perspective, to build the community barriers before confirming the upstream reservoir/mitigation option (given we all agree that this will be a necessary component of the overall system) is putting the cart ahead of the horse.

City – We are working with many stakeholders on the upstream reservoir, and citizen voices in support are important. Barriers are The City’s responsibility to support its part of the strategy, plug topographic lows and not leave communities exposed to overland flood risk as much as we can. The need for and size of barriers required have been determined considering how much mitigation an upstream reservoir could achieve. Building the barrier sooner than later reduces flood risk for Bowness without having to wait for a reservoir to be built.

The City’s requirement with respect to groundwater is to not make things worse, it is not required to keep everyone’s basements dry. Across the city, sump pumps, backflow valves and basement flooding are the homeowner’s responsibility. This project is looking at what can be achieved through the barrier design to reduce the risk of groundwater flooding in Bowness.

BRFM - The City is incorporating design specifications in other flood mitigation projects in Calgary that will mitigate groundwater flooding. In the case of the Bowness Barrier, the hydraulic head of the river will be at an elevated level due to the confinement of the river. Increased hydraulic head will result in increased pressure to drive groundwater flow. Hydrogeological experts from industry and academia have indicated that The City’s proposal to install an impermeable clay plug 1-2 m below ground level will have at best a minimal mitigating benefit to groundwater flooding and will likely have no benefit as the groundwater is responding to hydrostatic pressure from the river.



		<p>City: The City advised that the purposed of the groundwater studies that are to be completed in the stage of the project is to characterize the groundwater conditions in Bowness. There are not studies completed to date. At this point, groundwater mitigation measures options will be explored.</p> <p>Summarize: this next year The City is undertaking the studies to understand the issues and conditions in Bowness and then look at the objectives of what can be done for flood mitigation including groundwater. The City has heard that BRFM wants an objective for the barrier project to be full protection against groundwater flooding. To determine whether groundwater reduction is possible and to what extent, we need to complete the current studies. <i>(general agreement)</i></p>	
<p>3.</p>	<p>Groundwater/hydrogeology update</p>	<p>BRFM – requested an update on the scope and timeline for the groundwater/hydrogeology study program</p> <p>Klohn – Approximately 20 wells are proposed for the groundwater program. Location of boreholes and groundwater monitoring is currently being worked on. Some will be located on private land, some will be located on City lands like boulevards. Looking at completing a pump test in the park by Hextall Bridge for in situ conditions. There’s an inherent cost to get access to private land. We’re trying to manage the costs and assess access requirements. We can’t get a drill rig into everyone’s backyards due to physical access requirements.</p> <p>Klohn has a drill rig booked to drill boreholes and install monitoring wells for the second week of January. Won’t be able to do all of them all at once.</p> <p>Groundwater monitoring at the wells will continue for a calendar year. Then the groundwater model can be built after the field investigation and the lab testing is complete. Model will start to be built in March 2019. Data from drilling the boreholes will be used to inform the study as well.</p> <p>BRFM - based on our experience, which for many of us in the room is related to Oil and Gas industry, but also includes Hydro Geological experience, citing exploratory wells based on the surface ownership was not logical. The recommendation from our Hydrogeology expert was that in order to gain sufficient understanding of the subsurface to strategically place wells and build a comprehensive groundwater model a geophysical program involving 2 independent survey methods: ERT (which is only used for shallow water exploration, not oil and gas) and shallow seismic would be recommended. From the perspective</p>	



of optimizing the number of wellbores needed to delineate the groundwater channels in the alluvium, it was BRFM’s perspective that doing this geophysical program sooner would be better.

Klohn – Typically geophysics is not completed on water projects since you can get depths to bedrock from boreholes. We’re looking at what the dipping planes are. Obviously, the more data the better. For this study we will be characterizing the alluvium and the hydro-conductivity of the alluvium. O&G may have different requirements and objectives for determining subsurface conditions. Because we can never drill everywhere, we need to use professional judgement and models. We will not compromise getting the data we need to design the barrier. Klohn will request additional scope and budget if more data is required.

BRFM – our experience with water source projects, most notably in the oil sands area, all utilize geophysics to guide their exploration and understanding of the groundwater system

BRFM requested the City share the hydrogeology study terms of reference (ToR) with BRFM who will share with their consultant. City agreed to share the proposal from Klohn that addressed the scope of the study that would be part of the contracted scope of work since.

BRFM – [UCS2018-0092 2017 Flood Resiliency and Mitigation Annual Update – ATT 1] Status of the Expert Panel Recommendation on Groundwater is stated as being complete, however this cannot be since Groundwater studies have not been completed in Bowness.

City - Not closed out rather just acknowledged that the Golder and AE reports have been done. It remains a component of study going forward with projects. At this point further city-wide groundwater study is not prioritized. Therefore the studies are being completed as part of individual projects.

BRFM – Based on our expert’s feedback, development of a comprehensive groundwater model that predicts groundwater movement in Bowness is still 2 years away.

City – City has a good general understanding of groundwater movement in our river valleys, we know that the soil has high conductivity, there is large variability, have some data and have 2 studies by independent consultants. More information is required - project specific data is obtained for project design purposes on a site-by-site basis to enhance our understanding.

DN – to share hydrogeology study scope of work with BRFM



Doing as part of projects is currently the most efficient way to gain information using taxpayer dollars. Data for this project design is being collected with current studies.

Klohn - will log groundwater data for at least a year. Our budget is for the end of preliminary design and if we want to continue monitoring, The City will leave the loggers in the wells. We like to download them monthly to protect from losing data. We need data to build the model. Modelling won't stop after preliminary design. Once the model's produced it's easier to understand how the ground conditions react.

BRFM - how do you move into detailed design without the data

City – data gathered to that date is used, and continually be refined as more data is collected. At the end of preliminary design The City will reassess all the information and determine how to proceed forward.

BRFM – how deep will boreholes be, and what if you hit a boulder?

Klohn – boreholes will be drilled to bedrock. Drilling in Calgary river valleys is very challenging – if you can't get through, you have to move over and try again.

BRFM – Elbow communities get lowered groundwater because of the Springbank Reservoir. Where is the equitability?

City - It's a combination of pieces and using a tool that will work in each context. If physically stopping the groundwater in this case isn't the best tool then we will review the findings. The upstream reservoir on the Bow will be comparable to Springbank on the Elbow for groundwater. We do know that this barrier will stop overland flooding, providing immediate benefit. If we don't build a barrier then we have no further mitigation in Bowness beyond the TransAlta agreement. This goes back to the thinking in 2015, trying to increase the level of river flood protection for all Calgary communities to 1:200.

BRFM - our expectation is to be given the same level of protection that other flood prone neighbourhoods are receiving as one package. Problem is that there might never be anything else. We might be stuck with a barrier, no upstream reservoir.

BRFM – Reservoirs will push groundwater to a lower level but it will get further back out. Properties that didn't flood before may. We're concerned that we're not going to get equitable



		<p>treatment to communities with Springbank Reservoir. We want to know what size sumps we need to protect against 1230 cms. You've said you won't do that. I believe KCB's work will build a model that would tell us the answer to that.</p> <p>City - The City does not size sump pumps for citizens, but you could use the report to size your own sump pump. Let's see what comes back from the studies.</p> <p>BRFM – In order to complete the stormwater study, The City needs to understand how much water residents will be pumping to address property level mitigation. This water will likely be directed to the stormwater system and sanitary sewer system.</p> <p>BRFM - requested that as an action from this meeting The City commit to providing as part of the proposed design, or as an alternative design, a barrier design (including cost estimate) for a barrier that would provide effective groundwater mitigation such that at 1230 m3/sec river flow rate, the groundwater levels in Bowness would be no higher than Bowness residents are currently exposed to at a river flow rate of 800 m3/sec.</p>	
4	Actions	<ul style="list-style-type: none"> • DN: Review last meeting minute and send them back to JW. – By: Dec 24th • LM: Will send out the Dec 11th meeting minutes • DN: Will review with KCB and send the Terms of Reference • D: will determine the next meeting date, confer with JW 	<p>DN</p> <p>LM</p> <p>DN</p> <p>DN</p>
Meeting Concluded			