UPDATE ON THE LMFMS INITIATIVE

Briefing Note

Pathways to Action and Technical Synthesis Reports

Summer 2023

An update from the Leadership Committee of the
Lower Mainland Flood Management Strategy (LMFMS) Initiative

LMFMS Flood Forum, 2019

About this Briefing

The Leadership Committee for the Lower Mainland Flood Management Strategy (LMFMS) Initiative is distributing this briefing note and two reports to the Government of Canada, Province of British Columbia, Mainland Coast Salish First Nations and Lower Mainland local governments. The reports will also be posted at FloodWise.ca for everyone interested in flood risk reduction and resilience in the BC Lower Mainland.

We wish to acknowledge the contributions of all participating governments and other organizations in the LMFMS that have informed work in the initiative throughout Phases 1 and 2. We particularly acknowledge the valuable contributions of the Pathways to Action Working Group and the Emergency Planning Secretariat, which have informed the drafting of the Pathways to Action report.

Please find with this briefing note:

- ***Pathways to Action on Flood Risk Reduction and Resilience*** **report (Summer 2023)**
  The *Pathways to Action* report summarizes progress to date on key issues relevant to flood management and opportunities for all orders of governments to move forward collaboratively to reduce flood risk, increase resilience and adapt to climate change. The *Pathways to Action* Report and recommendations were developed at the direction of the LMFMS Leadership Committee, with input from a multi-jurisdictional *Pathways to Action* Working Group and the Emergency Planning Secretariat.

- ***Synthesis of Technical Analysis* (*Technical Synthesis*) report (Summer 2023**) The Technical Synthesis report details the information and tools developed and shared with flood authorities and other organizations through the LMFMS initiative since 2016 respecting Fraser River and coastal flood hazards and risks. The Technical Synthesis report was prepared by the Fraser Basin Council.

Background on the Initiative

The Lower Mainland Flood Management Strategy (LMFMS) initiative was a multi-year initiative aimed at supporting the development of a regional strategy to reduce the risks associated with Fraser River and coastal flooding and to increase the flood resilience of BC Lower Mainland communities.

- **Phase 1 (2014-2016)** focused on preliminary technical work, including an analysis of BC Lower Mainland flood scenarios, a regional assessment of flood vulnerabilities and a review of flood protection works and practices in the region.

- **Phase 2 (2016-2023**) focused on more advanced and detailed technical work to increase understanding of flood hazards and risks. Phase 2 also worked on developing, through the collaboration of governments and other entities with flood-related responsibilities, a preliminary draft strategy that would be further advanced through feedback and engagement.

Work in Phase 2 was under the direction of a Leadership Committee, Joint Program Committee for Integrated Flood Management, project-specific advisory groups and working groups, with support from the Fraser Basin Council as secretariat.

LMFMS workshop, 2019

HIGHLIGHTS

Pathways to Action Report

Work on Approach to Flood Risk Reduction

Over 90 federal, provincial, First Nations and local government authorities have some degree of responsibility for flood risk reduction in the Lower Mainland. Communities have responsibilities for flood management within their boundaries and understandably focus primarily on local priorities. Collaboration to build consensus on a region-wide strategy was seen by most governments participating in the Lower Mainland Flood Management Strategy initiative as important, and also a challenge.

In 2021 a preliminary working draft (Draft 1) of a regional flood strategy was developed by the Fraser Basin Council with guidance from the LMFMS Leadership Committee, input from advisory committees and working groups, discussions at a 2019 Flood Forum and other meetings and workshops with LMFMS participants. The draft was intended for comment and revision by LMFMS participants, with key issues to be taken forward for public and stakeholder engagement with the aim of informing and advancing the strategy.

Feedback on Draft 1

Feedback on Draft 1 of the LMFMS from governments and other entities with flood-related responsibilities is summarized in the *Pathways to Action* report (Appendix C).

Key take-aways from the feedback are:

- There was substantial support for a majority of recommendations in Draft 1 by those entities able to actively engage in the process. However, these responses should not be considered fully representative of all voices in the region as not all entities in the region provided comments.

- There was a diversity of feedback, including divergent perspectives, on several issues of strategic importance. It became clear that additional dialogue among all four orders of government was needed to clarify a common direction regarding these issues.

- In the context of the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), there was recognition of the requirement to co-create flood risk reduction approaches with First Nations, including plans, strategies, actions and other approaches.

A Pathways to Action Report

The LMFMS Leadership Committee supported a change in process to move forward on flood risk reduction and resilience. It decided to develop a *Pathways to Action* report as the strategic deliverable for Phase 2.

The Leadership Committee subsequently established a *Pathways to Action* Working Group to help address priority issues for the report. FBC served as the process facilitator for the Working Group and Leadership Committee to prepare draft content for the report based on the input, advice, contributions and recommendations of the Working Group and Leadership Committee. The Leadership Committee also received considerable valuable input from the Emergency Planning Secretariat in preparing and finalizing the report.

The LMFMS Leadership Committee puts forward the *Pathways to Action* report and its recommendations for next steps.

Highlights of Pathways to Action Report Recommendations

Chilliwack Field Tour, 2019

In the *Pathways to Action* report, there are a series of early and medium- term recommendations in 10 key areas to help reduce flood risk and increase flood resilience.

Many of these recommendations require ongoing collaboration among all orders of government, and they also call for related funding commitments to undertake the work.

The text of the recommendations can be found in the *Pathways to Action* report. The following are synthesized highlights:

Synopsis of Recommendations from *Pathways to Action* Report

1. Improve Understanding of Flood Risk

- Create an ongoing program to better understand Lower Mainland flood hazards and risks. The program would continually improve information about flood hazards, risks and resilience measures, as well as tools to inform flood-related planning and decision-making.

2. Enhance Coordination and Collaboration

- Align a regional strategic approach to flood risk reduction and resilience in the Lower Mainland with the *BC Flood Strategy* and other flood-related initiatives. The *BC Flood Strategy* could be relied on as guidance and/or direction on approaches to regional-scale decision making, including frameworks for prioritization, assessment and funding to implement any future potential regional- and local-scale flood strategies.

3. Assess and Address Regional Priorities

- Identify and prioritize the critical infrastructure and essential services that are at risk from coastal or Fraser River flooding in the Lower Mainland and make these early priorities for flood risk reduction, resilience and climate adaptation.

4. Advance Flood Risk Reduction, Resilience and Climate Adaptation Actions

- Establish a framework to guide and evaluate a full suite of flood risk reduction, resilience and climate adaptation measures, including nature-based solutions, green infrastructure and approaches that make more room for the river.

5. Strengthen First Nations Participation

- Invest in First Nations participation and capacity-building and seek guidance and direction on the implementation of UNDRIP articles 18, 19, 29 and 32, the *BC Declaration Act* (2019) and Bill C-15, which formalizes UNDRIP within Canadian law (2021), recognizing First Nation title and reconciliation beyond Sec 91 (24) Lands of the *Constitution Act*.

6. Strengthen a Strategy Development Process

- Establish a leadership table to oversee the implementation and ongoing refinement of *Pathways to Action* "early action" recommendations. The leadership table would include all orders of government (First Nations, local, provincial and federal governments).[1] The leadership table would support direction on a strategic regional approach to flood risk reduction and resilience, including development of new or updated terms of reference.

7. Secure Funding

- Secure funding commitments and invest in urgent actions to address critical infrastructure and essential service priorities with appropriate risk reduction and resilience measures.

8. Strengthen Regional-Scale Decision-Making

- The *BC Flood Strategy* process should provide guidance and/or direction on approaches to regional-scale decision making to implement regional-scale flood strategies. The proposed leadership table (see Strategy Development Process) should further explore how the unique

[1] Participation of the federal government would depend on the scope of roles and responsibilities of the leadership table (to be determined).

values, interests and needs of the Lower Mainland region could inform regional-scale decision making.

9. Refine Strategy Purpose and Goals

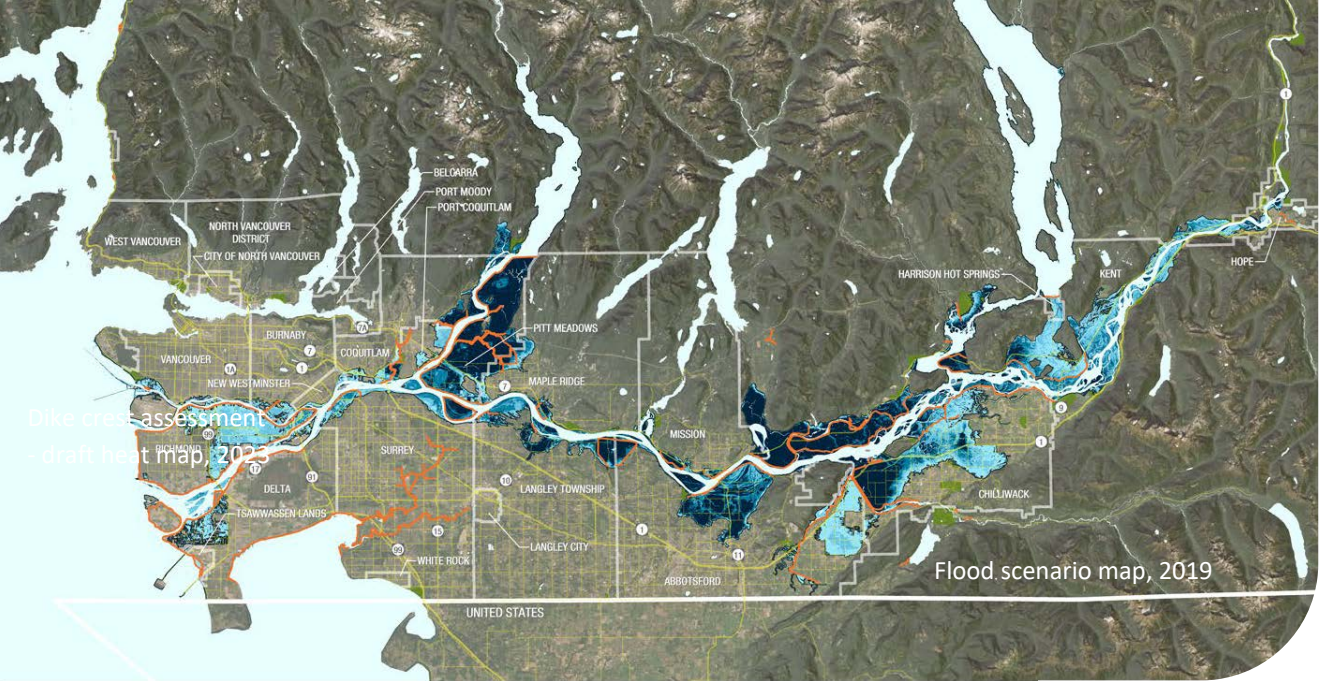
- A regional strategic approach to flood risk reduction and resilience should be flexible and iterative in response to changing regional needs, and it should include all four priorities of the Sendai Framework, to: improve understanding of flood risk, support investment and actions to reduce flood risk, strengthen flood risk governance, and enhance flood preparedness for effective response, including to "Build Back Better."

10. Clarify Geographic Scope and Flood Hazards

- A regional strategic approach to flood risk reduction would initially be expected to focus on both Fraser River and coastal storm surge flood hazards, inclusive of tributaries affected by these flood hazards. This approach would build on existing information, align with other relevant initiatives and advance an assessment of regionally significant pluvial (rainfall) and other flood hazards. Consideration should also be given to watershed-scale influences on flood hazards and risk reduction.

This report is a snapshot in time, and further planning, engagement and implementation of *Pathways to Action* recommendations will be needed. A key theme throughout this report is the need for all orders of government to work together. **This theme spans all recommendations and is critical to securing funding, addressing governance issues, and taking effective and timely action.**

The *Pathways to Action* and *Technical Synthesis* reports will be posted online at floodwise.ca.



Dike crest assessment - draft heat map, 2023

Flood scenario map, 2019

HIGHLIGHTS

Synthesis of Technical Analysis Report

The *Synthesis of Technical Analysis* (*Technical Synthesis*) is a summary report prepared by the Fraser Basin Council. It provides an overview of technical work completed throughout the LMFMS initiative together with a synopsis of implications for flood authorities to support flood risk reduction and resilience. The underlying reports, maps and resources developed since 2014 are available on the FloodWise website.

KEY HIGHLIGHTS OF LMFMS DELIVERABLES

Analysis of Flood Scenarios – Phase 1 (2015)

A review and analysis of different Fraser River and coastal flood hazard studies and scenarios was undertaken. Two coastal and two Fraser River flooding scenarios were identified to support a regional vulnerability assessment for the coastal foreshore area of White Rock to Squamish, and the lower Fraser River from Hope to the Salish Sea. The coastal scenarios were a 500-year flood with no sea level rise and a 500-year flood with 1.0 m of sea level rise (known as the coastal 2100 scenario). The Fraser River flood scenarios were the 1894 design flood (considered slightly larger than a 500-year flood) and a 500-year "moderate" climate change scenario with 1.0 m of sea level rise and a higher peak flow on the Fraser River (Fraser River 2100 scenario).

In addition to impacts from Fraser River flooding, communities may experience catastrophic consequences from flooding from local rivers and creeks, including debris flooding and urban flooding due to ineffective drainage infrastructure. The consequences from these additional sources of flooding were not addressed in this regional study, but it was recommended that these be examined in future site-specific flood risk assessments by individual communities for effective flood management.

KEY HIGHLIGHTS OF LMFMS DELIVERABLES

Regional Assessment of Flood Vulnerability (2016)

The two coastal and two Fraser River flood scenarios identified in the above Analysis of Flood Scenarios were the scenarios used for this assessment. The study assessed development within the floodplain (such as residential, commercial and public property, agricultural lands, transportation networks, critical infrastructure and municipal services) and its susceptibility to the selected flood hazard scenarios. Damages were found to be in the tens of billions of dollars for all scenarios. The least costly scenario — the 500-year coastal flood with no sea level rise — was estimated to be $19.3 billion dollars, while the most-costly scenario — the 500-year Fraser River flood in 2100 — was estimated at $32.7 billion dollars. Key in this assessment is that the future scenarios for 2100 did not consider additional future development, population growth or inflation.

This assessment found that the Lower Mainland is exposed to a high degree of flood risk, that significant funding is needed to rehabilitate existing dikes to meet current provincial standards, and that higher standards appear needed to address climate change. Additionally, funding is needed to consider other structural and non-structural (i.e., policy) measures to prepare communities for future flood emergencies.

Lower Mainland Dike Assessment (2015)

This desktop study reviewed 74 dikes in the Lower Mainland, which make up approximately 500 km of the 600 km of dikes in the region, to evaluate the level of protection provided by the dikes and to identify major deficiencies.

A dike evaluation matrix was developed to assess each dike segment in terms of its crest height, dike geometry, geotechnical stability during floods and seismic events, erosion protection measures, vegetation/ animal control, encroachments, appurtenant structures and administrative arrangements. A rating of “good,” “fair,” “poor” or “unacceptable” was assigned to each characteristic.

Fraser River dikes have significant variability. Although some are low enough to experience localized overtopping at the 20-year flood, many can contain the 100-year flood. Generally though, the dikes do not meet current provincial standards, and none fully meet or exceed the standards. The 74 dikes in this study were divided into 118 segments, and of the 118, 71% could be expected to fail by overtopping during the 1894 Fraser River design flood event (slightly larger than a 500-year flood event).

KEY HIGHLIGHTS OF LMFMS DELIVERABLES

Lower Mainland Flood Management Strategy Phase 1 Summary Report (2016)

This resource contains a high-level overview of the work undertaken in Phase 1 of the LMFMS, as well as key highlights and metrics from each of the projects.

Flood and Environmental Atlas (2019)

This online atlas mapped environmental values and features as well as dikes and flood extents in the lower Fraser River and coastal foreshore areas (using the four flood scenarios described above).

Hydraulic Modelling and Mapping in BC's Lower Mainland (2019)

This project significantly contributed to an understanding of regional flood hazards. The project developed a 2D hydraulic model for the lower Fraser River floodplain, and it assessed 27 Fraser River and coastal flood scenarios for present day events and climate change scenarios.

Five hypothetical mitigation scenarios — dike raising, a local dike setback, sediment removal, local land raising, and upstream storage — were also assessed to better understand their effects on flood depth and extent. The mitigation scenarios generally resulted in flood water level changes within the Fraser River corridor in the range of 10–40 cm. As a comparison, flood simulations based on climate change projections found that flood water levels could increase by 0.5–2 m in 2050 and 2100. Local governments and First Nations, as well as some non-governmental organizations, have used the hydraulic model and associated maps in 60+ flood-related projects to date.

Lower Mainland Flood Risk Assessment (2020)

This assessment improved understanding of flood risk in the Lower Mainland so that decision-makers can plan for and manage their communities' use of the floodplain. It overlaid Lower Mainland assets and values with coastal and Fraser River flood hazard areas to simulate a range of impacts on diverse assets and values of Lower Mainland communities.

The lack of comparable data regarding First Nations interests, values and reserve lands in this risk assessment, compared with other areas in the region, is recognized as a key shortcoming.

KEY HIGHLIGHTS OF LMFMS DELIVERABLES

Lower Mainland Dikes: Analysis of Freeboard and Vulnerability (2022)

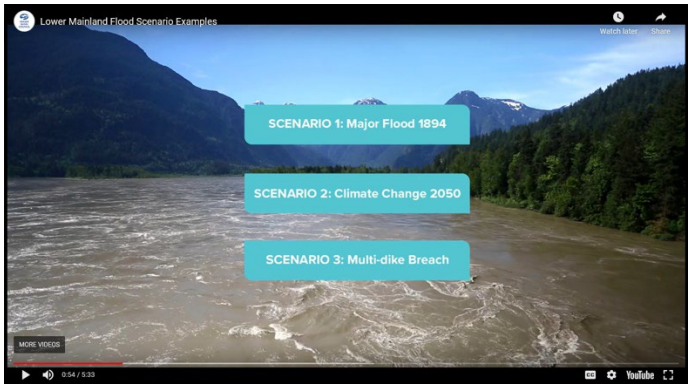
This project used the 2D hydraulic model mentioned above to compare potential flood levels near the dikes (water surface elevation) for the 50-year, 100-year, 200-year, 500-year and 1894 flood scenarios, with dike crest elevations surveyed most recently by the Province of BC between 2019 and 2020. Excel tables were prepared for each lower Fraser River dike that is regulated under the BC *Dike Maintenance Act*, to compare the modelled flood levels with dike crests and associated freeboard. This information helped to:

- identify potential locations for dike overtopping or loss of freeboard (notwithstanding other potential dike failure mechanisms such as piping). ***Note:*** *The work undertaken did not guarantee identification of all possible locations.*
- support the operations, maintenance and flood mitigation planning for diking authorities in advance of the 2022 freshet.

This analysis was limited to Fraser River freshet flood scenarios and did not include potential flooding from other rivers or from coastal storm surge. The analysis was limited to comparing dike height with flood levels. Moreover, it did not include other potential causes for dike failure that could occur prior to and separate from dike overtopping (e.g., erosion, seepage, piping).

Project Primer summary and video on flood modelling and mapping

Flood Modelling and Mapping in BC's Lower Mainland: A Project Primer



Project Primer Video

Acknowledgements

The LMFMS Leadership Committee and the Fraser Basin Council (FBC), as secretariat for the initiative, acknowledge the financial support of the LMFMS initiative over the past two years from the Government of Canada and the Government of BC through the National Disaster Mitigation Program. The Leadership Committee thanks all governments, organizations and individuals that contributed to the work of this initiative throughout Phases 1 and 2.

Pathways to Action was prepared by the Fraser Basin Council with oversight and direction from the LMFMS Leadership Committee. It was further informed by the input and advice of a multi-government Pathways to Action Working Group. Their collaboration and contributions are also most appreciated.

The Leadership Committee and FBC also acknowledge with gratitude the contributions and support of *Stó:lō* Tribal Council Chief and Chair of the Emergency Planning Secretariat, Tyrone McNeil, in the development of this report.

Leadership Committee Members

Sarah Fraser, Assistant Deputy Minister, Southcoast Region, BC Ministry of Forests

Kathryn Forge, Assistant Deputy Minister, Disaster Mitigation, BC Emergency Management and Climate Readiness

Andrew Hannan, Regional Director, Public Safety Canada

Sonia Talwar, Regional Director, Natural Resources Canada

Anna Classen, Regional Director General, Environment and Climate Change Canada

Jason Lum, Chair, Fraser Valley Regional District and Councillor, City of Chilliwack

Jag Gill, Director, Fraser Valley Regional District and Councillor, District of Mission

John McEwan, Vice-Chair, Metro Vancouver and Mayor, District of Anmore

Nicole MacDonald, Director, Metro Vancouver and Mayor of the City of Pitt Meadows

Dylan Kruger, Director, Metro Vancouver and Councillor of the City of Delta

Contact Us

For more information on the *Pathways to Action* report, contact the Leadership Committee, care of:

Province of BC:

Allan Johnsrude, Regional Executive Director South Coast Region (Allan.Johnsrude@gov.bc.ca) or Laura Plante, Executive Director Flood Resilience (Laura.Plante@gov.bc.ca).

You can also contact the Fraser Basin Council (floodstrategy@fraserbasin.ca).

For more information on the *Technical Synthesis* report, contact:

floodstrategy@fraserbasin.ca