



Comparison of Surveyed Dike Crests with Modelled Fraser River Freshet Scenarios

Vancouver Sun, November 2021 Flood Damage

Metro Vancouver's Flood Resiliency Task Force – June 22, 2022



Fraser Basin Council

1 of 22

Comparison of Surveyed Dike Crests with Modelled Fraser River Freshet Scenarios

Project Overview

- To support lower Fraser River freshet planning / preparations (and longer-term planning for potential dike upgrades)
- Funding provided by the BC Ministry of Forests, Flood Safety Section
- Northwest Hydraulic Consultants Ltd. updated the 2D hydraulic model (HEC RAS 2D) with dike survey data from 2019 – 2020
- NHC modelled 20-year, 50-year, 100-year, 200-year, and 1894 flood scenarios and compared the flood levels near the dikes with the surveyed dike crest elevations to help identify potential low sections

Comparison of Surveyed Dike Crests with Modelled Fraser River Freshet Scenarios

Project Deliverables

- Project report to summarize the scope, approach and limitations of the project
- Excel tables comparing surveyed dike crest elevations with multiple flood profiles (results are colour-coded based on estimated freeboard)
- PDF maps to help locate and ground-truth dike segments that may have potential low sections

Sample Results

Colour-Code	Red	Orange	Yellow	Green
Available Freeboard	< 0 m	0 – 0.3 m	0.3 – 0.6 m	> 0.6 m

	Crest El. (m CGVD2013)	Modelled Water Surface Elevation (m CGVD2013)						Available Freeboard (m)				
Chainage	2019/2020 Survey	1894 Freshet	0.5% AEP Freshet	1% AEP Freshet	2% AEP Freshet	2012 Freshet		1894 Freshet	0.5% AEP Freshet	1% AEP Freshet	2% AEP Freshet	2012 Freshet
0.00	11.84	11.90	11.45	11.13	10.81	10.25		-0.06	0.39	0.71	1.03	1.59
0.25	11.84	11.90	11.45	11.13	10.81	10.25		-0.06	0.39	0.71	1.03	1.59
3.83	11.81	11.90	11.45	11.13	10.81	10.25		-0.09	0.37	0.68	1.00	1.57

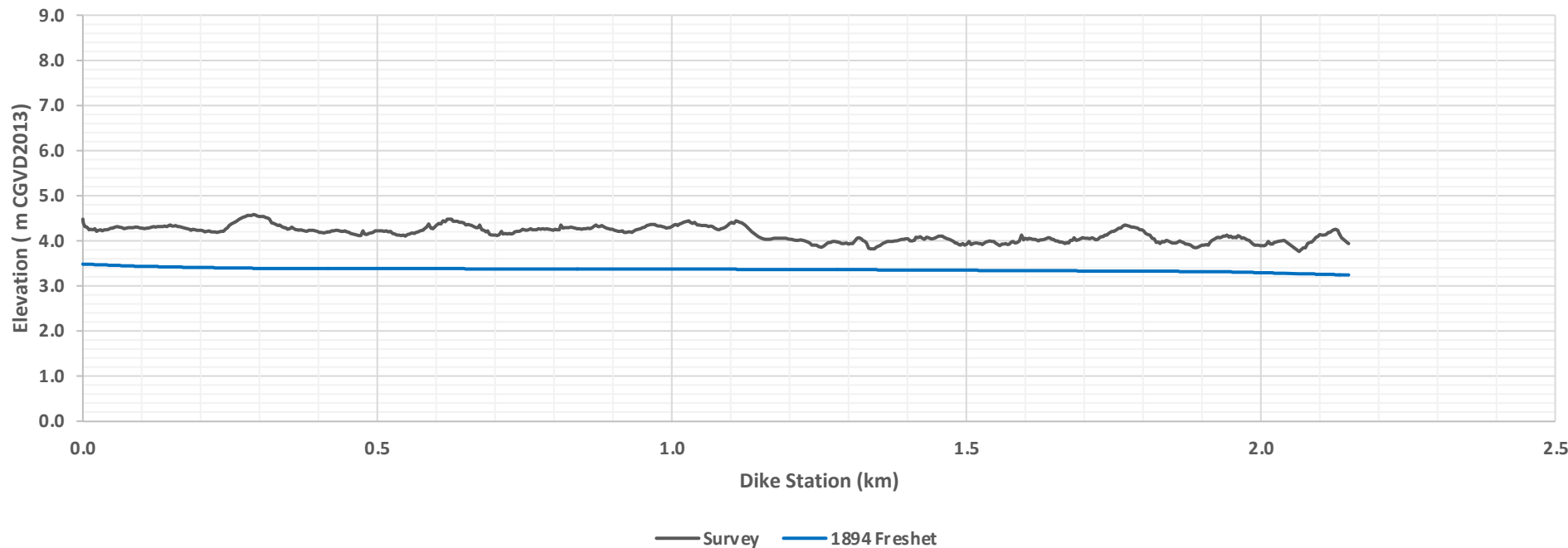
Sample Results

- Results are mixed
- Sample results for 6 dikes in the Lower Mainland
- There are limitations, uncertainties, and potential for errors
- Need to ground truth results

Available Freeboard (m)				
1894 Freshet	0.5% AEP	1% AEP	2% AEP	2012 Freshet
1.68	2.29	2.68	3.04	3.33
1.62	2.24	2.62	2.99	3.28
0.40	1.04	1.46	1.89	2.54
0.40	1.05	1.46	1.89	2.55
0.09	0.50	0.82	1.16	1.79
-0.02	0.39	0.71	1.05	1.68
-0.10	0.42	0.75	1.10	1.87
-0.23	0.29	0.62	0.97	1.74
-0.73	-0.07	0.26	0.61	1.36
-0.74	-0.08	0.25	0.60	1.35
-1.77	-1.23	-0.89	-0.55	0.19
-1.52	-0.98	-0.64	-0.30	0.44

Sample Results

Comparison of Surveyed Dike Crest and Modelled Water Surface for the 1894 Fraser River Freshet
(140_3_Queensborough)



Sample Results



Suggested Next Steps

- Recommended that diking authorities ground-truth results, particularly estimated low sections of dikes
- Undertake similar analysis for coastal flood scenarios
- Update 2015 Dike Assessment for a more comprehensive view of potential dike failures (including local authority ground truthing and/or verification)
- Include the Dike Consequence Classification (or equivalent information) to understand the relative risk of different dike failures
- Overlay the above information for a regional view to inform regional priorities for urgent action and over the longer-term

Questions and Suggestions?

Steve Litke,
Director, Water Programs
slitke@fraserbasin.ca



Fraser Basin Council

Metro Vancouver Emergency Management - Fraser River Freshet 2022

Brant Arnold-Smith

Program Manager, Security and Emergency Management
Corporate Services

June 22, 2022

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OUTLINE

1. MV Preparedness for Fraser River Freshet 2022
2. Lower Fraser River Forecasting
3. Summary



Barnston Island Ferry Dock

FRESHET METRO VANCOUVER PREPARATION

Metro Vancouver Monitoring

Mission Gauge Level	Flood Level	Measures Undertaken
3-6m	Flood Advisory	Deploy tiger dams / sand bags / generators tested / response procedures reviewed
>6m	Flood Watch	Departmental DOCs and / or EOC activated
>7m	Flood Warning	EOC (Level 3) in operation
	Flooding	Response

- Review and implement Emergency Management Plans (EMP) and Emergency Response Plans (ERP) as required

FRESHET: METRO VANCOUVER EMERGENCY RESPONSE

Liquid Waste Services

- **Focus Points:** Infrastructure such as pump stations and interceptors
- **Response measures:** protection of WWTPs, temporary pumping systems for effluent at WWTPs, sandbagging, tiger dams

Parks

- **Focus Points:** Kanaka Creek, Surrey Bend, Glen Valley, Derby Reach, Colony Farm, Deas Island, Iona Beach
- **Response measures:** partial or full park closure as required, sandbagging, tiger dams

FRESHET: METRO VANCOUVER EMERGENCY RESPONSE

Water Services

- **Focus Points:** Crossings and Pitt River Re-Chlorination Station
- **Response Measures:** system monitoring and inspection, sandbagging, and deployment of pumps

Solid Waste Services

- **Focus Points:** United Boulevard Waste-to-Energy transfer station can be effected by site flooding access due to roadways being at a lower elevation than the facility
- **Response measures:** temporary pumping systems, sandbagging, system monitoring and inspection

FRESHET: ELECTORAL AREA A (BARNSTON ISLAND) PREPARATION

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Barnston Island: Emergency Preparedness Information and Community Meeting – Monday, June 20 7:00 pm

With high river levels upon us, it is important that Barnston Island residents are prepared in case there is a flood-related emergency, so make sure to:

- Review PreparedBC's [Flood Preparedness Guide](#) and create an emergency plan for your household
- Register for Metro Vancouver's [emergency notification system](#)
- Monitor the [River Forecast Centre website](#) for the latest flood and freshet conditions
- Attend an upcoming community meeting to hear about ongoing emergency preparedness efforts for Barnston Island and what you should expect in case river levels continue to rise.
(Please note that the meeting date and time may be revised if conditions change. We will advise

Barnston Island EM Community Meeting

FRESHET: METRO VANCOUVER EMERGENCY RESPONSE

Electoral Area A

- **Focus Points:** Barnston Island
- **Response Measures:** declaration of local state of emergency, evacuation alert/orders, tiger dams, sandbagging, riprap, dike surveillance



ELECTORAL AREA A - BARNSTON ISLAND EMERGENCY RESPONSE

Mission Gauge Level	Flood Level	Measures Undertaken
6.2m	Initiate Evacuation Alert	Instruct livestock owners to begin movement of animals off the island
6.75m	104 th Avenue access to the Barnston Island ferry becomes inundated at high tide	City of Surrey closes the road when inundated
7.0m	104 th Avenue becomes continuously inundated and ferry slip unusable	Due to access no longer being available for emergency services, an evacuation order is required prior to the water reaching this point
7.5m	Dikes on north side of Island at significant risk of failure	
8.0m	Dikes at, or near overtopping	

2. LOWER FRASER RIVER FORECAST



FRASER RIVER AT MISSION WATER LEVEL FORECASTING

Predicted daily peak water levels for: 21-Jun-22 to 29-Jun-22

	Day 2: 21-Jun-22	Day 3: 22-Jun-22	Day 4: 23-Jun-22	Day 5: 24-Jun-22	Day 6: 25-Jun-22	Day 7: 26-Jun-22	Day 8: 27-Jun-22	Day 9: 28-Jun-22	Day 10: 29-Jun-22	1894 Flood
Gauge Name (Downstream to Upstream)	Peak level (m GSC)	Peak level (m GSC)	Peak level (m GSC)	Peak level (m GSC)	Peak level (m GSC)	Peak level (m GSC)	Peak level (m GSC)	Peak level (m GSC)	Peak level (m GSC)	Design Level (m GSC)
Fraser R. at Mission – 08MH024	5.47	5.57	5.64	5.72	5.74	5.82	5.82	5.71	5.71	8.89



Thank you

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LMFMS – Leadership Committee

Leaders – Role to oversee development of the LMFMS – originally focusing on funding and governance arrangements, but proposed to have wider decision-making roles going forward.

- Provincial Government – 2 senior staff (Ministry of Forests, EMBC)
- Federal Government – 2 senior staff (ECCC appointment pending, NRCan and Public Safety Canada)
- Local Government – 5 elected leaders (MV and FVRD Chairs and appointments from regional district Boards)
- First Nations Government – Originally 4 elected leaders (from Fraser Valley and coastal communities) (vacant presently)

LMFMS – Joint Program Committee

Practitioners – Role to give input to the development of the LMFMS, including technical aspects and perspectives from their organizations.

- Provincial Government – Ministry of Forests, EMBC, MoTI, MoECCS
- Federal Government – NRCan, Public Safety Canada, ECCC
- Local Government – MV, FVRD, and member municipalities
- First Nations – Organizations and communities
- Other – Port, YVR, Greater Vancouver Gateway Council, ALC, Insurance Bureau of Canada, NGOs, universities and more

* Working Groups and project-specific Advisory Committees as needed