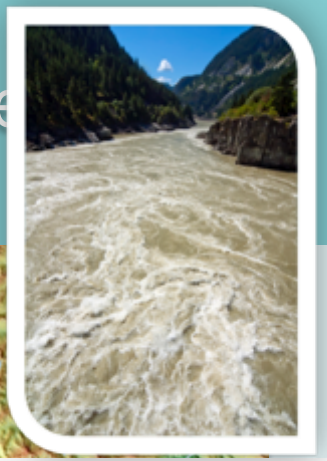
Coastal Flood Risk and Mitigation Planning in BC's Lower Mainland - Addressing Climate Risks for Coastal Transportation Infrastructure

– May 17, 2018

Presented by: Fraser Basin Council

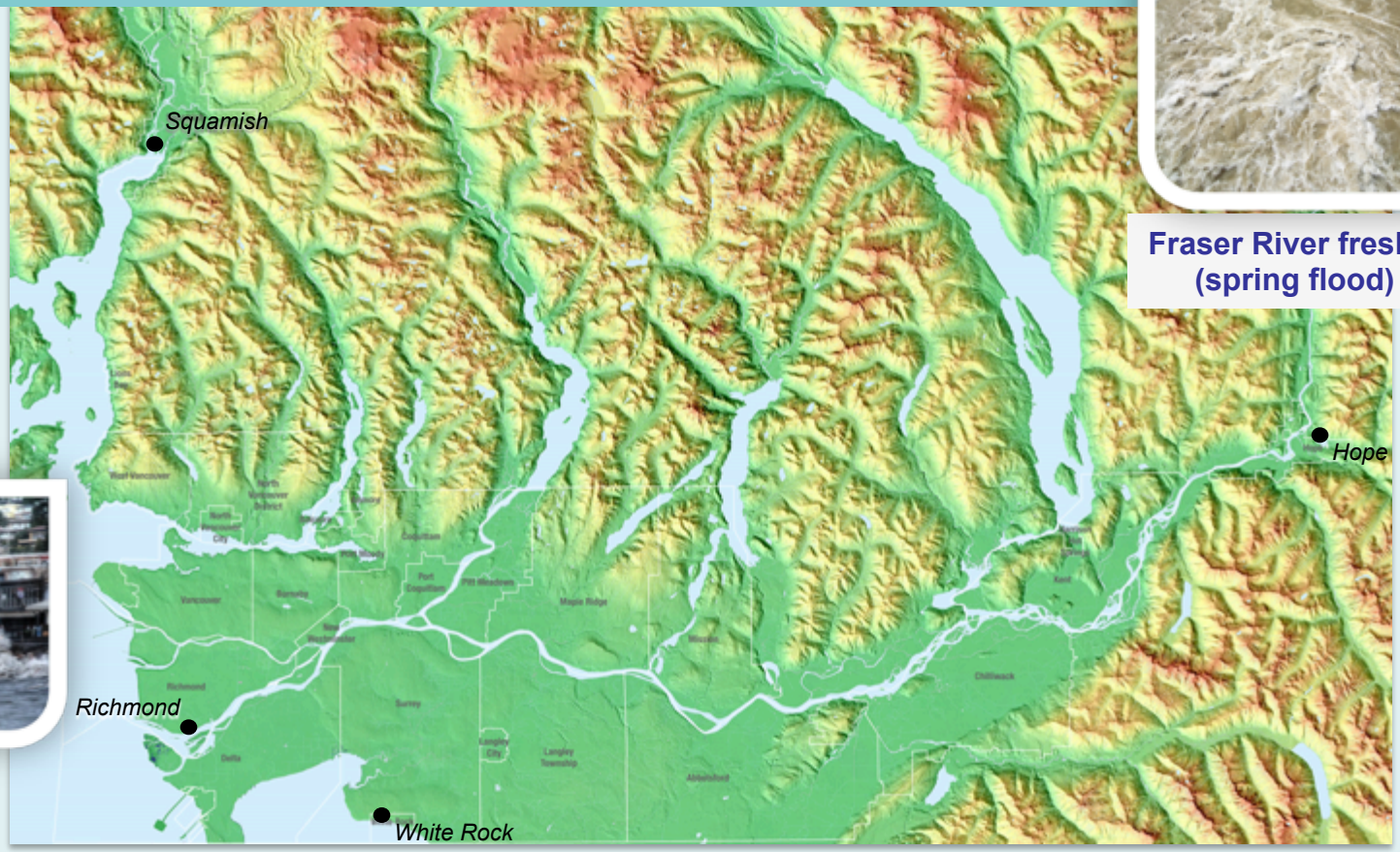
Lower Mainland Flood Management Strategy

- Aims to reduce flood risk for communities along the Lowe River and south coast



Fraser River freshet (spring flood)

Coastal storm surge (winter flood)



White Rock

Lower Mainland Flood Hazards

- Fraser River flood (spring)
  - Large snowpack
  - Rapid snowmelt (sustained warm period)
  - Rain during the freshet
- Coastal flood (winter)
  - Storm surge due to low pressure system
  - High winds increasing waves
  - Coinciding with high tides
- Climate change
  - Likely to increase magnitude and frequency of both
  - Sea level rise projections of 0.5m by 2050, 1m by 2100, and 2m by 2200

Lower Mainland Flood Management Strategy: Roles

Fraser Basin Council

- Facilitator, coordinator, administrator

Partners

- Funding, data, advice and expertise
- Other key work in parallel

Who is collaborating?

- **Government of Canada**
- **Province of BC**
- **Local Governments**
- **First Nations**
- **Regional Interests**
- **Transportation Sector**
  - Greater Vancouver Gateway Council
  - Marine Terminal Operators
  - Canadian National Railway
  - Canadian Pacific Railway
  - Port of Vancouver Fraser
  - TransLink
  - Vancouver International Airport Authority

Phase 1 of the Strategy (2014-2016)

Building a better understanding:

- Flood hazards
- Flood vulnerabilities
- Flood protection infrastructure, policies and practices

Phase 2 of the Strategy (2016-2019)

Developing a regional action plan:

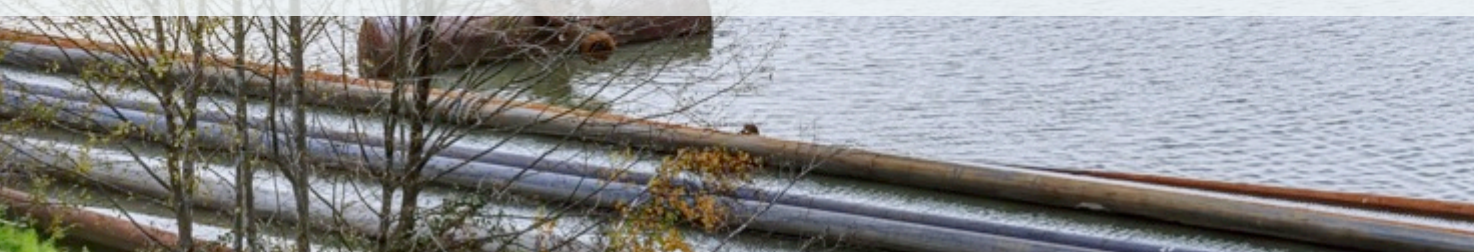
- National, provincial, regional, local priorities
- Recommended management options for diverse local circumstances
- Recommendations for secure, sustainable funding
- Through engagement and consultation, and through facilitation of a Leadership Committee

➢ **Phase 3 – Implementation**

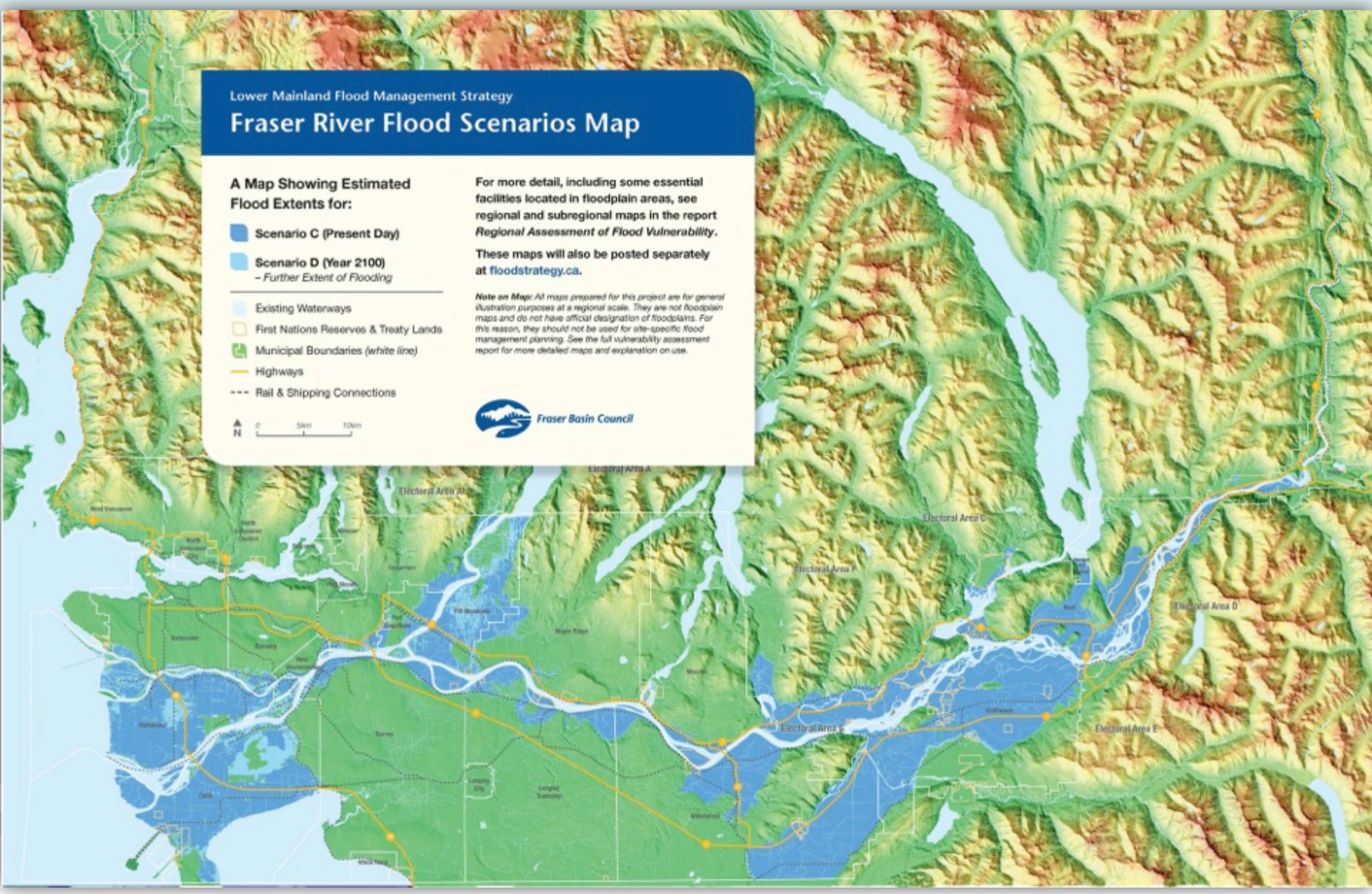
Project 1: Analysis of Flood Scenarios (approx. 1:500)

- Two Coastal Flood Scenarios (still water level)
  - Scenario A – Present Day (3.4 m)
  - Scenario B – Year 2100 (4.4m)

- Two Fraser River Flood Scenarios
  - Scenario C – Present Day (17,000 cms)
  - Scenario D – Year 2100 (19,900 cms)




Lower Mainland Flood Management Strategy
Coastal Flood Scenarios Map
A Map Showing Estimated Flood Extents for:
Scenario A (Present Day)
Scenario B (Year 2100)
– Further Extent of Flooding
Existing Waterways
First Nations Reserves & Treaty Lands
Municipal Boundaries (white line)
Highways
Rail & Shipping Connections
For more detail, including some essential facilities located in floodplain areas, see regional and subregional maps in the report Regional Assessment of Flood Vulnerability.
These maps will also be posted separately at floodstrategy.ca.
Note on Map: All maps prepared for this project are for general illustrative purposes at a regional scale. They are not floodplain maps and do not have official designation of floodplains. For this reason, they should not be used for site-specific flood management planning. See the full vulnerability assessment report for more detailed maps and explanation on use.
Fraser Basin Council
Squamish
Lions Bay
West Vancouver
North Vancouver District
North Vancouver City
Electoral Area A
Anmore
Belcarra
Coquitlam
Port Moody
Port Coquitlam
Pitt Meadows
Vancouver
Burnaby
New Westminster
Richmond
Surrey
Delta
Langley City
White Rock


Lower Mainland Flood Management Strategy
Fraser River Flood Scenarios Map
A Map Showing Estimated Flood Extents for:
Scenario C (Present Day)
Scenario D (Year 2100)
– Further Extent of Flooding
Existing Waterways
First Nations Reserves & Treaty Lands
Municipal Boundaries (white line)
Highways
Rail & Shipping Connections
N
0
5km
10km
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Fraser Basin Council
Electoral Area A
Electoral Area C
Electoral Area D
Electoral Area E
Electoral Area F
Electoral Area G

Project 2: Regional Assessment of Flood Vulnerabilities

4 major flood scenarios assessed:

- 2 coastal & 2 Fraser River – Present Day & 2100

Flood-related direct losses & indirect economic losses related to:

- People and communities
- Residential, commercial and public/institutional buildings
- Select infrastructure
- Cargo shipping delays
- Agriculture

Project 2: Regional Assessment of Flood Vulnerabilities

Estimated infrastructure losses

	A	B	C	D
Hydro Substations	$209 M	$407 M	$253 M	$330 M
Highways, Public Transit	$709 M	$764 M	$681 M	$791 M
Railways, Airports, Marine Facilities	$158 M	$203 M	$200 M	$216 M
Wastewater Plants	$66 M	$110 M	$176 M	$198 M
Other Critical Facilities	$284 M	$325 M	$393 M	$435 M
Dikes	$34 M	$34 M	$36 M	$36 M
Bridges	$0	$0	$3 B	$3 B
Total	**$1.4 B**	**$1.8 B**	**$4.6 B**	**$5.0 B**

Project 2: Regional Assessment of Flood Vulnerabilities

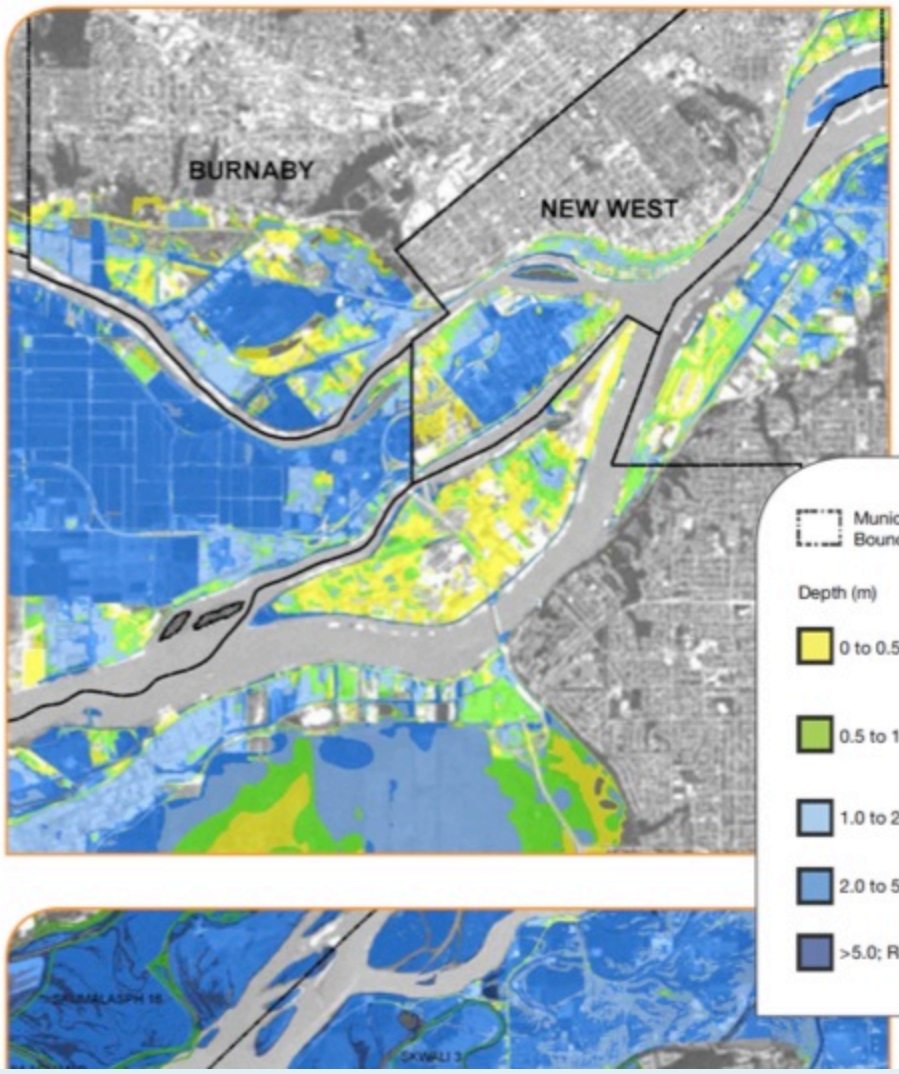
Inter-dependencies – Infrastructure damage and disruption (e.g. hydro) impacts other infrastructure, services, people and businesses (supply chains, cargo shipping, etc.)

Regional significance – infrastructure vulnerability makes flood risk a regional issue

Everyone in the region will likely be impacted one way or another

Project 2: Regional Assessment of Flood Vulnerabilities

Flood Depth Mapping



Map 3: Depth of Flood under Coastal Flood Scenario (Year 2100)

Map 3 shows projected depth of floodwaters under Scenario B (Coastal Flood – Year 2100) for the same area of New Westminster and Delta that is shown in Map 1.

Municipal Boundary

Indian Reserves and First Nations Treaty Lands

Depth (m)	
0 to 0.5	Most houses are dry; walking in moving water or driving is potentially dangerous; basements and underground parking may be flooded, potentially causing evacuation.
0.5 to 1.0	Water on ground floor; basements and underground parking flooded, potentially-causing evacuation; electricity failed; vehicles are commonly carried off roadways.
1.0 to 2.0	Ground floor flooded; residents evacuate.
2.0 to 5.0	First floor and often roof covered by water; residents evacuate.
>5.0; River	First floor and often roof covered by water; residents evacuate.

Phase 2 – Key Components and Activities Underway - Identifying Priorities for Flood Mitigation

- Overlay maps of dike status with vulnerability
- Refine evaluation of direct damages and indirect losses associated with critical infrastructure
- Consult with all orders of government, utilities, infrastructure, private sector to identify additional priorities

Phase 2 – Key Components and Activities Underway - Evaluating Flood Mitigation Options

Evaluate a wide range of mitigation approaches such as:

- Engineering (e.g. dike upgrades, realignment, etc.)
- Land use policies and floodproofing techniques
- Living shores, barrier islands, beach nourishment
- Managed retreat

Phase 2 – Key Components and Activities Underway - Funding and Financial Arrangements

- Strong business case for proactive / preventative approaches
- Cost-shared approach
- Regional approach
- Access current funding programs for near-term action while advancing a new program for the bigger picture
- Need sustainable funding mechanisms
- Funding role for industry, private sector, infrastructure sector?

Strengthening Infrastructure Resilience

What can you do?

- Learn more about your specific flood vulnerabilities (and upstream and downstream entities)
  - Estimated extent and depth of flooding
  - State of flood protection structures and policies

Strengthening Infrastructure Resilience

What can you do?

- Select a location / corridor outside of floodplains
- Identify the flood construction level and raise key assets above the flood level (e.g. floodproofing by adding fill or through design
- Elevate sensitive equipment and supplies above the flood level (e.g. electrical, HVAC, computer servers, etc.)

Thank You! For more information:

www.floodstrategy.ca

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