

District of Wells UBCM Funding Application

Disaster Risk Reduction-Climate
Adaptation March 2024 Intake

Lucy MacKenzie, Ph.D.
Water Resources Scientist
Updated March 22, 2024



Disaster Risk Reduction-Climate Adaptation Funding (DRR-CA)

Category 1: Foundational Activities

- **Risk Mapping:** allows a community to determine its vulnerabilities more accurately in relation to natural hazards
- **Risk and Resilience Assessments:** identify the social, economic, and environmental impacts that events will have on the community (e.g., natural hazards, climate-related risks)
- **Planning:** must address natural hazards and climate-related risks through the prioritizing of options and development of recommendations to reduce current and/or potential impacts

Category 2: Non-structural Projects

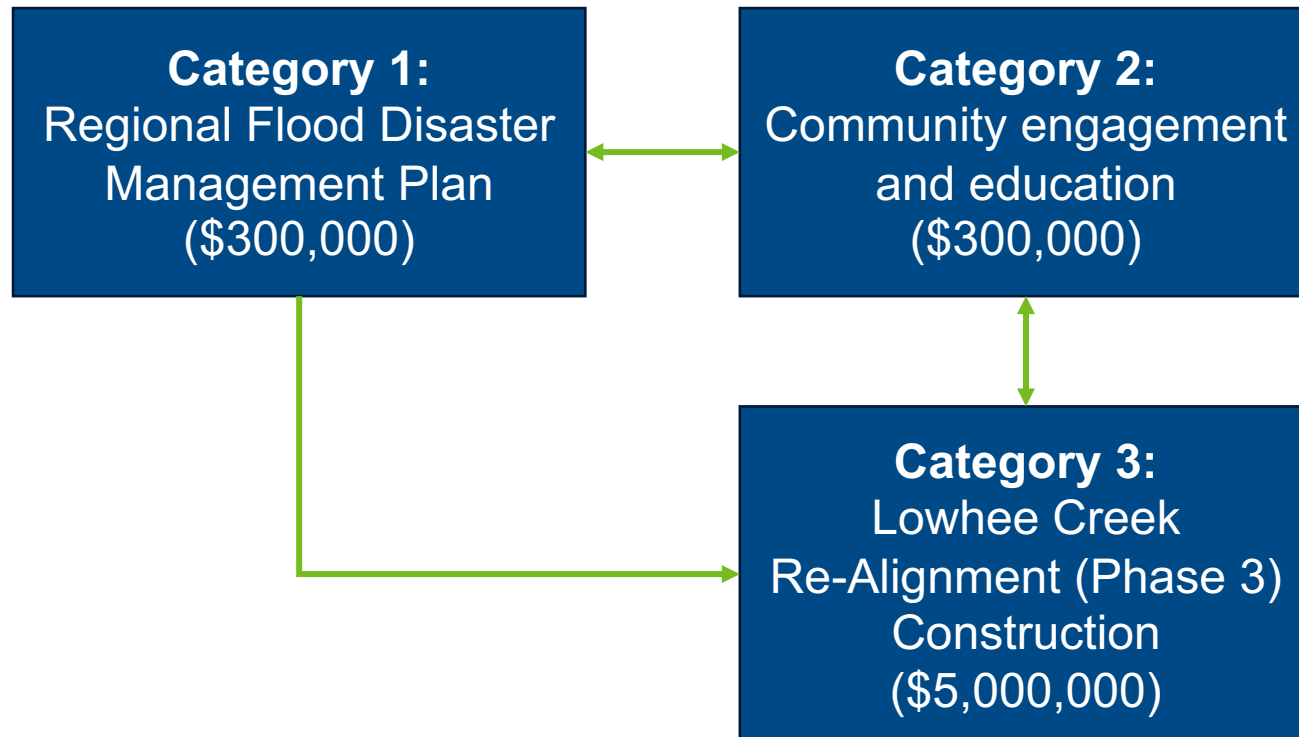
- **Land Use Planning and Education:** supports community resilience by using data, building partnerships, and supporting long-term disaster risk reduction-climate adaptation at the community level.
- **Temporary Mitigation Equipment:** reduces community risk from natural hazards and climate-related disasters in situations where no long-term structural solutions are readily available or where a community needs more time to find a long-term structural solution.

Category 3: Small-Scale Structural Projects

- Includes new construction and/or modification or reinforcement of existing publicly, provincially, and First Nations owned Critical Infrastructure, First Nations owned buildings or publicly owned buildings, including natural infrastructure, in order to reduce the risks of natural hazards and climate-related disasters.

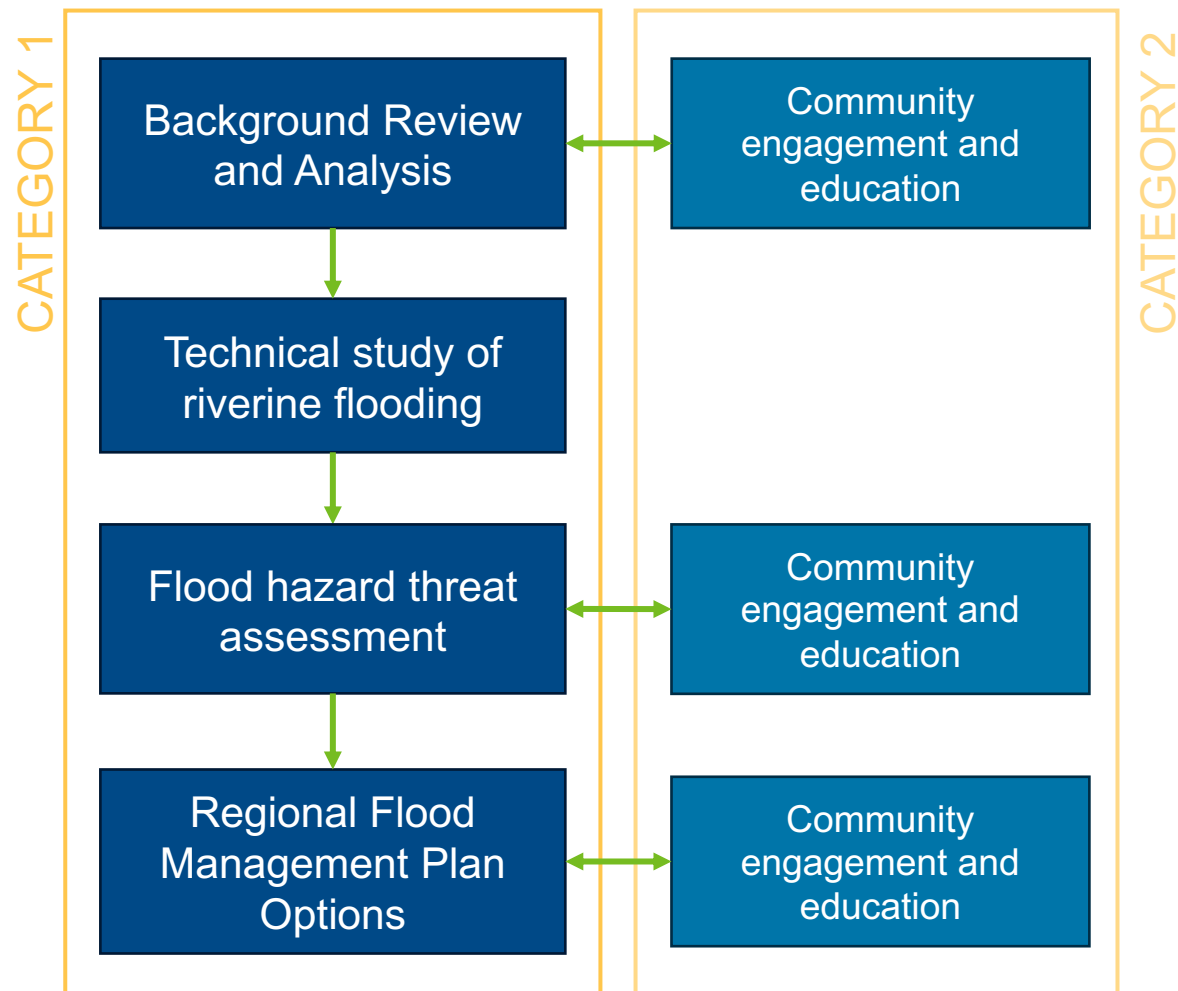
District of Wells DRR-CA Application

High-level overview of funding structure



Project Stages

Category 1 (with support of Category 2)



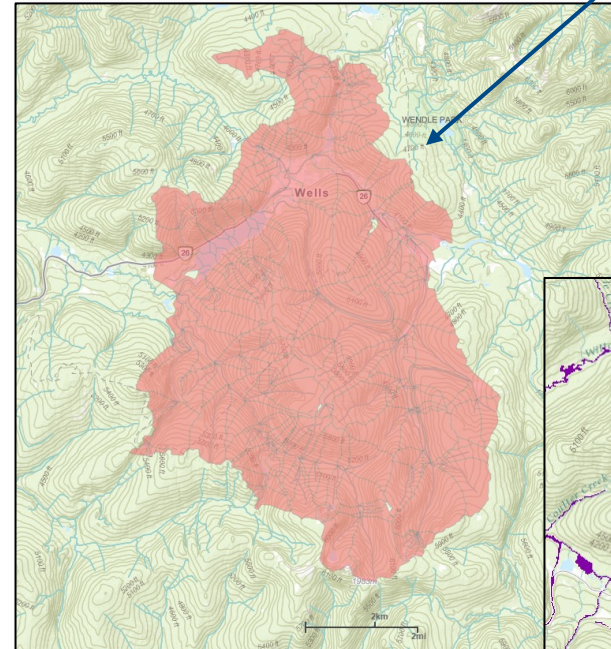
Stage 1: Background Review and Analysis

Technical (Category 1)

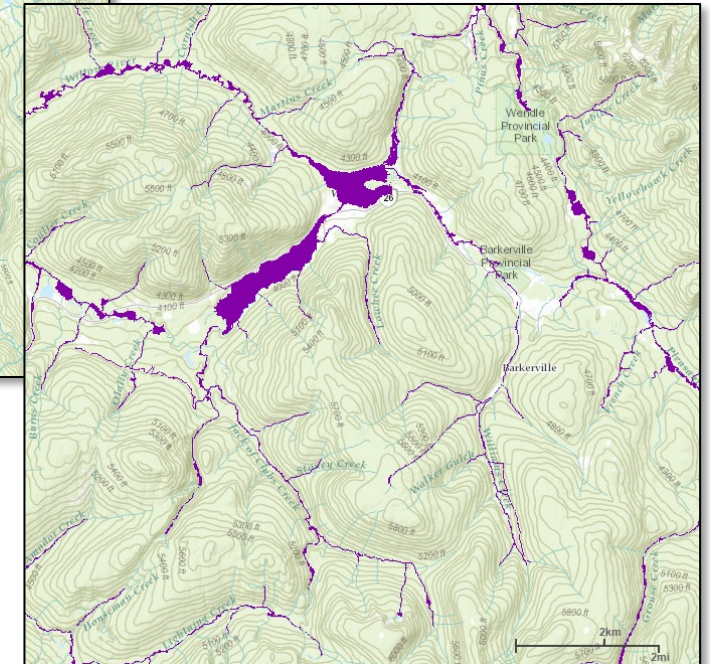
- Desktop analysis to provide a regional overview of the key project watersheds
 - Current climate and hydrology
 - Geology/vegetation/land use
 - Identify key regional issues:
 - Cariboo Gold development
 - Forestry
 - Wildfire
 - Water quality and sediment contamination
- Historical overview of flood-related hazards and flood mitigation
- Regional climate change assessment
 - Compare 1981 to 2010 climate normals to projected climate data for mid-term (2041-2070) and far-term (2071-2100) periods

Key Project Watersheds

- Williams Creek
- Lowhee Creek
- Jack of Clubs Creek/Lake
- Downey Creek



Proposed Study Area Watersheds
From BCC River Network Tools

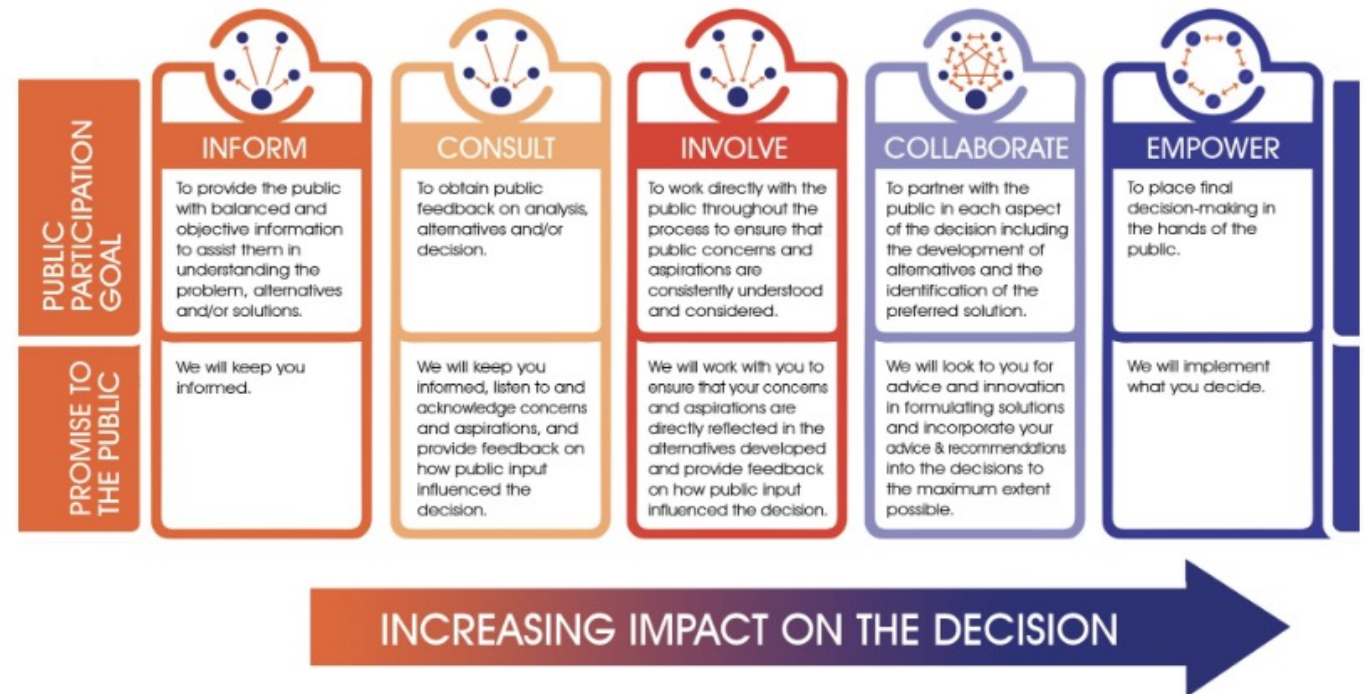


BGC Fast Flood Map (Tier 1)
From BCC Cambio Communities

Stage 1: Background Review and Analysis

Engagement (Category 2)

- Develop Community Engagement Plan
 - Decide on project level of engagement
 - Identify “who should be in the room”
 - Review engagement options (e.g., open houses, stakeholder meetings, surveys)
 - Develop an action plan
- Public Introductory Open House
 - Provide overview of project scope
 - Review and discussion of regional flood hazards and current flood mitigation
- First Nation Engagement Meeting
 - Align on project scope
 - Identify interest and/or opportunities for integration of Traditional Knowledge



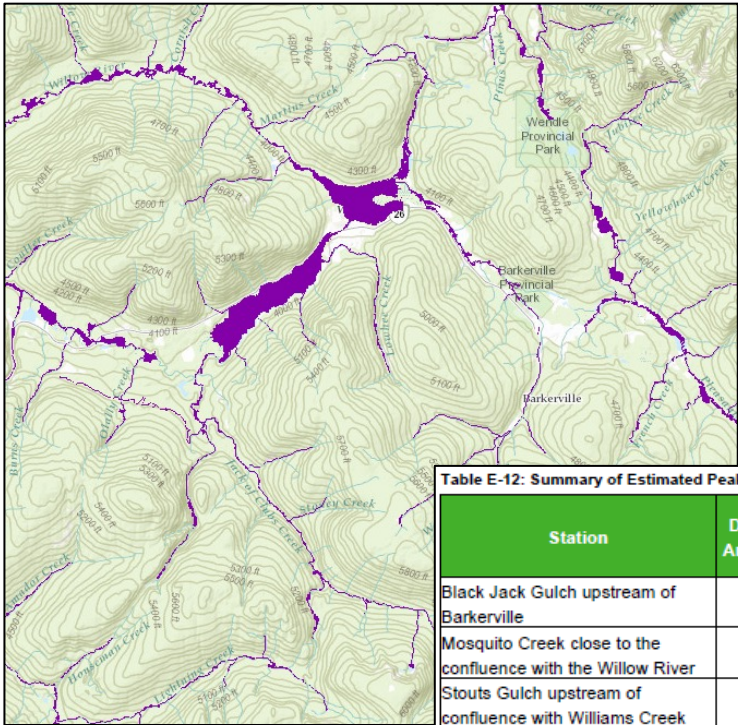
From IAP2: [IAP2 Canada / AIP2 Canada - Pillars of P2](#)

Stage 2: Technical Study of Riverine Flooding

(Category 1)

For each of the key watersheds:

- Hydrological assessment
 - Review of available hydrologic data (Cariboo Gold documents; Water Survey of Canada data)
 - Flood frequency analysis (current climate and climate change-impacted)
- Base level floodplain mapping (Tier 2)
 - Hydraulic model development
 - Hydraulic model calibration and verification
 - Design flood analysis (current climate and climate change-impacted)
 - Floodplain mapping results



BGC Fast Flood Map (Tier 1)
From BCC Cambio Communities

Table E-12: Summary of Estimated Peak and Low Flows of Selected Regional Stations						
Station	Drainage Area (km ²)	Flood Flows (m ³ /s)			Low Flows (m ³ /s)	
		Q _{2-yr}	Q _{10-yr}	Q _{100-yr}	7Q2	7Q10
Black Jack Gulch upstream of Barkerville	1.5	0.30	2.9	10	<0.01 ⁽¹⁾	<0.01 ⁽¹⁾
Mosquito Creek close to the confluence with the Willow River	2.7	0.29	2.2	11	<0.01 ⁽¹⁾	<0.01 ⁽¹⁾
Stouts Gulch upstream of confluence with Williams Creek	2.8	0.51	4.7	16	<0.01 ⁽¹⁾	<0.01 ⁽¹⁾
Slough Creek downstream of the confluence with Coulter Creek	24.2	4.5	7.4	11	0.046	0.030
Jack of Clubs Creek upstream of Jack of Clubs Lake	31.3	6.7	11	17	0.070	0.045
Willow River downstream of the confluence with Mosquito Creek	110.4	18	30	46	0.61	0.54

Estimated Peak and Low Flows from Selected Regional Stations
From Appendix 7.4-1 [Cariboo Gold Project Mine Site Hydrology Existing Conditions Report](#)

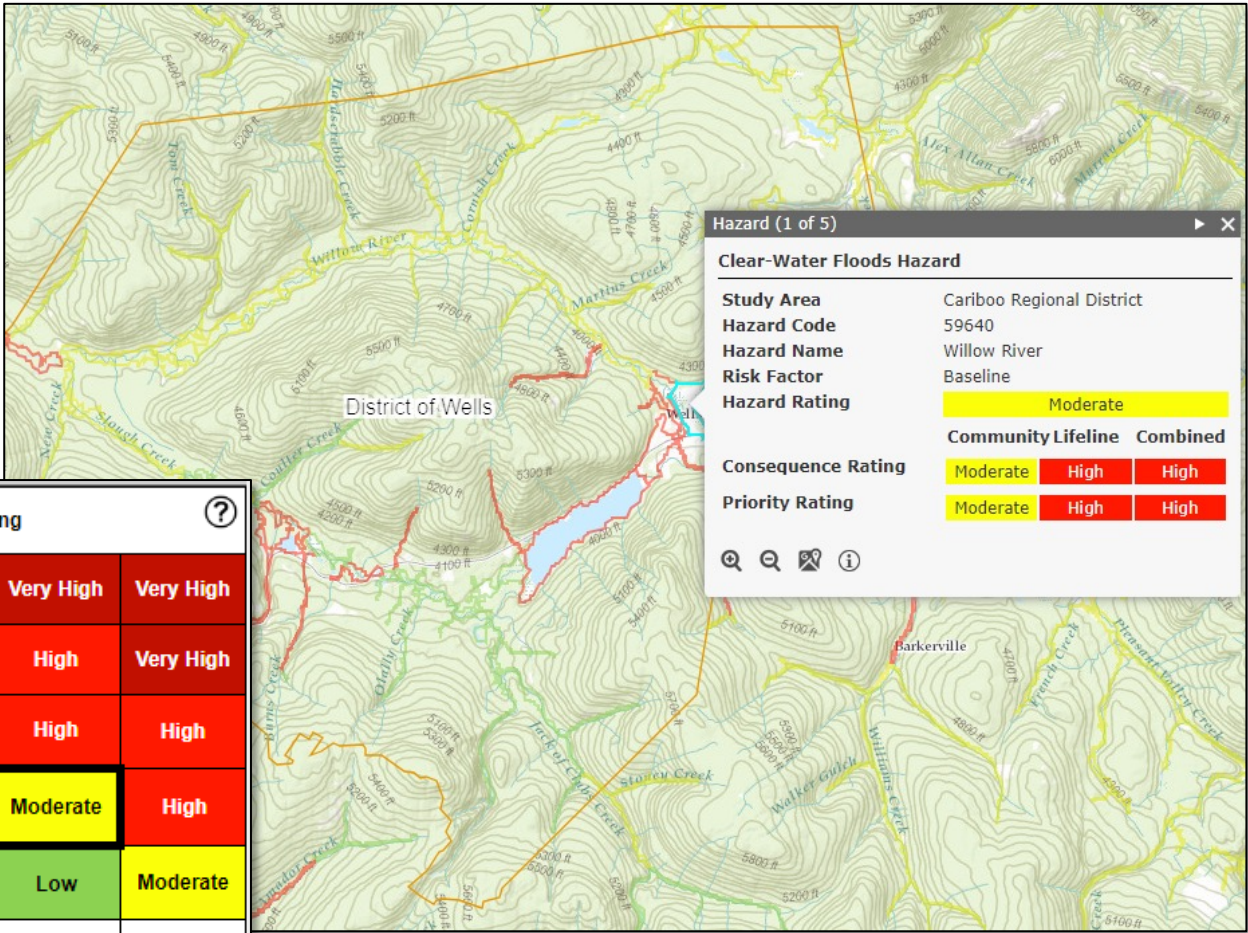
Stage 3: Flood Hazard Threat Assessment

Technical (Category 1)

For all areas covered by flood mapping:

- Identify elements at risk
- Identify exposure
- Determine consequence
- Determine risk

Geohazard Likelihood	Geohazard Rating ?				
Very High	Moderate	High	High	Very High	Very High
High	Low	Moderate	High	High	Very High
Moderate	Low	Low	Moderate	High	High
Low	Very Low	Low	Low	Moderate	High
Very Low	Very Low	Very Low	Low	Low	Moderate
Impact Likelihood	Very Low	Low	Moderate	High	Very High



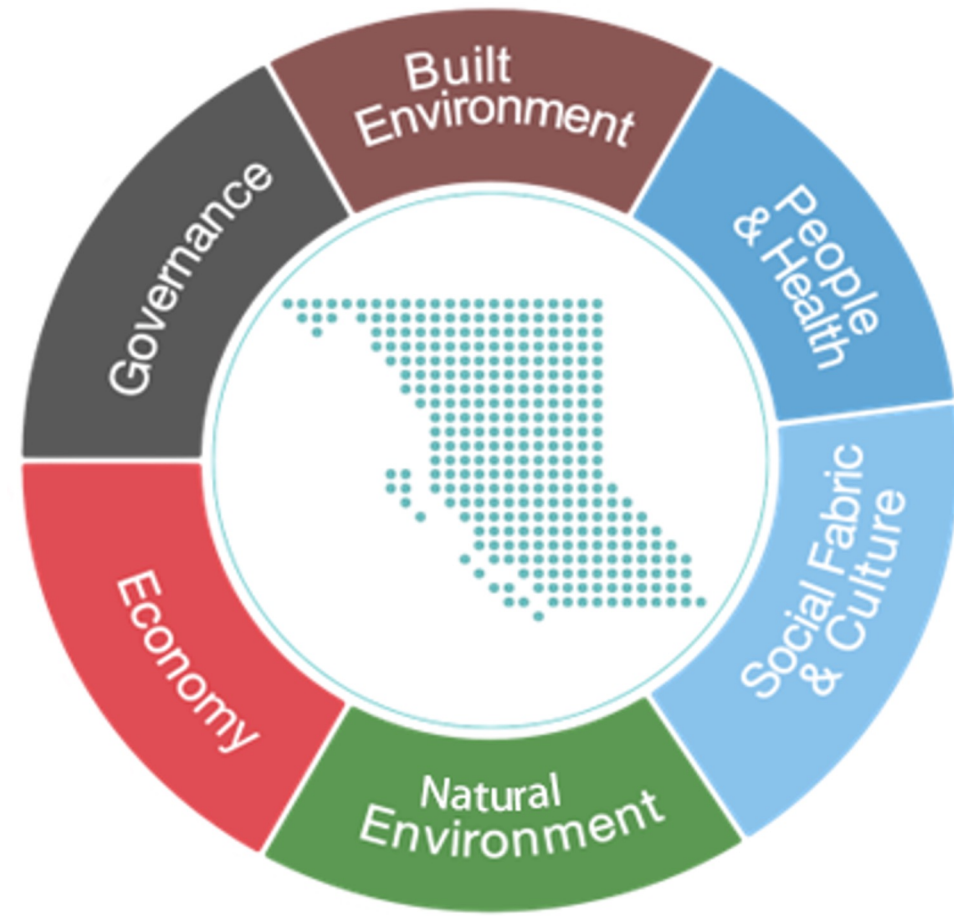
Example of Hazard Summary: Clear-Water Floods Hazard – Willow River
From BCC Cambio Communities

Stage 3: Flood Hazard Threat Assessment

Engagement (Category 2)

Engagement Session: **Identifying Valued Assets in the Region**

- Review results of base level floodplain mapping
- Provide overview of how flood hazard threat is assessed
- Gather input on valued assets within the project area

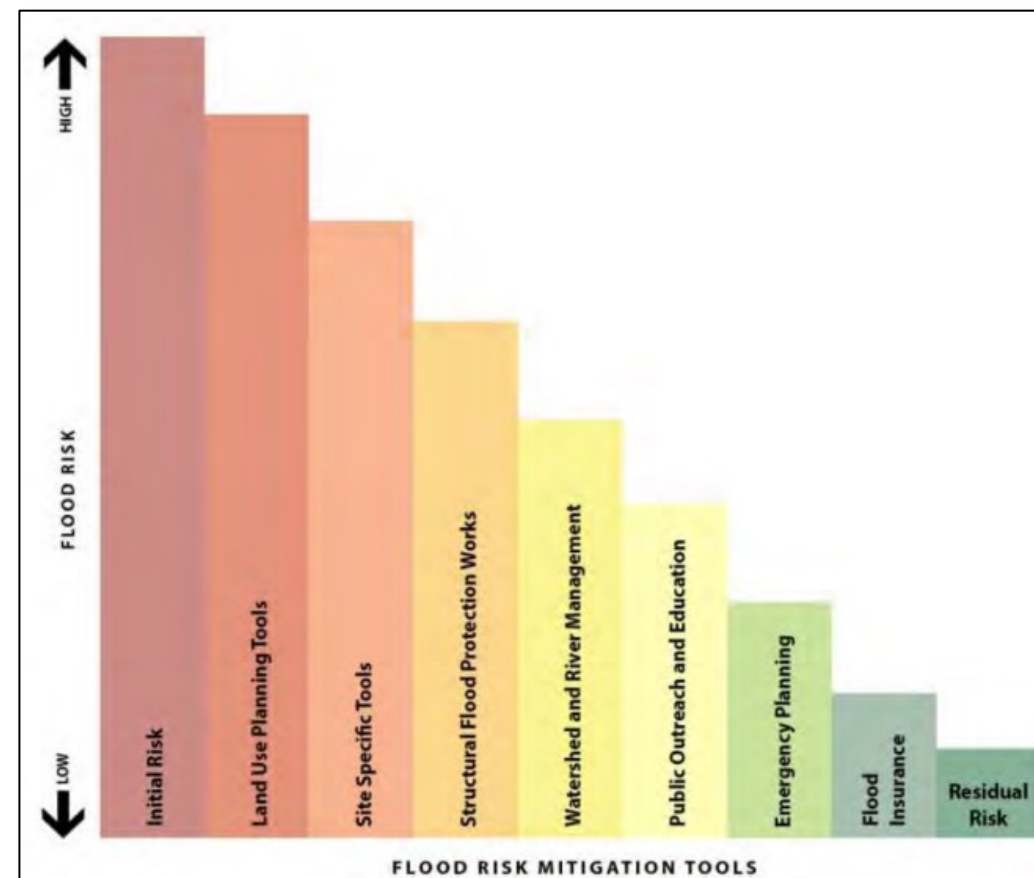


Vulnerable systems in BC's Disaster and Climate Risk and Resilience Assessments (DCRRA)
From BGC's DCRRA project work

Stage 4: Regional Flood Management Plan Options

Technical (Category 2)

- Review of approaches to flood risk mitigation
- Identify specific mitigation approaches of use within the project area
 - Develop prioritization approach to identify key flood issues/areas (informed by risk assessment)
 - Implement prioritization approach
- Identify conceptual-level flood mitigation options for the top three highest flood hazard threat areas ← Engagement Input
- Develop framework for further mitigation options as part of long-term flood hazard threat reduction strategy

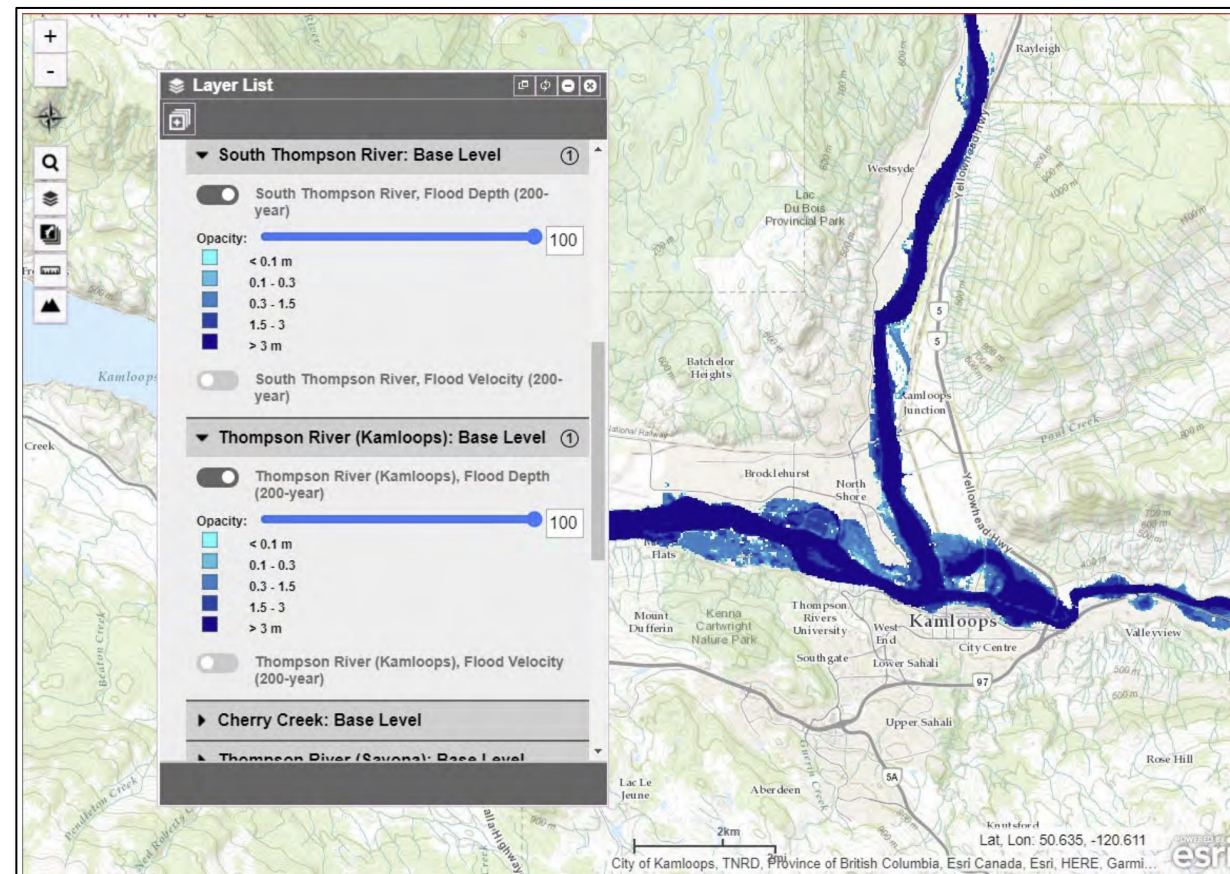


Flood Risk Management: Buying Down Flood Risk (adapted from 2008 US Army Corps of Engineers Flood Policy White Paper prepared by D. Riley)
From [KWL \(2017\) Squamish Integrated Flood Management Plan Final Report](#)

Stage 4: Regional Flood Management Plan Options

Engagement (Category 2)

- Engagement Session: **Flood Hazard Prioritization Framework**
 - Present results the results of flood hazard threat assessment
 - Gather input to inform flood hazard threat prioritization
- Engagement Session: **Conceptual-level Flood Mitigation Options**
 - Present flood hazard threat prioritizations
 - Collect input on conceptual-level flood mitigation options



Example of Base Level flood hazard map for confluence of North and South Thompson Rivers at Kamloops

From [BGC \(2021\) Thompson-Nicola Regional District Flood Hazard Assessment](#)

Closing

This presentation required a number of complex issues to be reduced to general concepts in a series of concise bullet points, photographs, and/or diagrams. The content of this presentation is not intended for design decisions or construction. This presentation is for general informational purposes only. BGC Engineering Inc.'s report(s) may contain more specific details concerning the issues identified in this presentation. Please consult BGC for further clarification if you have any questions or concerns.

Prepared by:

Lucy MacKenzie

Reviewed by:

Daley Clohan

Client:

District of Wells

Radloff and Associates

Date:

March 22, 2024