Project:	CVRD Coastal Flood Adaptation Strategy Phase 2 – Flood Risk and Options Assessment		
Meeting:	Engagement Round 3	**Original Document Date:**	29 September 2021
Subject:	Pre-Meeting Information Package – Adaptation Pathway Descriptions		

Note: *The original version of this document was prepared as a pre-meeting information package for the project's engagement Round 3 (held on 5 October 2021). The format and contents have been modified slightly compared to the original for clarity and consistency with information presented in the main report.*

Overview

Phase 2 of the CVRD Coastal Flood Adaptation Strategy (CFAS) is nearing completion. At our third Stakeholder and Partner engagement session on 5 October 2021, we will discuss adaptation pathways for the Saratoga Beach area. An adaptation pathway is a series of steps, with decision points, taken over time to adapt to rising seas and other coastal changes. We will think creatively about the pathways, with the objective of identifying a suite of preferred options. The outcomes will support further engagement and decision-making processes by the CVRD and other partners and stakeholders.

Adaptation Pathways

This section describes four adaptation "pathways," specific to the Saratoga Beach area. Pathways are descriptions of an imagined, but plausible, set of actions to address flood risk and resilience, that would take the community in different directions. These have been developed to reflect some of the preferences, values and challenges identified by participants in our second engagement session on Sept 9th.

The four pathways for this exercise are:

- Pathway 1: Staying Put and Taking the Edge Off
- Pathway 2: Dancing Out of the Way
- Pathway 3: Putting on Raincoats
- Pathway 4: Strengthening the Village

Figure 1: Imagining a path can help us envision possible futures.

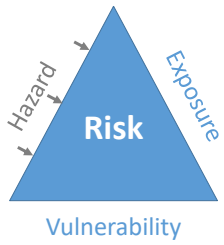
For each pathway outlined in the pages below, the first table provides a snapshot of the main characteristics, including a list of strategies that are typically taken. It also summarizes the pathway's flexibility, which describes the ease of changing strategy or reversing a decision over time, should climate or other risk be different than what is expected today. In general, a pathway is considered more robust when it is flexible. How much the pathway diverges from the current situation (status quo) is also indicated. Whether the pathway works by way of reducing the hazard, exposure, or vulnerability, is indicated in the "riskier triangle" diagram.

The table is followed by a hypothetical narrative to describe actions that would be taken under that pathway. The narrative is followed by a timeline diagram, to visualize, very generally, the pathway's potential effectiveness and residual risk into the future. Some adaptation strategies will take many years or decades to implement, while others can be implemented immediately. In contrast, some strategies can become more effective as the flood hazard increases (e.g., Retreat), while others may cease to be effective at all, beyond a certain point (e.g., Protect).

The pathway is then evaluated, at a high-level, based on simplified criteria. These consider how the pathway performs during a flood, and they consider the effects of the pathway itself (the rest of the time). Web resources are also provided for more insights on the pathway discussed.

Pathway 1: Staying Put and Taking the Edge Off

Strategies Emphasized	Protect (green) Protect (structural) Resilience (residual risk)	**Primary Influence on Risk / Resilience**	Reduces hazard
Flexibility	Low		
Divergence from Status Quo	Moderate		



What Happens in this Pathway?

Having heard from the community that there is a strong desire to maintain current settlement, development and use patterns in the Saratoga Beach area, the CVRD, as a Local Government authority, leads the charge on implementing a hybrid "Protect" approach to flood risk mitigation. This is led primarily by government support for green infrastructure. A number of Green Shores initiatives are developed, engaging community members in some of these efforts over a number of years as these are established. These initiatives build some community connectedness, reduce key aspects of coastal flood hazard (e.g., wave action, coastal energy). Similar initiatives are implemented to reduce flooding from estuaries, and allowing these areas to absorb coastal flood waters.

Planning and financing is also considered for limited hard shoreline protection options (e.g., rip rap, sea barriers, and possibly dikes). These are targeted to prevent damage to valued community and economic assets (e.g., K'ómoks cultural sites, Marina, individual properties). Note that engineered solutions are contrary to CVRD's existing bylaws/policies and the region currently has no dikes.

Outside of the "protect" strategies, emergency plans, with a strong emphasis on early warning and monitoring, are the main tools to support residents in the flood hazard zone. Residents are largely left to their own devices to implement floodproofing measures, which have become more commonplace on the BC coast. Hazard area disclosure statements are now required when selling/purchasing properties, making new owners aware of the risk. Insurance is used to manage financial risks for private residences, businesses and the public sector, but the rising rates make insurance unattainable for lower income households.

In time, key pieces of critical infrastructure (electrical transmission structures, telecom structures) are flood-proofed to prevent damage as the risk level increases. By the time hard shoreline features need replacing, there is little financial capacity or will to rebuild in these areas.

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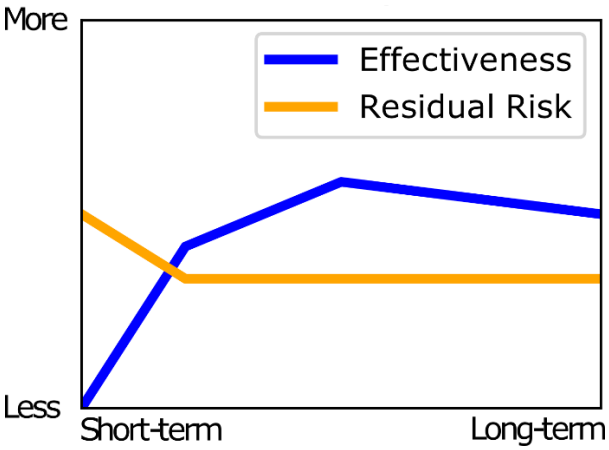
How Might Pathway 1 Fare Over Time?



How Might the Pathway Fare Over a Range of Criteria?

Effect of Pathway During a Flood

Criteria	Comments	Scoring
Human Health & Safety	Conditions become safer.	Slightly better
Residential Properties	Most are protected, as long as engineered flood protection structures are maintained.	Slightly better
Culture	Some First Nations heritage sites are preserved.	Slightly better
Infrastructure	Critical infrastructure is protected and retrofitted.	Far better
Economy	There are high costs, but existing businesses are protected.	Neutral

Effect of the Pathway Itself

Criteria	Comments	Scoring
Community involvement	Instills "fend for yourself" thinking, besides coming together to build nature-based solutions.	Neutral
Environment	Habitats are protected in the short-term, but fighting nature hinders ecosystems.	Slightly worse
Recreation	Some activities are preserved, but there are fewer nature-based activities.	Slightly worse
Implementation cost	The costs are high, and upfront.	$$$
Maintenance cost	The maintenance costs will be substantial.	$$
Implementability (regulatory, political, etc.)	Regulatory hurdles are balanced by strong political will for nature-based solutions.	Challenging

Web Resources

- Future of our coasts: The potential for natural and hybrid infrastructure to enhance the resilience of our coastal communities, economies and ecosystems (research paper): https://www.researchgate.net/figure/Examples-of-coastal-defenses-including-natural-infrastructure-managed-realignment-and_fig1_275641659
- Green Shores Program: https://stewardshipcentrebc.ca/green-shores-home/gs-about/
- International Guidelines on Natural and Nature-Based Features for Flood Risk Management: https://ewn.erdc.dren.mil/?page_id=4351
- Puget Sound Innovation Stories: https://innovationstories.psp.wa.gov/activity/dike-setback/
- Natural and Nature-Based Flood Management: A Green Guide (Book): https://www.worldwildlife.org/publications/natural-and-nature-based-flood-management-a-green-guide

Pathway 2: Dancing Out of the Way

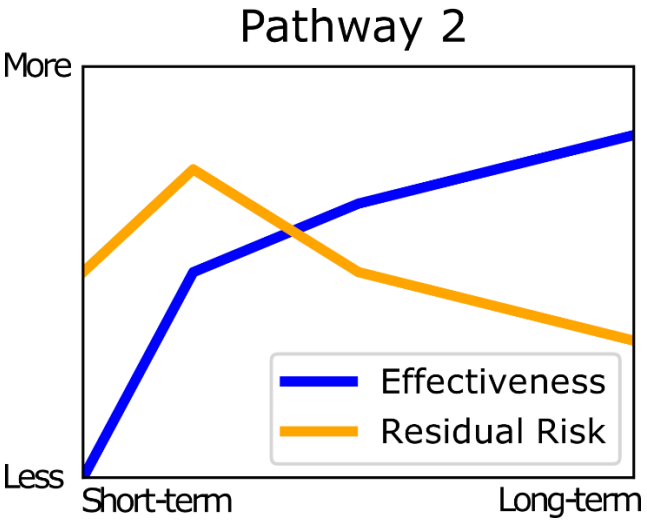
Strategies Emphasized	Avoid Retreat Resilience	**Primary Influence on Risk / Resilience**	Reduces exposure 
Flexibility	High		
Divergence from Status Quo	High		

What Happens in this Pathway?

The community decides to pursue a more flexible strategy that involves changes to current land use patterns. Communications and educational opportunities are provided to support the public in understanding the challenges of sea level rise and the need to work together on solutions. The approach is phased over time, and includes a community-led process of managed retreat. The CVRD, with the backing of senior government funding, supports this intention through development of post-disaster recovery plans that have publicly-vetted mechanisms for buying out properties and supporting relocation to other areas.

The CVRD develops planning and zoning tools in support of changing land use patterns over time. Initially, the Regional Growth Strategy is updated to avoid new development in sea level rise areas and the settlement node designation is transferred to another less hazardous area. The CVRD directs density, and high value assets, away from coastal flood hazard areas, with incentives for redistribution of density and promotes innovation to start to create more flexibility. Land uses in higher risk areas transition over time to be used primarily as public parks and recreational areas, protected cultural and archaeological sites, and/or to be dedicated to ecological restoration – in turn offering additional benefits for flood mitigation and other ecological services. This area remains a popular destination in the region, given the attractive natural features and beaches.

How Might the Pathway Fare Over Time?



How Might Pathway 2 Fare Over a Range of Criteria?

Effect of Pathway During a Flood

Criteria	Comments	Scoring
Human Health & Safety	While conditions are safer, relocation has an emotional toll.	Better
Residential Properties	Most are protected over the long-term.	Far better
Culture	Heritage sites in the floodplains are not preserved.	Sightly worse
Infrastructure	Appropriate changes are made and critical services are unaffected by flooding.	Far better
Economy	Up-front buyout costs outweigh disaster costs of doing nothing over time.	-$

Effect of the Pathway Itself

Criteria	Comments	Scoring
Community involvement	The "flood literate" community is equipped to make proactive, thoughtful design choices.	Far better
Environment	Coastal and estuarine ecosystems reclaim their habitat.	Far better
Recreation	Not all activities are preserved, but new opportunities emerge.	Slightly better
Implementation cost	The costs are high, but can be spread out over time.	$$
Maintenance cost	There are few maintenance costs, especially over the long term.	-$$$
Implementability (regulatory, political, etc.)	Planning work is required in the near-term, facilitating longer-term actions.	Slightly challenging

Web Resources

- The US EPA Rolling Easements Primer: https://www.epa.gov/sites/default/files/documents/rollingeasementsprimer.pdf
- Reimagining the Shoreline: Opportunities for Managed Retreat in BC: http://haznet.ca/re-imagining-the-shoreline-opportunities-for-managed-retreat/
- Planned Retreat Approaches to Support Resilience to Climate Change in Canada: https://ftp.maps.canada.ca/pub/nrcan_rncan/publications/STPublications_PublicationsST/328/328323/gid_328323.pdf
- New Jersey Blue Acres Buy-out Program: https://www.nj.gov/dep/greenacres/pdf/faqs-blueacres.pdf
- Monmouth Conservation Foundation: http://www.monmouthconservation.org/menu/

Pathway 3: Putting on Raincoats

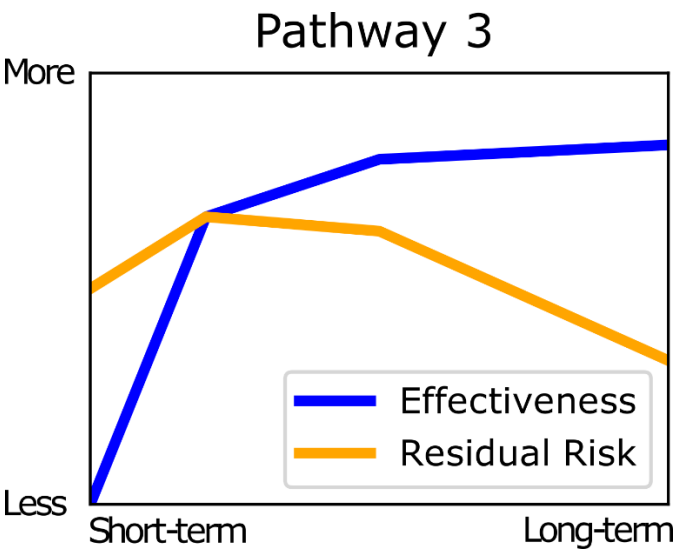
Strategies Emphasized	Accommodate Resilience	**Influence on Risk / Resilience**	Reduces vulnerability 
Flexibility	Moderate		
Divergence from Status Quo	Moderate		

What Happens in this Pathway?

Educational programs support the public in understanding the challenge of sea level rise and nuanced flood risk, enabling them to make considered choices about reducing risk to their homes and businesses. The CVRD implements new Flood Construction Levels (to elevate structures above flood levels), along with design guidelines and informational resources to improve accessibility and aesthetics. Programs provide comprehensive information, "how-to" guidebooks, incentives, and opportunities to pilot new approaches, which advances the uptake of flood-proofing measures for homes and businesses. Funding and other resources are provided to ensure lower income residents and service organizations have the option of permanently or temporarily flood-proofing living areas. Various levels of government are gradually adapting services and structures to move them above flood level or out of flood hazard areas.

The CVRD invests in its emergency preparedness capacity and region-wide volunteership, as flood events in coastal areas become a more regular occurrence. This includes neighbourhood preparedness programs and regional evacuation and emergency housing networks to support more frequent evacuations.

How Might the Pathway Fare Over Time?



How Might Pathway 3 Fare Over a Range of Criteria?

Effect of Pathway During a Flood

Criteria	Comments	Scoring
Human Health & Safety	Conditions become safer for those who can afford to make changes.	Slightly better
Residential Properties	Most are protected.	Slightly better
Culture	First Nations heritage sites are preserved.	Far better
Infrastructure	Critical infrastructure is protected and retrofitted.	Far better
Economy	There are high costs, but existing businesses are protected.	Neutral

Effect of the Pathway Itself

Criteria	Comments	Scoring
Community involvement	There is pro-active engagement toward "flood literacy".	Far better
Environment	Habitats are gjven space to adapt where this makese sense.	Slightly better
Recreation	Not all activities are preserved, but new opportunities emerge.	Slightly better
Implementation cost	The costs are relatively high and sustained.	$$
Maintenance cost	Maintenance costs are reduced as new designs are adopted globally.	Neutral
Implementability (regulatory, political, etc.)	There is political will and public buy-in for the required changes.	Slightly challenging

Web Resources

- Urban Green-Blue Grids: https://www.urbangreenbluegrids.com/measures/measures-for-separate-buildings/raised-constructions/
- Retrofitting for Flood Resilience A Guide to Building & Community Design (Book): https://www.routledge.com/Retrofitting-for-Flood-Resilience-A-Guide-to-Building--Community-Design/Barsley/p/book/9781859467343
- Flood Mapping Basics: https://www.youtube.com/watch?v=bNasdKVeivk

Pathway 4: Strengthening the Village

Strategies Emphasized	Resilience Retreat	**Primary Influence on Risk / Resilience**	Reduces vulnerability 
Flexibility	High		
Divergence from Status Quo	High		

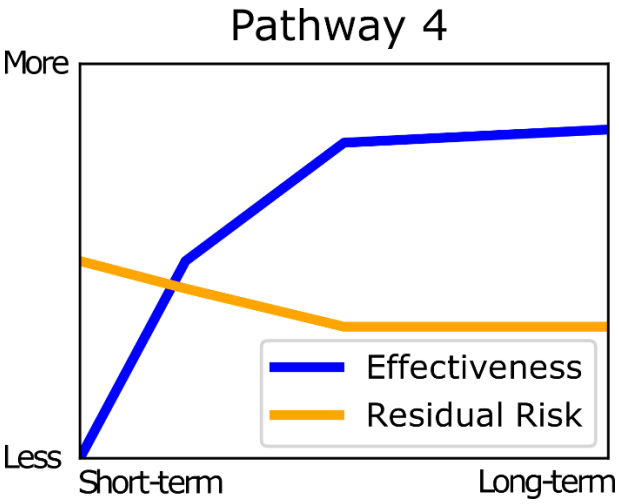
What Happens in this Pathway?

The community has decided to come together to pursue a highly collaborative way of life, focused on restoring the natural resilience and benefits of thriving ecological systems. Ongoing engagement, communication and shared learning is an integral part of the process.

The CVRD develops planning and zoning tools in support of changing land use patterns over time, avoiding further development in at-risk areas and prioritizing ecological restoration in flood risk zones as well as wetlands, estuaries and riverine habitat to moderate coastal flood hazard as well as overland flows. A strong partnership between K'ómoks First Nation, the CVRD and local community partners leads to strong relationships, shared investment and a growing ecological restoration culture across the region. K'ómoks cultural sites and values are designated as a high priority to protect. Development cost charges are routinely levied and primarily directed to parks and natural asset management initiatives.

Community members invest in a long-term collaborative process supported by the CVRD and others, to develop and implement creative solutions to re-distribute risk and benefits among residents inside and outside of the flood zone, allowing more people to remain in the area and benefit from the beautiful natural environment. The waterfront eventually becomes a shared public good, enjoyed and cared for by the whole community. Community and social resilience is high, leading to strong and supported emergency response and evacuation networks.

How might the Pathway Fare Over Time?



How Might Pathway 4 Fare Over a Range of Criteria?

Effect of Pathway During a Flood

Criteria	Comments	Scoring
Human Health & Safety	Safety is greatly increased over time as people are moved out of harms way.	Far better
Residential Properties	Most are protected over the long-term, depending on their location.	Far better
Culture	Heritage sites are protected and community respect is high.	Far better
Infrastructure	Appropriate changes are made and critical services are less affected by flooding.	Better
Economy	Changes are implemented opportunistically, and are much smaller than disaster costs.	-$$

Effect of the Pathway Itself

Criteria	Comments	Scoring
Community involvement	The community acts proactively and equitably, strengthening it substantially.	Far better
Environment	A changing land ethic helps ecosystems including with their adaptation.	Far better
Recreation	Some activities disappear, but sustainable and more inclusive options are created.	Far better
Implementation cost	The costs are moderate, and will be spent over a long period of time	Neutral
Maintenance cost	The maintenance costs will be minimal.	-$$$
Implementability (regulatory, political, etc.)	This pathway is a large shift from the status quo, and will be challenging to implement.	Very challenging

Web Resources

- Coast Adapt (Australia): https://coastadapt.com.au/pathways-approach
- Tofino Flood Plain Bylaw Development: https://talktofino.ca/flood-plain-bylaw-development
- Ontario Conservation Authority Flood Management: https://conservationontario.ca/policy-priorities/flood-management/conservation-authority-flood-management