

Regional Floodplain Management Plan – Phase 3

Flood Mitigation Planning – Project Update

November 4, 2021

1450 K.L.O. Road
Kelowna, BC, V1W 3Z4
rdco.com



Purpose

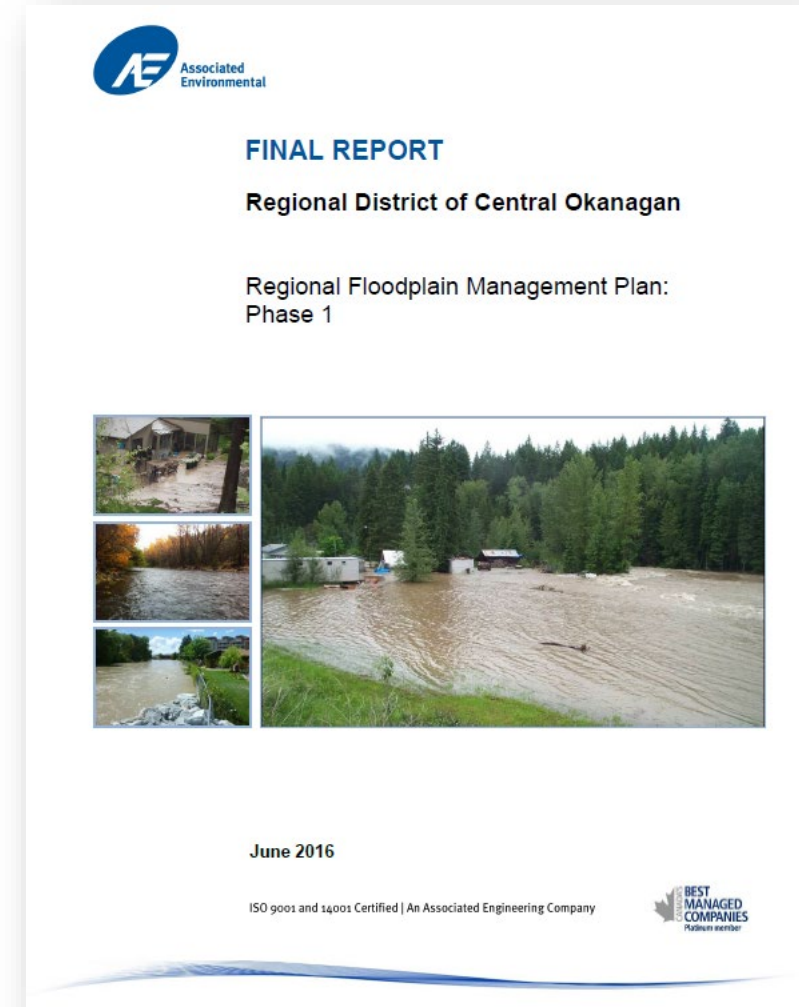
- Provide an update on Phase 3 of the Regional Floodplain Management Plan.
- Present information regarding the Flood Mitigation Planning project.

Background



Regional Floodplain Management Plan (RFMP) Phase 1

- Region-wide high-level risk assessment and gap analysis.
- Established the scope and priorities for Phase 2 & 3.



Priority Projects: Five Year Action Plan

#	Project	2017	2018	2019	2020	2021
1	Regional Flood Management Plan: Phases 2 and 3					
2	Regional Planning Lab					
3	Regional Housing Needs Assessment					
4	Regional Growth Strategy Monitoring Program					
5	Regional Citizen Survey					
6	Regional Housing Strategy					
7	Regional Growth Strategy Five-year Review					
8	Regional Agricultural Strategy					
9	Regional Employment Lands Inventory					

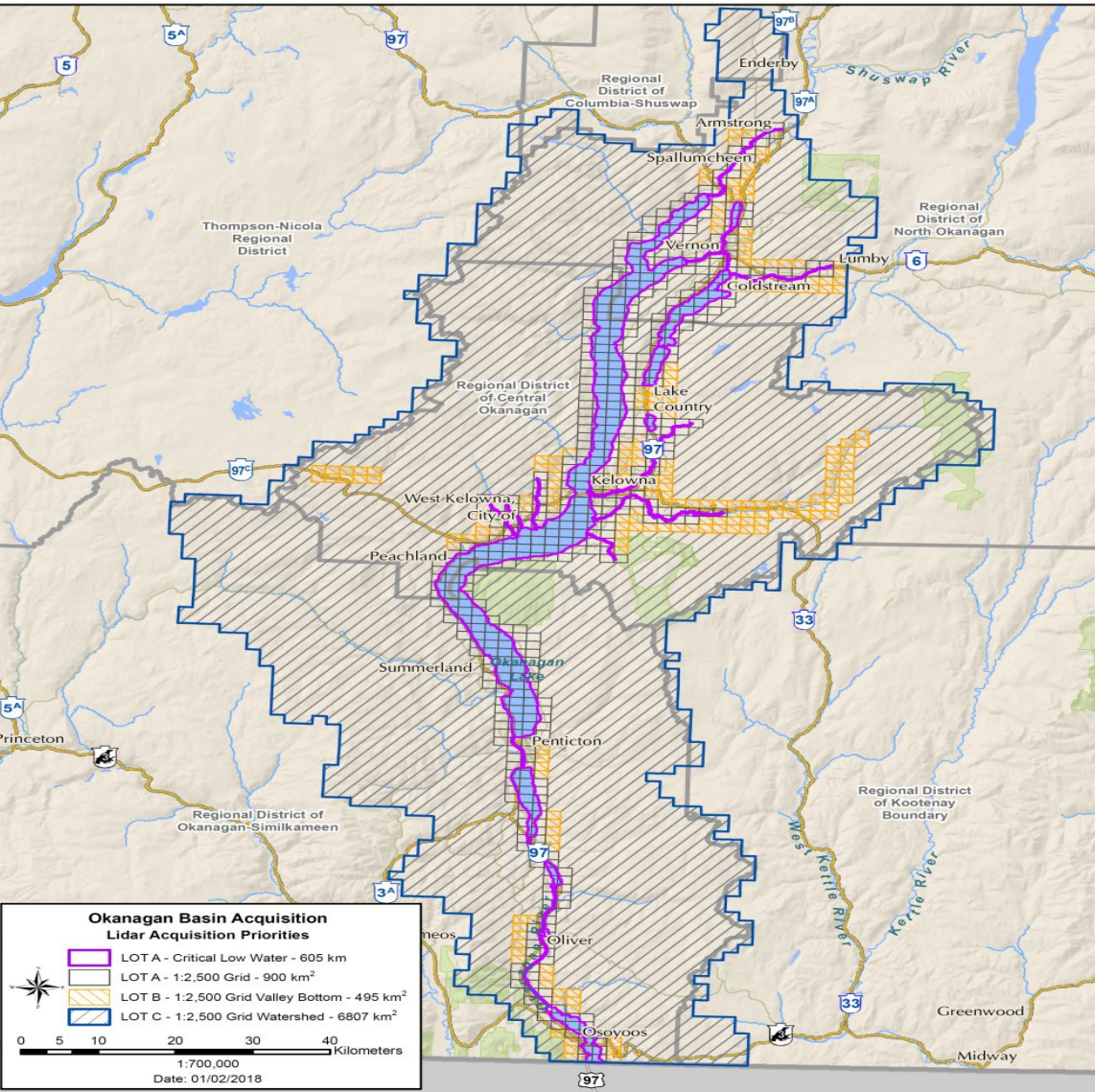
Background – RFMP Phase 2



Recommended Actions for Phase 2:

- Mission Creek Floodplain Mapping Update – *completed*
- Mission Creek Dike Breach Analysis – *completed*
- Mill Creek Floodplain Mapping – *completed*
- Confirm floodplains and alluvial fans within urban or residential developments
 - Lake Country (Vernon Creek) - completed
 - Peachland (Peachland & Trepanier Creeks) - completed
 - Kelowna (Bellevue Creek) - in process
 - West Kelowna (Powers and McDougall Creeks) – in process
- Okanagan Lake Flood Risk Mapping (OBWB) – *in process*

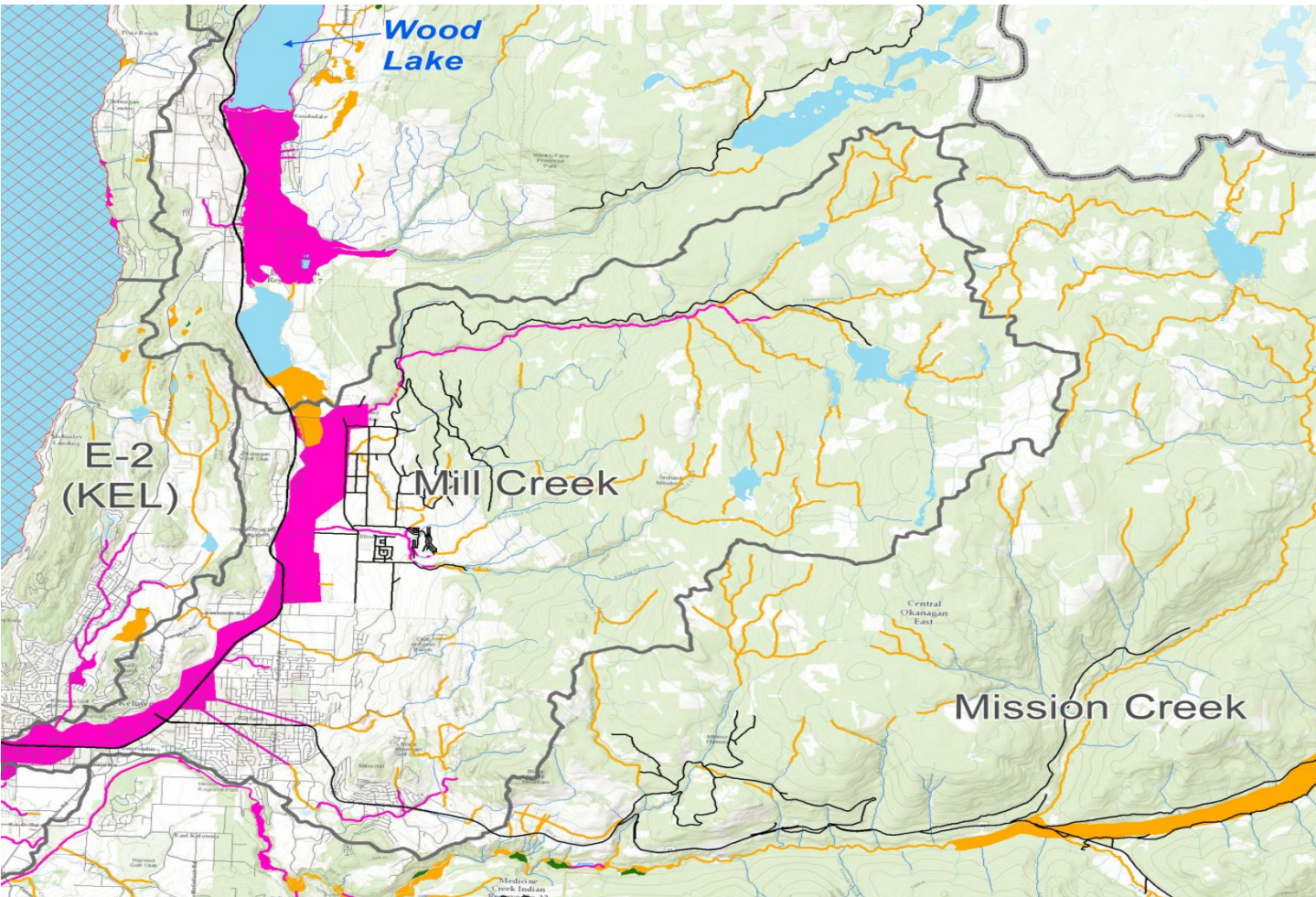
Okanagan, Wood, Kalamalka & Ellison Lakes Flood Level Mapping



- Finalized:
 - OBWB & GeoBC LiDAR project
 - Funding from EMBC
 - RDCO, RDOS, RDNO & OBWB flood mapping collaboration
 - Funding from NDMP & UBCM
- Outcome: Flood modelling and digital mapping

Dam Failure Inundation Mapping

- Beaver (Swalwell) & Crooked Lakes:
 - Completed in cooperation with the District of Lake Country in 2018
- Ideal (Belgo) Lake:
 - Completed in cooperation with the Black Mountain Irrigation District in 2018



Background – RFMP Phase 3



Flood Mitigation Planning

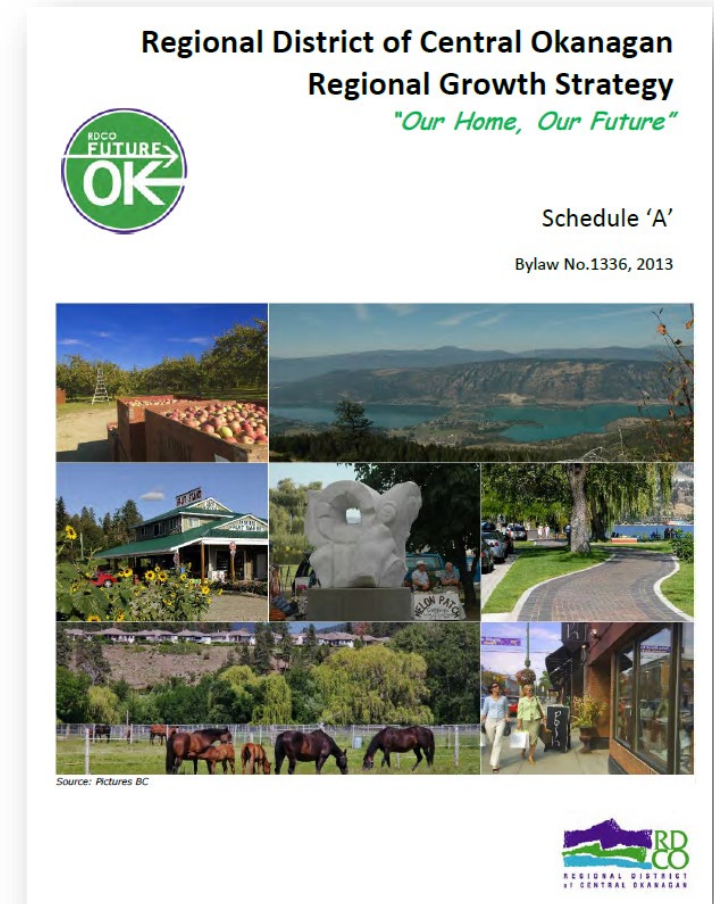
- \$150,000 UBCM grant funding awarded.
- Project initiated in January 2021.
- Next step in the process is to identify the best and most cost-effective mitigation strategies.

Project Deliverables

- 1) Engagement Framework & Summary of Engagement Activities.
 - Update presented to G&S in July 2021.
- 2) Non-structural Flood Mitigation Planning “Resource Guide”.
- 3) Non-structural Flood Mitigation Planning “Technical Report”.
- 4) Presentations to member municipalities, First Nations government, and the Regional Board.

Regional Growth Strategy Policies

- 3.2.1.11
 - Encourage cooperation and **information sharing** with regional partners on hazard identification and mapping programs to provide better and more information on **hazard management**.
- 3.2.1.12
 - Encourage cooperation and information sharing with regional partners to identify data and information necessary to improve hazard and **resiliency planning**.



Regional Board Strategic Priorities

Environment: We will initiate and support efforts to reduce our environmental footprint, adapt to climate change and connect with nature.

Specific actions include:

- Complete Phase II & III of the Floodplain Management Plan.

Through these actions we will see:

- A reduction in new construction in higher risk floodplain areas.

Desired Outcomes of the Floodplain Management Plan:

- Reduce flood risk.
- Improve emergency response.
- Increase resiliency to climate change.



An aerial photograph showing a residential area with houses and a marina. The water is dark blue, and the houses are mostly white with dark roofs. A large, dark, irregular shape in the water indicates a flooded area. The text "Central Okanagan" is in blue, and "FLOOD MITIGATION PLANNING" is in large white letters.

Central Okanagan FLOOD MITIGATION PLANNING

RDCO Regional Board Meeting

November 4th, 2021

Today's Presentation

- Quick reminders on what flood means in the Okanagan
- Overview of deliverables (Resource Guide and Technical Report)
- Key recommendations

Project Reminder!

1903



Bernard Avenue at
Abbott Street

City of Kelowna Archives

2017

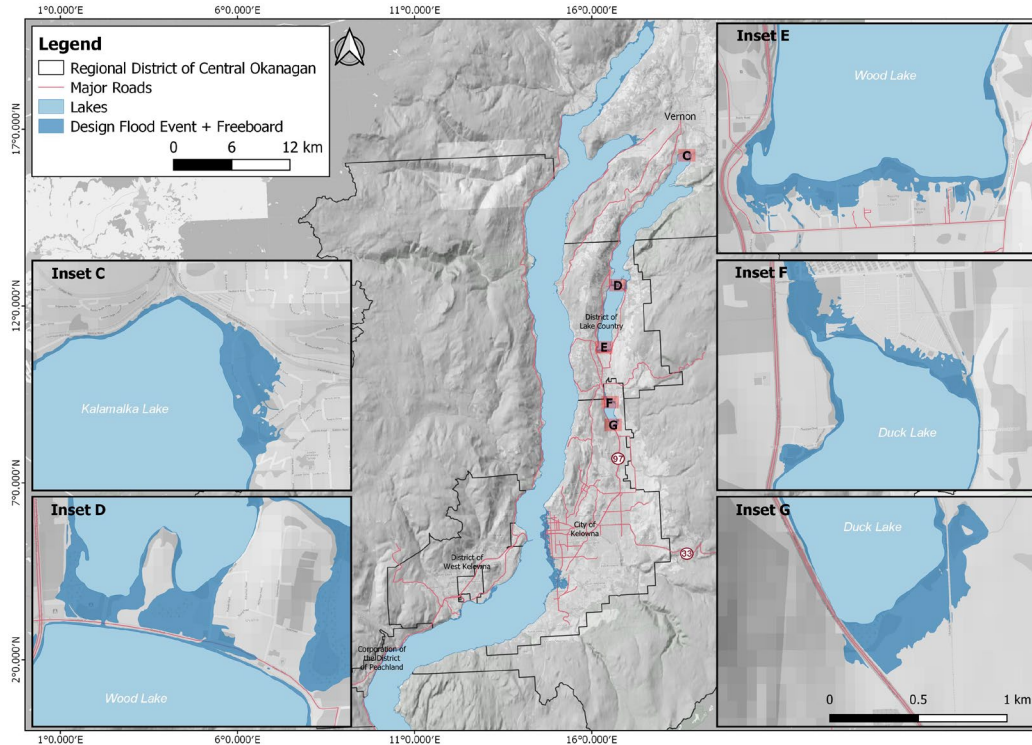


Off Sutherland Avenue

RDCO image. Used with permission

Not all flood hazards are created equal

Key message and best practice response



- Lake (Coastal)
- Creek and River
- Pluvial
- Erosion
- Avulsion



Key message #1: Flood hazards are nuanced. Mitigation actions need to be too.



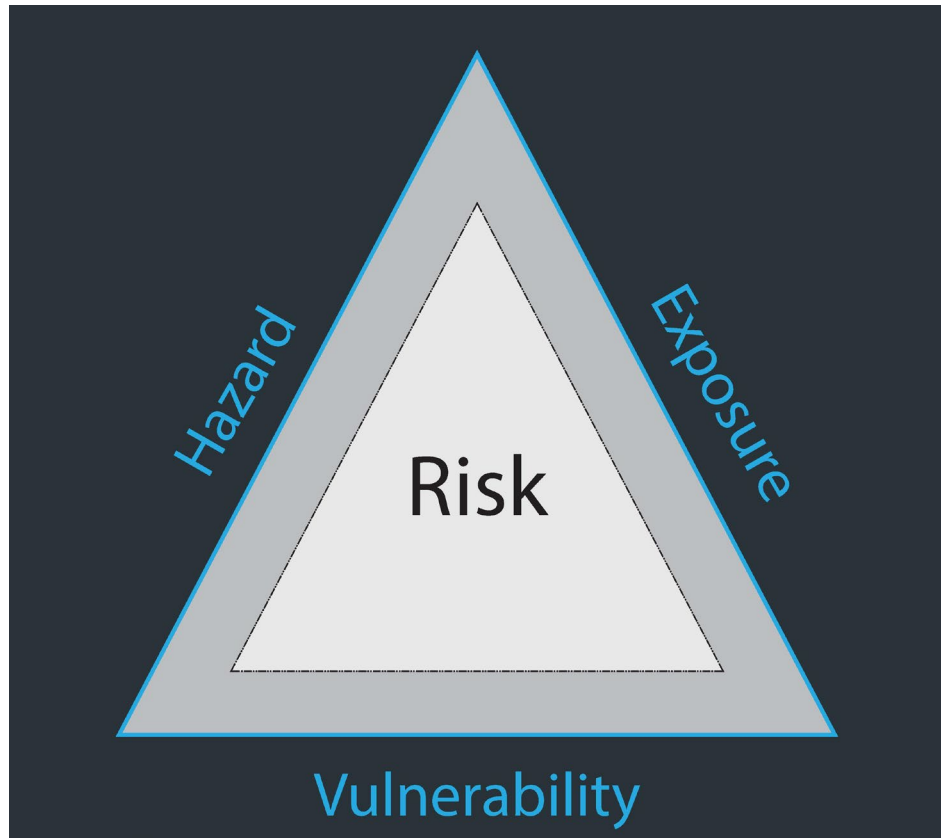
Action #1: Consider the nuance and range of events.

Flood hazard and risk profiles



Damages and consequences are what matter

Key message and best practice response

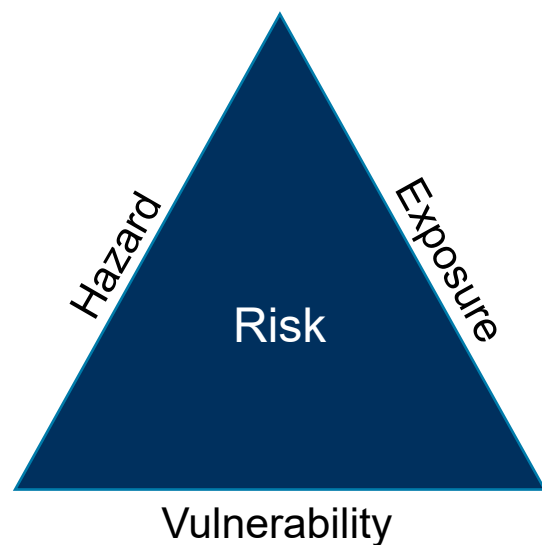


Key message #2: It's RISK that matters. Risk is messy and complex.



Action #2: Use risk as the basis for analysis. Acknowledge the messiness and uncertainty.

Potential for risk reduction

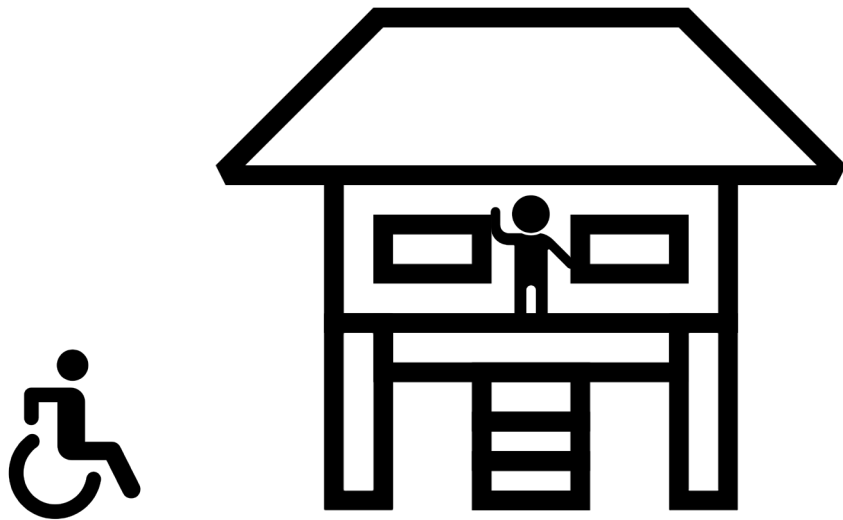


EFFECTIVENESS OF OPTION FOR RISK REDUCTION AND RESILIENCE DURING A FLOOD

PEOPLE	Health & safety
STRUCTURES	Damage to structures
DISRUPTION	Disruption of services and mobility (e.g., electricity, gas, communications)
ECONOMY	Damage to local economy including agriculture and tourism
EMERGENCY RESPONSE	Effectiveness of response
CLIMATE	Adaptability of option to multiple climate futures

Flood mitigation actions have consequences

Key message and best practice response

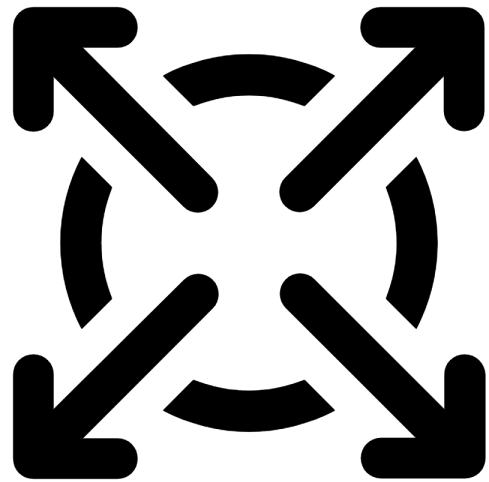


Key message #3: Externalities matter, especially when they exist 365 days a year.



Action #3: Strive for solutions that minimize externalities and have co-benefits.

Negative and positive externalities



EFFECT OF OPTION ITSELF ON ITS SURROUNDINGS

COMMUNITY

Housing

Social connectedness and supports

ENVIRONMENT

Habitat health (aquatic, wetland, and riparian)

CULTURE

Recreation and outdoor lifestyle

OBSTACLES

Regulatory

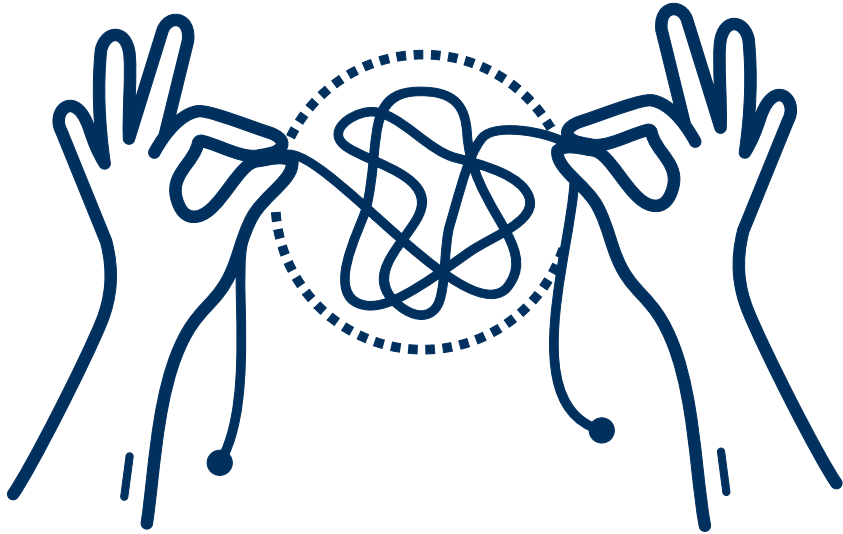
Political and public will

COST

Implementation cost

Maintenance cost

Taking action on non-structural mitigation



- This is a messy problem
- Solutions are not homogeneous:
 - Hazard type, severity, frequency
 - Existing land use (and all the things that go along with this)
 - Jurisdiction
 - Potential for risk reduction
 - Negative and positive externalities

Non-structural is not the norm...



Project Deliverables

NON-STRUCTURAL FLOOD MITIGATION

Resource Guide



Final

FALL 2021



Central Okanagan
**FLOOD
MITIGATION
PLANNING**

Non-Structural Flood Mitigation Technical Report

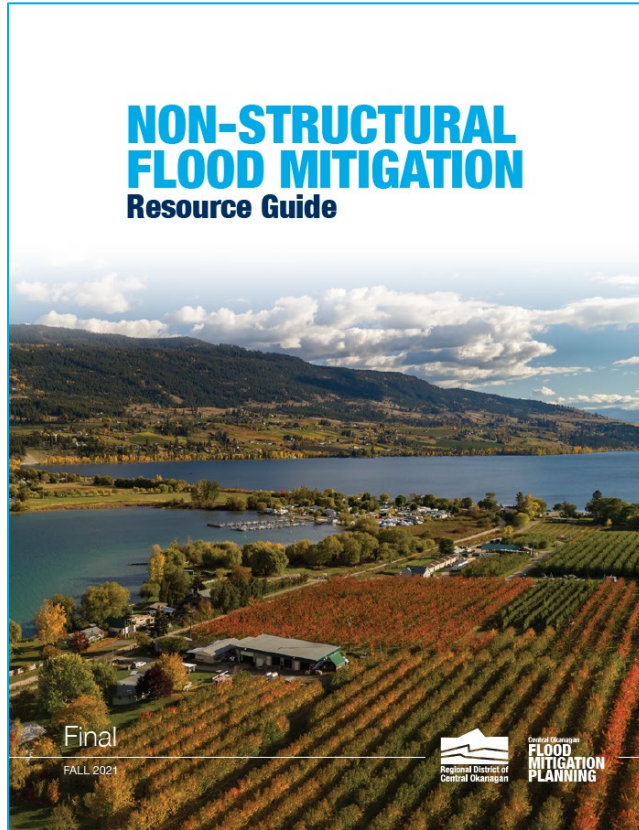
FINAL DRAFT

Fall 2021

Regional District of Central Okanagan

Central Okanagan
**FLOOD
MITIGATION
PLANNING**

The What




- A “Toolbox” of non-structural mitigation options
- Targeted at First Nation and Local Government

Options Overview


While flood risk is complex, the good news is that there is a very wide range of possible non-structural flood mitigation options that can be applied to your particular context. The remaining section of the Resource Guide presents detailed information on forty different non-structural flood mitigation options, to help you discern which combination or "suite" of options will allow you to best reduce flood risk, build resilience and meet the particularities of your context. These options can be considered as part of a "toolbox" of possibilities that can be drawn on in different ways over time, to best meet your particular needs, concerns and opportunities.


We have used the terms "Approach", "Strategy" and "Option" to organize and group ideas together in a way that makes it easier to see how they differ one from another, and so that it is easy to consider alternatives. In this Guide, these are defined as:

- **Approach** – an overarching category of non-structural flood mitigation strategies, based on whether it acts to reduce hazard, exposure or vulnerability, or increase resilience. There are six overarching Approaches in this Guide, summarized in the tables directly below. Each Approach is assigned a colour, to help with navigating through the Option profiles that follow.
- **Strategy** – a category of Options with a shared intention or objective. Within each Approach, there are multiple strategies. For example, under the Approach "Emergency Response," there are three strategies: "Monitoring and Warning", "Flood Response Planning" and "Neighbourhood Resilience Building."
- **Option** – specific actions that can be taken to fulfill the intention of a given Strategy. For example, within "Flood Response Planning", specific Options include "Flood Response Plan", "Flood Response Plan Maintenance", "Flood Response Training" and "Flood Response Resources".


 LAND STEWARDSHIP <i>Maintaining and restoring natural assets and systems (e.g., watersheds, wetlands, riparian areas, natural waterways) to help reduce flooding.</i>		
STRATEGY	RATIONALE	OPTION
Maintain natural assets	It is well documented that natural systems are extremely effective at managing the natural hydrologic cycles. Protecting and maintaining existing natural assets (e.g., natural vegetation and wetlands in upper watersheds, riparian areas, natural coastlines) will maintain the hazard profile going forward. Current practices (e.g., land development, hardening of riverine and coastal edges) generally increase hazard.	1. Protection of Upper Watersheds 2. Protection of Lower Watersheds 3. Protection of Riparian Areas and Lakeshores
Restore natural assets	Recognizing that many natural systems, which would historically have reduced flood hazards, have been damaged by human activity, it is known that in some cases restoring ecological function will reduce risk over time.	4. Constructed Wetlands 5. Dike Setbacks or Removals. Daylighting of Creeks


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 LAND USE MANAGEMENT <i>Encouraging or requiring types of land use in flood hazard areas that will prevent or reduce potential damage.</i>		
STRATEGY	RATIONALE	OPTION
Avoid	The surest means of limiting risk is to have no exposure to flood hazard. This is ideally managed by avoiding development in hazard areas in the first place.	6. Land Use Controls to Limit All Development 7. Land Use Controls to Limit High Consequence Development 8. Acquisition – Undeveloped Land
Retreat	For currently developed areas, managed or strategic retreat is another way to eliminate exposure to flood hazard. This might be total or partial retreat.	9. Acquisition – Post-disaster buyouts 10. Acquisition – Developed Land (Pre-disaster) 11. Life-Rights Agreements (Acquisition over time) 12. Relocation – Property 13. Relocation – Infrastructure
Redistribute	Another way of approaching exposure reduction is to consider the redistribution of assets across hazard areas. For example, removing highly vulnerable elements from flood hazard areas, or reducing density in highest hazard areas (i.e., floodway), and increasing density in flood fringes or outside the flood hazard area altogether.	14. Transfer of Development Potential 15. Rolling Easements 16. Density Redistribution 17. Right to Flood

 BUILDING MANAGEMENT <i>Regulations and strategies that make structures and belongings less susceptible to flood damage.</i>		
STRATEGY	RATIONALE	OPTION
Building Controls for New Builds	With flood hazard areas on the rise, and increasing development pressures, it is not always possible to sterilize land use within flood hazard areas. Changing the built form so that damages to structures are limited, or more easily recoverable is an effective means of reducing risk. This can be relatively easily achieved for new construction.	18. Elevate Structures (New Builds) 19. Elevate High Consequence Structures (New Builds) 20. Dry Floodproofing (Permanent) 21. Dry Floodproofing (Temporary) 22. Wet Floodproofing (New Builds)
Retrofitting of Existing Buildings	With flood hazard areas on the rise, and increasing development pressures, it is not always possible to sterilize land use within flood hazard areas. Changing the built form so that damages to structures are limited, or more easily recoverable is an effective means of reducing risk. Retrofitting of structures to limit or reduce damage is possible.	23. Elevate structures (Existing Builds) 24. Dry Floodproofing (Permanent) 25. Dry Floodproofing (Temporary) 26. Wet Floodproofing (Existing and New Builds)

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 EDUCATION AND AWARENESS <i>Strategies to educate the public, practitioners, and other stakeholders.</i>		
STRATEGY	RATIONALE	OPTION
Acknowledge and Disclose	A precursor to developing land use controls in flood hazard areas is the recognition, acknowledgement and public disclosure of the existence, extents, etc. of the hazard. Disclosure can also support uptake of other risk reduction or resilience measures (e.g., floodproofing, insurance).	27. Covenant on Title 28. Public and Accessible Flood Mapping
Public Education	Programs to educate the public about flood hazard, vulnerability, and risk as well as the provision of resources that can aid the public in making good decisions about flood-risk reduction.	29. Public Education (Multi-media) 30. Serious Gaming 31. Public Art
Media Education	Programs to educate the media, in advance of a flood event to support them to provide correct and useful information.	32. Media Education

 EMERGENCY RESPONSE <i>Strategies that are in place to ensure efficient and effective response when floodwaters are on the ground.</i>		
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Neighbourhood Resilience Building	During and after disaster, communities will generally recover more quickly if systems are in place to build communities that care about each other.	38. Neighbourhood Resilience Building

 INSURANCE AND DISASTER FINANCIAL ASSISTANCE <i>Financial strategies to manage residual risk.</i>		
STRATEGY	RATIONALE	OPTION
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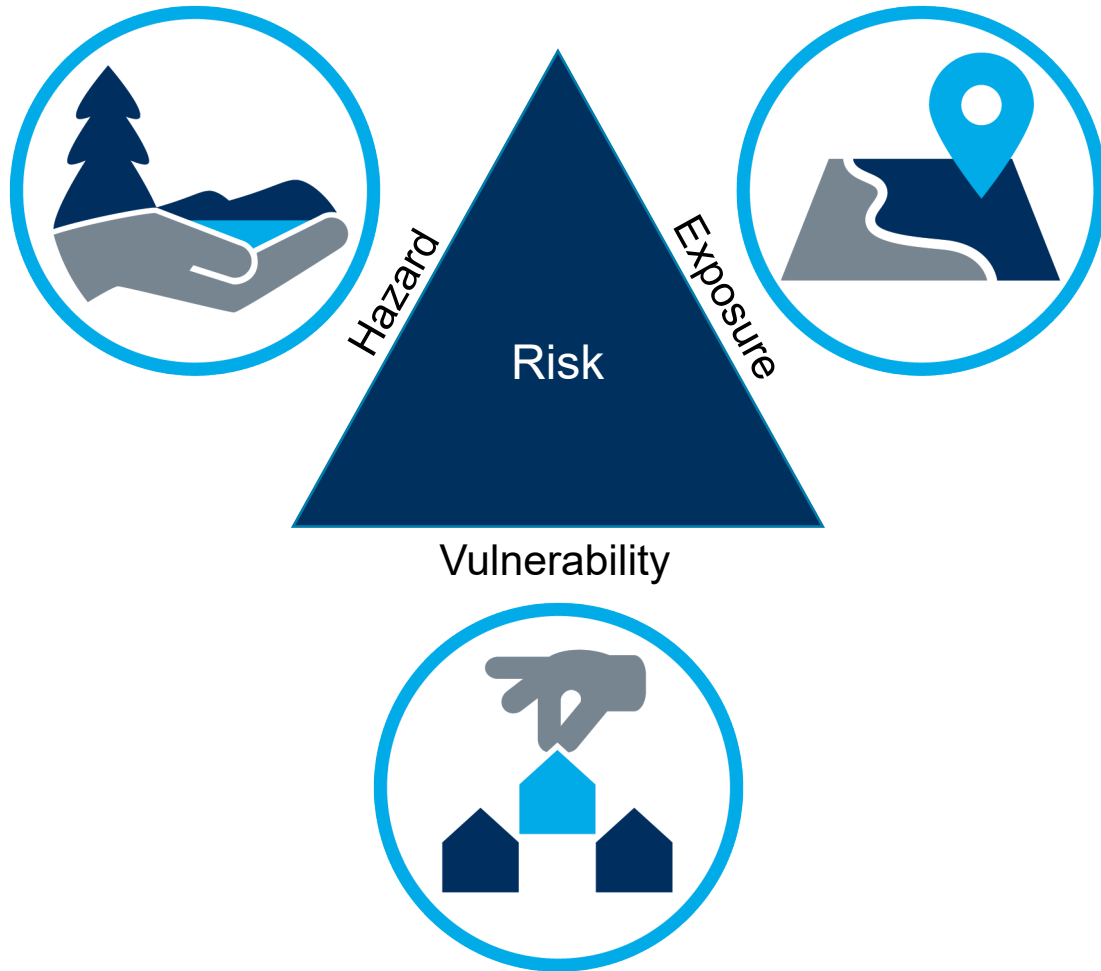
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26 Options to support risk reduction:

- Land Stewardship
- Land Use Management
- Building Controls

Risk Reduction Options



- **Land stewardship** – maintaining and restoring natural assets and systems
- **Land use management** – strategies and regulations to reduce exposure
- **Building management** – strategies and regulations that can reduce sensitivity of structures to flood damage

14 Options to support increased resilience:

- Education and Awareness
- Emergency Response
- Insurance and Disaster Financial Assistance



EDUCATION AND AWARENESS

Strategies to educate the public, practitioners, and other stakeholders.

STRATEGY	RATIONALE	OPTION
<i>Acknowledge and Disclose</i>	A precursor to developing land use controls in flood hazard areas is the recognition, acknowledgement and public disclosure of the existence, extents, etc. of the hazard. Disclosure can also support uptake of other risk reduction or resilience measures (e.g., floodproofing, insurance).	27. Covenant on Title 28. Public and Accessible Flood Mapping
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EMERGENCY RESPONSE

Strategies that are in place to ensure efficient and effective response when floodwaters are on the ground.

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INSURANCE AND DISASTER FINANCIAL ASSISTANCE

Financial strategies to manage residual risk.

STRATEGY	RATIONALE	OPTION
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Resilience and Supporting Activities



- **Emergency Response** – early warning systems, temporary barriers and response activities.
- **Insurance and disaster financial assistance** – financial mechanisms to manage residual risk and support recovery.
- **Education and awareness**— learning resources to support ‘all-of-society’ resilience.

Strategy and strategy rationale (why would we do this?)

First steps: considerations for planning

Regulatory actions to consider

Guidance documents to develop or draw on

Funding options

Maintaining effectiveness over time

Approach title and icon

Option number and title

How effective is this option at reducing risk?

What kind of negative externalities or positive co-benefits does this option bring?

What obstacles are there to implementation (including cost)?

Key opportunities and challenges

Works well at regional level

This option requires this to work well...

This option combines well with...

Case studies and examples

Land Use Management — AVOID

The surest means of limiting risk, is to have no exposure to flood hazard. This is ideally managed by avoiding development in hazard areas in the first place.

6. Land Use Controls to Limit All Development

Avoiding or limiting all new development in flood hazard areas.

EFFECTIVENESS OF OPTION FOR RISK REDUCTION AND RESILIENCE DURING A FLOOD EVENT		
PEOPLE	Reduce risks to health and safety of people	Highly effective
STRUCTURES	Minimize damage to structures	Highly effective
DISRUPTION	Minimize disruption of services and mobility (e.g., electricity, gas, communications)	Highly effective
ECONOMY	Minimize damage to local economy including agriculture and tourism	Highly effective
EMERGENCY RESPONSE	Increase the effectiveness of response	Highly effective
CLIMATE	Increase adaptability of option to multiple climate futures	Highly effective

EFFECT OF OPTION ITSELF ON ITS SURROUNDINGS		
COMMUNITY	Housing	Very Negative
	Social connectedness and supports	Neutral
ENVIRONMENT	Habitat health (aquatic, wetland, and riparian) and water quality	Very positive
CULTURE	Recreation and outdoor lifestyle	Positive
OBSTACLES	Regulatory	Very challenging
	Political and public will	Very challenging
COST	Implementation cost	\$
	Maintenance cost	\$

OPPORTUNITIES

- Complete risk reduction can be achieved.
- Co-benefits/co-use of land are great.

CHALLENGES

- Generally challenging in areas that are already developed.
- Development pressures can make this publicly, politically, and financially challenging. For example, the need for new and affordable housing is at odds with this option when developable land is limited. In the Okanagan, significant land areas are within the Agricultural Land Reserve, which constrains development, but also offers an opportunity to minimize structural development within ALR areas.

LAND USE MANAGEMENT — AVOID

6. Land Use Controls to Limit All Development

HOW TO IMPLEMENT
This option is primarily within the authority of local governments.

PROCESS COMPONENT	WHAT	HOW
Plan	Signal intent to manage hazardous lands and prepare to enact regulation.	<ul style="list-style-type: none">Develop or enhance natural hazard policy within Regional Growth Strategy or Official Community Plan.Develop flood hazard area maps if not already available. Consider developing advanced mapping with floodway and flood fringe to distinguish areas of highest hazard from areas where appropriately designed development may be acceptable.Review BC Flood Hazard Area Land Use Management Guidelines.
Regulate	Create Local Government bylaw or policy.	<ul style="list-style-type: none">Flood bylaw.Zoning bylaw.Review Columbia Basin Trust Official Community Plan Policies Supporting Climate Resilience (chapter 2.6 and 3.2).
Guide	Develop guidance for developers, realtors, public, etc. to explain why no development is allowed within parts of the floodplain, and review examples of appropriate policies.	<ul style="list-style-type: none">Work as a region to develop guidance document for realtors and the public to explain why development is being limited in hazard areas.
Fund	Finance development of regulation.	<ul style="list-style-type: none">Usually funded through normal operating budgets.No known funding programs.
Monitor/Enforce	Ensure that land is protected in perpetuity and establish systems to monitor effectiveness.	<ul style="list-style-type: none">Continue to engage and educate the public on the need to maintain natural functions of riparian areas.Support public in their advocacy for protected areas.Document number of development applications that do not adhere to regulations.Document the number of variances granted (if any).

DEPENDENCIES

- Public and accessible flood mapping

COMPLEMENTARY ACTIONS

- Other options in Land Use Management
- All options in Land Stewardship
- All options in Education and Awareness
- All options in Insurance

One historic example that has largely kept high hazard flood areas free of development are mapped and regulated floodplains under regulatory control of conservation authorities in Ontario. Noting here that the same blanket regulations are not possible within the current BC governance regime.

The Why and How



- **Background context:**
 - Flood in the Okanagan, inclusive of climate change trends
 - Best practice management
 - Governance context for flood management in BC
- **Project methods and results:**
 - Guiding principles
 - Engagement
 - Criteria development
 - Filling of toolbox
 - Policy scan

Strategic Actions for the Region

Formally establish a collaborative working group

Establish a Memorandum of Understanding to work collaboratively as a region; initiate this as the Regional District.

- Develop Terms of Reference.
- Leverage RDCO's Regional Planning Lab.
- Continue to build capacity for Government to Government relationships.
- Build on existing work and relationships.
- Consider a multi-hazard perspective.

Advance Flood Mapping and Disclosure

Flood mapping is necessary for most options presented in the resource guide.

- Build on efforts to date, and improve coverage to include:
 - Creek and river flooding
 - Pluvial flooding
 - Secondary hazards – erosion, debris flood-flows
- Make flood mapping publicly available, and make disclosure.

Create Policy Consistency

Policy scan highlighted diversity in region, and engagement highlighted this as a challenge to implementation.

- Share resources to develop pilot policy language for RGS, OCP, and bylaws.
- Encourage adoption of these policies across the region (through MOU) to avoid “tragedy of the commons”.

Summary

- In conformance with the Regional Board's Strategic Priorities and Regional Growth Strategy.
- Opportunity and framework for Central Okanagan jurisdictions to consider mitigating and preparing for risks using consistent strategies.
- Supports the Regional Emergency Program and EOC.
- Local flood hazards and their trajectory with climate change have highlighted the need for new approaches in flood management.

Recommendation:

THAT the Regional Board receive the Central Okanagan Flood Mitigation Planning Resource Guide and Technical Report and the Regional Floodplain Management Plan – Phase 3 report from the Director of Community Services dated November 4, 2021 for information.

An aerial photograph of a coastal city, likely San Francisco, with a large body of water in the foreground. The city's buildings and streets are visible in the background, and the water's surface is textured with ripples. The entire image has a blue tint.

Thank You!

For more information go to:
www.rdco.com/flood

Or contact Brittany Lange:
brittany.lange@rdco.com or 250-469-6149