



REGIONAL  
DISTRICT  
OF NANAIMO

# Englishman River & Little Qualicum River

Flood Hazard Mapping Projects

PRESENTATION TO BOARD

July 26, 2022



KERR WOOD LEIDAL  
consulting engineers



# + Overview – River Mapping



1. How did we get here?
2. About the River Mapping Projects
3. River Flood Hazards
4. Approach
5. Key Findings – Englishman & Little Qualicum Rivers  
(Nanaimo River study is in progress)
6. Next Steps

# + RDN Sea Level Rise & Climate Adaptation Program



- Work Supported by:
  - Regional Growth Strategy
  - Board Strategic Plan
  
- Interdepartmental RDN Working Group
  - Planning
  - Water and Wastewater Services
  - Emergency Services
  - GIS



# Adaptation Approaches in RDN



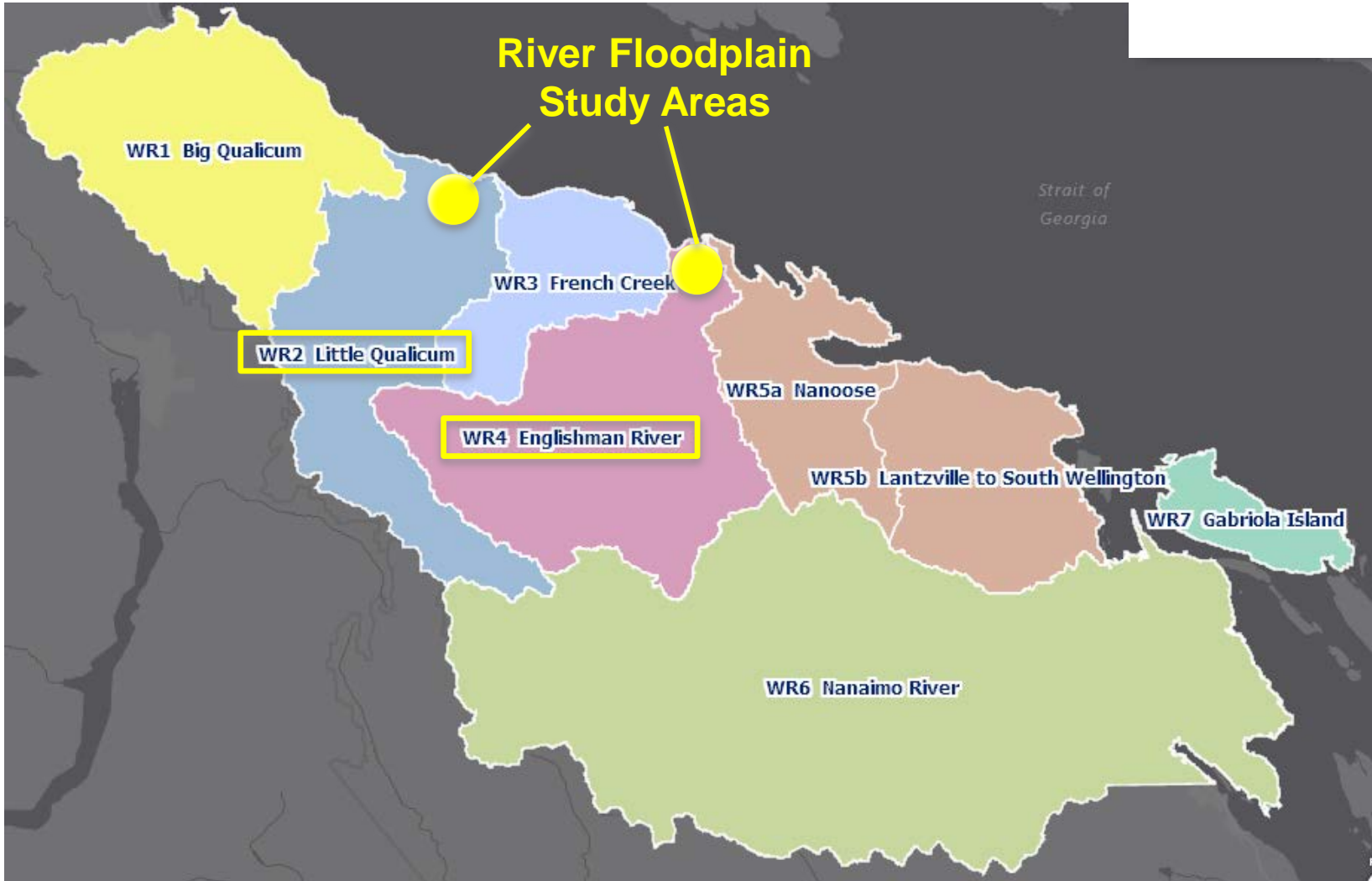
- **Existing floodplain maps**
- **2019 Flood Risk Assessment** & ongoing area-specific assessments and mapping (e.g. this project)
- **Development controls** to regulate construction of new buildings in designated floodplains (e.g. Floodplain Management Bylaw, Development Permit Areas, Estuary Regional Conservation Area, Zoning & Subdivision Regulations)
- **Strategic infrastructure & asset management planning**
- **Robust emergency management program (planning & response)**
- **Community outreach & volunteer opportunities (e.g. search and rescue, Neighbourhood Emergency Preparedness Program)**



Parksville Qualicum Beach News, 2020  
<https://www.pqbnews.com/news/roads-flood-during-winter-storm-in-parksville-qualicum-beach/>

# About the River Projects

# + Study Area Locations

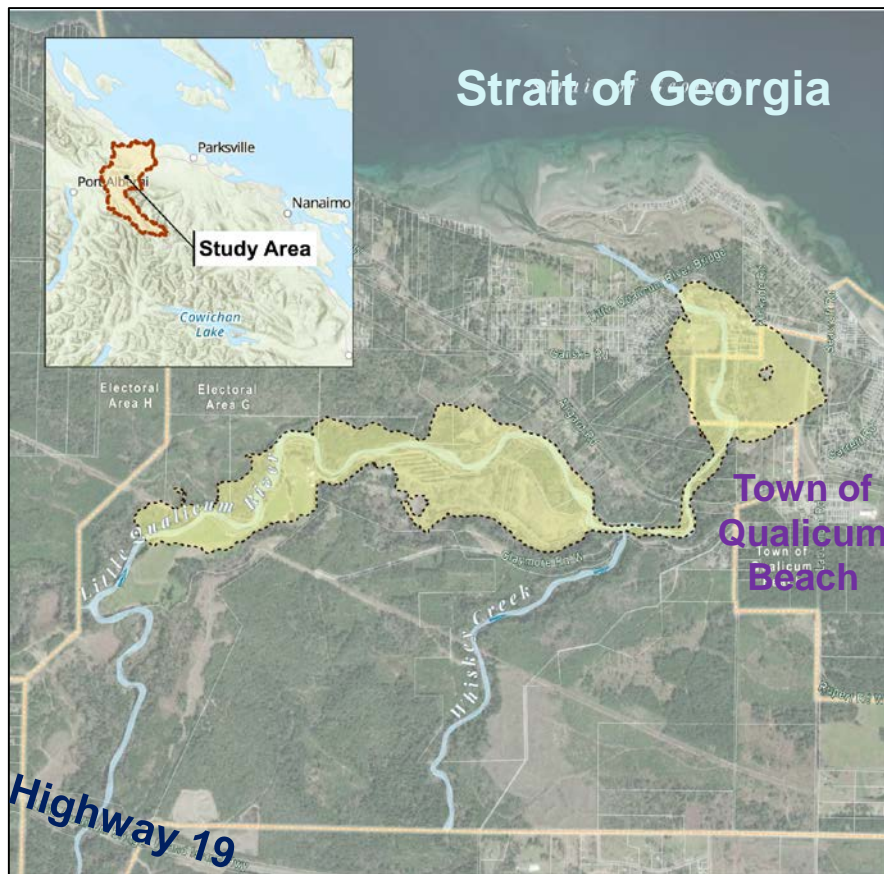




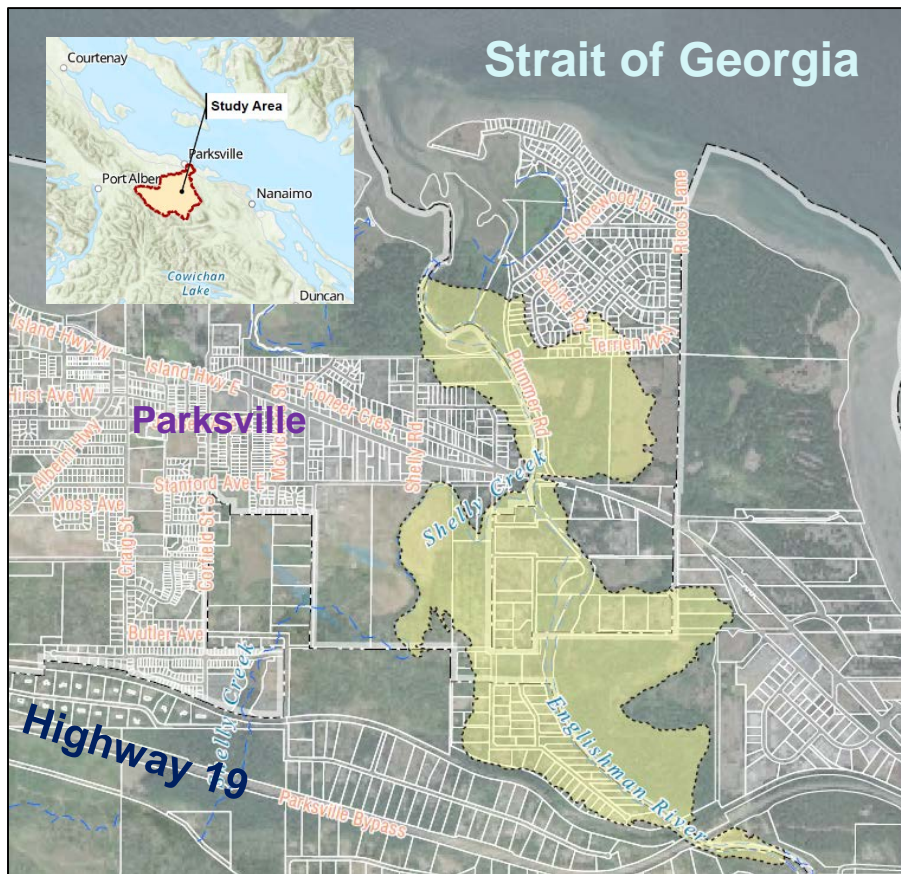
# River Floodplain Study Areas



## Little Qualicum River



## Englishman River





# Overall Project Goal/ Objectives



**Inform stakeholders** of current and future flood hazards and establish a **standard for public safety into the future**

1. Update the **regulatory flood hazard maps** for the Englishman River and Little Qualicum River
2. Lead a **high-level flood risk assessment**
3. Provide information to **support emergency response, flood mitigation, land use planning, comprehensive risk assessment**



# + Project Components



Flood **modelling** to understand how change could affect river flows & flood extent

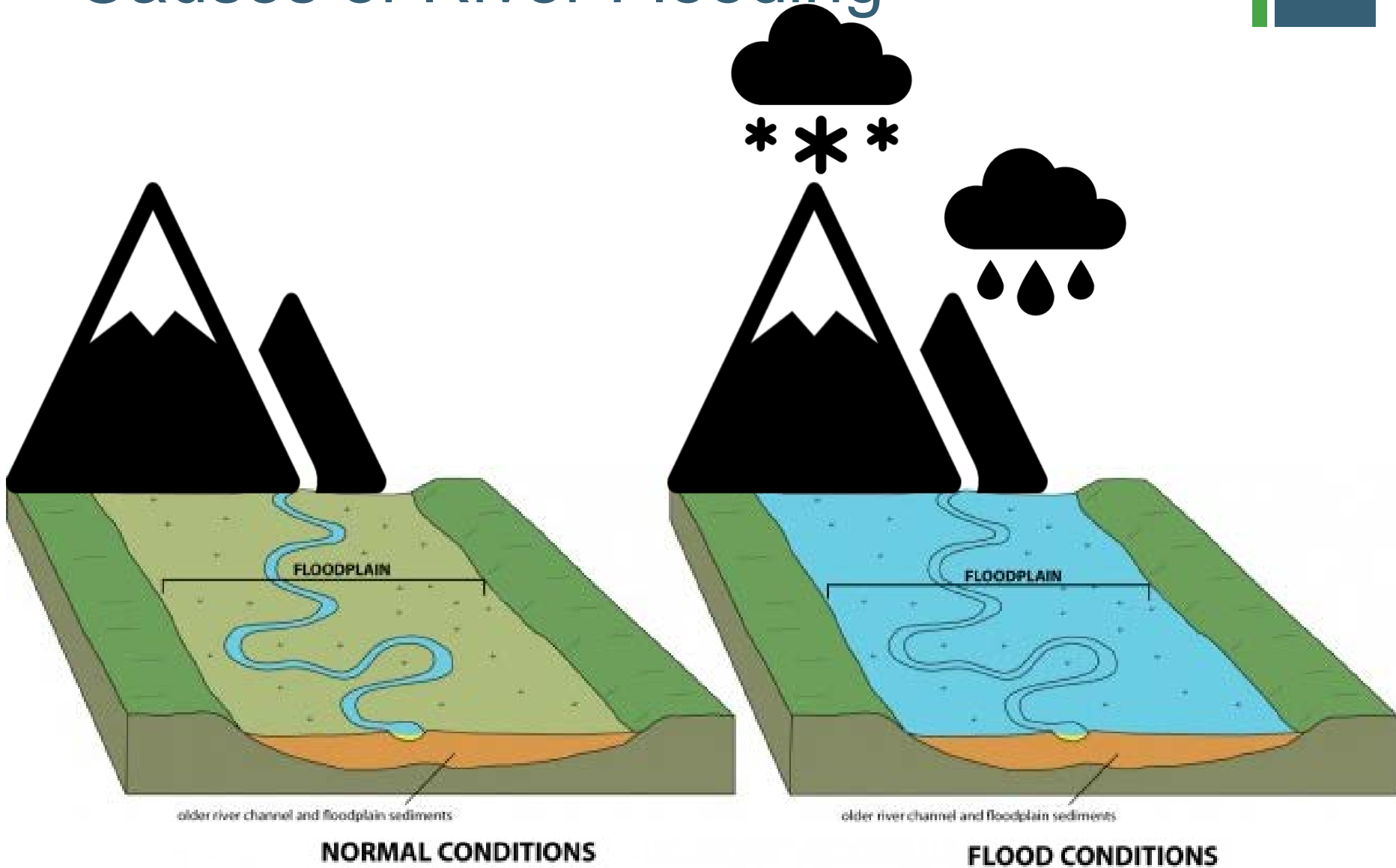
Visualize **flood extent & depth** under different scenarios

Estimate **impacts & prioritize** areas

Share **findings & recommend next steps**

# River Flood Hazards

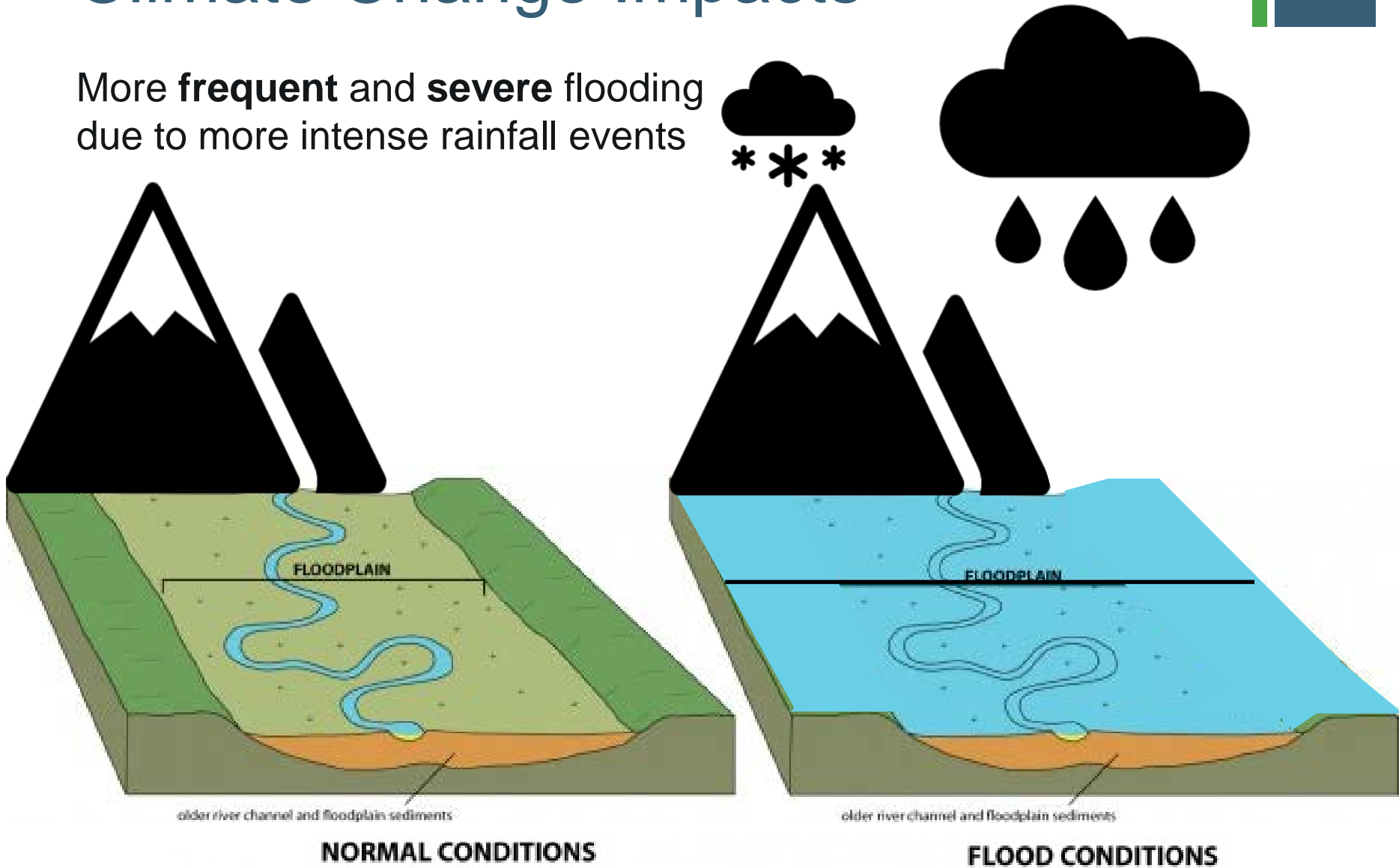
# + Causes of River Flooding



# + Climate Change Impacts



More **frequent** and **severe** flooding due to more intense rainfall events



**NORMAL CONDITIONS**

**FLOOD CONDITIONS**

# Study Approach

# + Regulatory Flood Mapping Approach

## 1. Topography & Bathymetry Data

- channel and floodplain shape

## 2. Hydrologic Assessment

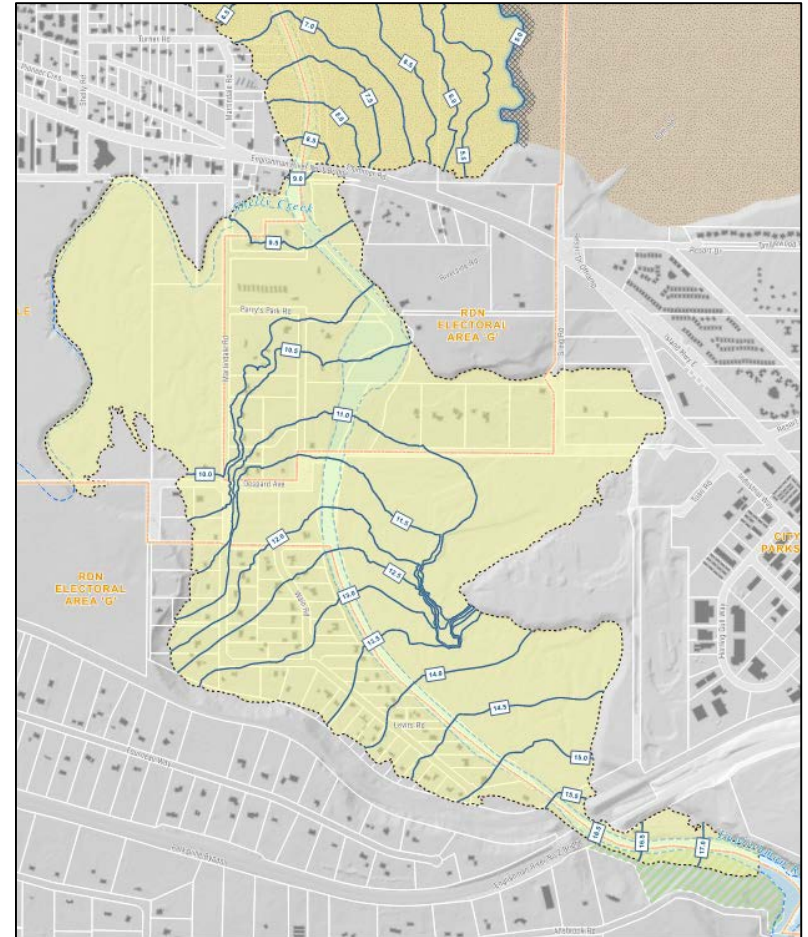
- flood flow size and shape
- climate change allowance

## 3. Hydraulic Modelling

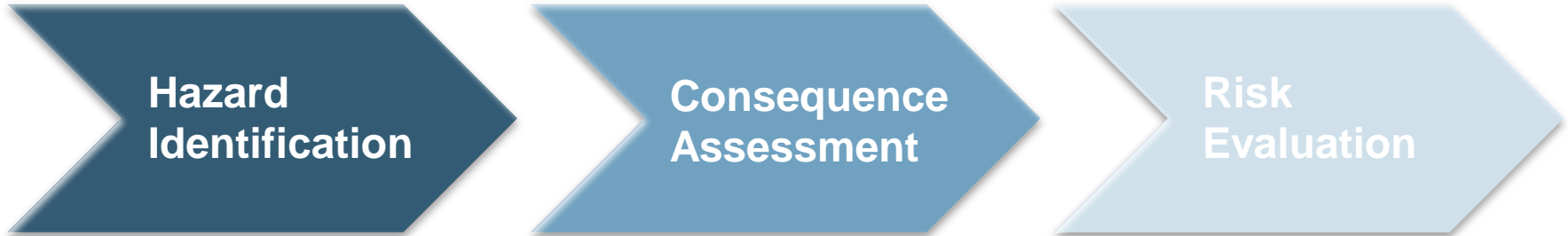
- translating flow to water level
- sea level rise

## 4. Mapping

- map background features
- map floodplain limits and flood levels



# + Risk Assessment Approach



- Flood hazard mapping
- Includes small and large size floods
- Includes existing and future flood hazards

- **Community Engagement** 
- Quantify flood impacts
- Flood exposure mapping

- Develop risk scores
- Quantify annual losses

# + Consequence Variables Assessed



- Assess the **direct exposure** of key **tangible** community elements:



Buildings Inundated



People in Inundated Area



Transportation Disruption



Inundated Water and Wastewater Infrastructure

- Other Consequence Variables considered at a high level:

- Tourism businesses
- Agricultural Lands
- Highway Infrastructure
- Cultural sites
- Septic fields and private wells
- Ecological habitat
- Water quality
- Other infrastructure services
- Business disruption/productivity
- Future development

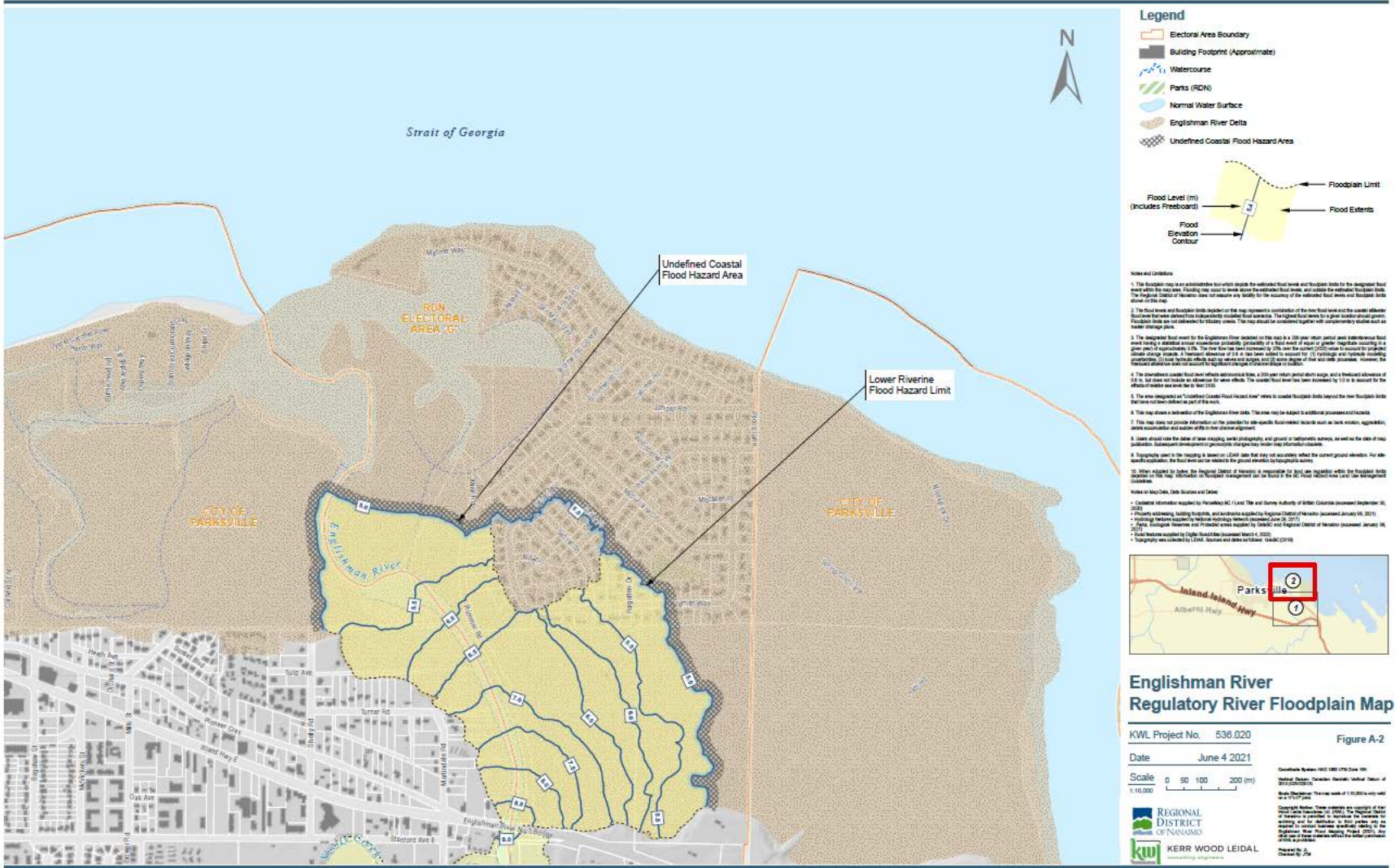


# Findings



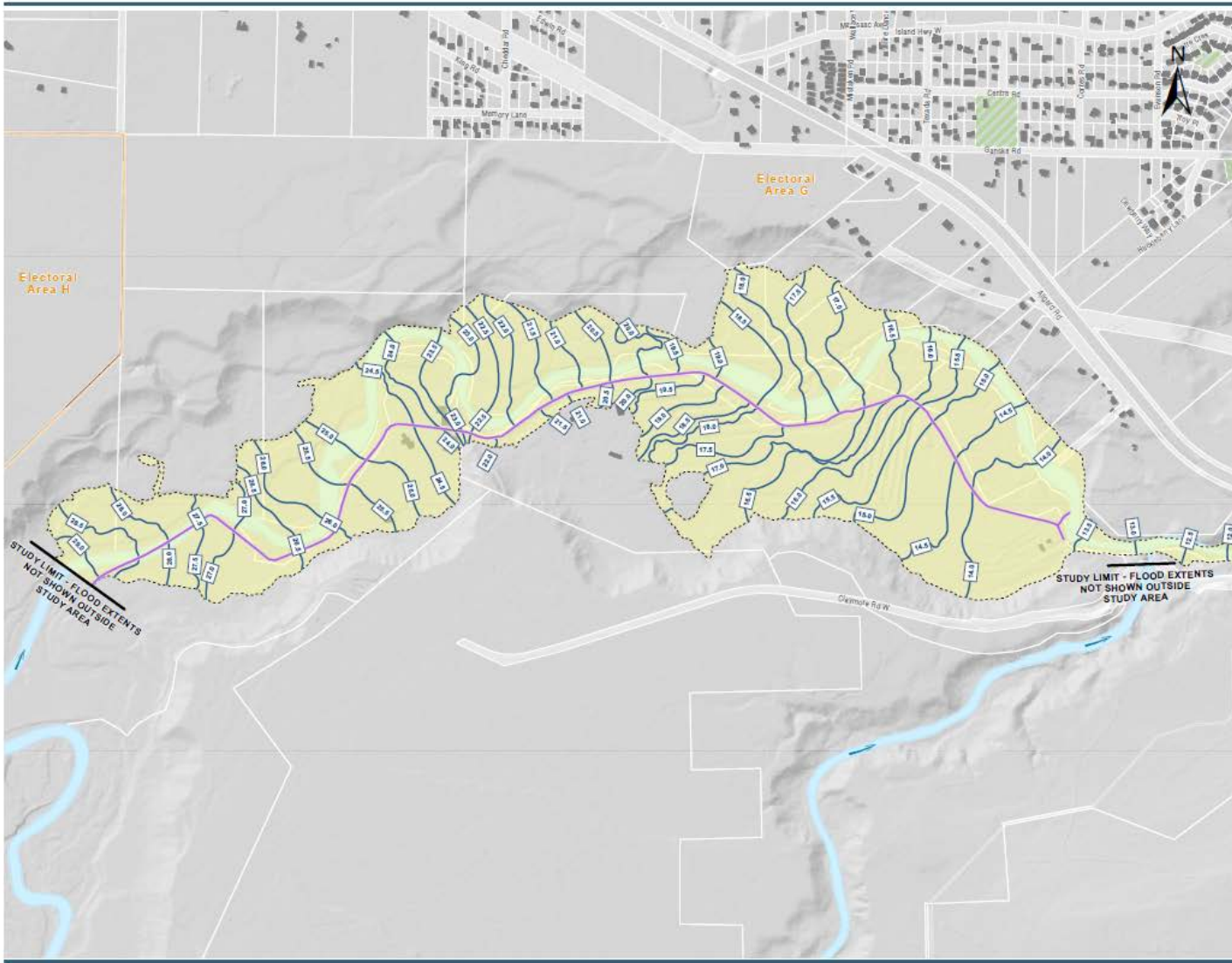


# Englishman River Floodplain Maps



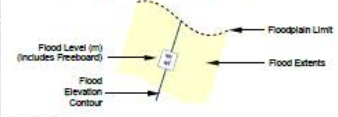


# Little Qualicum River Floodplain Maps



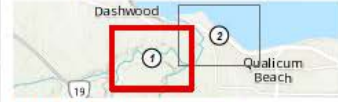
### Legend

- Electoral Area Boundary
- Building Footprint (Approximate)
- Non-Standard Dike (Approximate)
- Parks (RDN)
- Normal Water Surface
- Little Qualicum River Delta
- Undefined Coastal Flood Hazard Area



- Notes and Limitations**
1. This floodplain map is an administrative tool which depicts the estimated flood levels and floodplain limits for the designated flood area within the map area. Floodplain contours to be used above the estimated flood levels, and outside the estimated floodplain limits. The Regional District of Nanaimo does not assume any liability for the accuracy of the estimated flood levels and floodplain limits shown on this map.
  2. The floodplains and floodplain limits depicted on this map represent a combination of the best flood, coastal dike levee flood levels, and best flood levels from floodplains prepared for the purpose of emergency planning. Flood levels and floodplains limits were derived from independently available floodplains. The floodplains limits do not guarantee floodplains. Floodplains limits are not intended to be used for engineering purposes. This floodplains map is intended to be used for general informational purposes only.
  3. The designated floodplains on this map (shown in yellow) were derived from a 200-year return period best available flood level using a statistical annual exceedance probability (probability of a flood event of equal or greater magnitude occurring in a given year) of approximately 0.5%. The best flood levels prepared for the purpose of emergency planning for general informational purposes. A floodplains limit of 0.5% has been used to account for 11 floodplains and floodplains limits. The floodplains limits are not intended to be used for engineering purposes. The floodplains limits are not intended to be used for engineering purposes.
  4. The determined coastal flood levels include astronomical tides, a 200-year return period surge, and a lowest elevation of 0.8 m, but does not include an allowance for wave effects. The coastal flood level has been increased by 1.0 m to account for the effects of waves on sea level. (10/18/2015)
  5. The area designated "Undefined Coastal Flood Hazard Area" refers to coastal floodplains limits beyond the best floodplains limits shown on this map and is not shown on this map.
  6. This map shows a delineation of the Little Qualicum delta. This area may be subject to additional assessment and future work.
  7. This map does not provide information on the public safety risks associated with floodplains limits such as bank erosion, agricultural lands, and residential areas, or other risks associated with floodplains limits.
  8. Users may wish to consult the latest data regarding water management and floodplains limits, as well as the latest map publications. Independent developments or geographic changes may require map information updates.
  9. Flooding used in the map area is based on LIDAR data that may not accurately reflect the current ground elevations. For floodplains limits, the flood level can be reduced to the ground elevation by floodplains limits.
  10. When required by law, the Regional District of Nanaimo is responsible for land use regulation within the floodplains limits depicted on this map. Information on floodplains management can be found in the RDN Floodplains Area and Land Use Management Guidelines.
  11. The alignment of the river shown on this map was approximated based on a river data collected on May 15, 2011, and is not intended to be used for floodplains management purposes.

- Notes on Map Data, Data Sources and Dates**
1. Data sources supplied by Provincial GIS (1) and the Survey Authority of British Columbia (processed September 18, 2015).
  2. Property information, building footprints, watercourses, and boundaries supplied by Regional District of Nanaimo (processed January 18, 2015).
  3. The flood levels were prepared for the purpose of emergency planning using data obtained from the Provincial District of Nanaimo (processed January 17, 2015) from DASH (1) as well as other data on file with the study. Current level alignments and their corresponding coordinates were obtained from the Provincial District of Nanaimo (processed January 17, 2015). Floodplains limits were derived as part of this study and are presented in the accompanying report but were not included on this map.
  4. Flood boundaries supplied by DASH (1) (processed March 4, 2015).
  5. Floodplains limits supplied by LIDAR (1) (processed March 18, 2015).
  6. Floodplains limits supplied by LIDAR (1) (processed March 18, 2015).



## Little Qualicum River Regulatory River Floodplain Map

**KWL Project No. 538.021** **Figure A-1**

**Date:** April 20 2022

**Scale:** 1:10,000

**Coordinate System:** WGS 1984 UTM Zone 18N  
**Map Datum:** Canadian (Northwest) Datum of 1911  
**Units:** Meters  
**Scale Denominator:** The map scale is 1:10,000 only valid to ± 0.1%.

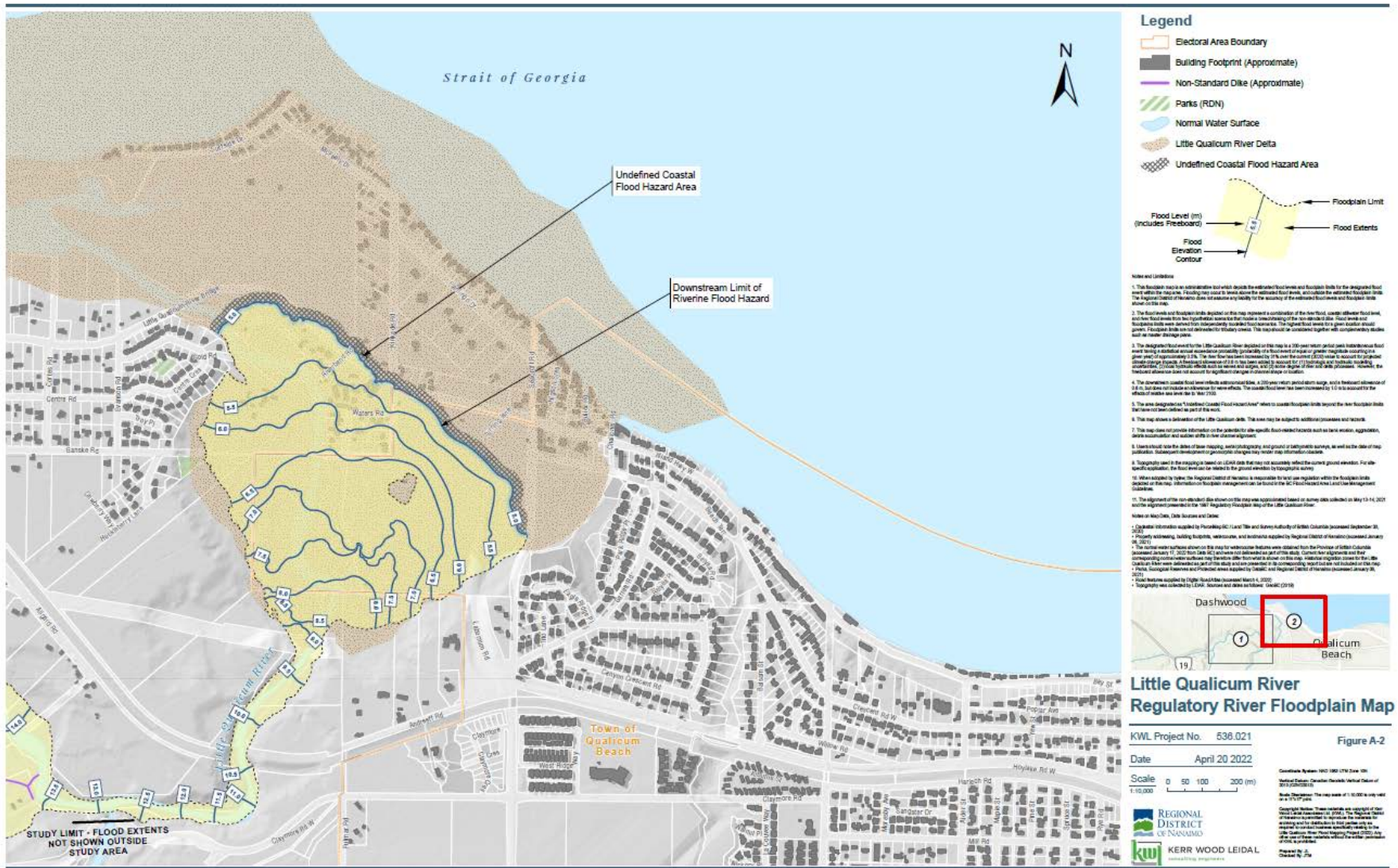
**Regional District of Nanaimo**  
**Kerr Wood Leidal**  
 Consulting Engineers

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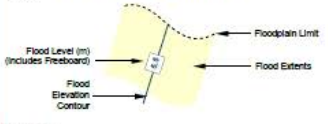
**Created by:** KWL



# Little Qualicum River Floodplain Maps



- ### Legend
- Electoral Area Boundary
  - Building Footprint (Approximate)
  - Non-Standard Dike (Approximate)
  - Parks (RDN)
  - Normal Water Surface
  - Little Qualicum River Delta
  - Undefined Coastal Flood Hazard Area



- Notes and Limitations**
1. This floodplain map is an administrative tool which depicts the estimated flood levels and floodplain limits for the designated flood event within the electoral area. Floodplain maps do not constitute any liability for the accuracy of the estimated flood levels and floodplain limits shown on this map.
  2. The flood levels and floodplain limits depicted on this map represent a combination of the river flow, coastal water level, and/or flood from the upstream riverine flood hazard. Flood levels and floodplain limits were derived from a hydrodynamic model of the river. Flood levels and floodplain limits were derived from a hydrodynamic model of the river. Flood levels and floodplain limits were derived from a hydrodynamic model of the river. Flood levels and floodplain limits were derived from a hydrodynamic model of the river.
  3. The designated flood event for this floodplain map is based on a 100-year return period peak instantaneous flood event having a statistical annual exceedance probability of flood level or higher greater magnitude exceeding a one percent (1%) of the time. The flood level and floodplain limits are based on a 100-year return period peak instantaneous flood event having a statistical annual exceedance probability of flood level or higher greater magnitude exceeding a one percent (1%) of the time. The flood level and floodplain limits are based on a 100-year return period peak instantaneous flood event having a statistical annual exceedance probability of flood level or higher greater magnitude exceeding a one percent (1%) of the time.
  4. The floodplain map is based on a hydrodynamic model of the river. The flood level and floodplain limits were derived from a hydrodynamic model of the river. The flood level and floodplain limits were derived from a hydrodynamic model of the river. The flood level and floodplain limits were derived from a hydrodynamic model of the river.
  5. The area designated as 'Undefined Coastal Flood Hazard Area' refers to coastal floodplain limits beyond the river floodplain limits shown on this map. This area may be subject to additional coastal risks.
  6. This map does not constitute information on the ground for additional purposes such as land use, agricultural, or other purposes.
  7. This map does not constitute information on the ground for additional purposes such as land use, agricultural, or other purposes.
  8. Floodplain maps are based on a hydrodynamic model of the river. The flood level and floodplain limits were derived from a hydrodynamic model of the river. The flood level and floodplain limits were derived from a hydrodynamic model of the river. The flood level and floodplain limits were derived from a hydrodynamic model of the river.
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  10. When applied to the Regional District of Nanaimo, it is the responsibility of the user to verify the floodplain limits depicted on this map. Information on floodplain management can be found in the KIC Flood Hazard Area Land Management Guidelines.
  11. The alignment of the river shown on this map was approximated based on some data collected on May 13-14, 2022 and is not intended to be used for navigation purposes.

**Notes on Map Data, Data Sources and Dates**

1. Digital information supplied by Planning BC (Land Use and Survey Authority of British Columbia) (June 2022).

2. Aerial photography, building footprints, water bodies, and features supplied by Regional District of Nanaimo (June 2022).

3. Flood level and floodplain limits were derived from a hydrodynamic model of the river. The flood level and floodplain limits were derived from a hydrodynamic model of the river. The flood level and floodplain limits were derived from a hydrodynamic model of the river. The flood level and floodplain limits were derived from a hydrodynamic model of the river.

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## Little Qualicum River Regulatory River Floodplain Map

KWL Project No. 538.021  
Date: April 20 2022  
Figure A-2

Scale: 0 50 100 200 (m)

Coordinate System: NAD 83 UTM Zone 18N  
Vertical Datum: Canadian National Vertical Datum of 1955  
Scale: The map scale is 1:50,000 (only valid for the map area shown).






REGIONAL DISTRICT OF NANAIMO  
KERR WOOD LEIDAL  
Consulting Engineers

STUDY LIMIT - FLOOD EXTENTS NOT SHOWN OUTSIDE STUDY AREA



# Key Areas Exposed to Flooding



	Englishman River	Little Qualicum River
 <b>Residential Neighbourhoods</b>	<ul style="list-style-type: none"> <li>• Martindale</li> <li>• San Pareil</li> </ul>	<ul style="list-style-type: none"> <li>• Surfside</li> </ul>
 <b>Tourist Destinations and Parks</b>	<ul style="list-style-type: none"> <li>• Rathtreavor Campground</li> <li>• Surfside Resort</li> <li>• Pathfinder Camp Resorts (formerly Perry's RV Park)</li> </ul>	<ul style="list-style-type: none"> <li>• Cedar Grove RV Park &amp; Campground</li> <li>• Riverside Resort</li> <li>• Qualicum National Wildlife Area</li> </ul>
 <b>Critical Roads</b>	<ul style="list-style-type: none"> <li>• Martindale Road</li> <li>• Plummer Road</li> </ul>	<ul style="list-style-type: none"> <li>• Kinkade Road</li> <li>• Highway 19A</li> </ul>
 <b>Federal Infrastructure</b>	-	<ul style="list-style-type: none"> <li>• Little Qualicum Hatchery</li> </ul>
 <b>Water &amp; Wastewater Infrastructure</b>	- San Pareil Water Intake	<ul style="list-style-type: none"> <li>• Surfside Groundwater Wells</li> <li>• Kinkade Wastewater Pump Station</li> </ul>

# Next Steps

# + Next Steps - Adaptation Program



PHASES	KEY DELIVERABLES	MILESTONES	
<b>INCEPTION (2016 – 2017)</b>	Backgrounder, Program Plan	Completed 2016	
<b>RESEARCH (2018 - 2023)</b>	Acquire LiDAR Develop coastal flood hazard maps Update riverine flood hazard projects <ol style="list-style-type: none"> <li>1. Englishman River</li> <li>2. Little Qualicum River</li> <li>3. Nanaimo River</li> </ol>	Completed 2017 Complete 2018 – 2019 Riverine flood hazard mapping projects in progress <ol style="list-style-type: none"> <li>1. Completed June 2022</li> <li>2. Completed May 2022</li> <li>3. <i>In progress - due Jan 2023</i></li> </ol>	E N G A G E M E N T
<b>PLAN (2023 – 2028)</b>	*Regional Integrated Flood Management Strategy (RIFM)	Pending funding approval <b><i>CCBF application - June 30, 2022</i></b>	
<b>IMPLEMENT (2022 onwards)</b>	<b>Update of the RDN's floodplain bylaw</b> *RIFM implemented via departmental adaptation plans and projects	<i>In progress - draft bylaw amendment</i> Pending future decisions; links to update of asset management plans	



# +Thank You!



## For More Information:

RDN webpage:

[www.getinvolved.rdn.ca/river-floodplain-map-update](http://www.getinvolved.rdn.ca/river-floodplain-map-update)

## **RDN Contact:**

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