



Update on the Sea Level Rise and Adaptation Program and River Floodplain Maps

RECOMMENDATIONS

1. That the Board direct the completed riverine mapping information be communicated to the public.
2. That the Board direct Regional District of Nanaimo Floodplain Management Bylaw No. 1469, 2006 be reviewed and updated to incorporate the findings of the riverine flood hazard mapping studies.

BACKGROUND

The *Local Government Act* grants authority for local governments to regulate land use, including natural hazards risk and flooding. In 2019, the Regional District of Nanaimo (RDN) completed a Hazard Risk and Vulnerability Assessment (HRVA)¹. The HRVA is an all hazards risk assessment to guide decisions on mitigation, preparation, response and recovery from hazards that pose a risk to the region, and is a requirement mandated by the Local Authority Emergency Management Regulation of the *BC Emergency Program Act*. The results revealed flood hazards pose a risk in the region, which are anticipated to worsen as sea levels rise and extreme weather events become more frequent. Acquiring up-to-date information will enable the RDN to better understand flood hazards and reduce the risk to people and property. In response, the RDN launched the Sea Level Rise and Climate Adaptation Program, which collaboratively builds capacity by gathering applicable information, assessing flood risks, identifying mitigation strategies, and broadly communicating findings. The outcomes will be integrated into land use and emergency planning and future infrastructure management, including the RDN's asset management plans.

Since 2018, the RDN Interdepartmental Working Group (planning, water and wastewater and emergency services professionals) and external consultants have completed a range of coastal and riverine flood hazard studies and mapping products aligned with the provincial guidelines and professional best practices. The coastal flood hazard project (including maps) was published on June 9, 2020² and was followed by three projects to update the provincial floodplain maps for the Englishman River, Little Qualicum River and the Nanaimo River. These are the only rivers in the RDN for which the Province prepared floodplain maps. The following is a summary of findings for the Englishman River and the Little Qualicum River riverine projects, and next steps in the project. The Nanaimo River study is under development and is scheduled to be completed in January 2023.

¹ Regional District of Nanaimo Hazard Risk and Vulnerability Assessment, September 2019 www.rdn.bc.ca/hazard-vulnerability-risk-analysis

²RDN Sea Level Rise and Climate Adaptation Webpage with overview report and coastal flood hazard mapping atlas www.rdn.bc.ca/sea-level-rise-adaptation-program

What is a floodplain map?

Flood maps generally identify the areas, normally dry, that may be covered by water during actual or potential flood events. Specific flooding risks are identified on structures, people and assets, and the flood hazard, present-day conditions and future conditions are visually communicated.

As required by Section 524 of the *Local Government Act*, local governments must consider relevant floodplain mapping information and hazards when preparing land use bylaws, including the establishment of Flood Construction Levels³. A riverine floodplain regulatory map shows the location of the normal channel of a river system, surrounding features or development, flood levels and floodplain limits (the estimated elevation and horizontal extent of the highwater marks of a 200-year flood⁴).

Approach to Riverine Flood Study and Mapping

In accordance with provincial standards, the 200-year return period flood scenario under future climate change conditions was used to develop the regulatory floodplain maps. To account for uncertainties in the analysis, a freeboard allowance of 0.6 metre was added to the final regulatory floodplain map. The comprehensive scope of the RDN riverine projects includes the following elements:

1. Flood Hydrology to estimate existing and future flood magnitudes and flood hydrograph shapes to be used in the hydraulic model, including regional climate change allowances.
2. Fluvial Geomorphology Assessment using historical aerial photos to define and assess the area surrounding the river channel that could be subject to future erosion processes.
3. Hydraulic Model Development used to produce the regulatory floodplain maps and the flood hazard maps for the risk assessment.
4. Flood Analysis Scenarios and Regulatory Mapping (1:10,000 scale), and
5. High-level Flood Risk Assessment based on ISO 31000 to understand how flooding could affect community infrastructure and properties in the study area.

Community Engagement

A series of workshops were hosted for each of the riverine projects with representatives from provincial, local government, community-based organizations, business owners and local residents from the study area. The workshops enabled participants to ask questions of subject experts and start a community conversation about flood hazards and future management.

Several key themes were:

- Valuing personal connections to the river systems for recreation, ecological value, and spiritual importance.
- Managing flood impacts to properties with comments varying from fair acceptance of annual flooding and interest in minimizing flood damage on their property to concerns about how flood mitigation works may

³ Flood Construction Level is a calculated level of elevation for buildings used to protect people and property from flood impacts.

⁴ The provincial Flood Hazard Area Land Use Management Guidelines designated flood based on the 1-in-200-year flood for floodplain mapping in BC. www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/flood_hazard_area_land_use_guidelines_2017.pdf

impact adjacent and downstream properties, and security of existing services, such as drinking water wells, drains, culverts, private wells and septic.

- Preserving and protecting the natural environment was strongly supported, including support for preserving and leveraging trees as natural assets in flood management, and preserving water quality for domestic use, fish habitat and health.
- Preserving road access and infrastructure for present-day and future conditions, including impacts on existing services, such as drinking water wells, drains, culverts, private wells and septic and impacts caused by log jams.
- Developing in the floodplain raised concerns about potential impacts, including water flow. Further efforts were needed to educate the public and realtors about local flood hazards.

Adaptation Program Implementation - Proposed Next Steps

The Adaptation Program incorporates best practices in risk management established through the federal government’s floodplain mapping framework and the international Sendai Framework. The Program is implemented in four phases, and is currently in Phase 2: Research, which includes completing the Nanaimo River flood hazard mapping project and updating the RDN’s Floodplain Management Bylaw No.1469 (see Table 1 below). At a future meeting, the Board and residents will be presented with a draft amendment bylaw to incorporate the coastal and riverine flood hazard project findings into the existing floodplain bylaw. Proposed changes will include adopting the new mapping information, clarifying terminology, and removing redundancies. In the interim, it is recommended the completed river flood mapping information be publicly communicated on the RDN website.

To support Phase 3, Plan, the RDN submitted a grant application to the federal Canadian Community Building Fund (CCBF) on June 30, 2022. If approved, the RDN will receive an estimated \$529,000 over five years to increase regional flood resiliency by developing an integrated flood management strategy. A key outcome will be assessing the coastal flood risks, identifying mitigation options and establishing a risk-based decision-making framework. Table 1 summarizes the Program phases, key deliverables and milestones.

Table 1: Summary of the Sea Level Rise and Climate Adaptation Program

PHASES	KEY DELIVERABLES	MILESTONES
1. INCEPTION	Backgrounder, Program Plan	Completed 2016
2. RESEARCH (Current Phase)	a. Acquire LiDAR b. Develop coastal flood hazard maps c. Update riverine flood hazard projects* i. Englishman River ii. Little Qualicum River iii. Nanaimo River d. Update of the RDN’s floodplain bylaw *Community engagement initiated through studies	a. Completed 2017 b. Complete 2018 – 2019 c. In progress i. Completed June 2022 ii. Completed May 2022 iii. In progress - due Jan 2023 d. In progress
3. PLAN	Regional Integrated Flood Management Strategy i. coastal flood risk assessment ii. identification of mitigation options/ priorities iii. preliminary adaptation plans iv. on-going community engagement	Pending funding approval CCBF application June 30, 2022

4. IMPLEMENT	Various departmental implementation plans and projects - pending	Pending future decisions
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The riverine mapping information recommended to be communicated to the public, includes the:

- Riverine Study Highlights (Attachment 1)
- Englishman River Flood Mapping Overview Report (Attachment 2)
- Englishman River Regulatory Floodplain Map (Attachment 3)
- Little Qualicum River Flood Mapping Overview Report (Attachment 4)
- Little Qualicum Regulatory Floodplain Map (Attachment 5)

FINANCIAL IMPLICATIONS

Updating the floodplain bylaw will incur community engagement costs estimated to not exceed \$6000. This cost is included in the current Long Range Planning Work Plan and budget in the 2022 - 2026 Financial Plan.

Future phases of the project will require a combination of provincial and federal grant funding and RDN budget funds. As noted, provincial and federal grant funding is being actively pursued.

STRATEGIC PLAN ALIGNMENT

The Sea Level Rise and Climate Adaption Program and sequential projects align with the Board’s strategic priority to be leaders in climate change adaptation by acquiring the technical information required to better understand flood hazards from climate change and sea level rise. The proposed next steps will increase public awareness and provide a modern approach to reducing the risk of flood events in the region.

Climate Change - Be leaders in climate change adaptation and mitigation, and become net zero by 2032. The Program will also support the Board’s strategic priority on growth management by contributing to the update of asset management plans.

REVIEWED BY:

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ATTACHMENTS

1. Riverine Study Highlights
2. Englishman River Flood Mapping Overview Report
3. Englishman River Regulatory Floodplain Map
4. Little Qualicum River Flood Mapping Overview Report
5. Little Qualicum Regulatory Floodplain Map

ATTACHMENT 2
RIVERINE FLOOD HAZARD MAPPING STUDY HIGHLIGHTS
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Englishman River

The Englishman River system located is located southwest of the City of Parksville and flows easterly from its headwaters on Mount Arrowsmith and discharges into the Strait of Georgia, north of Craig Bay. The river floodplain narrows at Highway 19A before it transitions into a coastal delta of ecological and recreational importance known as the Englishman River Estuary. The study findings are summarized as follows:

- Low-lying areas experience periodic flood events, such as Martindale Road and San Pareil on an annual and semi-annual basis.
- Extreme rainfall analysis provides a future peak with a +25% climate change factor. This factor is used in the calculation of future peak flow estimates.
- The 200-year return period present day peak flow discharge is 782 m³/s; translates to a 200-year peak flow of 978 m³/s under climate conditions.
- Flood extent comparison to present maps; little change to the flood extent attributed to the bowl-shaped river channel underlaid by bedrock formation.
- Flood depth comparison to present maps; low lying areas most effected present-day and future, such as Plummer Road, Martindale Road and San Pareil.
- The river channel position has remained fairly stationary over the past 70 years. The existing 30 meter buffer is deemed adequate; no changes to the existing land use setback regulations are recommended at this time.
- 10-year return period under present-day conditions, flooding is mostly contained within undeveloped areas near the river channel. Flooding is expected to reach a small cluster of homes in Martindale (near Shelly Creek) south of Highway 19A, and in San Pareil along Forgotten Drive and the Mistaken Place cul-de-sac.
- 200-year return period flood under present day conditions is expected to cause a larger amount of residential flooding in the San Pareil neighbourhood.
- Transportation disruptions is already significant under present-day flood scenarios and is expected to increase under future climate change conditions. Plummer Road and Martindale Road are vulnerable to flooding.
- Annualized loss values suggest that, on average, 106 people could expect to be impacted by flooding each year under present-day conditions, increasing to 343 people under future climate change conditions.
- Annualized loss values suggest on average 75 buildings could expect to be impacted by flooding each year under present-day conditions, estimated increase to 215 buildings under future climate change conditions.
- The San Pareil drinking water system intake is relatively resilient to a 10-year event under present conditions. The pump house requires flood management measure to avoid service delays during more extreme 200-year events under present and future conditions.

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RIVERINE FLOOD HAZARD MAPPING STUDY HIGHLIGHTS
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Little Qualicum River

The Little Qualicum River system is located southwest of the Town of Qualicum Beach, beginning at Labour Day Lake near Mount Arrowsmith and flows northwest towards Cameron Lake and then northeast into to the Strait of Georgia. The floodplain widens around the location of the Little Qualicum Hatchery then narrows due to a natural bedrock formation and transitions into a coastal delta, forming the Little Qualicum River Estuary Regional Conservation Area. The hatchery is located on the right bank of the Little Qualicum River floodplain and is protected by a 1.8 km long, non-standard berm. A summary of the study findings follows:

- Low lying areas are currently exposed to flooding along Water Road Kinkade Road and Flamingo Drive. Some properties along Surfside Drive and McFeely Drive are impacted during extreme flood events.
- Extreme rainfall analysis provides a future peak flow with a +31% climate change factor. This factor is captured in the calculated future peak flow estimates.
- The present 200-year return period flood event for the Little Qualicum River was estimated to be 329 m³/s. The future 200-year flood event accounts for a +31% climate change factor for a 2070 – 2099 time horizon under the RCP 8.5 emission scenario has a flow estimate of 431 m³/s. This is 22% greater than the value used in the existing 1997 regulatory floodplain study.
- Flood extent comparison to present maps; the channel position has remained fairly stationary with small areas of change. Concludes the existing 30 m buffer remains sufficient for land use planning purposes.
- Flood depth comparison to present maps; low lying areas impacted now will experience future impacts overtime, especially areas influenced by riverine and coastal systems.
- The results show during the 10-year return period event under present-day conditions, flooding is expected to reach a cluster of homes along Flamingo Drive, Kinkade Road, Waters Road, and some of the buildings in the Cedar Grove RV Park & Campground and the Riverside Resort Qualicum Beach.
- A 200-year return period flood under present-day conditions is expected to cause a larger amount of residential flooding along Flamingo Drive, Kinkade Road, Surfside Drive and the Riverside Resort. The Hatchery berm is lightly to experience overtopping where the parking lot is located.
- Transportation disruption, present-day and future, are significant for Kinkade Road, Flamingo Road, Waters Road, and Riverbend Road. Highway 19A is likely impacted under extreme conditions. The E & N Railway is not at risk under present or future high-water levels.
- Annualized loss results suggest an estimated 58 people could be impacted by flooding each year under present-day conditions, increasing to 227 people under future climate change conditions.
- The RDN's Surfside Groundwater Wells are vulnerable to sea level rise. The RDN's Kinkade Road Pump Station is susceptible to future climate conditions, 10-year and 200-year return periods.