Capital Regional Coastal Flood Inundation Mapping Project

Making a difference...together

FREQUENTLY ASKED QUESTIONS

Capital Regional District | November 2021

1. What is the CRD Coastal Flood Inundation Mapping Project?

The Capital Region Coastal Flood Inundation Mapping Project was completed to inform the Capital Regional District (CRD), its local governments, First Nations and other interested stakeholders of the future hazards associated with coastal flooding related to sea level rise and tsunamis. This work is intended to inform current and future flood policy and planning activities.

2. How was the Coastal Flood Inundation Mapping Project Undertaken?

This project involved three main tasks with distinct methodologies, results of which are provided in three separate reports:

- Task 1: Digital Elevation Model Development Report
- Task 2: Sea Level Rise Modelling and Mapping Report
- Task 3: Tsunami Modelling and Mapping Report

This project builds upon previous work; however, the scope and scale of this project has allowed the project team to undertake extremely detailed analysis, which will help the region better understand and plan for flooding that results from the changing climate and earthquakes.

3. What was the study area?

Study area includes the entire capital region, including First Nations.

3. How was this project funded?

In May 2019, working with and on behalf of local governments, the CRD received a $705,000 grant from the provincially and federally funded National Disaster Mitigation Program to undertake the project.

4. How is the capital region impacted by coastal flooding and tsunamis?

The capital region has a long and complex coastline (approx. 1,300 km) with several low-lying areas exposed to coastal flooding now, and into the future, with sea level rise. Most coastal flooding occurs today due to a combination of storm surge, wind and waves occurring at high tide.

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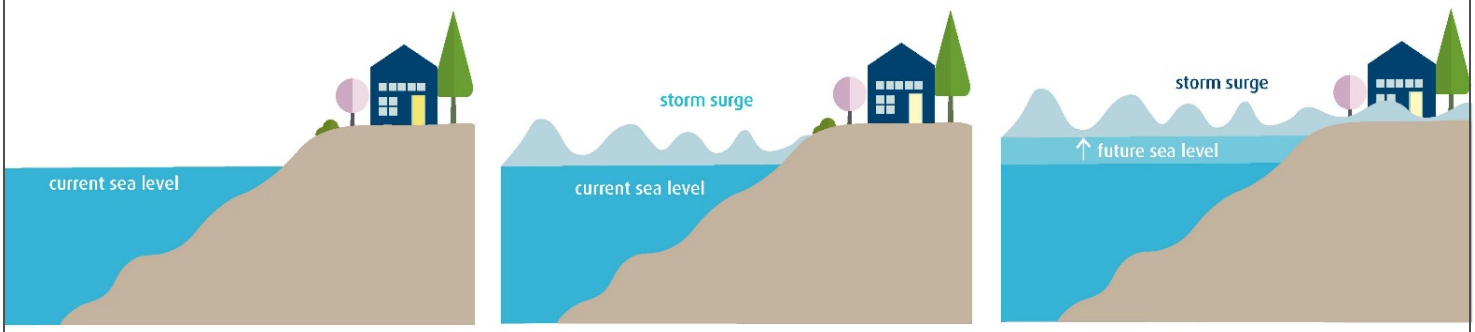
Effects of storm surges coupled with sea level rise



The west coast of Canada is vulnerable to tsunamis generated by earthquakes beneath the Pacific Ocean. The largest tsunamis in British Columbia result from earthquakes in the Cascadia Subduction Zone, where the oceanic Juan de Fuca plate moves underneath North America. The last significant Cascadia Subduction Zone event occurred on January 26, 1700. The British Columbia coast is also affected by tsunamis of more distant Pacific earthquakes, as experienced by an Alaskan earthquake in 1964.

The region around the southern end of Vancouver Island, including the San Juan Islands and water bodies such as the Juan de Fuca Strait, Salish Sea and Strait of Georgia, are also possibly subject to the effects of local fault systems running through Vancouver Island and adjacent areas to the south and east (see Section 1.3, Task 3 report).

5. How were local governments involved in this project?

From grant scoping phase to final completion, the CRD worked with an inter-municipal, multidisciplinary project team with representatives from multiple local governments. During the technical work, the region's local government staff more broadly were invited to two workshops, one shaping the methodology and project outputs, the other to review draft technical results.

Overall project results are being provided to the CRD Board in summer 2020 and local governments have been provided with data packages specific to their municipality or electoral area. In November 2021, an updated version of the technical reports and associated data, dated October 2021, were made available to local governments.

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6. How were First Nations involved in this project?

The CRD included neighbouring First Nations lands in the project and results will be shared directly with each Nation to support their own planning efforts.

7. What is the difference between this project and previous regional studies?

In 2015, CRD staff worked with members of the CRD Climate Action Inter-Municipal Working Group to complete an initial sea level rise study. This analysis only considered 24 sites, used a more basic analysis, and did not include all of the criteria required to inform Flood Construction Levels. This work identified the need for further study, including a more fulsome regional analysis. The current project (2021) provides further analysis on coastal flood inundation and recommended flood construction levels for the entirety of the capital region.

In 2013, the CRD completed the Capital Regional District Modelling of Potential Tsunami Inundation Limits and Run-Up (AECOM) study, which modelled tsunami impacts along the entire regional coastline from a Cascadian subduction zone 1-in-500 year earthquake scenario only. This project builds upon this work, investigating additional tsunami scenarios and potential flood inundation.

8. What were the results from Task 2, Sea Level Rise report?

The majority of the capital region's coastline is quite elevated, such that the general risk of extensive flooding is low. However, low-lying areas (such as beaches and urban marinas or waterfronts) are susceptible to coastal storm flooding – the extents of which are set to increase significantly due to sea level rise.

Over the course of the project, 221 distinct areas were analyzed for sea level rise inundation, resulting in a regional analysis and development of specific sea level rise flood construction levels (see what a flood construction level is below). Detailed analysis was also completed for five sites. Results provided in the report include recommendations for local governments to consider for setting coastal flood policy, including flood construction levels and for regional emergency planning activities.

9. What is a flood construction level?

Flood construction levels are designated elevations for habitable (living) space that must be followed for construction within an area exposed to flood hazard. As per Provincial Guidelines, flood construction level elevations describe where the

underside elevation of a wooden floor system, or the top elevation of a concrete slab. Local governments have authority to set flood construction levels in a flood prone area.

10. What were the results of Task 3, Tsunami report?

The capital region is at risk of tsunami activity, which could cause high waves to strike the coastline, and cause flooding in low-lying areas (such as beaches and urban marinas or waterfronts). Tsunami-related flooding can pose a risk to human populations, natural areas, culturally sensitive areas and infrastructure.

This study reported on tsunamis that have different probabilities of occurring. In some cases, results show a high maximum water level and low likelihood of occurring (only once in 2,500 years) and others show lower flood impacts but a higher likelihood of occurring. In total, this report included modelling of 11 different tsunami sources that may impact the capital region.

Of the areas modelled, **Port Renfrew** is arguably the most vulnerable, due to its low-lying urban core and its proximity to the entrance to Juan de Fuca Strait. It will be extremely important for local residents and tourists in Port Renfrew to be aware of the risk of tsunami flooding, as Cascadia Subduction Zone-driven events will arrive here before anywhere else in the study area.

In Esquimalt Harbour, values obtained in this study indicated heights twice as large as previous studies that modelled the Cascadia Subduction event at a lower magnitude. This modelling resulted in significant flooding of areas in **Victoria and Esquimalt Harbours** that were not inundated in the previous studies (AECOM, 2013; Cherniawsky, 2007). However, it is important to emphasize that these results report on the findings from the Cascadia Subduction Zone-L1 (CSZ-L1) event that has a higher magnitude but lower probability in comparison to the previous studies.

The **Sidney** local flood regions present a more complex picture, as they are potentially impacted by worst-case CSZ-L1 Source and the Devil's Mountain Fault line sources, both of which have lower probability of occurrence based on return time. Water levels from the Devil's Mountain Fault line event are up to 60% as large as from the CSZ-L1 event and represent a significant potential hazard for the area.

For **Saanich/Oak Bay**, the lower probability of occurrence Devil's Mountain fault is the dominant event for the northern portion of the region's coast line. Effects are relatively minor, except in Gyro Park, which faces north, and along the area around St. Patrick Street, in the south, where the CSZ-L1 event is dominant, has a 2,500-year return time.

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Sooke Harbour includes two water bodies which are progressively sheltered from a tsunami wave attack by spits or submerged sills. As with most of the sites studied, the greatest impact is from the CSZ-L1 and CSZ-NS scenarios. As a result, the predicted inundated area is fairly limited, though current speeds over the sills and the inundated barrier spit can be quite strong. It is not unlikely that the barrier spit could be breached or largely eroded by the strong overtopping currents.

11. How can my local government use the results of this project?

The outcomes of this project offer an opportunity for the capital region to work together to better understand how to prepare for future coastal floods and tsunamis, including emergency mitigation, planning and policy related activities. Further information embedded within this report will support emergency programs within the capital region: to prepare materials to support residents and visitors to understand the hazards of coastal floods and tsunamis; to make a plan; and to take action.

November 2021 Update

1. Can I still use the Version 1.0 (June 2020) reports?

The Version 1.0 Task 2: Sea Level Rise Modelling and Mapping Report and the Task 3: Tsunami Modelling and Mapping Report are superseded and should not be used. Although many sections of the Version 1.0 reports are unchanged, it is recommended that users do not use Version 1.0 reporting going forward.

2. What is different between the Version 1.0 and Version 2.0, Task 2: Sea Level Rise Modelling and Mapping?

The Task 2: Sea Level Rise Modelling and Mapping Report was updated with a refined technical approach for sea level rise mapping in the foreshore areas. In addition, additional transects were added to increase the resolution along specific coastal reaches where rapid shoreline changes were identified.

3. What is different between the Version 1.0 (June 2020) and Version 2.0 (October 2021), Task 3: Tsunami Modelling and Mapping report?

The addition of transects in Version 2.0 resulted in changes to the identification numbers of each transect relative to Version 1.0. This necessitated an update to the Executive Summary, summary tables in Section 4, discussion in Section 6.5 which outlines tsunami impact on flood development policy, and Appendix D.