OUR COASTAL CITY

Building a Toolkit for Coastal Adaptation in the City of Nanaimo

May 2026

CITY OF NANAIMO
THE HARBOUR CITY

Want to dive into our work to date?

(purely optional and not required!)

This document is the second in a series explaining the work of the *Our Coastal City* project. Please see 'An Introduction to Coastal Climate Adaptation in the City of Nanaimo' (February 2026) at ***www.getinvolvednanaimo.ca/sea-level-rise*** if you'd like to read more detail about the first stages of our project.

Acknowledgments

The City of Nanaimo is located on the Traditional Territory of the Snuneymuxw First Nation.

This project is led by the City of Nanaimo as part of the *Sea Level Rise Management Plan (SLRMP)* initiative. Technical work is being led by Northwest Hydraulics Consultants Ltd. (NHC) with engagement and planning support from Lanarc 2015 Consultants Ltd. (Lanarc). We would like to extend our gratitude to all parties and people who have provided time, knowledge and information to assist in this work.

What's inside?

Lots of information! Feel free to skip around to what interests you most.

SECTION 1: **Project Overview**

Learn about the Our Coastal City project. Find out what work has been completed and what will be explored in this round of engagement.

SECTION 2: **Approaches to Adaptation**

Learn about a broad menu of adaptation methods that are being explored for the City's waterfront areas. We'll talk about the strategies we have available to respond proactively to sea level rise and coastal risks.

SECTION 3: **Risks & Objectives**

Take a look at the risks mapped through technical analysis. Learn about the proposed objectives for adapting to sea level rise in each of the study areas.

SECTION 4: **What Happens Next?**

We will invite you to give us your feedback and will share what the project will be exploring next.

SECTION 1

Project Overview

The City of Nanaimo has over 30 km of coastline. As climate change causes sea levels to rise, we will need to develop resilient strategies to protect what's important to us along Nanaimo's shore. **Our Coastal City is about starting conversations, planning ahead, and taking action** to prepare our City's coast.

What do rising seas mean for coastal communities?

Coastal impacts are already happening today. During high tides, King Tides, or storm surges, flooding and shoreline erosion is occurring in some areas. As sea levels continue to rise, these events are expected to become more frequent, more severe, and affect larger areas.

Impacts Today

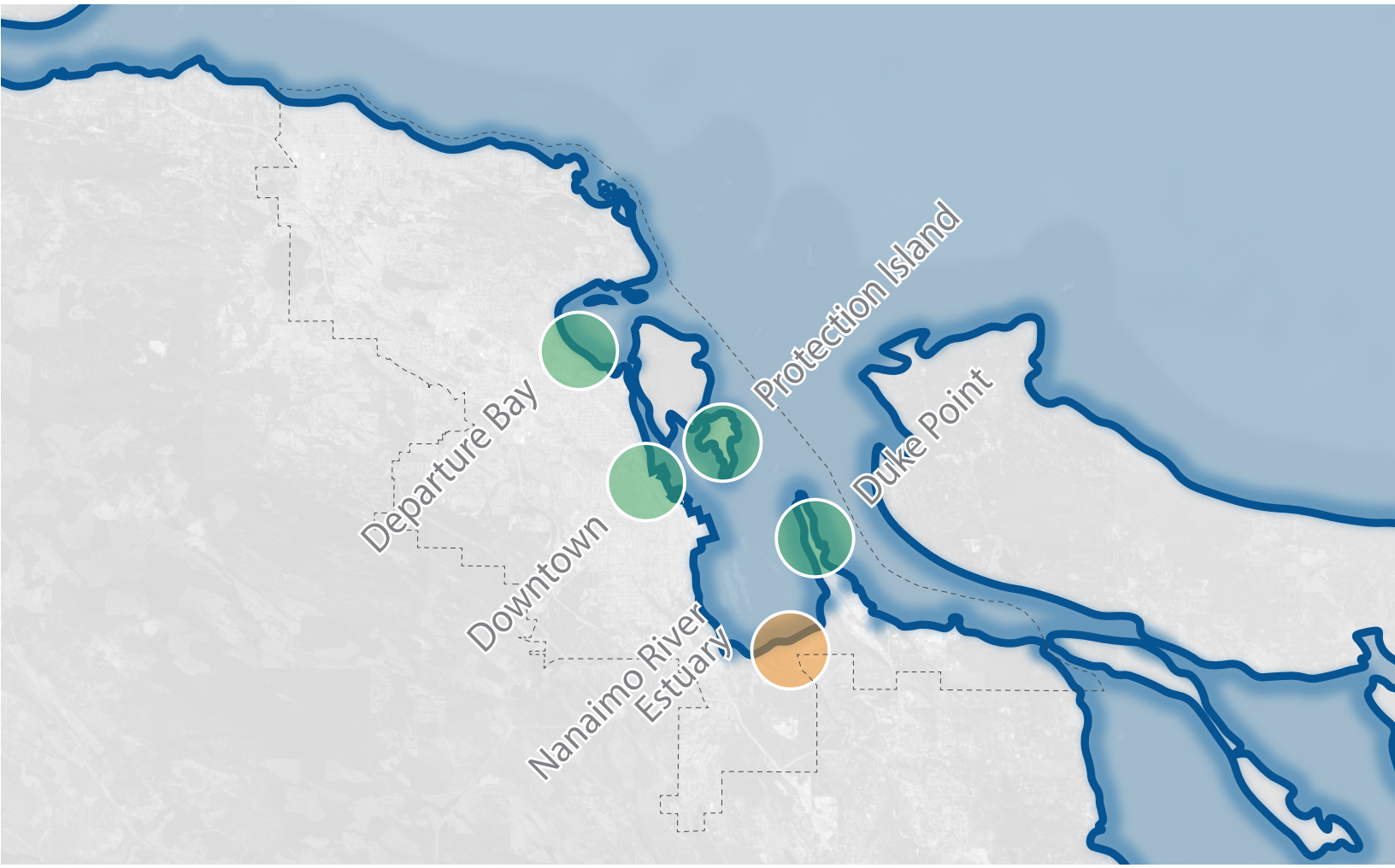
- Some damage to critical infrastructure like roads, bridges, sewer, water, and communications
- Temporary loss of park usage and shoreline access points
- Some destruction of plant and wildlife habitat
- Erosion and loss of coastal lands
- Temporary flooding of communities
- Waves washing out sea walls, berms, and other shoreline defenses
- Some damage to cultural, parks, and recreational assets

Impacts Tomorrow

- Increased duration and frequency of today's hazards
- Threats to human health and safety
- Increasing insurance costs
- More salt contamination in soils, groundwater, and surface water resources
- Longer periods of flooding and recovery
- Loss of intertidal zone habitats
- Interruptions to business and economic loss

Areas with Rising Risks

The City completed an initial *Sea Level Rise Study* in 2018. **It identified — at a high-level — areas along the City's shoreline which face increased vulnerability to flooding as sea levels rise.** Our work focused on these areas: building our technical knowledge and exploring plausible approaches to prepare for rising seas.



LEGEND

- Areas of the City identified in the 2018 *Sea Level Rise Study* with higher vulnerability to coastal flooding.
- Additional area of special interest

Our Work to Date

How did we add to our understanding of what's at risk?

The first stage of the project involved technical studies to increase our understanding of impacts to the areas with rising risks. These efforts laid the groundwork for our current work where we are investigating potential strategies to support the resilience of each area.

Technical Study Highlights

Floodplain Mapping

The team developed floodplain maps to identify how far water will travel inland from the coastline. They help us to understand what is at risk and the associated levels of risk. There are four technical studies that were involved in the development of floodplain maps: a **Joint Probability Analysis** - to determine water level and waves, **Regional Modeling, Nearshore Detailed Modeling**, and **Floodplain Maps.**

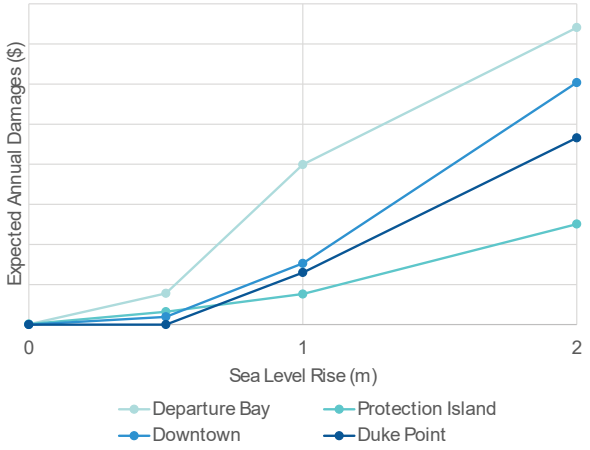
Floodplain Mapping: *An excerpt from the Departure Bay map showing future inundation extents in the long-term.*

Updated Flood Construction Levels

Using the results from the Floodplain Mapping, updated Flood Construction Levels (FCLs) were generated. Flood construction levels dictate the minimum elevation of a livable space required to reduce potential for flooding. These were refined from the initial, conservative FCLs generated in 2018, and in many cases were lowered (good news!).

Economic Risk Analysis

By overlaying the inundation extents for each area with an inventory of buildings, roads, and infrastructure in each area the team was able to perform an Economic Risk Analysis for each area of focus. **This allowed us to estimate 'Expected Annual Damages' in dollars for a variety of future scenarios:** at 0.5m, 1.0m, and 2.0m of sea level rise.



Economic Risk Analysis: *Rising damages were calculated to occur for each area as sea level rise.*

Round 1 Engagement Results

Technical studies help us understand the physical risks of sea level rise, but in order to decide how to proceed, we also need to understand what the community values within these areas. **To build this understanding, the first round of the project included engagement with interest holders and the public.** Through community outreach, focus groups, public meetings, and an online survey we gathered information about values, priorities, and knowledge pertaining to sea level rise and potential adaptation.

FEEDBACK HIGHLIGHTS

Most respondents (94%) have at least a basic knowledge of sea level rise (SLR).

30% of respondents live on or own property that they think is at risk of being impacted by sea level rise.

COMMUNITY PRIORITIES FOR ADAPTING TO SLR

- Preserve shorelines and natural areas
- Plan with consideration for future generations
- Protect homes and infrastructure
- Maintain safe public access to the shoreline

(93%) of respondents prioritize solutions that mimic the natural coast

ACCESS TO THE COAST

Top ways respondents access the coast are:

- Visiting public spaces (parks, beaches, etc.)
- Enjoying scenic views (from home or public locations)

AREAS WITH NOTABLE IMPACTS

- Departure Bay
- Protection Island
- Downtown
- Duke Point

RESPONDENT CONCERNS

- Loss of beaches, shoreline habitat, and public access
- Too much short term focus and not enough planning for the future
- Public cost and taxes to fund adaptation projects

HOME OWNER FEEDBACK

HOMEOWNER CONCERNS ABOUT SLR

- Loss of the shoreline and beaches
- Impacts to homes and property
- Too much short term focus and not enough planning for the future

HOMEOWNER PRIORITIES FOR ADAPTING TO SLR

- Preserve the shoreline
- Protect homes and property
- Include long term planning for future generations

Read the full engagement results: **www.getinvolvednanaimo.ca/sea-level-rise**

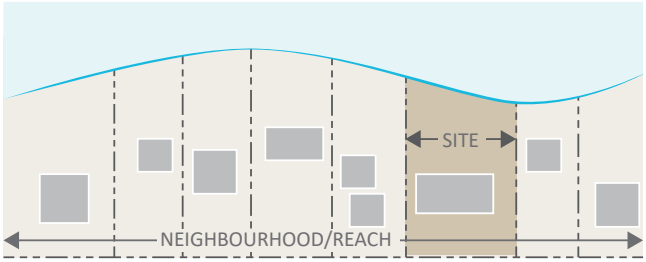
SECTION 2

Approaches to Adaptation

There are many pathways available to address sea level rise. Together, we can select strategies that will help us navigate evolving coastal conditions. Our path to a successful future means considering a range of strategies and planning how to combine them to support resilience in both the short and the long term.

A story of two scales.

When starting to adapt to sea level rise, one of the first decisions is at what level to tackle the problem. Sea level rise adaptation can respond to either larger **neighbourhood scale** solutions (multiple properties, protecting land by changing the foreshore) or smaller **site scale solutions** (singular property, protects occupants, and assets).



Adaptation Scales: *Neighbourhood and site scale strategies each focus on differing areas and solutions.*

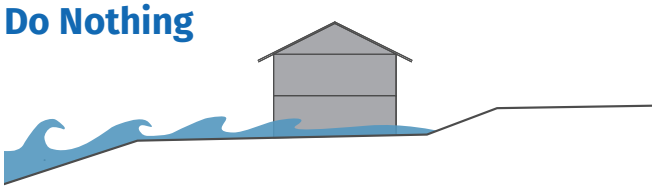
Neighbourhood scale example: *This project supported broad shoreline adaptation through the creation of a marine spit, salt marsh terraces, and foreshore planting (Beach Creek Estuary, Qualicum Beach, BC).*

Site scale example: *A residential Green Shores approach to reduce property impacts from winter storms, wave run up, and rising sea levels (credit: Stewardship Centre for BC).*

What actions are possible?

Depending on the scale of the solution, coastal adaptation can then take many forms. At the highest level, adaptation strategies can be broadly categorized into five approaches. In practice, a combination of measures will be required.

Do Nothing

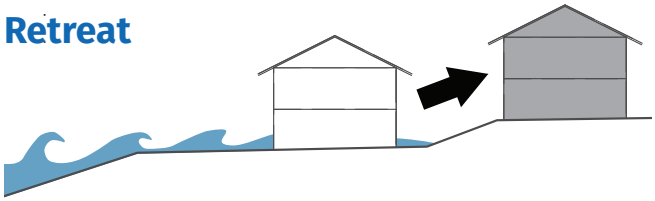


This means not planning, preparing or developing any strategies to deal with the impacts of sea level rise. **Doing nothing will most likely result in a delayed and much a more costly response** to sea level rise in the future.

Avoid

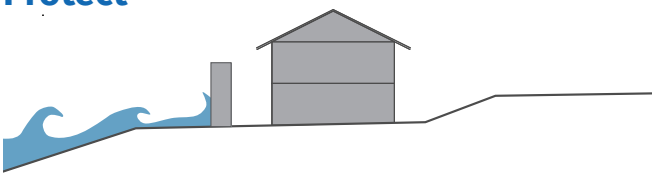
In areas with little or no development, **avoiding future development through "no-build" areas is often the most effective approach to mitigating coastal hazards.** In areas with extensive existing human development, this approach may be more difficult.

Retreat



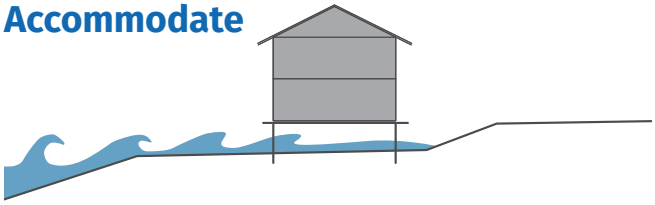
Retreat involves strategic, and often phased, **relocation of people and assets outside of high hazard areas.** It may also benefit the natural environment by providing space to adapt to the effects of climate change and sea level rise. Retreat can be implemented with assistance over long timescales to avoid negative outcomes.

Protect

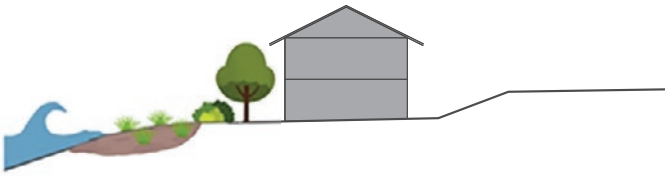


Protecting involves constructing barriers against flood waters. This can include **"hard" measures like dykes and seawalls or "soft" measures like green shores**. "Hard" measures often have negative impacts on ecosystems. Without proper coordination or consideration, they can also have negative impacts on neighbouring properties.

Accommodate



Accommodation involves adapting existing land uses through measures like elevating living areas and improving building design to help a structure withstand flooding.



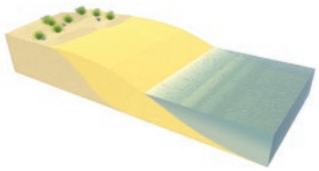
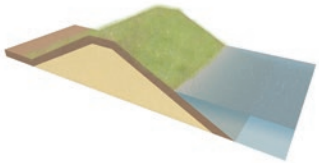
"Soft" measures work with natural systems to find ways to protect against flooding while expanding the ecological integrity of a shoreline. These often involved the creation of new habitat and ecosystems.

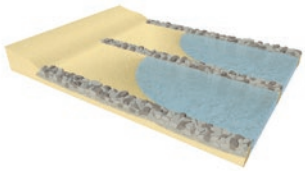
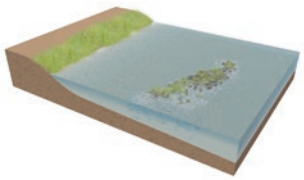
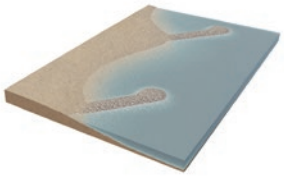
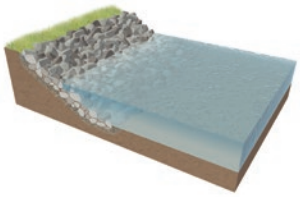
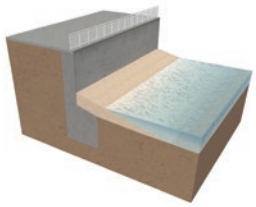
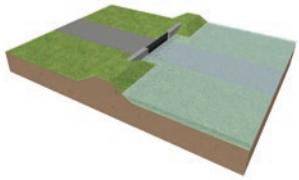
A Toolkit of Strategies

The following suite of adaptation tools are common best management practices within the five approaches. They run the gradient of 'natural' to 'hard' solutions (think green shores to seawalls), and each corresponds to a broad 'neighbourhood' scale or more local 'site' scale.

Considering methods and determining viability.

When looking at the list, it is important to note that technical studies will determine conditions for different locations (and which methods might be applied). Each method balances a variety of criteria related to people, economics, the environment, recreation/culture, and impacts to infrastructure that will need to be considered. Each method also puts a different level of responsibility on public governments versus private landowners.

Adaptation Tool		Scale	Benefits & Limitations
Beach Nourishment		Neighbourhood	• Expands the usable beach area, increasing public access and use • Reduces wave runup and wave effect elevations at the natural boundary
Living Shores		Neighbourhood / Site	• Supports intertidal habitat creation and coastal vegetation • May help improve water quality • Offers opportunities for educational signage and demonstrations • Must be sheltered from erosion
Dykes		Neighbourhood	• Prevents flooding of properties directly behind • Will resist storm waves with proper armouring • Recreation opportunities on top of the dyke • Active or vehicular transportation opportunities on top of the dyke • May block desirable views of the water

Adaptation Tool		Scale	Benefits & Limitations
Groynes		Neighbourhood	· Can extend lifespan of beach nourishment projects · Wide range of construction methods and materials · Investment cost varies by methods and materials used · Interrupts shoreline walking path · Can increase beach erosion
Offshore Reef / Breakwater		Neighbourhood	· Can facilitate creation of marine habitat · Opportunities for recreation · May be augmented as seas rise · Potential visual impact and navigation hazard
Pocket Beach / Headland		Neighbourhood	· Creates opportunities for increased public access, recreation, and use · Can be relatively expensive
Rock Armoring		Neighbourhood / Site	· When properly engineered have an indefinite lifespan · Negative impact on natural ecosystems (coastal squeeze and intertidal habitat loss) · Creates wave splash, but less than seawall · Can create adverse effects on neighbouring properties
Sea Walls		Neighbourhood / Site	· When properly engineered have an indefinite lifespan · Negative impact on natural ecosystem (coastal squeeze and intertidal habitat loss) · Creates wave splash · Can create adverse effects on neighbouring properties
Temporary Flood Barriers at Driveways		Neighbourhood / Site	· Relatively easy to install · Suitable for locations where grades do not allow for raised roadways · Barriers must be placed in advance of storm

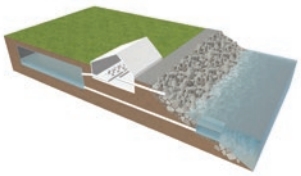
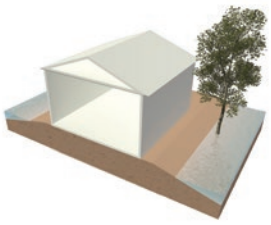
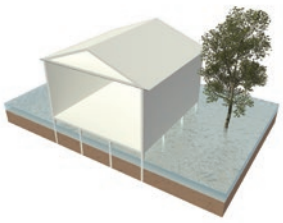
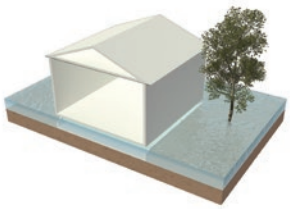
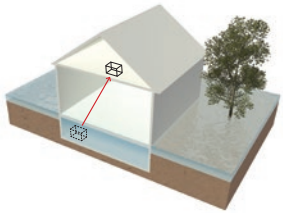
Adaptation Tool		Scale	Benefits & Limitations
Floodbox / Pump Station		Neighbourhood	• Used to drain large areas that have been inundated by coastal and inland floodwaters when storm drains are overwhelmed • Expensive to build • Can have high energy consumption
Elevate on Fill		Site	• At appropriate elevations can provide ongoing protection from flooding • Adjacent property constraints may limit space for fill slope • May require maintenance to prevent erosion
Elevate on Piles		Site	• Provides protection from a broad range of flood conditions • May allow for additional parking space under the building • Emergency access is restricted
Wet Floodproofing		Site	• Can be used for crawl spaces, parking, or storage where temporary flooding is acceptable • Does not stop flooding
Protect Building Systems		Site	• Requires relocation of critical equipment above flood level • Can often be applied as a retrofit to existing buildings. • Can be used along with other adaptation tools • Can allow quicker building recovery • Does not stop flooding

Table adapted from:
Lanarc 2015 Consultants Ltd. (Lanarc), Northwest Hydraulics Consultants Ltd. (NHC). 2018. *Sea Level Rise Primer Part Ii: Sea Level Rise Adaptation Best Practices.* City of Campbell River: Campbell River Rising Seas.

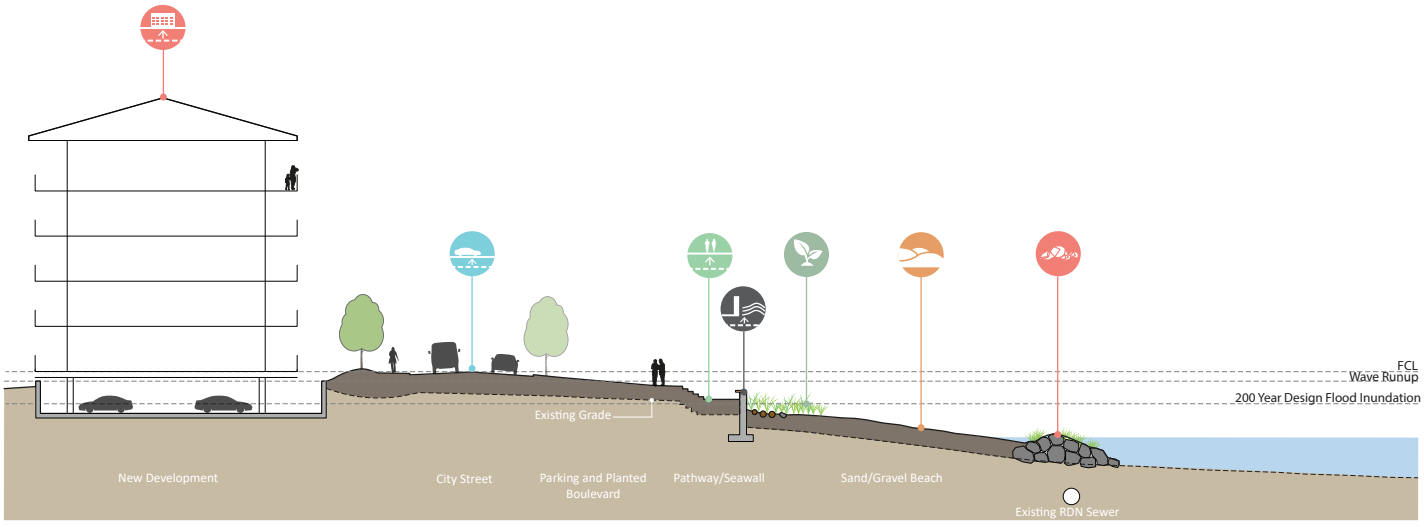
Putting the Pieces Together

The methods in the toolkit will likely be used in combination, relying on many different interventions to protect buildings and community spaces from future flooding. The sections below show some examples of how you might approach adaptation in different locations within the City.

Adapting in low-lying, developed areas.

The section below illustrates a conceptual approach to a location like Departure Bay, where a waterfront beach and streetscape play a role in holding back floodwaters. By raising everything a little over time — beach, seawall, walkway, and road — no one component needs to do all of the lift. Each is done at its natural time of replacement. Inland, new development is then raised to meet Flood Construction Levels (FCLs) at time of redevelopment.

How might you combine methods in different areas?

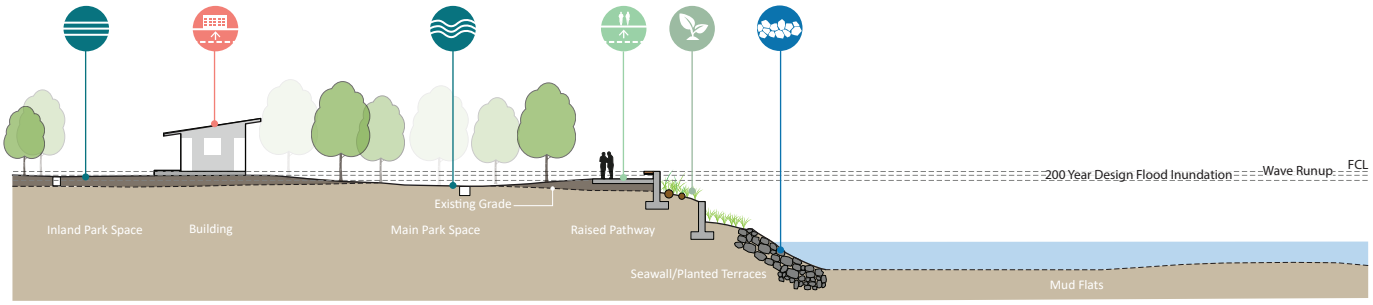


ADAPTION STRATEGIES

- Habitable floors of new development to be above FCL. Parking to be above still flood water (200 Year flood design) or wet floodproofed
- Raise road to be above wave runup at time of reconstruction
- Raise waterfront trail as sea level rises
- Raise seawall at time of reconstruction
- Naturalized area (dunegrass complex)
- Boulder reef break water
- Beach nourishment, beach retained as a community amenity

Options for waterfront parks.

The section below shows a different set of conditions — a waterfront park (like Maffeo Sutton). In the park setting, planning can determine where we can allow for some flooding, and where it is definitely not ok. This can allow us to be creative as the park is redesigned and renewed over time.

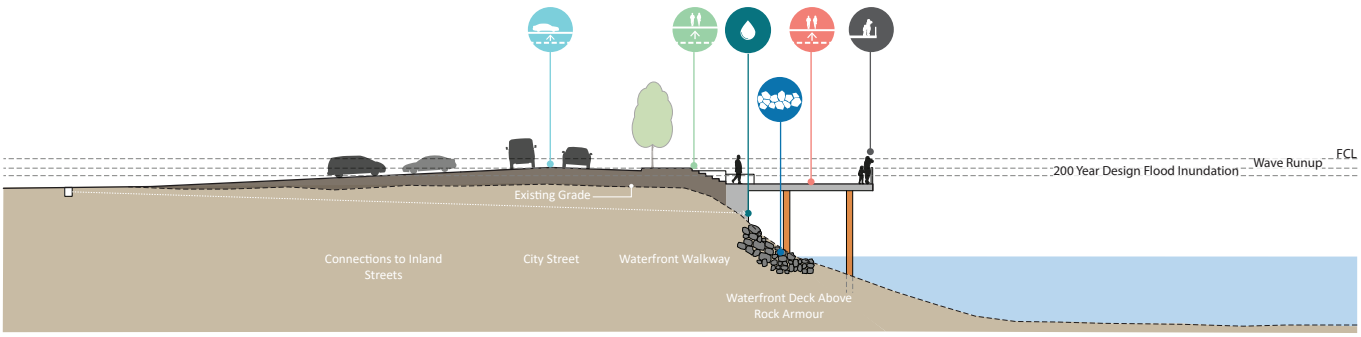


ADAPTION STRATEGIES

- Non-floodable park uses designed to be above waves/ inundation and to drain
- New park buildings to be constructed above FCL or designed to be wet floodproofed
- Some park uses acceptable to be temporarily floodable and to drain post storm
- Raise waterfront trail as sea levels rise
- Naturalized terraces with tiered seawalls (dunegrass complex above 2.5m, sedge complex above 0.9m)
- Rock armour foreshore

Considering movement corridors.

This next section shows a walkway facing the harbour (like along Downtown's boat basin). The street can act as a method to hold back floodwaters while integrating a raised walkway (similar to the existing Harbourfront Walkway) to maintain views and access.



ADAPTION STRATEGIES

- Raise road to above wave runup (road to ramp down to Museum Way)
- Raised pedestrian route with ramp/step down to waterfront deck
- Storm drain flood box outlet through sea wall
- Rock armour foreshore
- Existing deck on piles (raise elevation when rebuild occurs)
- Flood barrier handrail and temporary barriers (interim)

SECTION 3

Risks & Objectives

Based on the technical results and community values, **initial objectives have been identified for each area** (with a continued focus on Departure Bay, Downtown, Protection Island, and Duke Point). This section presents the risks for the locations, as well as proposed objectives being considered.

Determining Risk

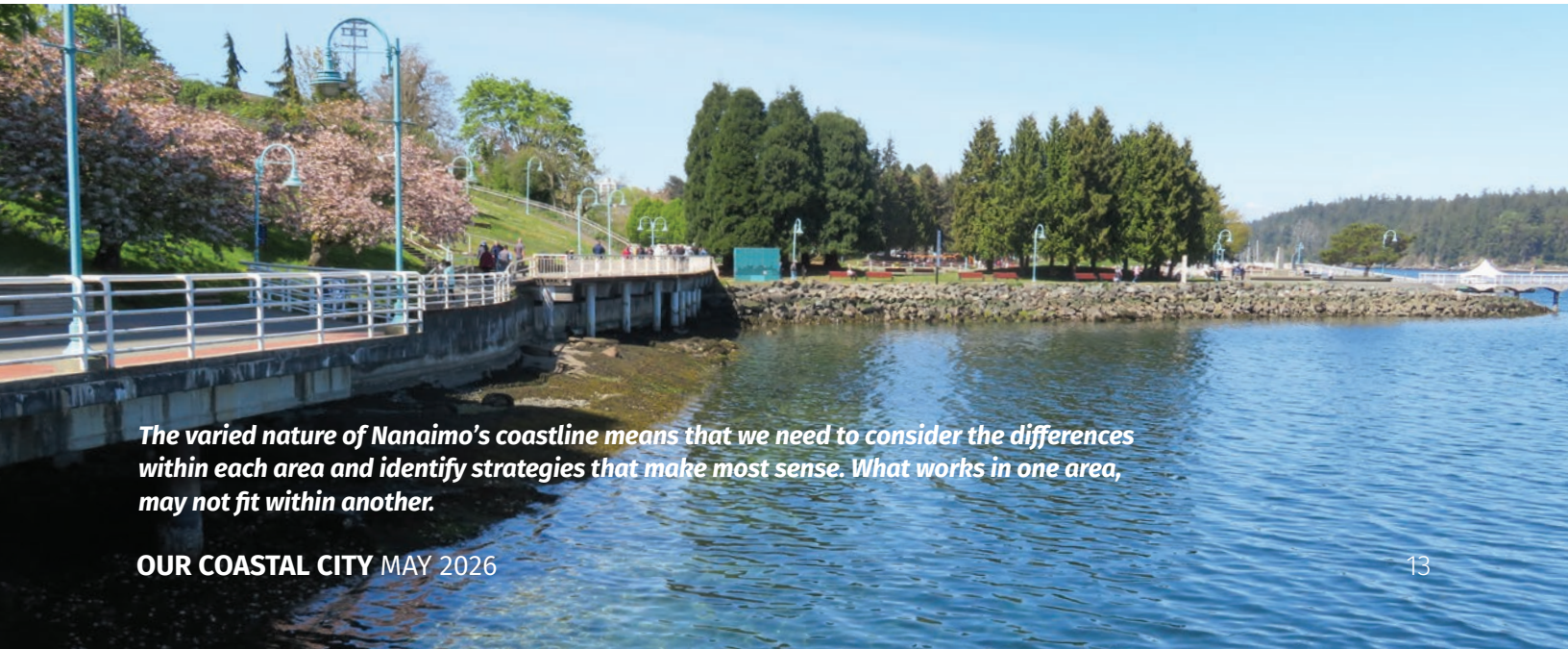
The technical studies illustrate anticipated future flood water levels. Risks are identified and summarized based on how these future flood levels interact with roads, buildings, infrastructure, public spaces, and other elements in each area of focus. **Risks have been categorized into the short, medium, and long terms** to help structure what actions may need to be taken when.

Setting Objectives

Based on the risks identified, the team has generated a first set proposed objectives for each area. **These have been informed by the community values we heard in Round One engagement as well as input from City staff, interest holders, and technical partners.** These are presented on the following pages for each of Departure Bay, Downtown, Protection Island, and Duke Point.

Understanding Timelines

On the following pages risks have been catagorized into the short, medium, and long terms. A valid question is when are these expected to occur — 2035, 2050, 2100? Because how fast sea levels will rise is dependant on how we as a society either limit, or increase, our greenhouse gas emissions, tying a flooding level to a specific year in the next century is difficult. For the purposes of this report, we have used figures from the City of Nanaimo's 2018 *Sea Level Rise Study*, which estimated SLR relative to the year 2000 as +0.06m in 2018, +0.38m in 2050, and +0.88m for 2100. This corresponds roughly to a 'short-term' of 2050-2060, 'medium-term' of 2080-2100, and long-term of 2100+.



The varied nature of Nanaimo's coastline means that we need to consider the differences within each area and identify strategies that make most sense. What works in one area, may not fit within another.

Departure Bay

Departure Bay is home to a variety of important community destinations. Departure Bay Beach has destination open space, commercial, and residential land uses. The southern portion also includes areas with bluffs as well as the BC Ferries terminal and adjacent industrial land.

Identified Risks

Short-Term:

- Some risk to residential properties and neighbourhood streets from flooding today.

Medium-Term:

- Seawall no longer able hold back flooding in its current configuration.
- Increased road inundation.
- Inland properties exposed to flooding.
- Access challenges to public parks during flood events.
- Damages to commercial and multi-family residential properties.
- Ferry access and terminal exposed to flood risks.

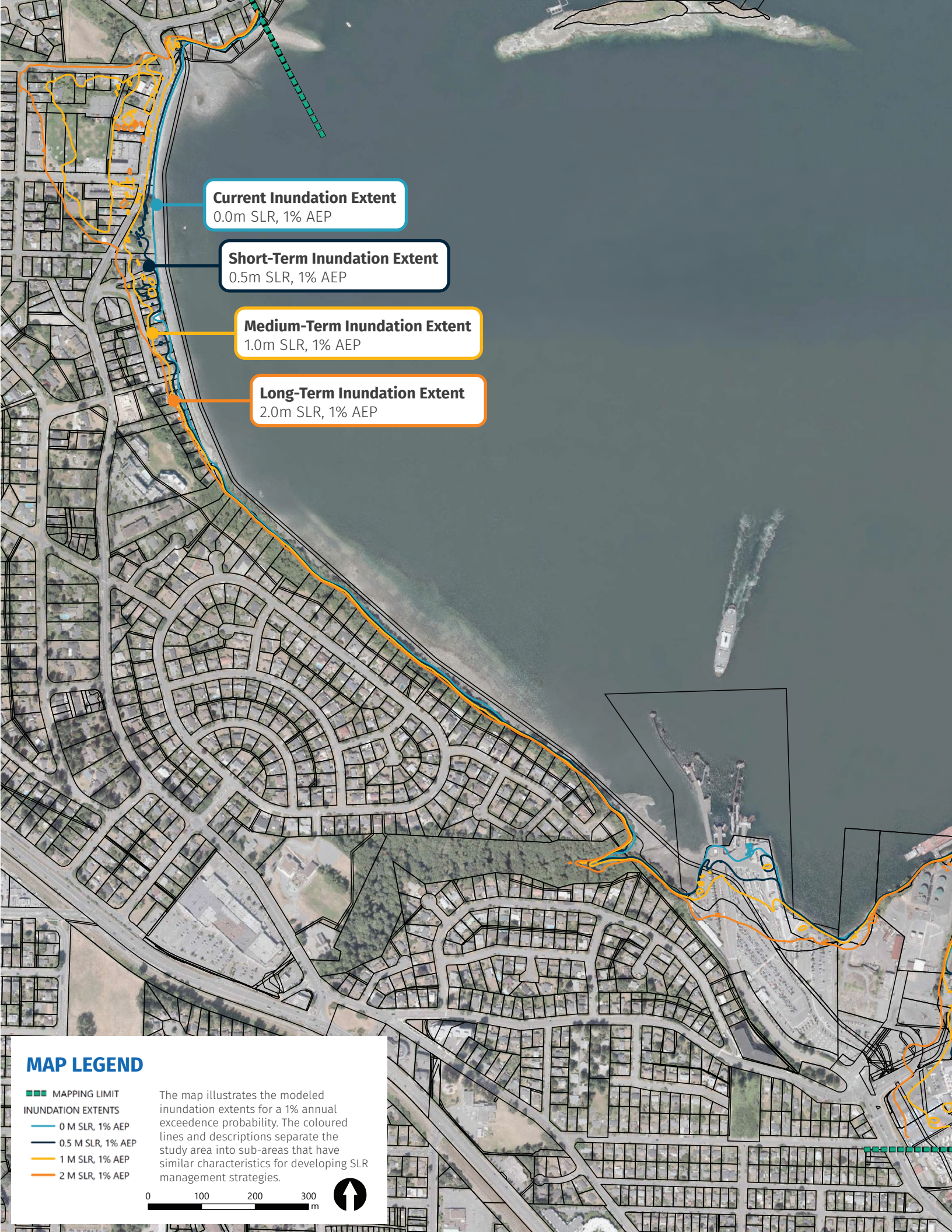
Long-Term:

- Erosion at the toe of Cilaire bluffs.

Proposed Objectives

- Maintain public waterfront access.
- Seek ways to improve foreshore habitat.
- Provide continuous waterfront walk- and cycle-ways.
- Allow for continued road access to area.
- Plan for continued residential and commercial properties in the area.
- Develop strategies for how public/private cooperation could work together to mitigate impacts to homes, access, and infrastructure.
- Develop strategies to mitigate the impacts of erosion.
- Maintain transportation and industrial uses.

Departure Bay's seawall and adjacent beach.



MAP LEGEND

MAPPING LIMIT

INUNDATION EXTENTS

- 0 M SLR, 1% AEP
- 0.5 M SLR, 1% AEP
- 1 M SLR, 1% AEP
- 2 M SLR, 1% AEP

The map illustrates the modeled inundation extents for a 1% annual exceedence probability. The coloured lines and descriptions separate the study area into sub-areas that have similar characteristics for developing SLR management strategies.

0 100 200 300 m

Downtown

Downtown Nanaimo contains key commercial, residential, and public assets in a vulnerable area originally built on historic mine tailings. Addressing coastal risk here will require collaboration and cooperation between many interested and affected parties.

Identified Risks

Short-Term:

- Some areas of the park exposed to flood risks.
- Some parts of the waterfront walkways exposed to flood risks today.
- Portions of the industrial lands at risk of flooding today.

Medium-Term:

- Large areas of the park subject to inundation.
- Waterfront walkways more flood-prone.
- Damages to the commercial store fronts.
- Front Street flooding, impacting buildings.
- Increasing risks to the waterfront industrial lands.
- Impacts and access challenges for transportation options in the area (e.g. ferry, helicopter, port).

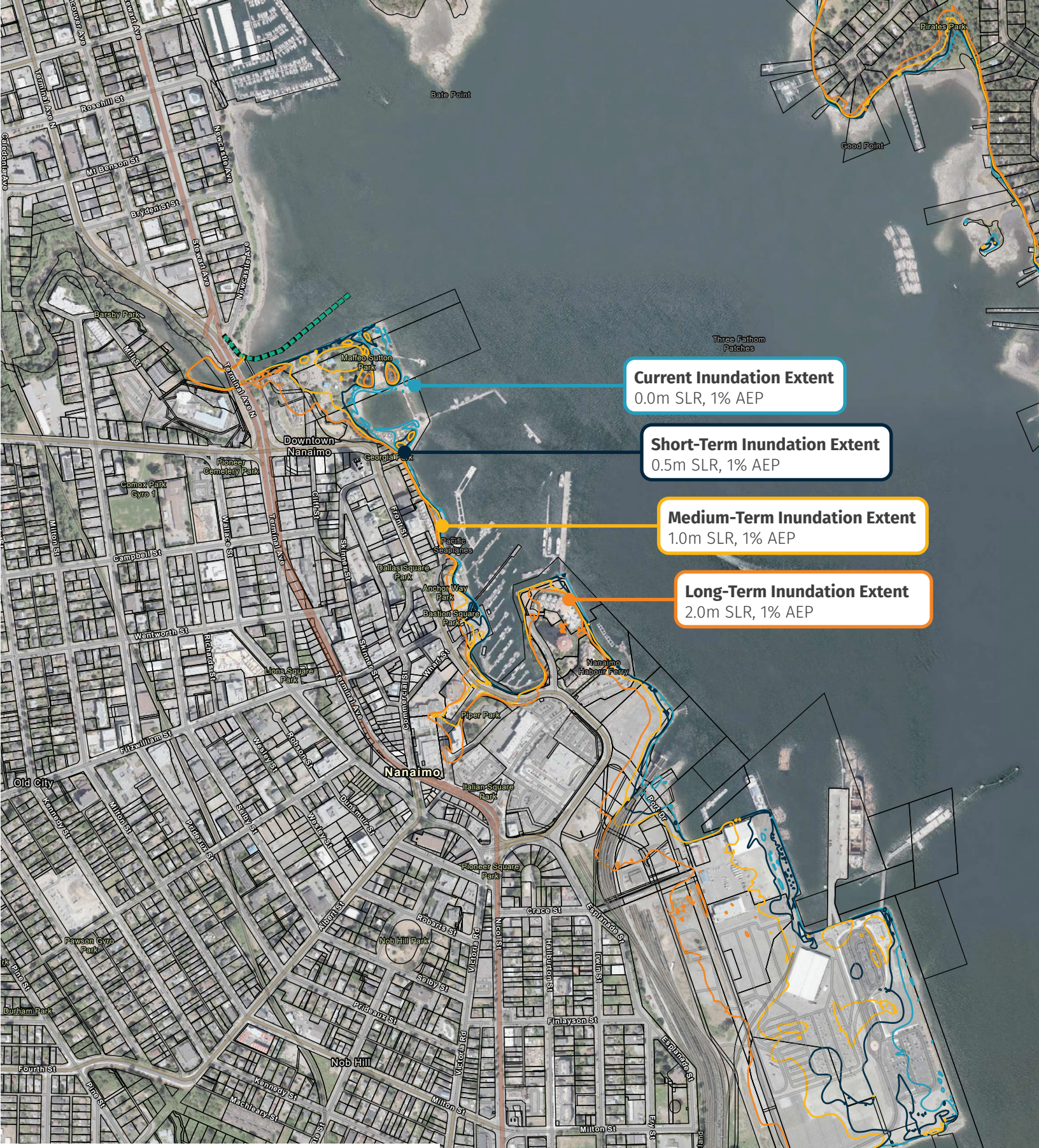
Long-Term:

- Greater access challenges and infrastructure impacts in the long-term.

Proposed Objectives

- Maintain public waterfront access.
- Maintain waterfront park and event spaces.
- Provide continuous waterfront walk- and cycle-ways.
- Seek ways to improve foreshore habitat.
- Mitigate impacts to downtown buildings.
- Plan for ongoing waterfront commercial uses.
- Allow for continued road operations in the area.
- Maintain transportation uses/access.
- Maintain industrial uses/access.
- Develop strategies for how public/private cooperation could work together to mitigate impacts to access and infrastructure.

Downtown's waterfront walk on concrete piles.



MAP LEGEND

INUNDATION EXTENTS

- 0 M SLR, 1% AEP
- 0.5 M SLR, 1% AEP
- 1 M SLR, 1% AEP
- 2 M SLR, 1% AEP

The map illustrates the modeled inundation extents for a 1% annual exceedence probability. The coloured lines and descriptions separate the study area into reaches that have similar characteristics for developing SLR management strategies.

0 100 200 300 m

Protection Island

Predominately a residential area, Protection Island is at risk of impacts from coastal risks on all sides. Adaptation considerations should look to address flooding and wave action, as well as keep transportation options to — and on — the island functioning in the long term.

Identified Risks

Short-Term:

- Some areas exposed to flood risks today.
- Impacts from wave exposure.

Medium-Term:

- Increasing risk of flooding to low-lying areas.
- Flooding and access challenges to park spaces.
- Flooding and damages to residential properties.
- Flooding of some roadways.
- Impacts to transportation (e.g. ferry connection).
- Impact to public boat ramps.
- Loss of foreshore habitat in some zones.

Long-Term:

- Greater access challenges, property damages, and infrastructure impacts in the long-term.

Proposed Objectives

- Maintain public waterfront access.
- Maintain waterfront park spaces as community amenities.
- Mitigate impacts to private property.
- Seek ways to improve foreshore habitat.
- Allow for continued road operations.
- Maintain transportation access.
- Explore neighbourhood scale solutions to mitigate impacts to buildings and people.
- Develop strategies for how public/private cooperation could work together to mitigate impacts to homes, access, and infrastructure.

Protection Island (on the right) viewed from above.

MAP LEGEND

INUNDATION EXTENTS

- 0 M SLR, 1% AEP
- 0.5 M SLR, 1% AEP
- 1 M SLR, 1% AEP
- 2 M SLR, 1% AEP

The map illustrates the modeled inundation extents for a 1% annual exceedence probability. The coloured lines and descriptions separate the study area into reaches that have similar characteristics for developing SLR management strategies.

0 100 200 300 m

Duke Point

The Duke Point study area encompasses access to the BC Ferries terminal, industrial land uses, Jack Point & Biggs Park, and critical highway infrastructure. Flooding and wave action are the primary concerns, including future inundation of Duke Point Highway (Highway 19) during flood events.

Identified Risks

Short-Term:

- Some areas exposed to flood risks today.

Medium-Term:

- Increasing risk of flooding to many areas.
- Flooding of Duke Point Highway.
- Impacts to transportation access (e.g. ferry connection).
- Impact to waterfront industrial uses.

Long-Term:

- Greater access challenges, property damages, and infrastructure impacts in the long-term.

Proposed Objectives

- Protect waterfront industrial lands.
- Allow for continued road operations.
- Maintain access to transportation uses (e.g. ferry connection).
- Seek ways to improve foreshore habitat.
- Develop strategies for how public/private cooperation could work together to mitigate impacts to access/infrastructure.

Highway to BC Ferries Duke Point terminal.

MAP LEGEND

INUNDATION EXTENTS

- 0 M SLR, 1% AEP
- 0.5 M SLR, 1% AEP
- 1 M SLR, 1% AEP
- 2 M SLR, 1% AEP

The map illustrates the modeled inundation extents for a 1% annual exceedence probability. The coloured lines and descriptions separate the study area into reaches that have similar characteristics for developing SLR management strategies.

0 100 200 300 m

SECTION 4

What Happens Next?

We are now in the second round of engagement for the *Our Coastal City* project. **Round Two's engagement focuses on discussing the risks and potential objectives presented in this document.** We want to hear your thoughts!

How do I participate and how will it be used?

We have an online survey where you can provide your feedback. Your input will be used in the final stage of the project where we develop long-term approaches for areas at risk.

Stay Connected with the Project: Get Involved Nanaimo

Get Involved!

Access the project webpage through by visiting:
www.getinvolvednanaimo.ca/sea-level-rise

Take the Survey!

Want to learn more and provide feedback on sea level rise adaptation? Visit the webpage and fill out the survey from May 19 - June 12!

Questions?

Please contact the City of Nanaimo:
Email: *david.stewart@nanaimo.ca*

The Regional District of Nanaimo is also studying coastal risk and adaptation through their parallel *Our Changing Coast* project.

Our Changing Coast

Coastal adaptation in the Regional District of Nanaimo.

Coastal adaptation approaches transcend jurisdictional boundaries. The Regional District of Nanaimo is conducting a parallel process to align strategies for coastal adaptation along the mid-island coast.

For more information about *Our Changing Coast* visit:
www.getinvolved.rdn.ca/coastal-risk

CITY OF NANAIMO

THE HARBOUR CITY