Kōrero mai | Let's talk

Draft Coastal Hazards Adaptation Plan

Planning for sea-level rise in Whakaraupō Lyttelton Harbour and Koukourarata Port Levy

Find out more

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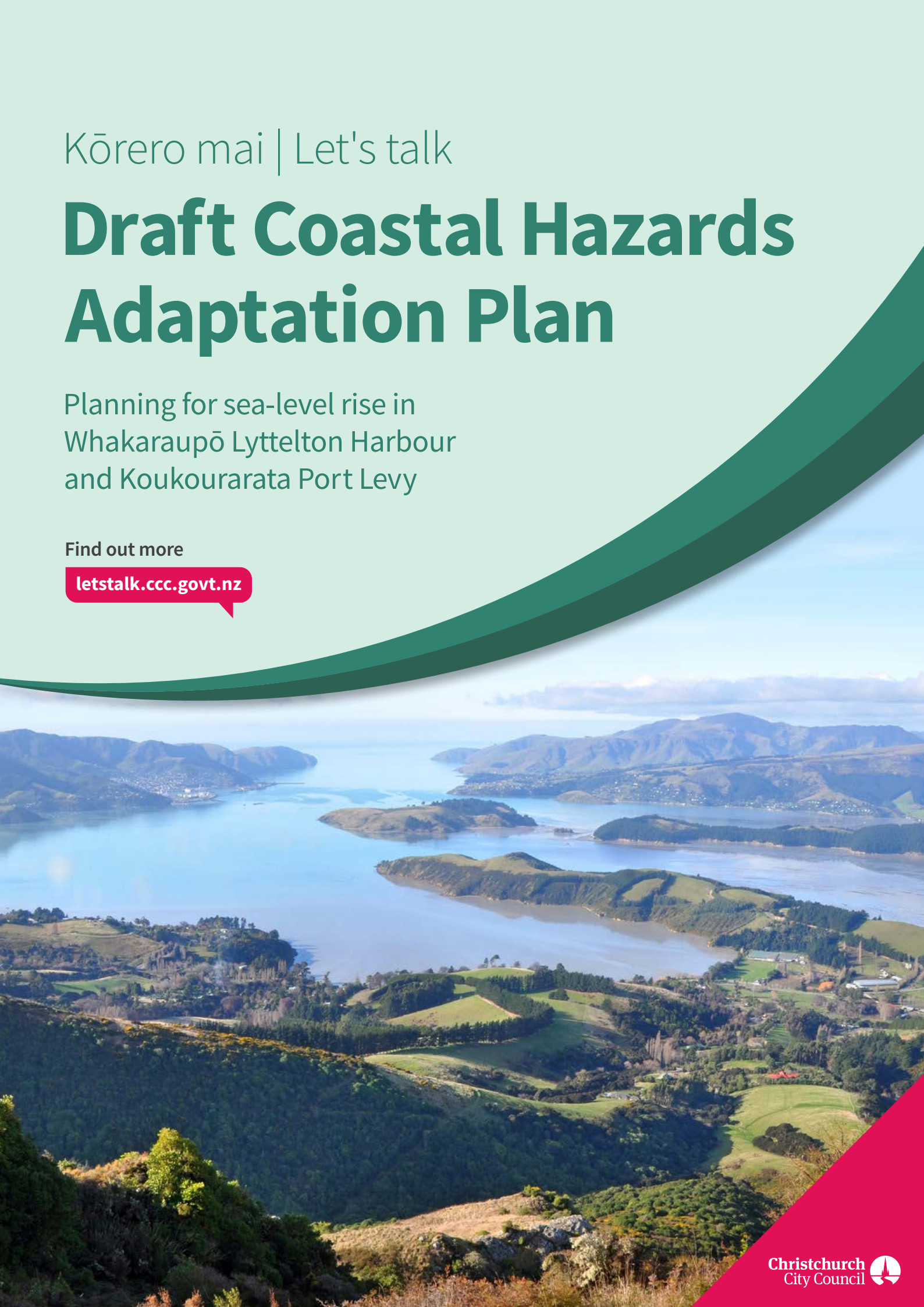

Christchurch City Council

Mō tātou, ā, mō kā uri ā muri ake nei.
For us and our children after us.

Christchurch City Council recognises the rangatiratanga of Te Hapū o Ngāti Wheke and Te Rūnanga o Koukourarata over their respective whenua. We're working in partnership to plan for impacts on public assets and places of value.

This plan is the result of the dedicated mahi of the Coastal Panel.

Thank you, Aurora Smith, Bex Gordon, Darryl Millar, David Gregory, Gina Waibi, Ihorangi Reweti Peters, Jillian Frater, Jo Zervos, Joan Blatchford, Karen Banwell, Luana Swindells, Makarini Rupene, Manaia Cunningham, Paul Dahl, Tayla Nelson-Tuhuru.

We also appreciate the dedication and guidance of the Specialist and Technical Advisory Group and the leadership of the Independent Chair.

"Never doubt that a small group of committed citizens can change the world; indeed, it's the only thing that ever has."

– Margaret Mead

About this document

We've been working with communities to plan for our future. Tell us what you think.

This draft plan sets out how we could manage the risks posed by coastal hazards and sea-level rise for six communities in the Christchurch district: Rāpaki, Allandale, Teddington, Te Wharau Charteris Bay, Purau and Koukourarata Port Levy. Its actions have been considered and proposed by a Coastal Panel of people from those communities, including local rūnanga.

The plan focuses on managing vulnerable public assets, such as roads, wharves and water supply pipes, over the next 100 years. For each asset, the Coastal Panel has proposed a preferred pathway for adapting it over time, alongside the expected cost.

On 16 October 2024, Christchurch City Council endorsed this draft plan and is now seeking public feedback on the Coastal Panel's preferred adaptation pathways before they're presented to the Council for a final decision in 2025.

Kōrero mai | Let's talk

We want to know what you think about this plan and its priorities. Head online to find out more and give your feedback.

Phone us on **03 941 8096** or email **letstalk@ccc.govt.nz**

You need to give us your feedback by 17 November 2024.

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We know that sea levels are rising because of climate change. Over time, this is going to have a big impact on how we live, use and move around our district's coastline and low-lying inland areas. While we don't have all the answers about what life is going to look like in the future, we do know there are some important decisions we can be making now so we're better prepared.

To that end, and guided by our Coastal Adaptation Framework, we've been working with communities and rūnanga across Whakaraupō Lyttelton Harbour and Koukourarata Port Levy to plan for the risks posed by coastal hazards and rising sea levels.

The focus of this work has been on vulnerable public assets that are owned and managed by Christchurch City Council. They're defined as vulnerable because they're either at risk now or are likely to be within the next 30 years.

This draft plan sets out the Coastal Panel's preferred adaptation pathways for each asset, which are recommendations to the Council on how to address the risk to them over the coming decades. These preferred pathways have been developed following the panel's assessment of the information and data available today. A range of workable alternative options remain in the plan, as we know that life in 2050 or 2080 will be very different to life today and we may need to take a different approach.

There are also many other areas across our district that will be impacted by coastal hazards over time. With 20 centimetres of sea-level rise, we expect around $3.2 billion in roads and water infrastructure, and $14 billion in private properties, to be at risk. The Council and ratepayers have limited funds for adaptation which need to be balanced across our communities. We can't afford to do everything, which means we're going to need to weigh up carefully how we spend public money. It also means that, gradually, we're all going to need to make changes and learn to live with some of the effects of rising seas and a changing climate.

The **Coastal Panel** is a diverse group of community members and rūnanga representatives from the Whakaraupō Lyttelton Harbour and Koukourarata Port Levy areas, alongside a couple of city-wide representatives.

The panel is supported by a Specialist and Technical Advisory Group made up of various experts from a range of fields and organisations. It helps the Coastal Panel's decision-making by providing information, advice and guidance.

Glossary

Term	Definition
Adaptation	The process of adjusting to change, or a strategy to anticipate and cope with the impacts of climate change.
Adaptation options	A range of actions that can be taken to address the risk posed by coastal hazards. These include policies, practices, built structures and ecological interventions.
Adaptation pathway	A range of options that can be used on their own, or in combination with each other, to adapt to coastal hazards over time. Adaptation pathways include signals, triggers and thresholds for an adaptive management approach that allows for re-evaluation of the pathway and the best way forward as conditions change over time.
Assets	Public or private infrastructure, places, natural environments, services and any other thing of value.
Coastal hazards	The coastal hazards considered in this document are coastal flooding, coastal erosion and rising groundwater.
Coastal Panel	The Coastal Panel is a group of rūnanga and community representatives tasked with analysing the adaptation options and identifying preferred adaptation pathways for their adaptation area, which are then submitted to Christchurch City Council for a final decision. The Coastal Panel includes wider city and youth representatives.
Exposure	Being present in a place or setting that could be affected. Where people, livelihoods, species or ecosystems, environmental functions and their services or resources, infrastructure, buildings, and economic, social or cultural assets could be harmed.
Long term	Thirty to 100 years into the future.
Priority Adaptation Location	A defined location that's exposed to coastal hazards and is the focus of this round of adaptation planning. Adaptation pathways have been developed for public assets in these locations.
Road closure	A road closure means that a certain section of road is temporarily or permanently blocked off, preventing all, or certain, types of vehicles and pedestrians from using it.
Short term	Less than 30 years into the future.
Signal	Pre-determined changes in physical, social, cultural, economic and risk attributes, which provide early warning (signal) that a trigger (decision point) is approaching in the near to medium term. It should prompt thinking and initial engagement processes on the next steps or any changes to the trigger.
STAG	The Specialist and Technical Advisory Group (STAG) provides information and advice to support evidence-based decision-making by the Council and the Coastal Panel. It's made up of experts from different disciplines.
Trigger	A pre-determined indicator which, when reached, provides sufficient lead time to cover community engagement, consenting, design and construction and funding arrangements, to ensure a new adaptation action or pathway can be implemented before the adaptation threshold is reached.
Threshold	The point at which agreed objectives, community values, risk exposure or levels of service are no longer being met or start to fail, requiring an alternative adaptation action or pathway to be in place before this happens. Thresholds are tied to a change in conditions rather than a particular time.
Vertical land movement	Tectonic movement that results in land moving up or down.

Contents

Message from the chair of the Coastal Panel

Kia ora koutou,

I am pleased to present this Draft Coastal Hazards Adaptation Plan to you on behalf of the Coastal Panel.

Once finalised, it will guide the management of public assets in the Whakaraupō Lyttelton Harbour to Koukourarata Port Levy area for the coming decades. This will help us gradually adapt to, and in some ways learn to live with, the effects of sea-level rise and a changing climate.

We know that sea levels are rising. Locally, they have risen by about 10 centimetres over the last 15 years, and we expect to see a further 14 to 23 centimetres by 2050.

On paper, those do not necessarily sound like big numbers, but the science tells us that, over time, they will have increasing adverse impacts on our communities.

This draft plan is all about getting ahead of those impacts. It is another positive step forward since 2021, when we first started this conversation with people who live, work and play in Whakaraupō Lyttelton Harbour and Koukourarata Port Levy.

At that time, with community input, we set up the Coastal Adaptation Framework which has guided this entire planning process – right up to the final decisions that will eventually be made by Christchurch City Council about the pathways in this plan.

If you imagine those two milestones like bookends in this planning process, then in between them sits the setting up of the Coastal Panel, selecting the six priority locations, public engagements on the community objectives and the draft adaptation pathways, and now the document before you today.

All in all, a tremendous amount of listening, thinking and planning has taken place to get us to this point.

This draft plan's proposals and pathways are founded in strong technical support from the Specialist and Technical Advisory Group and the Council's Coastal Hazards Adaptation Planning team, as well as significant input from rūnanga and communities across months of feedback-gathering.

The plan recommends signals to guide courses of action when it comes to community assets like roads, water pipes, boat ramps and jetties. It also considers the wider transport network and the connectivity between communities and Christchurch. Throughout it, there is acknowledgement that tough decisions and trade-offs will need to be made to balance competing priorities and costs for the Council and for ratepayers.

In some cases, preferred pathways reflect a decision to prioritise the natural environment by closing, moving or removing assets. In other cases, assets have been deemed important to leave in place and protect.

In Koukourarata, for example, the Coastal Panel's preferred pathway is to ultimately move Pa Road away from the coastline. While in Purau, the panel would prefer to see the jetty and boat ramp protected and upgraded, as they form an important part of the wider area's marine infrastructure.

These are the sorts of challenging, real-world proposals this document puts forward – to get ahead of the very real changes and decisions coming down the line for our communities and for future generations.

You can play an important part in this process by taking time to read through the information and then giving your thoughts on it. Consider whether you think we've got it right, wrong or somewhere in between.

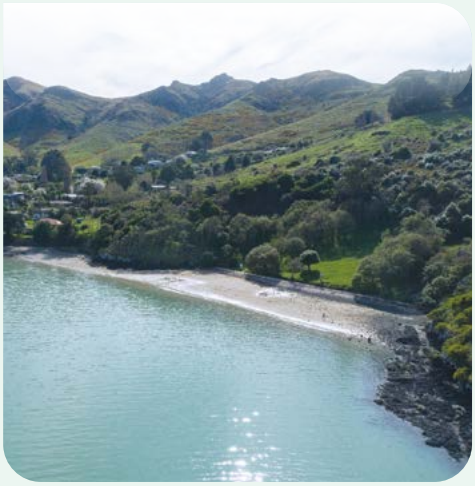
Please spread the word and make sure your friends and whānau living in the area also have a chance to shape their futures. It is important we hear from as many people as possible.

Ngā mihi maioha,

Darryl Millar
Independent Chair
Coastal Panel

Message from Te Hapū o Ngāti Wheke (Rāpaki) Rūnanga

Whakaraupō and the wider Banks Peninsula was created by Tūterakiwhānoa, a Ngāi Tahu ancestor, in his search for Aoraki and his brothers. Generations later, the harbour was given its name of Whakaraupō – 'the reed-filled harbour' – by the great explorer Tamatea-Pōkai-Whenua. He also gave his name to the prominent peak overlooking Rāpaki Bay, Te Poho o Tamatea, which is the ancestral mountain of this area.



Whakaraupō was first settled by Waitaha and Ngāti Māmoe, with Ngāi Tahu assuming mana whenua of the area in the 18th century through conquest and intermarriage. Ngāi Tahu asserted their manawhenua status through the actions of the chief Te Rakiwhakaputa, who threw his rāpaki (waistmat) upon the beach which is now known as Te Rāpaki o Te Rakiwhakaputa, or Rāpaki for short. Te Rakiwhakaputa's son, Wheke, remained at Rāpaki and his descendants are now known as Ngāti Wheke.

Ngāti Wheke are the hapū that hold mana whenua and mana moana over Whakaraupō and the surrounding area. The takiwā of Ngāti Wheke reflects the events and deeds of Te Rakiwhakaputa (a Ngāi Tahu rangatira of Ngāti Kurī descent) and his sons, Manuwhiri and Wheke, who secured their descendants mana whenua rights to the area. Ngāti Wheke acknowledge Ngāti Māmoe and Waitaha whakapapa lines, as well as Ngāi Tahu, due to the intermarriages between Waitaha and Māmoe who inhabited Whakaraupō upon the arrival of Te Rakiwhakaputa.

Te Pataka a Te Rākaihautū refers to Banks Peninsula being the pātaka (storehouse) of Te Rakaihautu, an important Waitaha ancestor. This area was referred to as a pātaka because of the abundant natural resources that could be found on, and around, the peninsula.

To delve into our origins, history and journey we glean vital information that will move us forward. Most strategic plans have a short, three- to five-year horizon, but when our tīpuna strategised, their horizons were intergenerational. When Rakiwhakaputa placed his rāpaki on the shores of Huimai, he was not just claiming this land for himself, but for the generations to come. When Rākaihautū shaped our whenua and dug our lakes, it was with future generations in his mind. And when Tamatea Pōkai Whenua stood on our maunga and called Ngātoroirangi to send him fire, it was not just to keep him warm, it was to ensure the survival of his uri (descendants). In all these stories, ahi kā (burning fires) has ensured our survival and occupation of these lands from generation to generation. Rākaihautū lit the fires of occupation on this whenua, Tamatea re-ignited the fire that had gone out, bringing the fireballs that made this land volcanic, and Te Rakiwhakaputa laid down his rāpaki and established ahi kā for his descendants.

This strategic plan, rooted in our historical and cultural significance, is our way of carrying on this legacy for the next generation. Each fire represents different parts of our journey, from Te Ahi Tawhito, the ancient fires, to the Ahi Kā, the home fires that burned today, and Ahikāroa, into the future, ensuring a continuous flame of our heritage.

Ngāi Tahu ancestors are embedded in the landscape by momentous historic achievements, placename and sustained occupancy.

Message from Manaia Cunningham, representative of Te Rūnanga o Koukourarata

Christchurch City Council's Coastal Hazards Adaptation Planning team has been tasked with an extremely challenging job: to analyse data and assess coastal properties and communities of immense historic significance around Banks Peninsula. Utilising this data, and with the help of various community members, the team has set up a Coastal Panel to share information and to develop solutions and plans in response to our current environmental state.

We are in an environmental crisis, with increasingly severe weather events on the horizon. We will experience more intense storms, droughts and fluctuations, and our properties are presently in the paths of these events to come. It is important that we act now. We must not bury our heads in the sand or hope that these events won't affect us. Instead, we need to prepare for the future, ensuring that the next generation knows that the leaders before them made tough decisions based on careful observations and emerging data. This process may not please everyone, but we can allow everyone to have a voice. By presenting the data and facts transparently, individuals can make informed decisions about where they want to live safely in the future.

This pilot program is of great significance to the people of Christchurch, Banks Peninsula and Canterbury as a whole. It serves as a model for how local territorial authorities and communities can make collaborative decisions.

While infrastructure decisions are often driven by economic considerations, it is crucial to embrace innovative ideas from individuals of Waitaha Canterbury and Te Pataka o Rakaihautū Banks Peninsula which allow people to live safely on lands where their ancestors have lived for hundreds of years. There are sustainable ways to inhabit these areas, manage the land, protect water sources and preserve vital soil, ensuring resilience for whatever the future holds.

To the readers, please look at the imagery and please spend a bit of time looking at the data. The staff leading this program are genuine, excellent listeners and skilled facilitators of decisions that will impact our lifestyles, our turangawaewae and the economic outcomes for our district. We are privileged to live in this place, and the Coastal Hazards Adaptation Planning team, like all of us, is committed to protecting what we have now.

Tēnā koutou katoa. Kia ora rā.

Climate change and coastal hazards

Our climate is changing. Here in Ōtautahi Christchurch and Te Pataka-o-Rākaihautū Banks Peninsula, the future is likely to bring warmer weather, more days of extreme wind and more intense rainfall. The warming climate is also causing sea levels to rise, mainly through a combination of thermal expansion and the melting of ice sheets and glaciers. This means more of our district will be at risk from coastal hazards in the future.

Coastal flooding happens when normally dry, low-lying coastal areas are flooded by the sea. This usually happens as a result of a severe storm, but rising sea levels could also cause 'sunny day' flooding from high tides.

Coastal erosion is a natural, ongoing process that occurs when the sea wears away the land. Some coastal areas experience short periods of erosion, but then recover (build up again) while others continuously erode and never recover. Coastal erosion may become more severe as a result of the impacts of climate change such as rising sea levels and more regular storms.

Rising groundwater can bring the water table closer to the ground surface. Near the coast, the level of the sea often influences groundwater levels. We can therefore expect to see the groundwater rising as sea levels rise. At its most extreme, groundwater could rise above ground level and cause temporary or permanent ponding of water.

Sea levels have risen by around 10 centimetres over the last 15 years in Whakaraupō Lyttelton Harbour. We expect to see a further 14 to 23 centimetres by 2050, and between 38 centimetres and 1 metre by 2100.

As this happens, coastal flooding, coastal erosion and rising groundwater are starting to have an impact on communities right across Whakaraupō Lyttelton Harbour and Koukourarata Port Levy. Low-lying areas will experience deeper flooding more often. The water may also stay around for longer as groundwater levels rise and it gets harder for surface water to drain away into the soil. Areas at risk of erosion are also likely to lose land at a faster rate as sea levels rise because tides and waves will reach further inland.

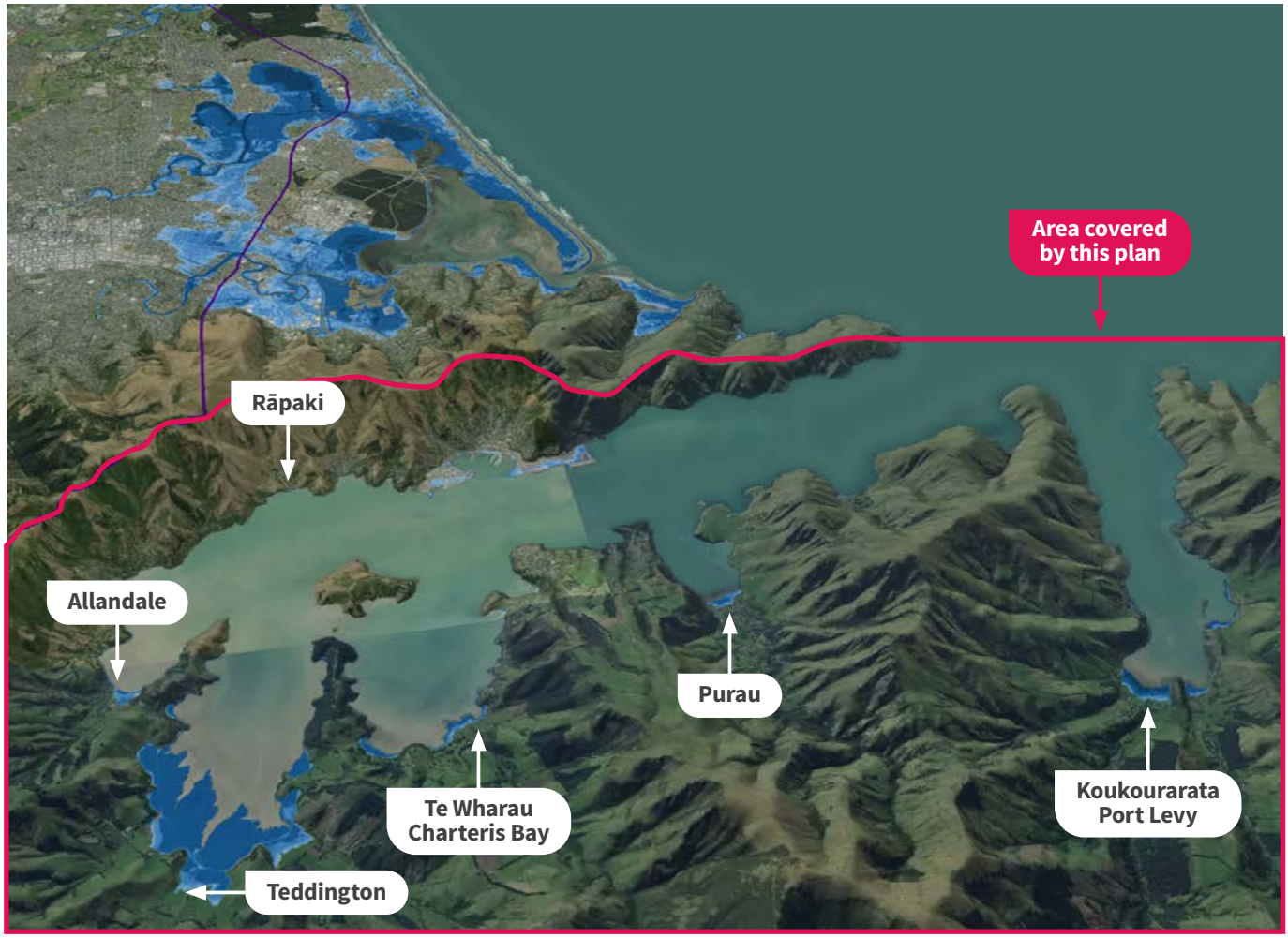
Like other parts of the district, some areas in Whakaraupō Lyttelton Harbour and Koukourarata Port Levy are sinking due to a process called vertical land movement, while other areas are more stable. Where sinking is happening, it's been more pronounced following the Canterbury Earthquake Sequence, with some areas sinking at 3 to 5 millimetres a year.

Tidal flooding of Jetty Road in Koukourarata Port Levy.

Looking to the future

It's important to note that, while we have a good understanding of how coastal hazards will impact us, it's hard to predict the exact rate at which sea levels will rise further into the future, particularly over longer timeframes and in places where the land is also moving up or down.

The rate of change will depend on the rate of global greenhouse gas emissions, which reflect the choices of society as a whole. If tipping points are reached, such as the collapse of the West Antarctic Ice Sheet, it's possible we'll see sea levels rise much more quickly. That's why it's important to have a robust and flexible plan in place for the future of our coastal communities.



This aerial view shows the expected extent of coastal flooding across Christchurch city and the Whakaraupō Lyttelton Harbour to Koukourarata Port Levy Adaptation Area (where this plan is focused) with 1 metre of sea-level rise during a 1-in-100 year storm event.

You can explore these maps in more detail on our website at

letstalk.ccc.govt.nz

Planning to adapt

A dynamic approach

It's hard to plan for anything over a 100-year timeframe, and coastal hazards are no different. One of the biggest challenges is making sure we act in the right way at the right time. The Ministry for the Environment gives us guidance on how to tackle this by using a Dynamic Adaptation Pathways Planning (DAPP) approach.

There's no one-size-fits-all approach to adaptation planning, and there are many different ways we could adapt depending on the situation. We could:

- **Maintain:** Keep doing what we're already doing
- **Accommodate:** Live with the hazard
- **Protect:** Keep the hazard away
- **Retreat:** Move away from the hazard
- **Avoid:** Don't move into the way of the hazard in the first place.

The Coastal Panel has looked at all of the possible adaptation options and used this information to identify preferred pathways for each vulnerable asset. These pathways are a series, or combination, of options which the Coastal Panel recommends to address the risk to public assets over the next 100 years.

We have more certainty around short-term options in a pathway. Longer-term options are more of a guide and aren't set in stone, so we aim to keep a range of viable options available over the long term. There's a lot that can change over the next 100 years that might impact the best way to address the risk, and this is all part of the DAPP process. We'll have opportunities in the future to re-visit these pathways as conditions change.

DAPP also allows us to plan despite the uncertainty around the level and timing of climate impacts. Rather than having concrete timeframes outlining when we'll act, we're led by a range of signals, triggers and thresholds.

Visit **letstalk.ccc.govt.nz** to learn about:

- The way the Coastal Panel has used DAPP
- More information on the DAPP approach to adaptation planning
- More detail about specific adaptation planning options.

letstalk.ccc.govt.nz

Spring high tide at Koukourarata Port Levy wharf.

Knowing when to act

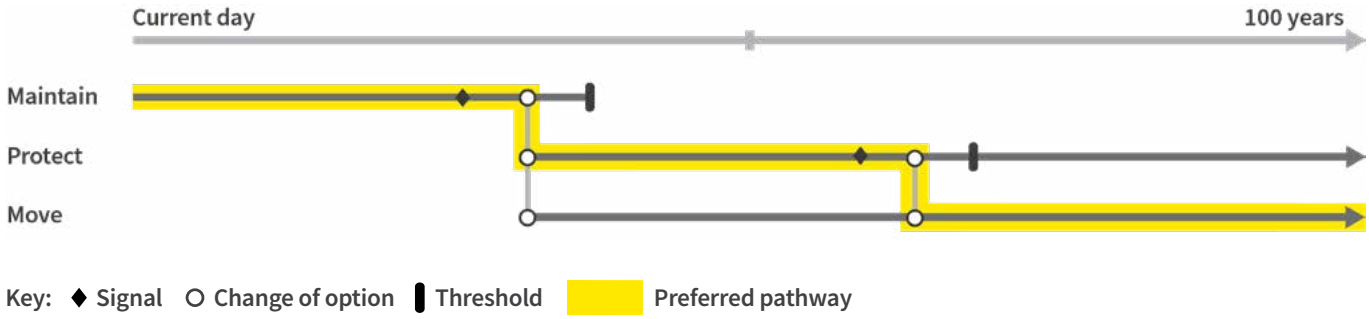
We've identified some initial signals and thresholds to help you understand when we expect to act on options in the Coastal Panel's preferred adaptation pathways. Let's break these down into a bit more detail so you know what you're looking at.

♦ **Signals** aim to warn us that it's time to pay attention and start planning for the next step in the pathway because the level of risk has increased (for example, if the land around a building starts to flood more often).

Thresholds put a line in the sand by stating what impacts or conditions we're trying to avoid (for example, the building itself gets flooded more often, making it unsafe or unable to be used).

Triggers come after signals and tell us when it's time to act and start putting in place options so we don't hit a threshold. The development of good triggers needs a detailed understanding of the next adaptation option and how long this will take to design, approve and put in place. Triggers will be identified as part of the implementation phase and aren't looked at in any detail in this plan.

You'll see these signals and thresholds later in the document on pathway diagrams like the one below. These diagrams show the Coastal Panel's preferred pathways and the alternate options that could be reconsidered in the future.



Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway

We see the need for a common framework that brings together local, regional and national datasets that can be used to inform and monitor signals, triggers and thresholds. We'll be working with partners, like Environment Canterbury and the Ministry for the Environment, to discuss opportunities and to seek to develop a common approach.

In an emergency

A storm, flood or other event that causes major damage could exceed all signals, triggers and, possibly, even thresholds in place for an asset. If this happens, some action, like temporarily repairing roads, may be taken by the Civil Defence Emergency Management team, as needed, to ensure people are safe.

Where possible, the Council would look to take the preferred adaptation pathways identified in this plan into consideration when moving into the recovery phase after a major event. Such events may speed up adaptation pathways and, positively, be used to build back infrastructure that's safer from coastal hazards and lasts longer.

Developing the draft plan – the process so far

This isn't the first conversation we've had with you about coastal hazards adaptation planning. Guided by community feedback, the Coastal Panel has identified the preferred adaptation pathways described in this plan. The process to come up with these preferred pathways has been supported by the Specialist and Technical Advisory Group.

Here's a reminder of the work to date, where we're at in the process, and the final step yet to come.

The process		Public involvement
	2021	
We developed a *Coastal Adaptation Framework* in which we set out seven guiding principles, and the process we planned to use, for adaptation planning across the district.		Members of the community expressed interest in joining the Whakaraupō Lyttelton Harbour – Koukourarata Port Levy Coastal Panel.
We also developed a *Catalogue of Coastal Hazard Adaptation Options* to ensure we considered all options throughout this process.		You provided feedback which was integrated into the *Coastal Adaptation Framework* and *Catalogue of Coastal Hazard Adaptation Options*.
	2022	
The *Coastal Adaptation Framework* was adopted by the Council and the Coastal Panel was established.		You told us what you valued most about living in the area, which public assets were most important to you and what kind of adaptation planning outcomes you would and wouldn't like to see.
The Coastal Panel developed five community objectives based on the community's feedback about what they valued and would like to see in the future.		
The Coastal Panel were supported by the Specialist and Technical Advisory Group (STAG) in identifying six Priority Adaptation Locations, which would become the focus of this round of adaptation planning.		**We shared the community objectives and Priority Adaptation Locations developed by the Coastal Panel.**
Each adaptation option was considered by the Coastal Panel for alignment with the community objectives. The options were also scored for effectiveness, feasibility and environmental impact by the STAG, alignment with mana whenua values by rūnanga, and the Council's guiding principles by Council staff.		Private property owners at risk from coastal hazards in the short term were contacted directly with more information about their individual risk.
	2023	
The Coastal Panel developed adaptation pathways based on the scored options. These pathways included the range of viable adaptation options that could be used to adapt each asset to the risk.		The Coastal Panel sought your feedback on the range of options being considered in each adaptation pathway.
	2024	
Supported by the STAG and the feedback you provided, the Coastal Panel assessed these pathways and identified their preferred adaptation pathway for each asset.		**The Coastal Panel is now seeking your final feedback on its preferred pathways.**
The Coastal Panel will present their preferred adaptation pathway recommendations to the Council for a decision.		

Community objectives

In previous engagements, people told us what they valued about living in Whakaraupō Lyttelton Harbour and Koukourarata Port Levy, and the things they'd like to see in the future. The Coastal Panel turned this important feedback into community objectives which have been used throughout the process to develop the Coastal Panel's preferred pathways.

Community resilience

Foster the preparedness of communities (current and future) to determine how best to support themselves through times of disaster and disruption.

Community and culture

Retain a sense of community, social connectivity and sense of place by recognising the importance of heritage, identity, community spaces, places (such as parks and marae) and neighbourhoods.

Infrastructure

Ensure infrastructure, such as roads, jetties, waste, communications, electricity and water networks, are sufficiently resilient to support the health, safety and wellbeing of communities now and in the future.

Access to natural areas

Protect and enhance access to the land and the sea for mahinga kai (food gathering), cultural activities, recreation, leisure and enjoyment for current and future generations.

Environment and landscapes

Protect landscape amenity and protect the natural environment for mahinga kai, natural resources and native biodiversity.

Engaging children and youth

Climate change is going to unfairly impact future generations, so it's crucial that children and young people have a strong voice in this work, giving them an opportunity to guide their own futures. Here are some of the ways we've listened to children and youth and worked alongside them in our planning process. We've also had young people on the Coastal Panel, and they've been amazing – **ka rawe to mahi nga hoa!**

Climate Change Learning Programme

We supported delivery of the Climate Change Learning Programme in 13 schools across the district in areas exposed to coastal hazards, reaching about 800 children.

Next-Generation Conversation (NGC)

An unforeseen but successful offshoot of our school engagement was the student-led creation of the NGC. It was originally formed in 2021 and made up of 23 students who took part in the learning programme and also had input into our Coastal Adaptation Framework. They still meet regularly after school to discuss policy issues and to seek opportunities to engage with decision-makers.

Creative pursuits

We supported groups in three schools in Whakaraupō Lyttelton Harbour to plan and develop climate change adaptation street art in highly visible locations in their communities. Students have also put together songs, documentaries, school travel plans, spoken word poetry and submissions on various matters.

Out-of-the-box engagement events

We ran a tile painting workshop for members of the community to give feedback on what they value about living in the area. This family event proved to be popular with children and adults alike. Some of the tiles have been used next to the new CoastSnap community science site in Motu-kauati-iti Corsair Bay. The others were gifted to Diamond Harbour School to use as part of their mural at the wharf.

During this time, we also ran 'beachinars' (beach seminars) with school students at their local beaches. These were interactive workshops with the children to help build their understanding of coastal processes and how sea-level rise might impact these environments in the future.

The bigger picture

A lot of our attention has been on planning for specific assets and areas across the harbour, but we haven't lost sight of the fact that how we address the risk to one asset can often have an impact on how we can, and should, plan for other assets across the harbour. This is particularly true for the transport network, where there are a number of vulnerable sections of road in different locations that we're planning for.

Moving around in the future

As sea levels rise, more frequent disruptions and delays from things like flooding and coastal erosion will gradually become a part of life, making it harder to move around the harbour. We may need to learn to live with these impacts and, in the longer term, find other ways to move around that don't rely so much on roads.

The Coastal Panel has considered whether we could make big changes to our road network over time, like investing money in improving and expanding the Summit Road and its connections. But these routes would also be vulnerable to a range of hazards, cost a lot of money and be challenging to build. So, when it comes to roads, the Coastal Panel has largely focused its attention on how vulnerable sections of road might be adapted, in places like Teddington and Te Wharau Charteris Bay, for example.

Looking back

By now, we're used to being able to drive just about everywhere. But we haven't always been so reliant on cars, especially in Te Pātaka-o-Rākaihautū Banks Peninsula. In the past, boats were used to connect isolated communities and move everything from people, animals, produce, crops, groceries and building materials.

Image supplied by Canterbury Museum.

Visitors arriving on steam pinnace *Canterbury* at Governors Bay about 1905.

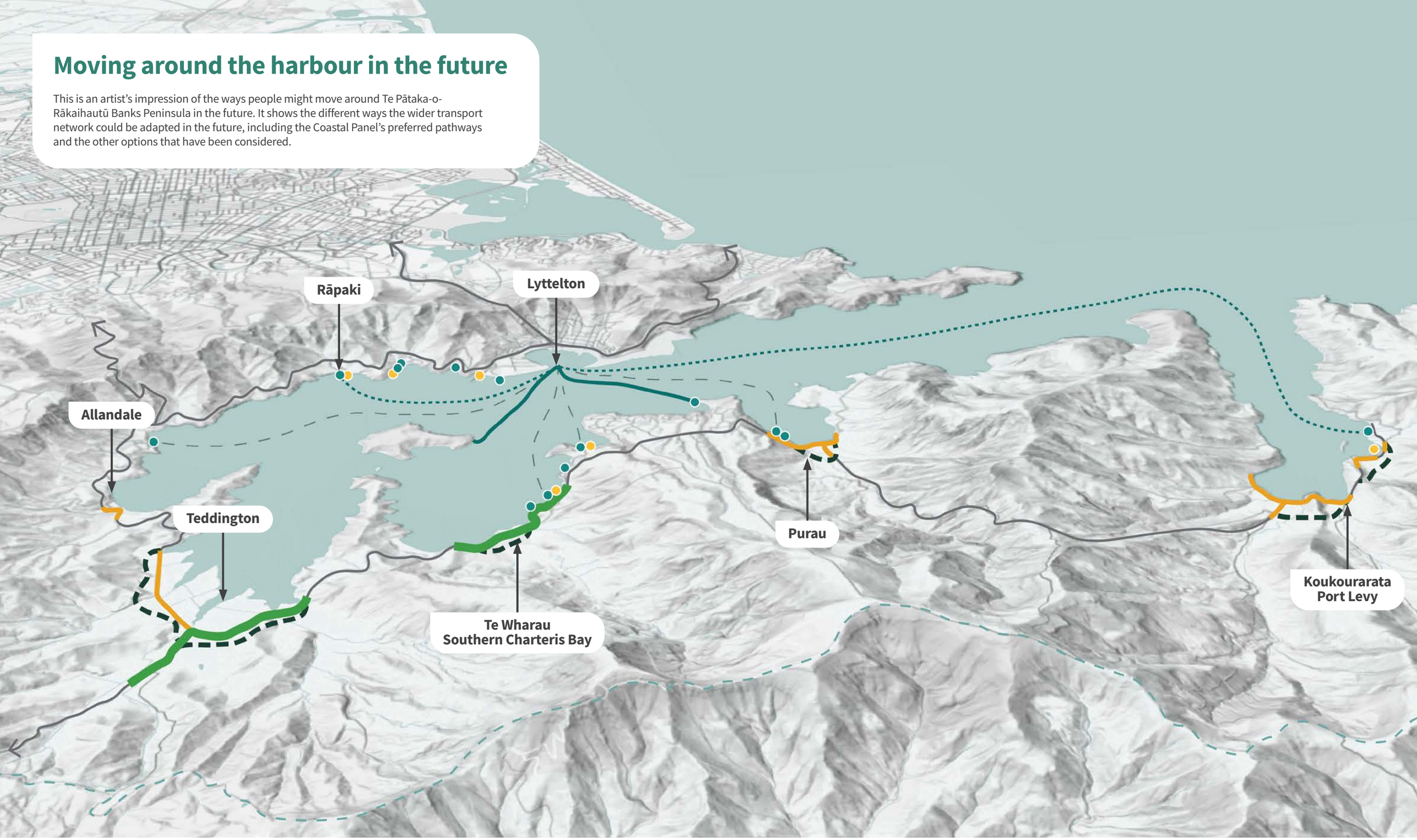
Across Whakaraupō Lyttelton Harbour and Koukourarata Port Levy we already have a lot of marine infrastructure, like jetties, wharves, and boat ramps, which has been built over past decades.

With our roads under threat, we could look to learn from the past and build up the resilience of this marine infrastructure, giving us another way to move around the harbour in the future. At the very least, improving this infrastructure would mean we have more resilient alternative access routes when roads are unable to be used, which is particularly critical for communities at the end of the road, like Koukourarata Port Levy.

Further work is needed to explore how we could provide more opportunities to move around the harbour, and the Coastal Panel has recommended that Christchurch City Council and Environment Canterbury work on this together. While the Council is responsible for the marine infrastructure and the related access roads, Environment Canterbury is responsible for public transport services, including ferry transport.

Moving around the harbour in the future

This is an artist's impression of the ways people might move around Te Pātaka-o-Rākaihautū Banks Peninsula in the future. It shows the different ways the wider transport network could be adapted in the future, including the Coastal Panel's preferred pathways and the other options that have been considered.



The marine transport network

- Existing ferry routes
- Lifeline routes
- Recreational boat (and other watercraft) routes
- Existing public wharf, jetty or boat ramp
- Existing private wharf, jetty or boat ramp

Adaptation options considered by the Coastal Panel for roads

- It's possible to make the road more resilient by raising and/or protecting it.
- It's possible to maintain the road at a reduced level of service.
- It's possible to move the road further inland. (These lines are indications only and not meant to show exactly where roads would be moved.)
- Possible road routes that were investigated but not considered possible.
- Existing road connections.

See which of these options are part of the Coastal Panel's preferred pathways later in the document.

Possible changes to levels of service

The network of roads across Whakaraupō Lyttelton Harbour and Koukourarata Port Levy are maintained at different levels of service. “Levels of service” is a term used to describe the quality and/or quantity of a service provided to a community, such as a road. Generally, roads that are well used have a higher level of service, but a number of other factors are considered too, including location, usage and importance for community or industrial access.

The Coastal Panel has recommended accepting a lower level of service for some at-risk roads which are going to become increasingly costly, or challenging, to maintain at existing levels. This could be done in a range of ways, including:

- Temporary road closures
- Lower-capacity traffic for a time, such as one lane being closed
- Changes to the road surface, such as seal being replaced with gravel, or bridges being replaced with fords
- Four-wheel-drive vehicles being recommended at times
- Less usable road space
- Temporary or permanent heavy-vehicle restrictions to limit damage to a road
- More frequent road maintenance and disruption to traffic.

Lower levels of service might also need to be considered for other public assets, such as tracks and walkways.

Thinking more about resilience

Below are some examples of other things that could help people as roads become increasingly affected by coastal hazards or as levels of service are lowered:

- Flood markers on the side of flood-prone roads so you can see the depth of flooding and make an informed judgement about whether it’s safe to drive through. The Council could also provide advice on safe water depths for different vehicle types.
- Better monitoring of flooding, with timely updates to a website or your phone to tell you when roads are flooded or temporarily closed.
- Being more prepared to work from home, where possible, flexible around the times you travel, or open to using a different route or mode of travel (for example, the ferry service between Lyttelton and Diamond Harbour).

We recognise some of these ideas may mean less-convenient travel, and we don’t expect the changes to happen quickly, but we’d rather be open about them now and have the conversations early.

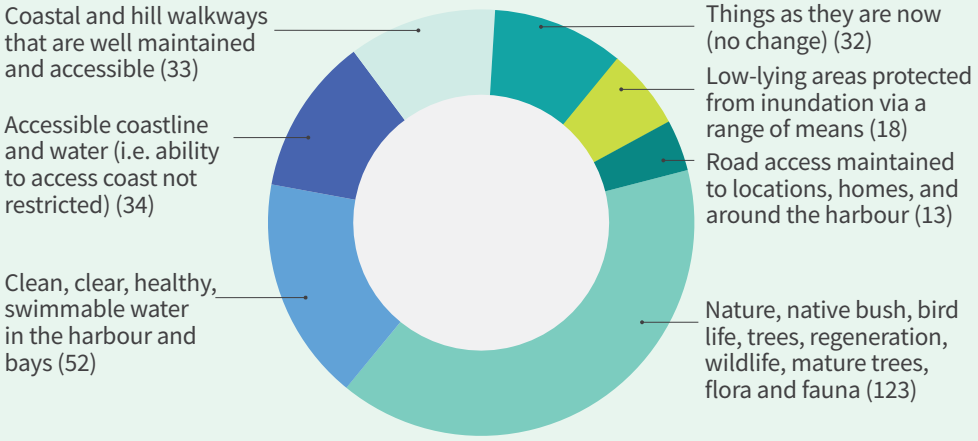
Helping the natural environment thrive

Whakaraupō Lyttelton Harbour and Koukourarata Port Levy are widely recognised for a diverse range of habitats – including nationally significant tidal mudflats and saltmarsh, and rocky shores – all of which support a variety of native plants and animals. How these values are impacted by adaptation planning in each area can add or take away from the ecological value of the harbour as a whole – something we haven't lost sight of through the development of preferred pathways.

When we asked people what they valued about living in the area, many described their connections to the natural environment and the importance of supporting and, where possible, enhancing these connections.

People were asked how they wanted the coast to look in 100 years

People most often talked about the natural features of the area, like trees, plants and birdlife.



The importance people place on the environment has been front-of-mind throughout the adaptation planning process, with two of the Coastal Panel's five community objectives centred around these values.

Access to natural areas: Protect and enhance access to the land and the sea for mahinga kai (food gathering), cultural activities, recreation, leisure and enjoyment for current and future generations.

Environment and landscapes: Protect landscape amenity and the natural environment for mahinga kai, natural resources and native biodiversity.

It's no secret that the biggest threat to the natural environment is, often, people. There are no easy answers when it comes to adaptation planning – there are always trade-offs that need to be considered, and prioritising the natural environment will often come at a cost.

The Coastal Panel has evaluated these trade-offs and, in some cases, its preferred pathways reflect a decision to prioritise the natural environment by, ultimately, closing and removing assets rather than choosing to protect them into the future at the cost of the environment.

The image on the following page illustrates what the natural coastal environment in this area would have looked like before human settlement. You can get a sense of the ecosystems that would've been present in the transitions between the water, mudflats and dry land. It also highlights some of the different ways in which we benefit from these environments. There are opportunities across the harbour to regenerate parts, or all, of the ecosystems shown in this image, like the regeneration of the reserves in Allandale and Purau.

"

I value the wharf and the native birds around this area. I love kingfishers and fantails which often roam around my house.
~ Port Levy

I love the community, walkways and being able to wander down to the beach. Also the marina-area walkways.
~ Lyttelton

I love kayaking out in harbour. The Cass Bay to white gates track. Birdlife. The sea views.
~ Cass Bay

A sense of community – both small communities within Whakaraupō and the whole harbour itself. A strong sense of identifying – with the harbour and with Banks Peninsula.
~ Governors Bay

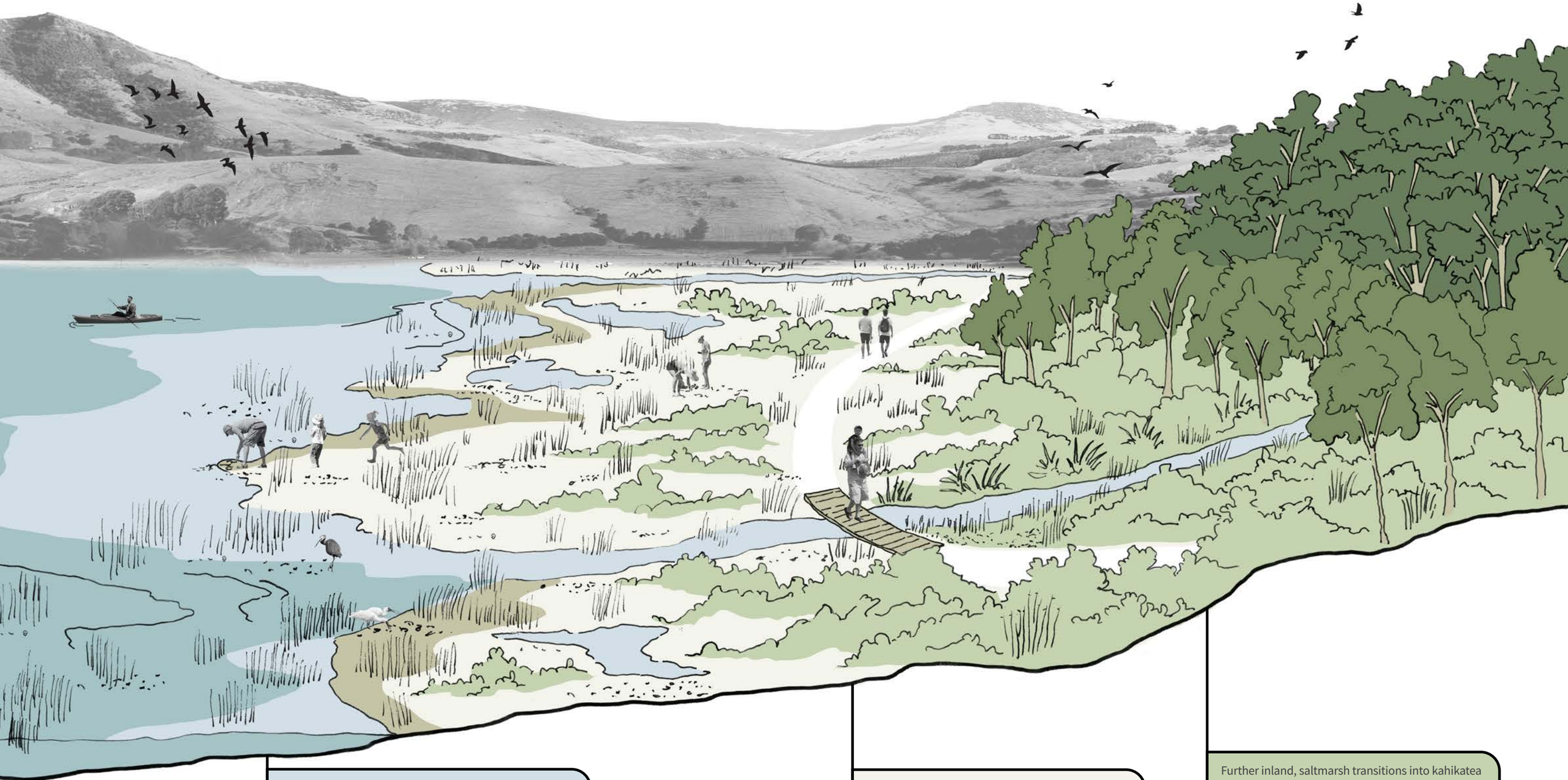
The easy connection to nature. Good for dog walking. Beautiful views... Wild swimming in the sea at Purau. Good amenities close by.
~ Diamond Harbour

I love walking down to the beach and the gentle lapping of the waves. There is a wide range of bird life, and Purau is amazing to swim and kayak and so many more reasons.
~ Purau

"

Ecological opportunities

This is an artist's impression of how the coastal environment used to look and how people might enjoy this environment today. There are opportunities to restore the ecosystems shown here.



Saltmarsh thrives in the salty, wet conditions found where the land meets the sea. The lower reaches of salt marsh are home to a mix of native plants, like saltgrass, oioi, sea rush, and a variety of small native herbs, like sea-primrose, which provide important habitat for a range of animals. It helps to protect against coastal erosion and storm surges by slowing down incoming waves.

As we move further inland, the soil gets a bit drier and we start to see more of the shrubby ribbonwood. This plant's roots do a good job at holding onto the soil, stabilising the land and protecting it against erosion. These kinds of environments act as natural floodplains, helping to absorb water and reduce the risk of flooding inland.

Further inland, saltmarsh transitions into kahikatea swamp forest. These forests were once widespread ecosystems that were teeming with a diversity of life. As well as providing more protection against flooding and erosion, they're really good at taking carbon dioxide out of the air and storing it, helping to slow down climate change. This is a process we call carbon sequestration.

How you can get involved

The health and improvement of these natural environments is already the focus of several community groups and collaborations, such as Whaka-Ora Healthy Harbour, which is a collaboration between Christchurch City Council, Environment Canterbury, Ngāi Tahu and the Lyttelton Port Company. There will be plenty of opportunities for members of the community to be involved in the regeneration of these environments which are such an important part of people's way of life.

You can find ways to get involved on the Council's website and Volunteering Canterbury's website. Visit ccc.govt.nz and volcan.org.nz

You can also reach out to your local Community Board or contact the Council for more information about creating an event, or about planned events happening in your community.

Community art installation in Motu-kauati-iti Corsair Bay. The tiles were painted by members of the community during a previous engagement, to express what they love about living in the area.

Adaptation planning for communities

The following pages look at the Coastal Panel's preferred adaptation pathways for vulnerable public assets in each of the six priority locations: Rāpaki, Allandale, Teddington, Southern Charteris Bay, Purau and Koukourarata Port Levy.

Remember that, within a preferred pathway, we have more certainty around short-term actions than long-term actions, which will need to be reassessed in the future to make sure they're still the best way to adapt. We've estimated when adaptation options might need to be be put in place. These timings are based upon the best available hazard information, using a precautionary climate scenario (SSP5-8.5)*, in alignment with best practice.

All of the preferred adaptation pathways are still subject to Council approval and the availability of funding, and will need to be prioritised against other investments across the district.

Important things to know

About public assets

- While we're planning for communities as a whole, the Council is directing public funds towards public assets. This means the focus of adaptation planning is on things like roads, wastewater and water supply pipes, wharves, jetties and boat ramps, among other assets, some of which are more critical than others.

About private assets

- While the Council is focusing its planning on public assets, we're aware that privately owned assets are also at risk, and some property owners will feel anxious and uncertain about their future. We've prepared a factsheet for property owners, which you can find on our website at ccc.govt.nz/coastalhazardsinfo
- It's also important to note that some adaptation options and pathways will, if progressed, have an impact on private-property owners. For example, if privately owned land is needed to allow for things like building a new road, or if Council- owned assets are moved away from their current location, this may affect nearby properties, and the owners of those properties would be consulted first. None of the Coastal Panel's preferred pathways are likely to have direct impacts on private property in the next 20 to 30 years, so any conversations would only happen when and if the relevant signals were met.

About funding

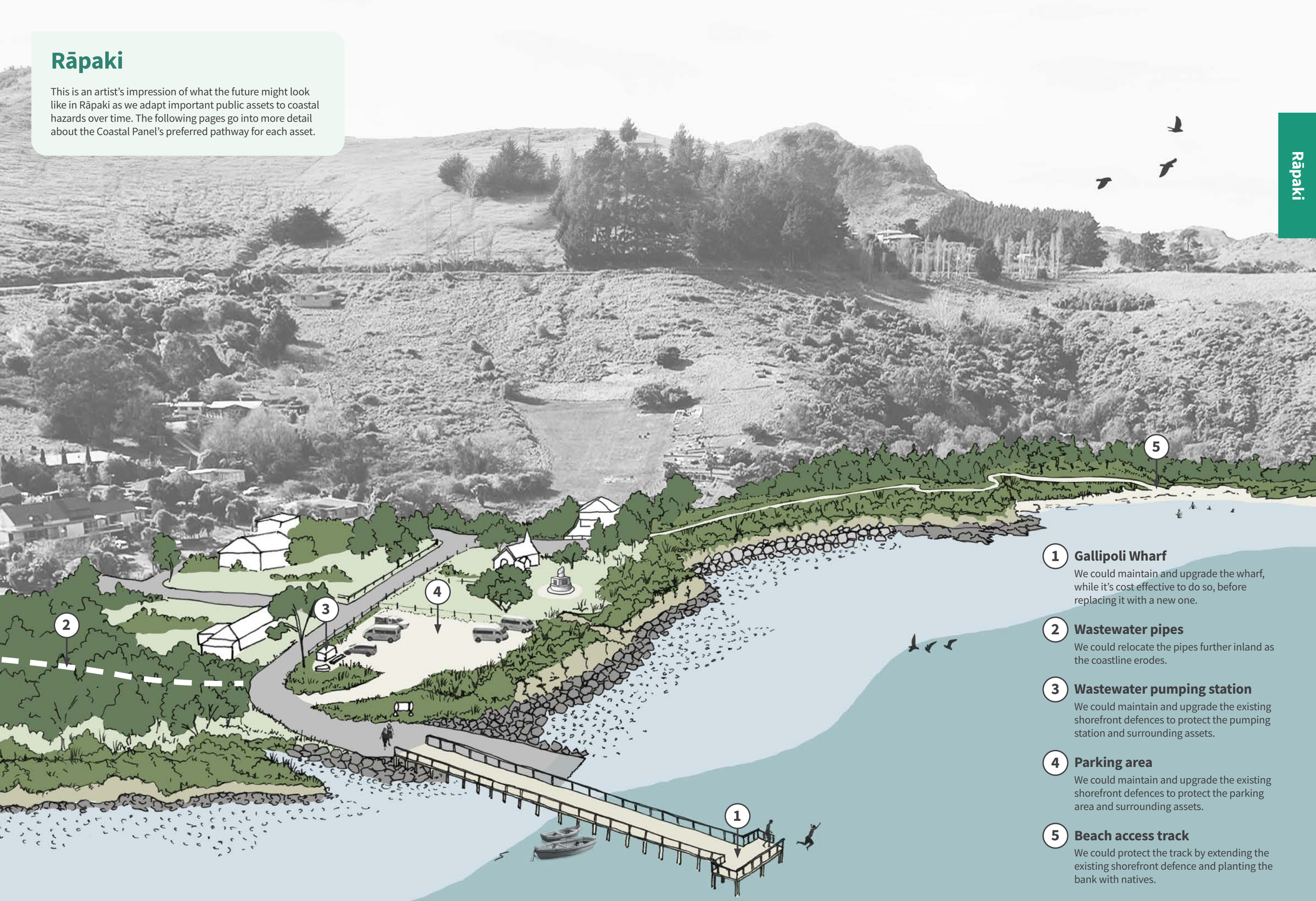
- Some adaptation options for the Whakaraupō Lyttelton Harbour to Koukourarata Port Levy area would need significant investment, yet may only benefit relatively small numbers of people. The Council and residents have limited resources and must balance the considerable investments needed for climate adaptation with other investments needed across the district. It's also important to remember that any major works will take time to happen. These factors mean we'll all need to learn to live with some of the impacts of rising seas and a changing climate. One example could be more frequent temporary road closures or delays from flooded roads. As a society, we'll need to get used to changing our behaviour (when we travel, for example) to work around these impacts. Given these challenges, there's no guarantee existing Council assets will be maintained and available into the future. The closure, removal or retreat of different assets are options that may be considered for any asset in response to changing conditions and needs across the district.
- Funding will be sought for actions that are likely necessary within the next 10 years. Longer-term actions will be reassessed and re-prioritised as we hit signals and triggers, and against wider adaptation investment needed in other parts of the district.

Find out more about funding on page 78.

*SSP5-8.5 refers to a climate scenario in which greenhouse gas emissions keep increasing because global societies and governments don't take enough action to lower them sooner. The scenario assumes high emissions continue between the years 2100 and 2150, before they're later stabilised, at seven times pre-industrial levels, by 2250.

Rāpaki

This is an artist's impression of what the future might look like in Rāpaki as we adapt important public assets to coastal hazards over time. The following pages go into more detail about the Coastal Panel's preferred pathway for each asset.



1 Gallipoli Wharf

We could maintain and upgrade the wharf, while it's cost effective to do so, before replacing it with a new one.

2 Wastewater pipes

We could relocate the pipes further inland as the coastline erodes.

3 Wastewater pumping station

We could maintain and upgrade the existing shorefront defences to protect the pumping station and surrounding assets.

4 Parking area

We could maintain and upgrade the existing shorefront defences to protect the parking area and surrounding assets.

5 Beach access track

We could protect the track by extending the existing shorefront defence and planting the bank with natives.

Rāpaki

Important context

Rāpaki is the main settlement in the takiwā (region) of Te Hapū o Ngāti Wheke. We recognise the rangatiratanga of the rūnanga over the whenua and we're working together to plan for impacts on public assets in this community. There are many taonga and sites of significance that are not public, some of which are exposed to coastal hazards. While they're not included in this document, we're supporting the rūnanga to make plans for these assets where appropriate.

The overarching story

Rāpaki is a small, close-knit community with spectacular views across Whakaraupō. It's highly valued for its connection to the moana (sea). One of its most valued public assets is Gallipoli Wharf. Built in 1916 to commemorate the lives of young Māori soldiers lost in the war, it plays an important part in the community's day-to-day life. We've heard from mana whenua about its importance for mahinga kai (food gathering), as a lifeline in the event of an emergency when road access is closed, and for recreation. The access to the beach is valued for similar reasons, and people come from right across the district to relax, picnic and swim there. The carpark is well used during summer, including by people launching boats. It's also been used in emergencies as a helipad, being one of the only flat areas nearby. If Gallipoli Wharf and the existing rock armouring along the shorefront are maintained and improved as needed, these aspects of life in Rāpaki will probably look quite similar in the future.

The beach at Rāpaki.

Gallipoli Wharf

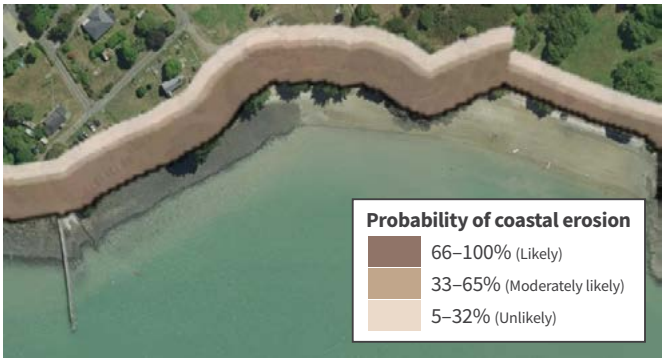
The risk

In terms of coastal hazards, Rāpaki is most at risk from coastal erosion, with most of this community being well above sea level and, therefore, away from the impacts of coastal flooding and rising groundwater.

Around 20 years ago, the rūnanga constructed rock armouring along a section of the shorefront, which provides protection to the area immediately inland, including a church and urupā (burial ground). The level of adaptation action needed in Rāpaki relies, to some extent, on the future of this rock armouring, making it a key feature of our planning in this area, despite it not being publicly owned.

Current sea level

1m sea-level rise

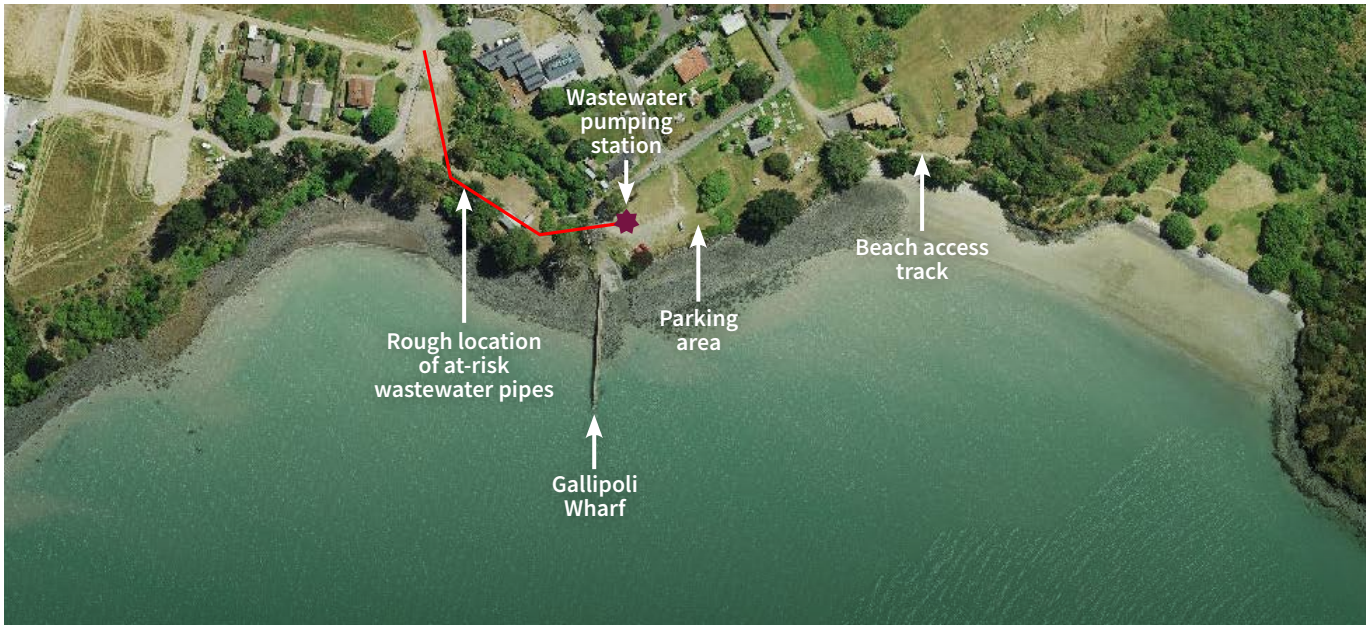


These images show how this area is likely to be affected by coastal erosion as sea levels rise.

What we're planning for

We're planning for four public assets in Rāpaki:

- Gallipoli Wharf
- the beach access track
- the parking area
- the wastewater pumping station and wastewater pipes.



An aerial view showing the location of key assets.

Kōrero mai | Let's talk

The following pages include diagrams that show how adaptation options have been linked together to form adaptation 'pathways' over time for a given community asset (a section of road, for example).

All of the options in a diagram are workable, but the highlighted pathway is the Coastal Panel's preference at this point in time.

Do you think the panel's got it right? Head online to give your feedback and to find out more about the opportunities and risks for a given adaptation option.

letstalk.ccc.govt.nz

Gallipoli Wharf

The Coastal Panel's preferred adaptation pathway is to improve the resilience of the existing wharf and, later, to replace it with a new one.

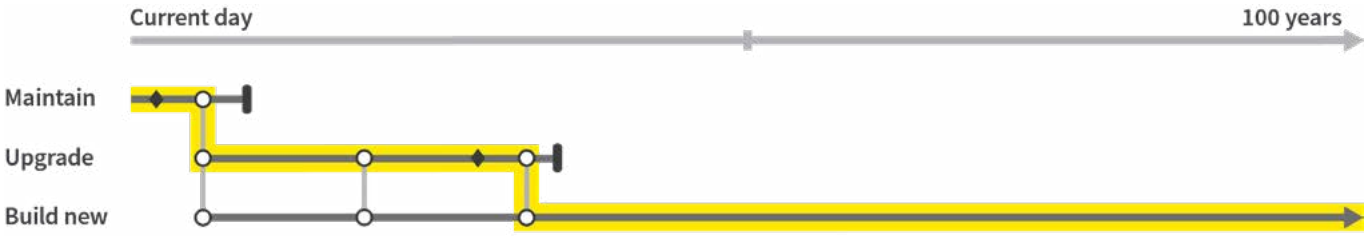
This is the preferred pathway because having a wharf in Rāpaki is important for marine access, recreation and mahinga kai (food gathereing). It's also a part of the wider marine infrastructure network across the harbour, which could be important in the future, especially during emergencies.

The Coastal Panel prefers upgrading the existing wharf in the first place because it has historical and cultural significance.

When repairing and upgrading the wharf is no longer practical, the preference is to build a new wharf. At that point, there'd be consultation with the rūnanga and wider community about how we could consider the different values.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining, upgrading and building a new wharf.



Key: ◆ **Signal** ○ **Change of option** ▮ **Threshold** **Preferred pathway** (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

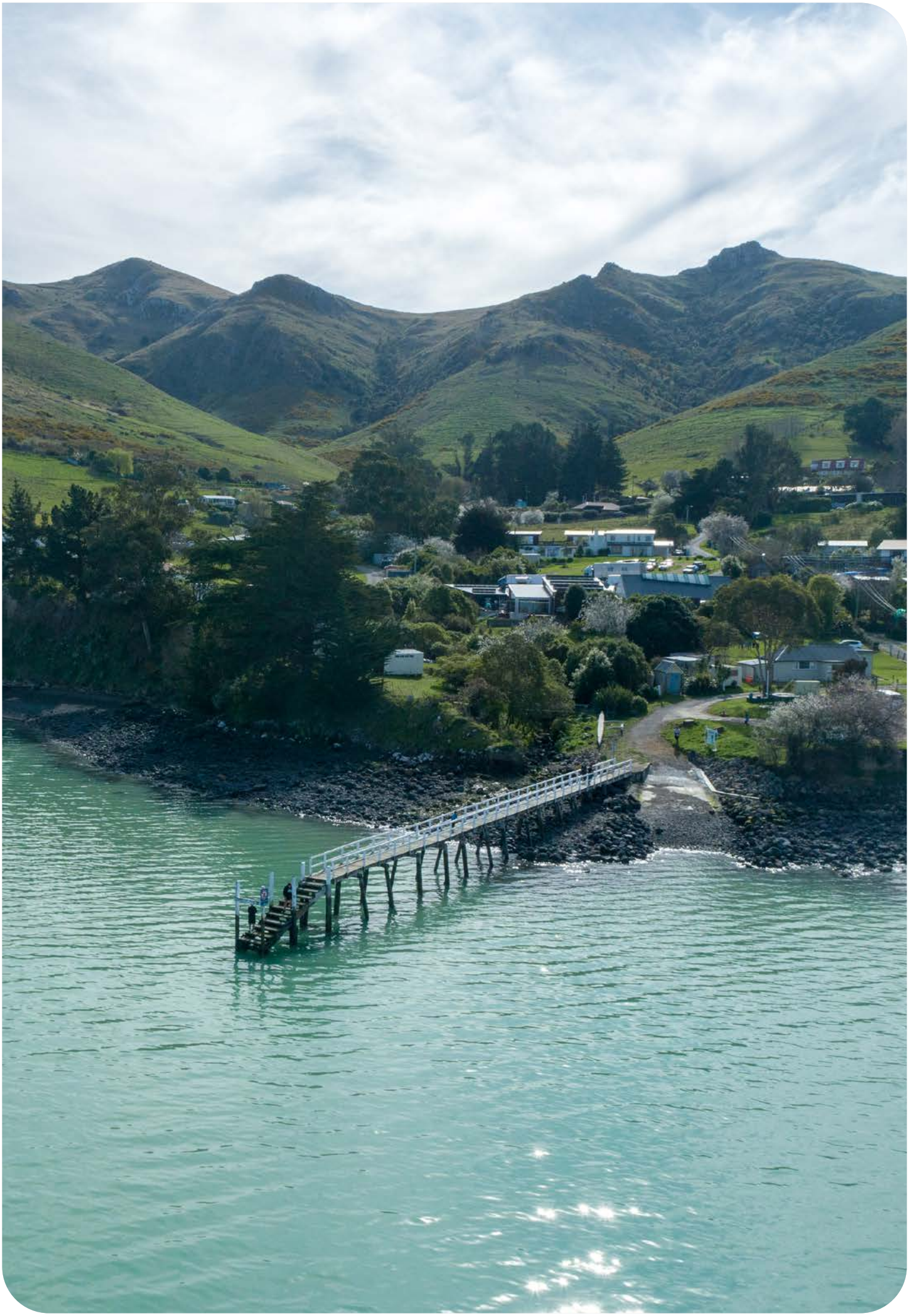
Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• Sea levels nearing the wharf's deck • erosion around the wharf • condition of the wharf.	We want to act before the wharf becomes unsafe or unable to be used.	It's likely that some repairs will be needed within the next 10 years. It's harder to know when the wharf will need to be replaced, but this could be around 30 years from now.	It could cost about $5.5 million to upgrade and, later, replace the wharf.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

A future assessment of the wharf's condition might reveal unexpected challenges which mean it's better to build a new wharf sooner, rather than investing in major upgrades to the existing one. With any upgrades, it may also be possible to extend the life of the wharf for longer than shown in the pathway diagram.

Closing the wharf hasn't been included as an alternative option in the pathway because of its role as a lifeline for access in the event of an emergency. However, closure is possible for all public assets in the future and could be considered here if conditions change.



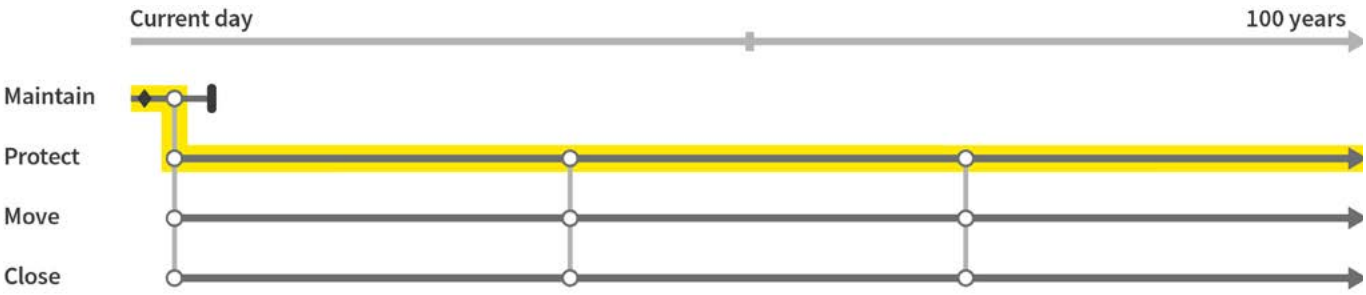
Beach access track

The Coastal Panel's preferred adaptation pathway is to protect the western end of the track by extending the existing shorefront defence to the east. Planting above the defence, stormwater drainage works and tree removal may also be needed to make sure the slope is stable and the track is safe. We may need to move eastern parts of the track slightly inland as the coast erodes.

This is the preferred pathway because having access to our natural environment and moana (sea) is important to the community and is reflected in the community feedback received to date. Extending the existing shorefront defence will provide protection to the beach access track and, therefore, help to keep the beach easily accessible for longer. This will also support the existing shorefront defence by reducing the risk of erosion around its eastern edge and provide the land, and property that sits behind the track, with some protection.

The pathway

The diagram below shows the preferred pathway of protecting the track, and two alternative options of moving or closing it.



Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	Threshold What we're trying to avoid	Timing When the steps in this pathway might happen	Estimated cost* What it could cost to put this pathway in place
• Maintenance costs • the track or surrounding land eroding • availability of funding.	We want to act before the track is eroded, making it unsafe or unable to be used.	It's likely action will be needed in the next five years to avoid meeting the threshold.	It could cost around $750,000 to protect the track.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The Coastal Panel considered moving the whole track further inland at some point in the future, but this would be challenging because the surrounding land is steep and not owned by Christchurch City Council.

Closing the track was also considered, but that would mean losing safe access to the beach. Neither option is preferred, but they remain on the table and could be reconsidered later.

Parking area

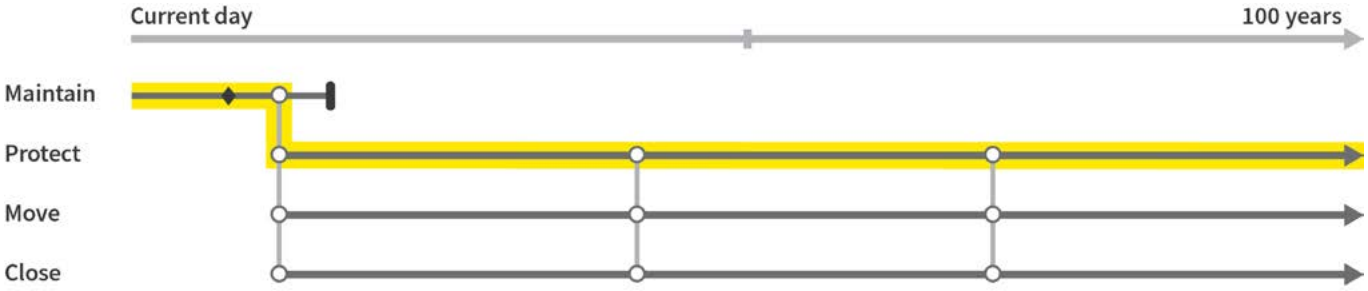
The Coastal Panel's preferred adaptation pathway is to maintain and, over time, upgrade the existing shorefront protection and, also, plant along the coastal edge to make it more stable.

This is the preferred pathway because it'll mean that landward public and private assets can keep being protected and it removes the risk of erosion without many trade-offs.

Future maintenance and further upgrades will be needed as sea levels rise, so defences should be designed to be adaptable. The environmental impact of protection is expected to be low in this area because it's already defended and future upgrades can be designed to blend in with the rocky beach.

The pathway

The diagram below shows the preferred pathway through the options of maintaining and protecting the parking area, and two alternative options of moving or closing it.



Key: ◆ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• Waves over-topping the existing defence • the condition of the defence.	We want to act before the parking area is eroded, making it unsafe or unable to be used.	The defence is likely to need repairs over the next 15 years, at which point it'll probably need an upgrade. The planting can happen any time.	It could cost up to $1.5 million to upgrade the existing defence.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

Moving the parking area was considered, but it's not the preferred option because alternate sites are steep, populated and not owned by Christchurch City Council.

The parking area may need to close if the shoreline isn't protected against erosion. This isn't the preferred option because it'd make accessing the boat ramp, wharf and beach more difficult and mean this flat area wouldn't be available for helicopter landings in an emergency.

Wastewater pumping station

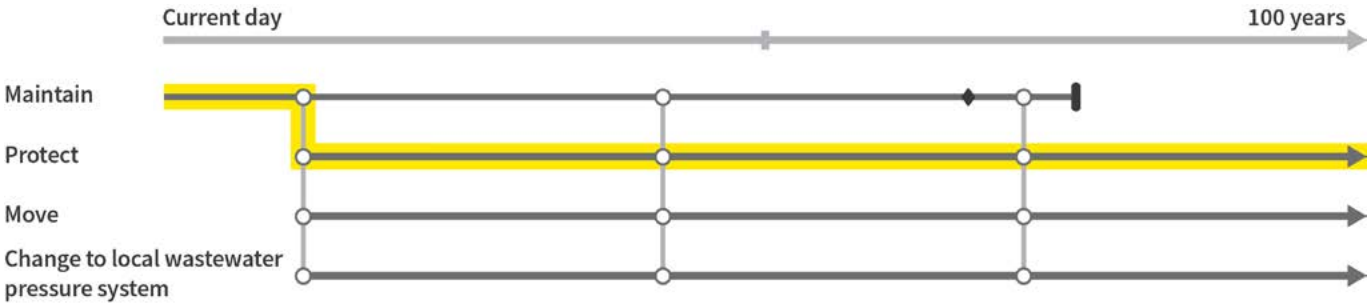
The Coastal Panel's preferred adaptation pathway is to maintain and, over time, upgrade the existing shorefront defence.

This is the preferred pathway because it'll mean that landward public and private assets can keep being protected and it removes the risk of erosion without many trade-offs.

Future maintenance and further upgrades will be needed as sea levels rise, so defences should be designed to be adaptable. The environmental impact of protection is expected to be low in this area because it's already defended and future upgrades can be designed to blend in with the rocky beach.

The pathway

The diagram below shows the preferred pathway through the options of maintaining* and protecting the wastewater pumping station, and two alternative options of moving or changing it to a local pressure system.



Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

*While this asset can be maintained for a long time, as indicated by the signal, the upgrade of the existing shorefront protection is likely to happen much sooner, in alignment with the preferred pathway for the parking area (page 33).

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• A decision is made to not maintain or improve the existing defence • the land in front of the pumping station starts to erode.	We want to act before the wastewater pumping station can't function properly or before there's any risk of environmental contamination.	The wastewater pumping station sits behind the parking area. If no action is taken to maintain and upgrade the existing shorefront defence, it's likely we'll need to act in about 80 years to protect the wastewater pumping station and to avoid meeting the threshold. This is based on the projected rate of shoreline erosion.	It could cost up to $1.5 million to upgrade the existing defence.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The alternative options include relocating the wastewater pumping station or decommissioning and replacing it with property-based pressure sewer connections and pumping systems. Both options would be more costly than the preferred option.

Of the two, relocating the pumping station is likely to be the more cost effective of the alternatives and could be done if the shoreline defence wasn't maintained. Installing a pressure system would require a range of changes to the wastewater network, including pumps on individual private properties. The cost effectiveness of this option depends on things like how many new houses are built in the future.

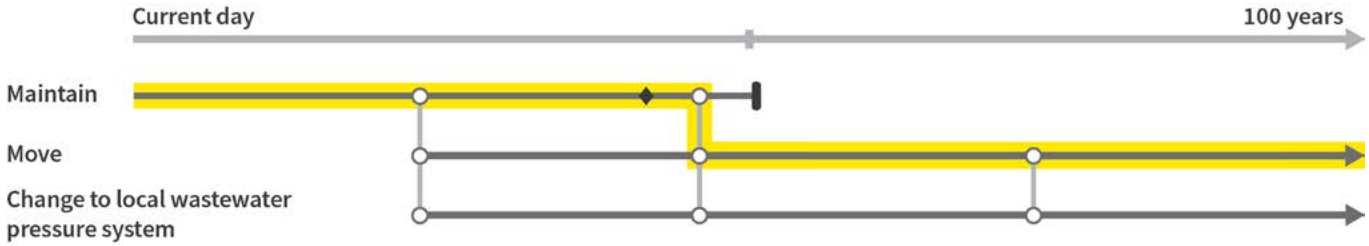
Wastewater pipes

The Coastal Panel's preferred adaptation pathway is to move the pipes away from the coast.

This is the preferred pathway because moving the wastewater pipes would be more cost effective than the alternatives and could be done without having much of an impact on the surrounding environment.

The pathway

The diagram below shows the preferred pathway through the options of maintaining and moving the pipes inland, and one alternative option of changing to a pressure system.



Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
The land within 3 to 5 metres of any section of the pipe is starting to erode.	We want to act before the wastewater pipes can't function properly or before there's any risk of environmental contamination.	Action will likely be needed within the next 50 years to avoid meeting the threshold. This is based on the current projected rate of shoreline erosion.	It could cost about $200,000 to move the pipes.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative option

The alternative option of changing to a local wastewater pressure system would be more expensive, and the risks to both the existing wastewater pump station and the pipes can be addressed through other adaptation options.

Closing the wastewater pumping station and pipes hasn't been included as an alternative option in the pathway because of the important service they provide. However, closure is possible for all public assets in the future and could be considered here if conditions change.

Allandale

This is an artist's impression of what the future might look like in Allandale as we adapt important public assets to coastal hazards over time. The following pages go into more detail about the Coastal Panel's preferred pathway for each asset.

1 Allandale landfill

We could remove the landfill. We might need to improve the existing rock-wall defence to make sure it stays contained until this can happen.

2 Governors Bay to Allandale Foreshore Track

We could keep the track open for as long as possible by accepting that the track will flood and be affected by erosion more often. Eventually, we would close the track.

3 Allandale Hall

We could close and remove the hall when the ongoing repairs are no longer funded or it's at risk of coastal hazards.

4 Allandale Domain

We could naturalise and restore the ecological value of this area through landscaping and planting native species.

5 Governors Bay Teddington Road

Not a lot is going to change for a while. In the future, we might need to accept the road flooding more often.

6 Public toilet

We could build a relocatable toilet on a more elevated part of the domain.

Allandale

The overarching story

Very few people live in Allandale, but it's valued by a larger community of people for its recreational opportunities. Often considered a part of the neighboring Governors Bay community, locals and visitors alike come to stroll the scenic foreshore track to Governors Bay and let the dogs loose at the domain. As sea levels rise, these assets are going to become harder and more expensive to maintain. The track is going to be worn away in areas, the domain is going to become increasingly boggy, and the closed landfill will be at risk from coastal erosion.

These changes present an opportunity to shift the area's recreational focus towards the ecological potential and values which could benefit from rising sea levels. The surrounding communities could be empowered to come together and drive this transition. In the future, you might come to Allandale to wander through the regenerating native flora, learn about the rare and highly significant saltmarsh ecosystem at the coastal edge, and do some native bird watching while you picnic.

Allandale Hall and domain

Allandale to Governors Bay foreshore track

The inter-tidal mudflats and remaining saltmarsh, found at the head of Whakaraupō in Allandale, hold significant conservation value and potential. Saltmarsh ecosystems are nationally rare and threatened because humans have changed many of the natural environments they exist in.

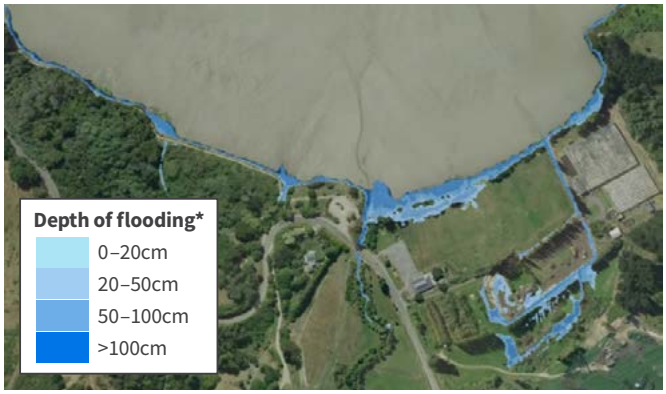
These ecosystems also provide the coastline with a protective buffer, helping to reduce the risk of coastal hazards by slowing down wave energy and stabilising the ground.

There's an opportunity to restore the saltmarsh and its natural transition to forest in this area, enhancing the area's ecological value.

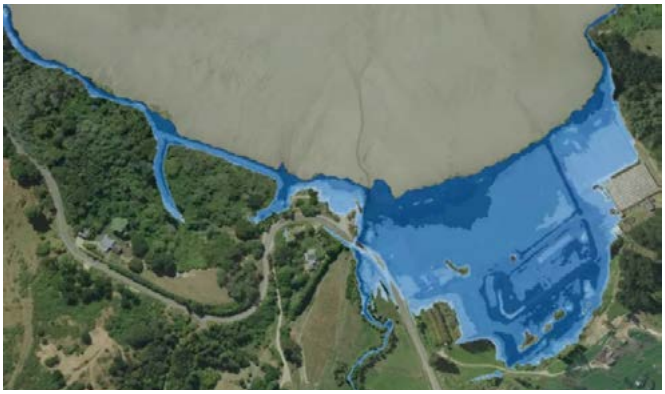
The risk

Coastal flooding, coastal erosion and rising groundwater all pose a risk to Allandale. The images below show that, as sea levels rise, the area will experience deeper flood events over a larger area. The water may also stay around for longer as groundwater levels rise and it gets harder for surface water to drain away into the soil. Areas at risk of erosion are likely to lose land at a faster rate as sea levels rise.

Current sea level



1m sea-level rise



These images show how this area is likely to be affected by coastal flooding, as sea levels rise, during a 1-in-100-year storm event.
**In many places, the areas at risk from flooding are also at risk from rising groundwater.*

What we're planning for

We're planning for six public assets in Allandale:

- Allandale landfill
- Allandale Hall
- Governors Bay to Allandale foreshore track
- Allandale Domain
- a short stretch of Governors Bay Teddington Road
- the public toilet.

An aerial view showing the location of key assets.

Kōrero mai | Let's talk

The following pages include diagrams that show how adaptation options have been linked together to form adaptation 'pathways' over time for a given community asset (a section of road, for example).

All of the options in a diagram are workable, but the highlighted pathway is the Coastal Panel's preference at this point in time.

Do you think the panel's got it right? Head online to give your feedback and to find out more about the opportunities and risks for a given adaptation option.

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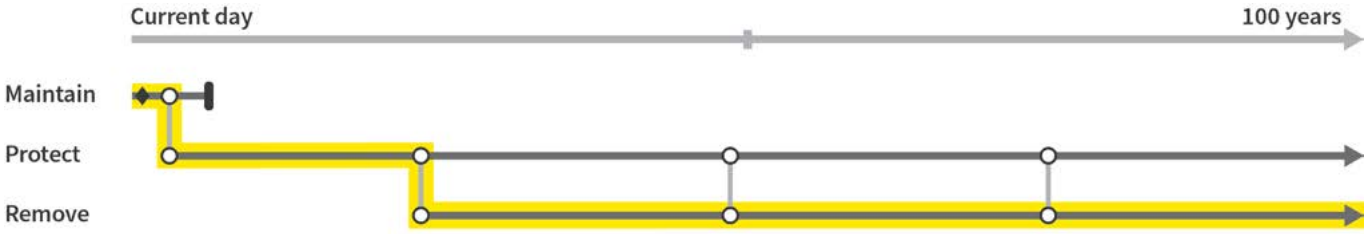
Allandale landfill

The Coastal Panel's preferred adaptation pathway is to ultimately remove the historic landfill. For this to happen, we need to undertake an investigation and feasibility study to better understand the amount and type of material in the landfill and the costs and implications of removing it. The Council will need to decide to fund the investigation and support the outcome of the feasibility study. In the meantime, the Coastal Panel supports ongoing monitoring to limit the risk of environmental contamination, and the planned maintenance and upgrade of the existing defence.

Removing the landfill is the preferred pathway because it aligns with community and rūnanga objectives to protect the natural environment and because it's the only option that entirely removes the risk of environmental contamination. Its removal would help to restore the natural coastline.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining, protecting and removing the landfill.*



Key: ◆ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

*There are no signals on the 'protect' line because the removal of the landfill would happen as soon as feasible and not because the protection started to fail in the preferred pathway.

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• The outcome of the investigation and feasibility study • monitoring shows a risk of environmental contamination.	We want to act before the landfill is exposed and pollution is released into the harbour, or before the landfill's defences no longer properly protect the site.	The existing protection probably needs upgrading in the next 5 years to avoid meeting the threshold. It's harder to know when the landfill will be removed, but this could happen at any point after the conclusion of the investigation and feasibility study, depending on the outcomes and a decision by the Council to support and fund the removal.	It could cost between $600,000 and $1.6 million to improve the existing defences, depending on the extent of this work. Removing the landfill could cost about $80 million.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative option

Protecting the landfill may be necessary in the short term, but it's not the preferred long-term option because it doesn't remove the risk of environmental contamination in the future.

Allandale Hall

The Coastal Panel's preferred adaptation pathway is to permanently close and remove the hall at an appropriate point in time.

Allandale Hall is currently closed and in need of repairs. The funding of possible repairs is being explored by the community outside of this planning process. The timing of the hall's permanent closure and removal will depend on the extent of any repairs undertaken.

This is the preferred pathway because it will become harder and more expensive over time to protect the hall from the impacts of coastal hazards and the surrounding area will become increasingly wet and boggy. As it does, it will also become more difficult to provide water services and access to the hall.

The pathway

The diagram below shows the preferred pathway of closing and removing* the hall at an appropriate point in time. This would happen after any repairs made to the hall were no longer effective.

Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

*The preferred pathway line fades in gradually to show that the timing of this option is indicative and depends on the extent of any repairs made outside of this process.

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• The hall is impacted by coastal (or other) hazards, needing additional repairs • availability of funding for the existing repairs • how often the hall is used (assuming it's repaired).	The hall will need to be closed and removed before it's significantly impacted by coastal hazards, presents a health and safety risk to users, or when the repairs and maintenance can no longer be funded.	The hall will likely need to be removed at some point in the next 50 years due to increasing hazard impacts, or perhaps much sooner if it's not repaired.	It could cost up to $630,000 to close and remove the hall and landscape the remaining land.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The timing of the hall's closure could change depending on how long its ongoing repairs are funded. This means it could be closed sooner or later than shown in the pathway.

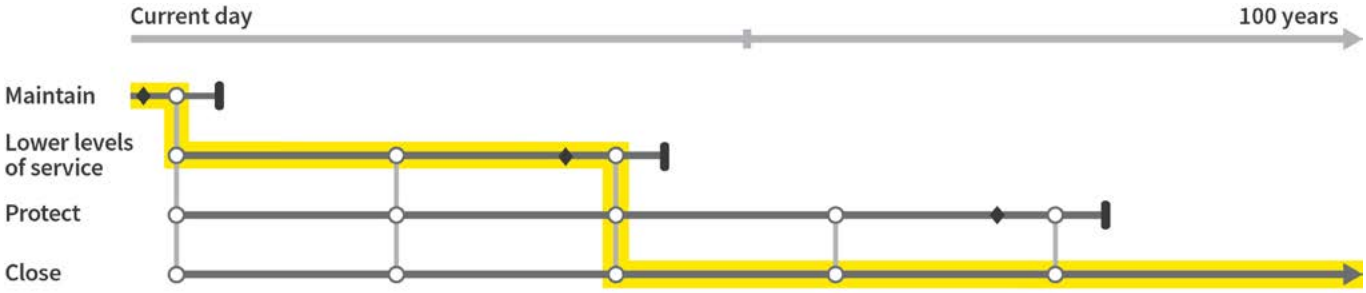
Governors Bay to Allandale foreshore track

The Coastal Panel's preferred adaptation pathway is to keep the track open for as long as it's cost effective to do so. Over time, this will mean a move towards a lower level of service, so the track will flood more often during storms and high tides, become narrower in places, and the surface may become uneven. Ultimately, the track will be closed. The northern section of the track provides access to a pumping station and may need to be protected for longer.

This is the preferred pathway because it means this valued track can be kept open for as long as possible without the significant costs and environmental impacts of investing in ongoing protection.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining the track, reducing its levels of service, and then closing it, with one alternative option of protecting it.



Key: ◆ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• How often the track floods • how quickly it's eroding • increasing maintenance costs • possible removal of the Allandale landfill which would interrupt access.	The track will be closed when it's unsafe on a sunny day or regularly unable to be used due to flooding. This could result from frequent flooding from the sea in combination with erosion of the track.	By reducing the level of service, we believe we could keep the track open for some time, although there'll be times when it'll be impassable or, at least, less accessible for some users. At some point, the track will need to be closed, and we expect this could happen in about 30 to 50 years.	It could cost about $1 million to maintain the track at a lower level of service.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The Coastal Panel considered moving the track inland, but this wasn't a preferred option due to the costs, challenges and steep land that would make it less accessible.

Continuing to protect the track at the same, or a lower, level of service was also considered, but it would become increasingly costly and challenging as sea levels rose because the entire length of track would need protection and ongoing maintenance. This would also have an impact on the surrounding environment.

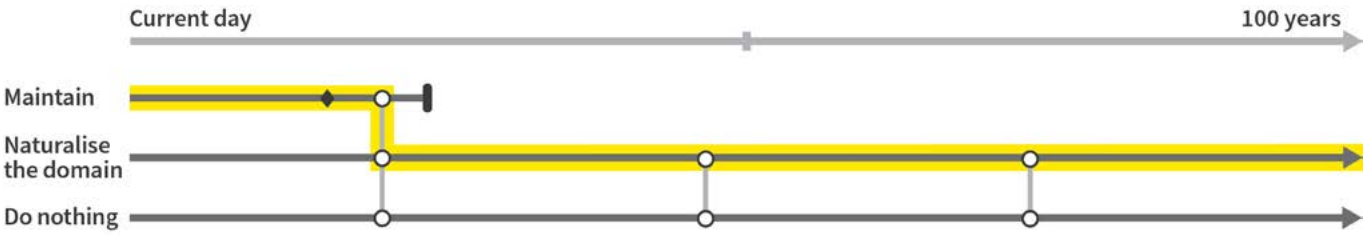
Allandale Domain

The Coastal Panel's preferred adaptation pathway is to restore the ecological value of this area through landscaping and planting native species.

The restoration of this land will have a range of environmental benefits, helping to support native species and threatened ecosystems such as saltmarsh. This naturalisation could happen on its own over time, but the management of this process would mean we'd see better outcomes sooner.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining and naturalising the domain, with one alternative option of doing nothing.



Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• It gets hard to maintain or use the domain because of wetter ground conditions • trees are impacted by saltwater intrusion, creating a health and safety risk • interest from the community to drive or be involved in the restoration.	We want to act before the land becomes too wet to use or maintain.	Action will likely be needed within the next 25 years to avoid meeting the threshold, but there would be advantages to starting the restoration work sooner.	It could cost about $1 million, depending on the extent of the planting and landscaping, and any pathways, boardwalks or signage.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The other option is to do nothing and allow the domain to naturally regenerate on its own. This could take a long time to happen, and there's a risk that invasive species and weeds could mean the full ecological opportunity is missed or takes much longer.

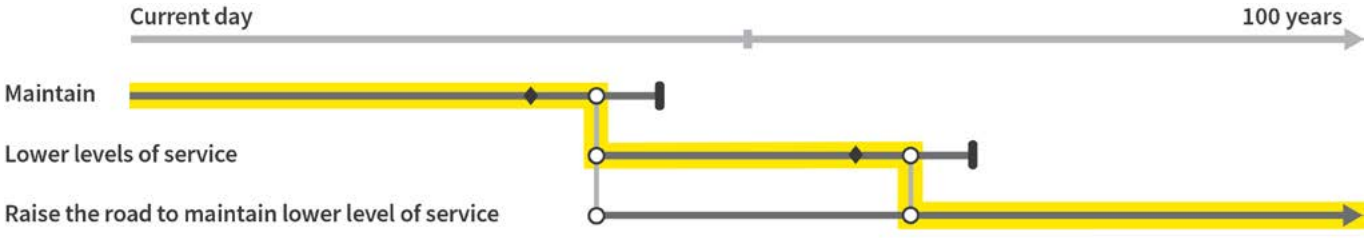
Governors Bay Teddington Road (near Allandale Hall)

The Coastal Panel's preferred adaptation pathway is to maintain the road at a lower level of service in the future. This will mean accepting more frequent road interruptions over time. At first, the impact is likely to be low, but, as sea levels rise, we can expect temporary road closures to happen more often. At this point, the road would likely need to be raised above future flood levels and the surrounding drainage improved to maintain the road at the lower level of service.

This is the preferred pathway because only a small section of road would need to be managed at a lower level of service, so the impacts are likely to be manageable. Raising the road to maintain it at a lower level of service is a cost-effective solution to lower the risk and keep access.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining the road, reducing its levels of service or flood-proofing it.



Key: ♦ **Signal** ○ **Change of option** **Threshold** **Preferred pathway** (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
The road starts to flood more often, increasing maintenance costs and road interruptions and closures.	We want to act before the road is significantly damaged or access is significantly impacted by exposure to coastal hazards.	Action is likely needed within the next 50 years to avoid meeting the threshold. It may be needed sooner if there's significant risk from the stream flooding, or if the landfill is removed, exposing the road to greater risk.	It could cost around $750,000 to raise the road, allowing it to be maintained at a reduced level of service.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The Coastal Panel considered moving the road elsewhere, but that would be extremely costly compared to the preferred pathway.

Closing the road hasn't been included as an alternative option in the pathway because there are workable ways to keep this relatively small section of road open and avoid the impact that its closure would have on road users. However, closure is possible for all public assets in the future and could be considered here if conditions change.

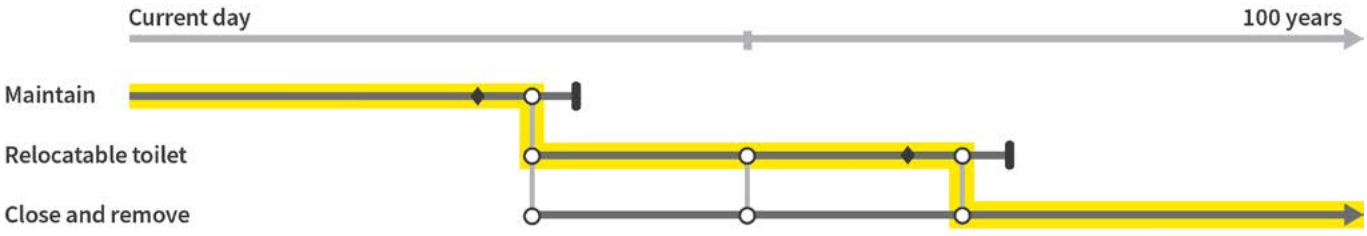
Public toilet

If there's need for a toilet in the future, then the Coastal Panel's preferred adaptation pathway is to build a relocatable one on the least-exposed part of Allandale Domain. Eventually, the whole domain will become more impacted by flooding and rising groundwater, so the toilet will need to be closed and removed.

This is the preferred pathway because it means a toilet would be available on-site for public use. Once flooding becomes a more regular issue, a relocatable toilet can easily be moved to another, higher part of the domain or another location in the district, meaning the investment isn't lost.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining the existing toilet, building a new relocatable one, then closing and removing it.



Key: ◆ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• The toilet (or access to it) is more regularly affected by flooding and rising groundwater • changes to the surrounding assets that mean a toilet is no longer needed.	We want to act before the toilet or surrounding area is significantly impacted by coastal hazards – making the toilet unusable, inaccessible or hard to maintain – or before there's any risk of environmental contamination.	Action will likely be needed within the next 40 years to avoid meeting the threshold. It may be best to act sooner in response to the restoration of the domain.	It could cost about $500,000 to close and remove the existing toilet, replace it with a new relocatable toilet, and then, ultimately, remove it.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative option

Closing and removing the toilet is a possibility if it's decided there isn't enough need for one as the surrounding area changes.

Teddington

This is an artist's impression of what the future might look like in Teddington as we adapt important public assets to coastal hazards over time. The following pages go into more detail about the Coastal Panel's preferred pathway for each asset.

1 Governors Bay Teddington Road

Not a lot is going to change for a while. In the future, we might need to accept the road being impacted by flooding and other coastal hazards more often.

2 Charteris Bay Road and Gebbies Pass Road

We could maintain the road as it is, for a while, before raising it to reduce the impacts of coastal hazards.

Teddington

The overarching story

Teddington is a low-lying community at the head of Whakaraupō Lyttelton Harbour. Very few people live in Teddington, yet the roads that travel through this community are an important part of the wider transport network.

There are three major roads exposed to coastal hazards in Teddington: Governors Bay Teddington Road, Gebbies Pass Road and Charteris Bay Road. These roads provide access to communities across the harbour and are valued by industries such as the Lyttelton Port Company, forestry and farming, which all operate in the area.

As sea levels rise, these roads and the surrounding land are going to be increasingly impacted by coastal flooding and rising groundwater. Raising and flood-proofing these roads require more culverts to support better drainage of the land. This will also have the added benefit of helping the important saltmarsh ecosystem migrate inland as conditions change and may present an opportunity to add access for pedestrians and cyclists. This would allow more people to appreciate the impressive landscapes, flora and fauna found in this part of the harbour.

Looking out across the head of the harbour in Teddington from Governors Bay–Teddington Road.

Teddington supports the largest and most diverse area of saltmarsh vegetation in the Waitaha Canterbury region. In this habitat you can find maakoako/sea primrose and the northern most population of coastal wind grass, both of which are at risk of extinction, adding to the ecological importance of the area.

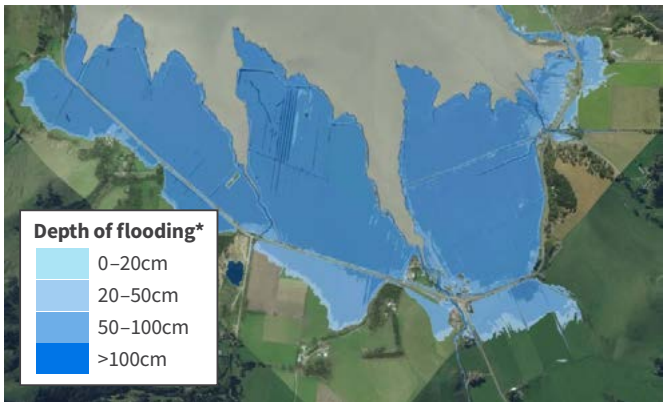
These ecosystems also provide the coastline with a protective buffer, helping to reduce the risk of coastal hazards by slowing down wave energy, and stabilising the ground.

This environment can be supported to migrate inland as sea levels rise through planned culverts, making sure these values aren't lost over time.

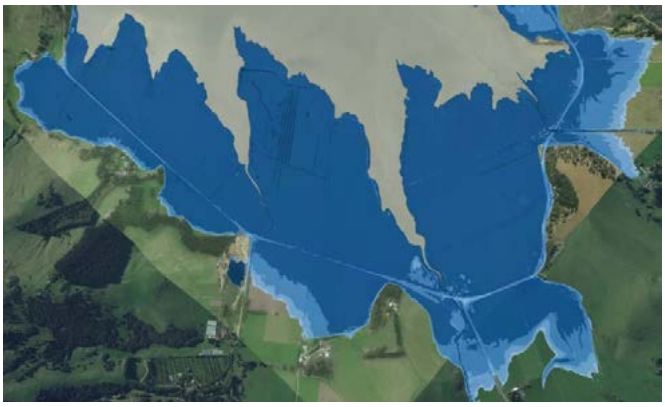
The risk

Rising groundwater and flooding pose the biggest risks to Teddington and the public roads in the area. The images below show that, as sea levels rise, the area will experience deeper coastal flood events and the roads will become more vulnerable. The flood water will also stay around for longer as groundwater levels rise and it gets harder for surface water to drain away into the soil. The area affected by coastal hazards is unlikely to change much due to the shape of the surrounding land, but the impacts will become more common and extreme as sea levels rise, as shown by increasing flood depths on the right-most image below.

Current sea level



1m sea-level rise



These images show how this area is likely to be affected by coastal flooding, as sea levels rise, during a 1-in-100-year storm event.
**In many places, the areas at risk from flooding are also at risk from rising groundwater.*

What we're planning for

There are two key sections of road we're planning for in Teddington:

- the exposed section of Governors Bay Teddington Road
- the exposed sections of Gebbies Pass and Charteris Bay roads.

These roads are an important part of the wider transport network, connecting communities across the harbour with Christchurch city.

An aerial view showing the location of key assets.

Kōrero mai | Let's talk

The following pages include diagrams that show how adaptation options have been linked together to form adaptation 'pathways' over time for a given community asset (a section of road, for example).

All of the options in a diagram are workable, but the highlighted pathway is the Coastal Panel's preference at this point in time.

Do you think the panel's got it right? Head online to give your feedback and to find out more about the opportunities and risks for a given adaptation option.

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The roads

The Coastal Panel's preferred adaptation pathway is to provide this section of Governors Bay Teddington Road with lower levels of service over time. This could mean some on-road flooding during storms and some changes to the surface of the road. Long term, some flood-proofing would be needed to maintain the road at its lower level of service.

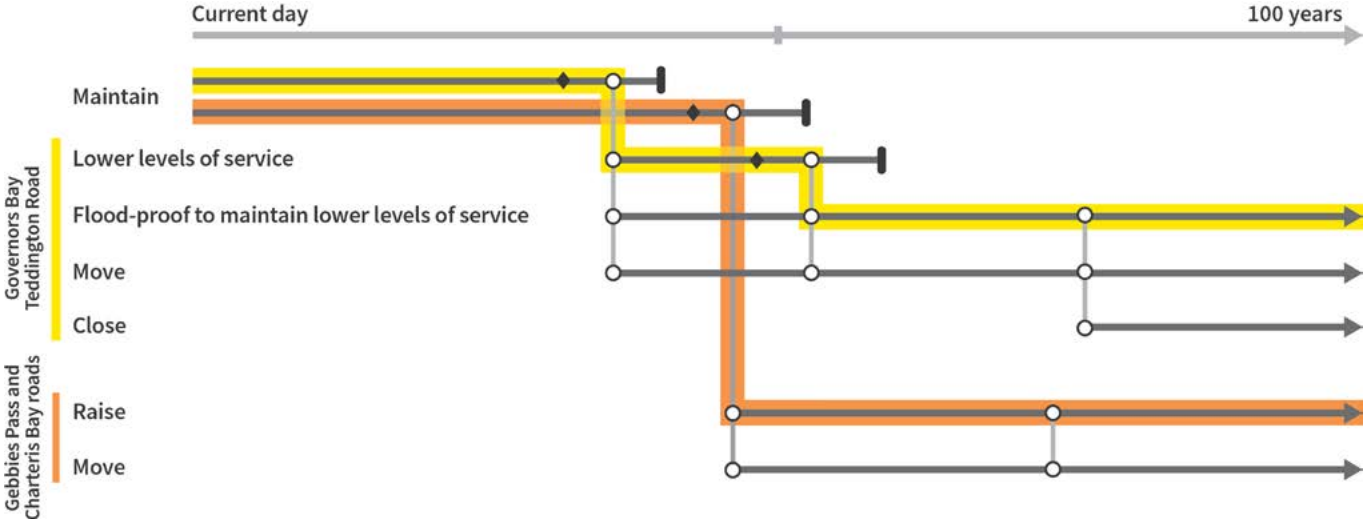
The Coastal Panel has made a tough call here, recognising that there are likely to be limited funds available in the future and that trade-offs need to be made. The priority is to secure at least one route between communities and Christchurch city, and this section of Governors Bay Teddington Road is more at-risk than Gebbies Pass and Charteris Bay roads, which could be protected more easily and provide a resilient travel route to Christchurch city and beyond via Gebbies Pass. That doesn't mean Governors Bay Teddington Road wouldn't be available for use, but, over time, it may be more frequently impacted by reduced-speed zones or one-way sections, or temporarily closed and traffic directed over Gebbies Pass.

The Coastal Panel's preferred adaptation pathway is to raise and protect these sections of Charteris Bay Road and Gebbies Pass Road, adding more culverts to help manage drainage and support positive ecological outcomes.

This is the preferred pathway because it'd protect a key access route between the harbour and Christchurch city. It'd be costly, but it's cheaper than the alternative option of moving the road. Raising the road would have an impact on the environment. However the addition of culverts would help the saltmarsh to move inland as sea levels rise. There may also be an opportunity to create better access for cyclists and pedestrians as the road is improved.

The pathway

The diagram below shows the preferred pathways through the adaptation options for Governors Bay Teddington Road and Charteris Bay and Gebbies Pass roads.



Key: ♦ Signal ○ Change of option ▮ Threshold

Preferred pathway: Governors Bay Teddington Road

Preferred pathway: Gebbies Pass and Charteris Bay roads

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
Governors Bay Teddington Road			
• The frequency of coastal flooding or groundwater impacts causing temporary road closures • increasing damage and/or maintenance costs • safety concerns around driving in water.	We want to act before the road is significantly damaged or access is significantly impacted by exposure to coastal hazards, to minimise impacts on road users.	We expect the road to be increasingly impacted by coastal hazards over time. Impacts are likely to be infrequent over the next decade or two. After this point, we expect flooding of the road and high groundwater levels to mean that interruptions will happen more often. These will be particularly noticeable in about 40 years, when the road might flood several times per year. After this point, some flood-proofing may be needed to maintain the road at this lower level of service. This would involve raising the road.	It could cost about $8 million to flood-proof the road.
Gebbies Pass and Charteris Bay roads			
• The frequency of coastal flooding or groundwater impacts causing temporary road closures • increasing damage and/or maintenance costs • safety concerns around driving in water.	We want to act before the road is significantly damaged or access is significantly impacted by exposure to coastal hazards, to minimise impacts on road users.	Impacts on this road are expected to increase over the coming decades. To make sure we have a resilient road between the harbour and Christchurch city, the road will need to be raised within the next 40 to 50 years to avoid meeting the threshold.	It could cost about $25 million to raise the road by one metre and install several culverts to manage drainage around the road.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The Coastal Panel considered moving the roads further inland. This would have the greatest benefit for the ecological values in the area but it's not preferred because it would be very expensive and would expose the roads to other hazards, like landslips.

The panel also considered closing this section of Governors Bay Teddington Road, as it'd be cost effective and would create ecological opportunities. It's not preferred because it'd have an impact on road users and the resilience of the wider road network, reducing the number of routes in and out of the harbour.

Unlike the options above, closing Gebbies Pass Road and Charteris Bay Road hasn't been included as an alternative option in the pathway because of the importance of this route in maintaining the resilience of the wider transport network. However, closure is possible for all public assets in the future and could be considered here if conditions change.

Te Wharau Charteris Bay

This is an artist's impression of what the future might look like in Te Wharau Charteris Bay as we adapt important public assets to coastal hazards over time. The following pages go into more detail about the Coastal Panel's preferred pathway for each asset.

1 The boat ramp

We could do some minor protection work to extend the life of the boat ramp. Eventually, we would close it.

2 Marine Drive and underlying water supply and wastewater pipes

We could raise the road and protect these assets by maintaining and upgrading existing defences and building new defences where needed.

Te Wharau Charteris Bay

The overarching story

Te Wharau Charteris Bay is a relatively large, connected community, with many people living there to be close to nature and to make the most of the recreational opportunities available in the area. It's also a popular destination for holiday-goers and visitors, who come to enjoy the sun and water activities.

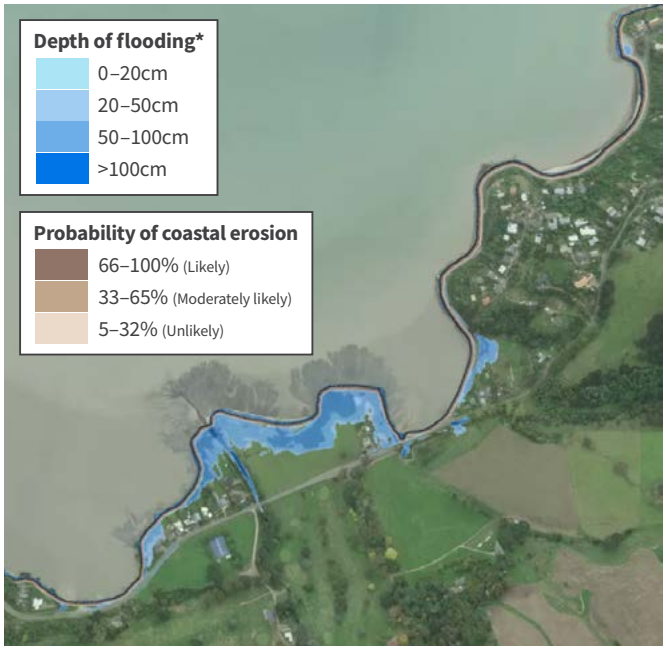
Access is a key concern in Te Wharau Charteris Bay. While it serves as a destination for both residents and holiday-goers, it's also an important thoroughfare for travellers heading to places like Diamond Harbour, Purau, and Koukourarata Port Levy, making it a crucial part of the wider transport network around the harbour.

The alluvial fans and intertidal mudflats contribute to the wider ecological value of the harbour and provide important habitat for a range of native flora and fauna. A decision to protect the road in places may have an impact on these ecosystems if they cannot migrate inland as sea levels rise.

The risk

Coastal flooding, coastal erosion and rising groundwater all pose a risk to the southern end of Te Wharau Charteris Bay. The images below show that, as sea levels rise, the area will experience deeper flood events, meaning the roads will become more at risk. The flood water will also stay around for longer as groundwater levels rise and it gets harder for surface water to drain away into the soil. Areas at risk of erosion are likely to lose land at a faster rate, which will also put the roads and underlying pipes at greater risk.

Current sea level



1m sea-level rise

These images show how this area is likely to be affected by coastal flooding and coastal erosion, as sea levels rise, during a 1-in-100-year storm event.
**In many places, the areas at risk from flooding are also at risk from rising groundwater.*

What we're planning for

We're planning for four public assets in Te Wharau Charteris Bay:

- Marine Drive
- the wastewater pipes
- the water supply pipes
- the boat ramp.

An aerial view showing the location of key assets.

Kōrero mai | Let's talk

The following pages include diagrams that show how adaptation options have been linked together to form adaptation 'pathways' over time for a given community asset (a section of road, for example).

All of the options in a diagram are workable, but the highlighted pathway is the Coastal Panel's preference at this point in time.

Do you think the panel's got it right? Head online to give your feedback and to find out more about the opportunities and risks for a given adaptation option.

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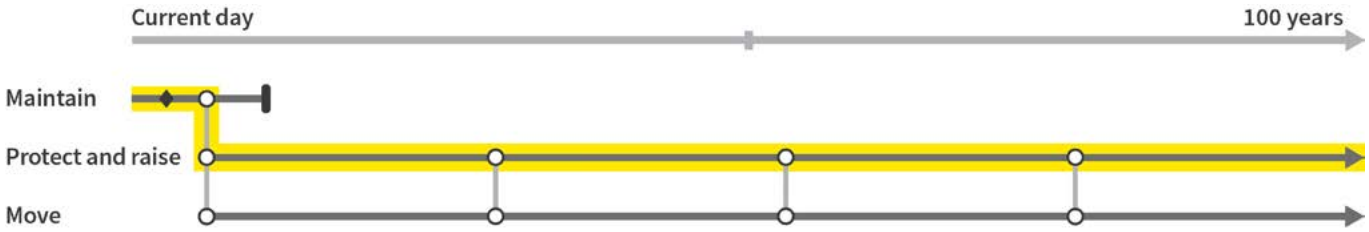
Marine Drive and underlying pipes

The Coastal Panel's preferred adaptation pathway is to raise and protect the vulnerable sections of Marine Drive, improving any existing defence as needed. This work would also protect the wastewater and water supply pipes buried beneath the road.

This is the preferred pathway because it'd protect a key access route between communities and Christchurch city. Large stretches of this road have already been protected through rock armouring and, therefore, improving this defence would have less environmental impact and cost than building protection along currently undefended sections of road. The existing defence, and any new protection, would also protect the pipes.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining and then raising and protecting the road and pipes, with one alternative option of relocating them.



Key: ♦ **Signal** ○ **Change of option** **Threshold** **Preferred pathway** (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• The frequency of coastal flooding • groundwater impacts causing temporary road closures • the rate of erosion • increasing damage and/or maintenance costs • safety concerns around driving in water.	We want to act before the road is significantly damaged or access is significantly impacted by exposure to coastal hazards. Access could be impacted by road closures from coastal flooding or groundwater, or due to road repairs if vehicles damage the weakened road.	Action will likely be needed within the next five years to protect the southern sections of road (and underlying pipes) which currently have no protection. Action will likely be needed within the next 25 years to improve the protection to the northern sections of road (and underlying pipes) that are already protected, to avoid meeting the threshold. Works might be needed sooner, depending on the condition of the existing defence.	It could cost about $27 million to protect and raise the road.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The option to move the road and underlying pipes further inland has also been considered by the Coastal Panel. This would be very expensive, and the steep land in some parts of Te Wharau Charteris Bay would make this option challenging.

The closure of this road and underlying pipes hasn't been included as an alternative option in the pathways because of the importance of Marine Drive for access, and the service the pipes provide. With that in mind, closure is possible for all public assets in the future and could be considered here if conditions change.

Boat ramp

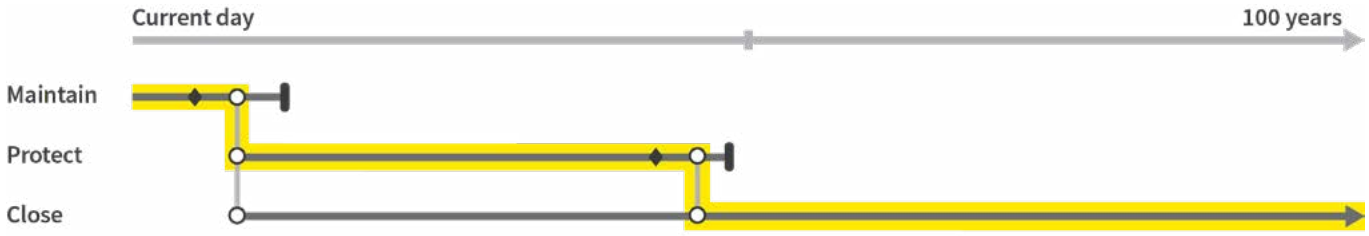
The Coastal Panel's preferred adaptation pathway is to do some minor work to protect the boat ramp and extend its life. As costs increase and it becomes less useable, it'll be permanently closed.

This is the preferred pathway because we expect to be able to keep the ramp open at relatively low cost for some time.Once higher sea levels start to cause regular flooding of the parking area, impacting the usability of the boat ramp, it'd be closed.

The boat ramp can only be used for small boats during certain tides so can't be used as a lifeline asset in an emergency in the same way that some other jetties and wharves across Whakaraupō Lyttelton Harbour and Koukourarata Port Levy can. With alternative ramps available nearby at Diamond Harbour and Purau, the boat ramp isn't going to be as important in the future and helps to explain why closure is part of the preferred pathway.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining, protecting and then closing the boat ramp.



Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• Land around the boat ramp is eroding • rising sea levels mean the ramp isn't usable during some tides.	The boat ramp will be closed when it's no longer usable or when it becomes particularly difficult or costly to maintain.	Some further shoreline protection will likely be needed within the next 10 to 15 years. Beyond this point, we expect the ramp to be maintainable for about 40 years before it'd need to be closed.	It could cost between $250,000 and $2.35 million to protect the boat ramp, depending on the extent of the defence and whether the boat ramp and parking area are also upgraded.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The boat ramp could be closed when it becomes impacted without undertaking any protection or flood-proofing. However, the cost of doing this work is relatively low and would almost double its life expectancy. This would allow the ramp to be used for recreation for longer.

Protecting the boat ramp for longer was also considered but it's not preferred because it'd likely mean the parking area and surrounding land would need to be raised. This would be costly, create access challenges and may have an impact on the surrounding environment.

Purau

This is an artist's impression of what the future might look like in Purau as we adapt important public assets to coastal hazards over time. The following pages go into more detail about the Coastal Panel's preferred pathway for each asset.

1 Purau Avenue, Camp Bay Road and Purau Port Levy Road

We could accept that these roads will be impacted by flooding and other coastal hazards more often in the future. As sea levels rise, we could either move the vulnerable sections of road further inland (1A) or raise and protect them in their current location (1B).

2 Purau Avenue

We could maintain the existing defence, providing the road with continued protection. As sea levels rise, we could either raise the road or accept that it might flood more often.

3 The boat ramp

We could maintain and upgrade the boat ramp as needed.

4 The jetty

We could maintain and upgrade the jetty, while it's cost effective to do so, before replacing it with a new one.

5 Purau Reserve

We could naturalise and restore the ecological value of this area through landscaping and planting native species.

6 Public toilet

We could replace the closed toilet with a relocatable one on the highest part of the reserve.

Purau

The overarching story

Purau is a small beachfront community with several private properties already exposed to coastal hazards and many more will be exposed over the coming decades. For the rūnanga, Purau is a significant place of connection and ancestral occupancy. Many of those that live in Purau do so for its tranquillity, sense of community and connection to nature. It's also a popular destination for visitors during the summer months, whether for swimming or sunbathing at the beach, or for boating and paddleboarding off the well-used boat ramp and jetty. The intertidal mudflats and cobble beach in Purau add to the overall ecological values of Whakaraupō Lyttelton Harbour and provide important habitat for birds, as well as shellfish and cockles which are significant for their mahinga kai (food gathering) value. There are opportunities to enhance the area's ecological values through the naturalisation of the reserve and to reclaim the mauri (essence) for this space, and for Purau as a whole.

There's a small, man-made dune, called a bund, that provides the shorefront and landward assets, such as the road, with some protection from coastal hazards. This area is eroding and, without intervention, it'll eventually be washed away, causing the beach to slowly move inland as sea levels rise. The low-lying sections of Purau Avenue, Purau-Port Levy Road and Camp Bay Road will be impacted by rising groundwater. As the shorefront erodes, they'll also be at risk of erosion and coastal flooding. These roads provide what is, effectively, the only access route to Purau, Koukourarata Port Levy and Camp Bay, so they're highly valued. The current stormwater drainage, an open channel on the landward side of the road, regularly floods.

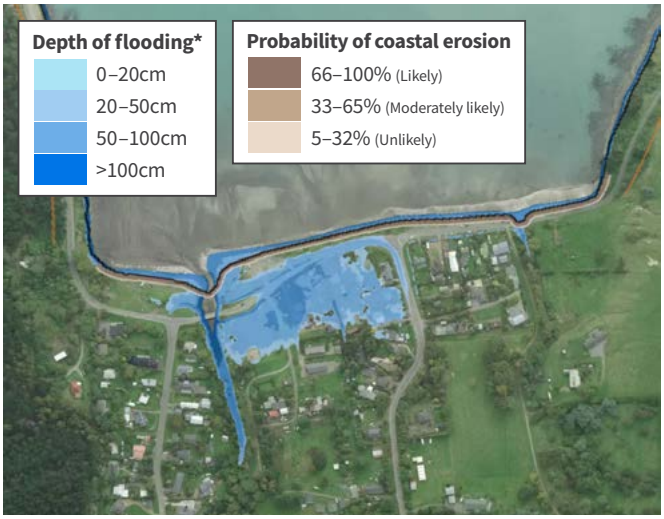
Many of the residential buildings in Purau are likely to be affected by coastal hazards over the next 100 years, many much sooner than later. The reserve will become increasingly wet and hard to maintain, and the existing toilet block, which is currently out-of-service, is already prone to flooding. The boat ramp and jetty are well-used assets that'll need more maintenance as sea levels rise. In time, they'll need substantial upgrades if they're to be kept.

Life in Purau will, inevitably, change in the future. A decision to protect the road in its current location would create a hard edge that'd cause the beach and its linked ecological values to be lost over time. A decision to relocate the road would leave space for the beach to move inland as sea levels rise, which would help to preserve some of the ecological and recreational values. However, this option would have an impact on private properties, as public land isn't available to build a new road on so private land would need to be purchased.

The risk

Coastal flooding, coastal erosion and rising groundwater all pose a risk to Purau. The images below show that, as sea levels rise, the area will experience deeper flood events, putting public assets and private properties at greater risk. The floodwater will also stay around for longer as groundwater levels rise and it gets harder for surface water to drain away into the soil. Areas at risk of erosion are likely to lose land at a faster rate, increasing the risk to the shorefront sections of Purau Avenue and Camp Bay Road.

Current sea level



1m sea-level rise

These images show how this area is likely to be affected by coastal flooding and coastal erosion, as sea levels rise, during a 1-in-100-year storm event.
**In many places, the areas at risk from flooding are also at risk from rising groundwater.*

What we're planning for

We're planning for six public assets in Purau:

- The longshore section of Purau Avenue towards Diamond Harbour
- the shorefront sections of Purau Avenue, Camp Bay Road and Purau Port Levy Road
- the jetty
- the boat ramp
- Purau reserve
- the public toilet

An aerial view showing the location of key assets.

Kōrero mai | Let's talk

The following pages include diagrams that show how adaptation options have been linked together to form adaptation 'pathways' over time for a given community asset (a section of road, for example).

All of the options in a diagram are workable, but the highlighted pathway is the Coastal Panel's preference at this point in time.

Do you think the panel's got it right? Head online to give your feedback and to find out more about the opportunities and risks for a given adaptation option.

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Purau Avenue, Camp Bay Road and Purau Port Levy Road

The Coastal Panel's preferred adaptation pathway for the shorefront sections of Purau Avenue, Camp Bay Road and Purau Port Levy Road is to move towards a lower level of service and to do some short-term protection work along the shorefront as needed. Long term, the panel would prefer to see investment in either raising and protecting the roads to a greater degree, or in moving them away from the hazard.

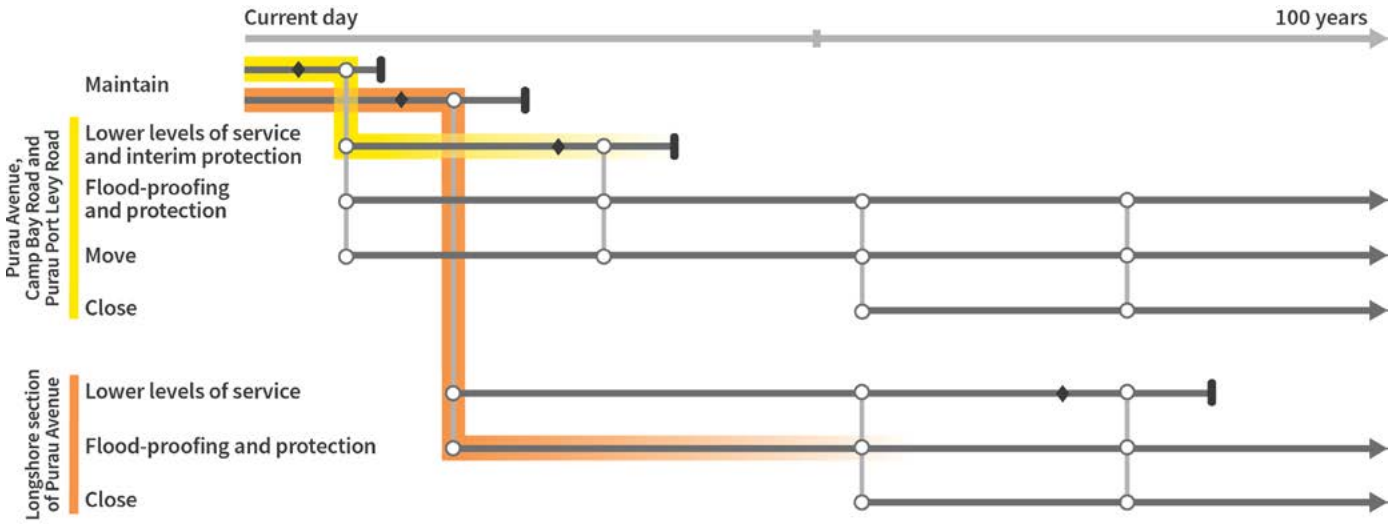
Reduced levels of service, and some short-term protection, is the preferred first step in the pathway. Managing the roads at a lower level of service will mean more frequent temporary road closures in the future, and these are expected to increase gradually, with only minor changes at first. Long term, the panel's preference is to either move the road inland or to raise and protect it in its current location. These two options will have major cost and environmental impacts, and there are many things that can change over the coming decades that will impact what the best course of action is. The Coastal Panel's recommendation is to keep both options on the table, to be considered in the future as a possible next step in the pathway.

The Coastal Panel's preferred adaptation pathway for the longshore section of Purau Avenue is to continue to protect the road in its current location. Long term, a decision may need to be made to either lower the level of service or to raise the road above future flood levels.

This is the preferred pathway because the road is already protected and quite high above sea-level. At some point in the future, the road will be flooded more regularly. Then, a decision will need to be made around whether to accept the flooding as a lower level of service or to raise the road above future flood levels. The Coastal Panel recognises that this decision could depend on what happens with the other sections of road and, therefore, recommends both options are kept on the table, to be considered in the future as a possible next step in the pathway.

The pathway

The diagram below shows the preferred adaptation pathway for the shorefront sections of Purau Avenue, Camp Bay Road and Purau Port Levy Road, alongside the preferred pathway for the longshore section of Purau Avenue.



Key: ♦ Signal ○ Change of option ▮ Threshold

Preferred pathway: Shorefront sections of Purau Avenue, Camp Bay Road and Purau Port Levy Road

Preferred pathway: Longshore section of Purau Avenue

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
Shorefront sections of Purau Avenue, Camp Bay Road and Purau Port Levy Road			
• The frequency of coastal flooding or groundwater impacts causing temporary road closures • the rate of erosion, increasing damage and/or maintenance costs • safety concerns around driving in water.	We want to act before the road is significantly damaged or access is significantly impacted by exposure to coastal hazards. Access could be impacted by road closures from coastal flooding or groundwater, or due to road repairs if vehicles damage the weakened road.	Action will likely be needed in about 10 to 20 years to avoid meeting the threshold. Small areas of shorefront protection may be needed sooner, depending on the impact of storms and the rate of erosion.	It could cost between $1 million to $2 million to protect the road in the short term, depending on the amount of defence needed.
Longshore section of Purau Avenue			
• The frequency of coastal flooding or groundwater impacts causing temporary road closures • increasing damage and/or maintenance costs • safety concerns around driving in water.	We want to act before the road is significantly damaged or access is significantly impacted by exposure to coastal hazards. Access could be impacted by road closures from coastal flooding or groundwater, or due to road repairs if vehicles damage the weakened road.	The existing defence will likely need upgrades in 20 to 30 years. The road might need to be raised much later on.	It could cost about $3.5 million to upgrade the existing defence along this road.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

Protecting the shorefront sections of road in their current location would be costly and have a significant impact on the natural environment, eventually leading to the loss of the beach. Protection may impact views of the water and wouldn't address the risk of flooding from the stream, or the impacts of rising groundwater, which may already impact private properties along the shorefront. It may, however, provide landward properties with some protection against erosion.

Moving the road would be very costly and challenging because the surrounding land is steep and not owned by the Council. The road would also likely need to be raised above future flood levels, which would likely impact the ability of water to drain from the land to the coast. However, it's feasible that Purau Avenue could reconnect with Purau Port Levy Road further inland. If the road was moved, there'd be impacts on access to private properties in Purau, and access further around the harbour to Camp Bay. Additionally, a number of shorefront properties would likely be at risk of coastal hazards as the beach eroded and moved further inland.

Closing one or all of these roads would have a big impact on access to Purau and other connected communities such as Koukourarata. Therefore, it's not the Coastal Panel's preferred long-term option, but it remains on the table as an option that could be considered in the future.

The exposure of the Purau community to coastal hazards means a lot might change over the coming decades to impact the best course of action in the future.

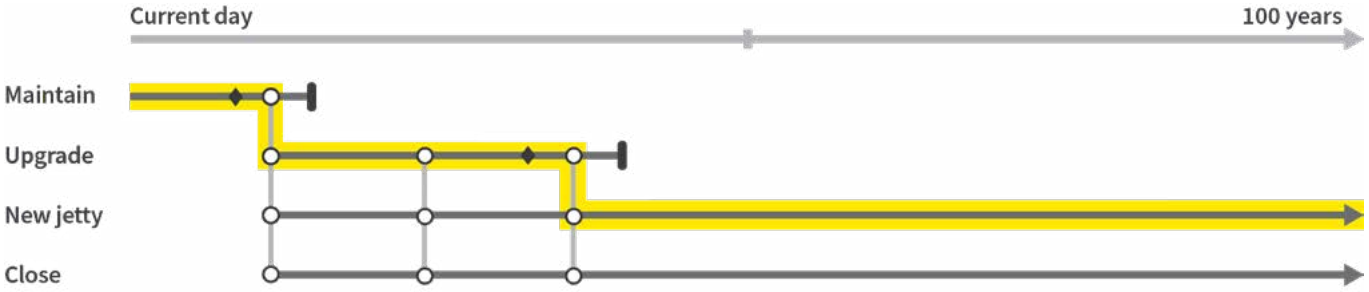
The jetty

The Coastal Panel's preferred adaptation pathway is to improve the resilience of the existing jetty and, at some point in the future, replace it with a new one.

The panel's preferred pathway recognises the importance of the jetty to the community now and in the future, as the roads are increasingly at risk of coastal hazards. If it's cost effective to do so, the resilience of the existing jetty could be improved through upgrades. At some point, a new jetty will be needed. This could be sooner or later, depending on whether it can be upgraded.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining, upgrading and then replacing the jetty, with an alternative option of closing it.



Key: ◆ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• Sea levels nearing the wharf deck • erosion around the wharf • condition of the wharf.	We want to act before the jetty becomes unsafe or unable to be used.	A condition assessment would be needed to understand exactly when we might reach this point, but it's likely action will be needed within the next 15 years to avoid meeting the threshold.	It could cost about $5 million to upgrade the existing jetty and then replace it with a new one.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The alternative option of closing and removing the jetty isn't preferred because it's so well used and may become even more important in the future. Another alternative would be to replace the jetty with a new structure sooner, but extending its life first will give us time to make a decision on the roads, which will help us to understand whether a bigger investment in the jetty makes sense.

The boat ramp

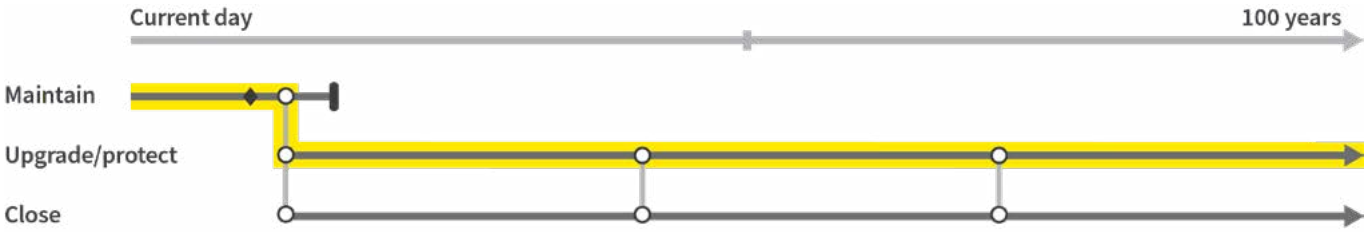
The Coastal Panel's preferred adaptation pathway is to continue to upgrade and protect the boat ramp as needed.

This is the preferred pathway because it'd allow this well-used asset to be kept for future use. The panel also recognises it could become more important in the future if access over water is needed to help connect communities increasingly cut off when roads are impacted by rising seas. This boat ramp is more defendable than the Charteris Bay boat ramp and it's able to be used during most tides, making it a more important asset to protect in the future.

This pathway also includes protecting the land either side of the boat ramp, to make sure people can safely access and use it during a range of tides.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining, upgrading and protecting the boat ramp, with an alternative option of closing it.



Key: ♦ Signal ○ Change of option ▮ Threshold **Preferred pathway** (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• Land around the boat ramp is eroding • rising sea levels mean the ramp isn't usable during some tides.	We want to act before the boat ramp becomes unsafe or unable to be used.	The first upgrades will likely be needed within the next 25 years to avoid meeting the threshold.	It could cost about $2 million to upgrade and protect the boat ramp.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The alternative option would be to close and remove the boat ramp. This isn't preferred because the ramp is well used and may become even more important in the future when access via the road is impacted.

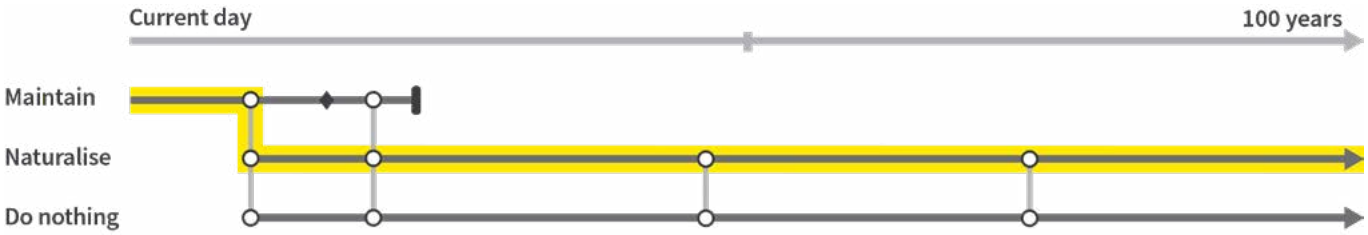
Purau Reserve

The Coastal Panel's preferred adaptation pathway is to improve the ecological value of this land through landscaping and planting native species.

The restoration of this land will have a range of benefits, helping to support native species and, potentially, reducing the risk of flooding from the stream and sea. This naturalisation could happen on its own over time, but the management of this process will mean we see better outcomes sooner.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining and naturalising the reserve, with an alternative option of doing nothing.



Key: ◆ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• It gets hard to maintain or use the reserve because of wetter ground conditions • it gets hard to access the reserve because of ponding in low-lying areas • interest from the community to drive, or be involved in, the restoration.	We want to act before the land becomes too wet to use, mow and maintain.	Action will likely be needed within the next 25 years to avoid meeting the threshold, but there would be advantages to starting the restoration work sooner.	It could cost up to $1.2 million, depending on the extent of the landscaping and planting.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative option

The alternative option would be to do nothing. We expect this would cause the reserve to become increasingly weedy and boggy over time as sea levels rise and it's more frequently flooded.

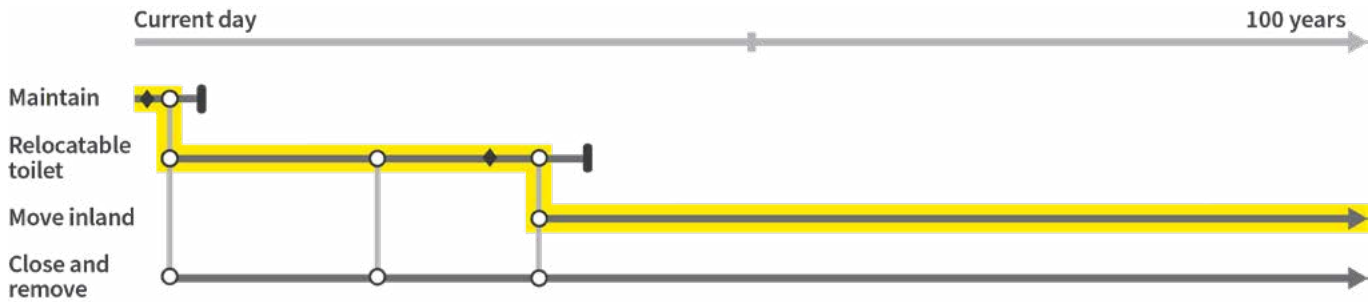
Public toilet

The Coastal Panel's preferred adaptation pathway is to build a new, relocatable toilet on the inland edge of the reserve. In the future, the preference is to move the toilet further inland as the risk of coastal hazards increases.

The public toilet in Purau has been out-of-service for many years and it's in an area at risk of flooding by the sea and stream. The Coastal Panel's preference is to remove the existing toilet and build a new, relocatable one that can be placed on the landward edge of the domain. As sea levels rise and the risk to the toilet increases once again, the toilet can be removed or moved further inland and away from the hazard zone.

The pathway

The diagram below shows the preferred pathway through the adaptation options of building a new, relocatable toilet on the domain and then moving it further inland, with an alternative option of permanently closing and removing the toilet.



Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• The toilet (or access to it) is more regularly exposed to flooding and groundwater impacts • changes to the surrounding assets that mean a toilet is no longer needed.	We want to act before the toilet is significantly impacted by coastal hazards, making it unsafe or unable to be used, or before there's any risk of environmental contamination.	The toilet is currently out-of-service and a new toilet is needed now. The toilet can be placed on the inland edge of the reserve for about 30 years before it needs to be moved again.	It could cost about $500,000 to demolish the existing toilet and to build a new, relocatable toilet on the reserve.

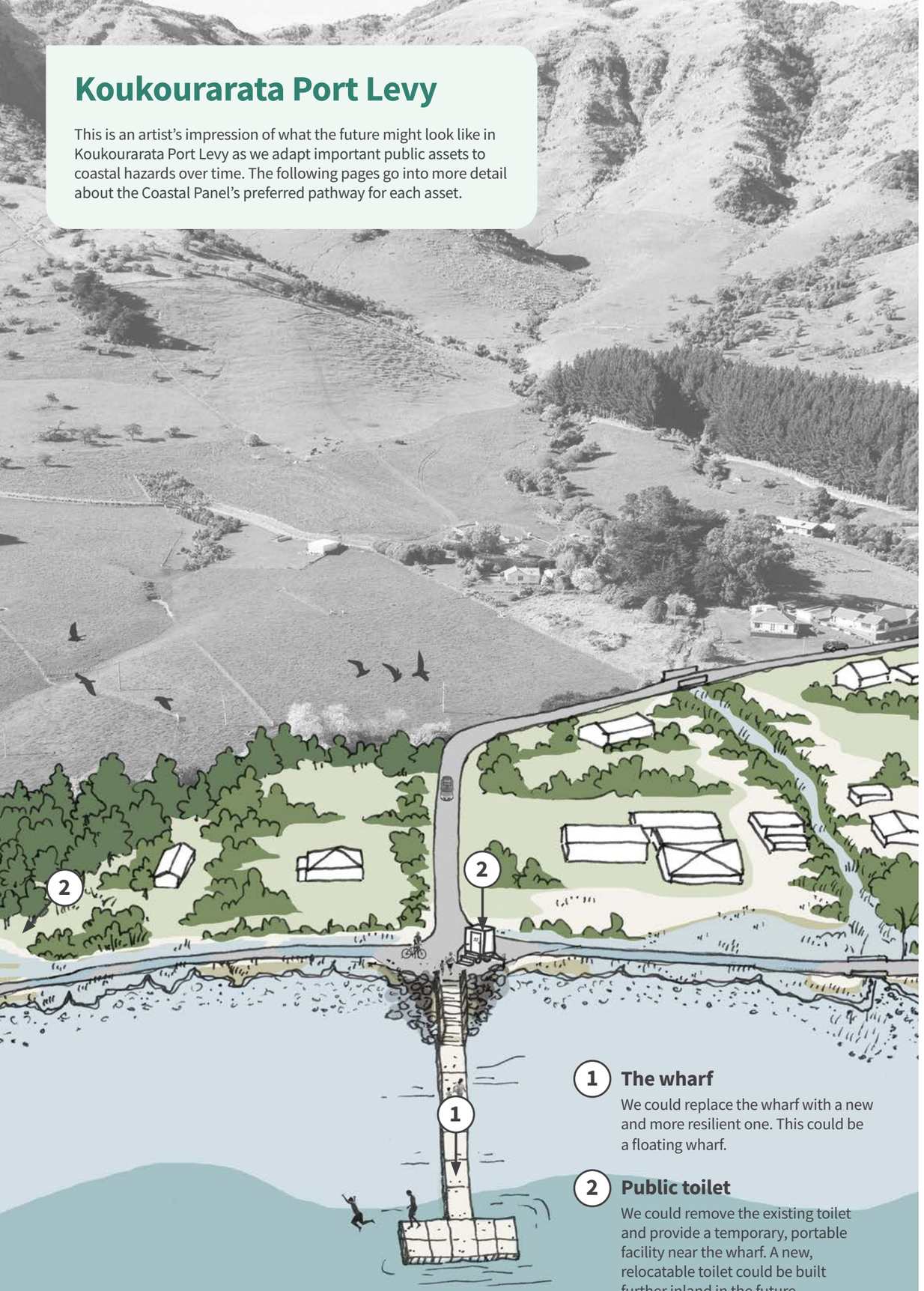
*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative option

The alternative option is to close and remove the public toilet and not provide a replacement. This isn't preferred because the Coastal Panel believes it's important to have this facility available for local users.

Koukourarata Port Levy

This is an artist's impression of what the future might look like in Koukourarata Port Levy as we adapt important public assets to coastal hazards over time. The following pages go into more detail about the Coastal Panel's preferred pathway for each asset.

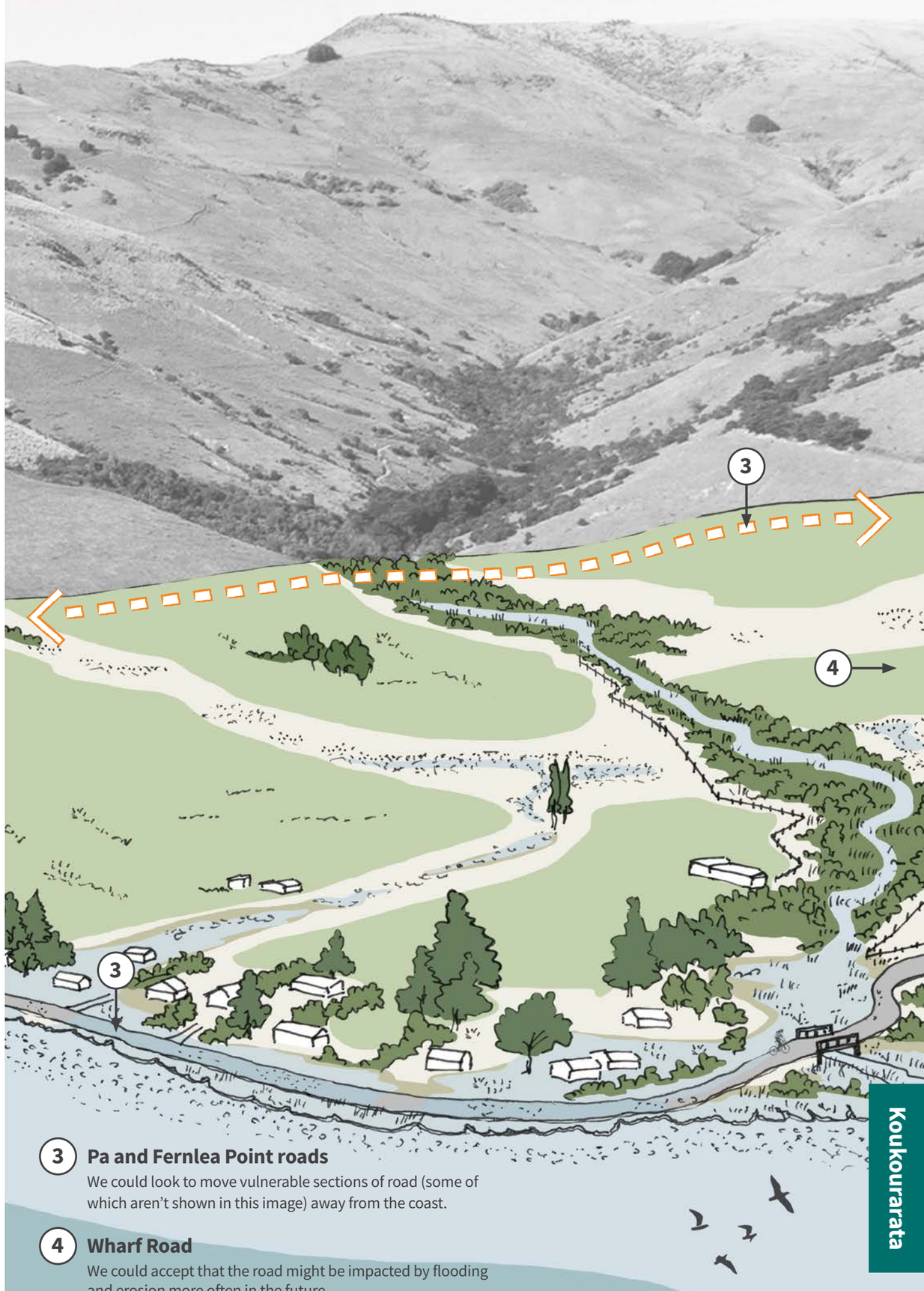


1 The wharf

We could replace the wharf with a new and more resilient one. This could be a floating wharf.

2 Public toilet

We could remove the existing toilet and provide a temporary, portable facility near the wharf. A new, relocatable toilet could be built further inland in the future.



3 Pa and Fernlea Point roads

We could look to move vulnerable sections of road (some of which aren't shown in this image) away from the coast.

4 Wharf Road

We could accept that the road might be impacted by flooding and erosion more often in the future.

Koukourarata

Important context

Koukourarata is the main settlement in the takiwā (region) of Te Rūnanga o Koukourarata. We recognise the rangatiratanga (chieftainship) of the rūnanga over the whenua (land) and we're working together to plan for impacts on public assets in this community. There are many taonga and sites of significance that aren't public, some of which are exposed to coastal hazards. While not part of our work, we're supporting the rūnanga to make plans for these assets where appropriate.

The overarching story

Koukourarata is a small and resilient rural community centred on the eastern side of the bay. It's relatively isolated, and the roads in and out of the community are exposed to a range of hazards, including coastal flooding, coastal erosion, rising groundwater, landslip, treefall, and ice and snow in the pass during the colder months. Access is a key concern in Koukourarata, and the ability to travel to Christchurch city somewhat depends on how the risks to roads are managed locally, as well as in Purau, Te Wharau Charteris Bay and Teddington. The wharf is valued for recreation, but it also remains accessible to boats and could, therefore, be used for access if the roads were closed.

Koukourarata is valued by locals for its tranquillity, natural landscapes and connection to the moana (sea). It's not uncommon to see people swimming, fishing, kayaking and jumping off the wharf during the summer. And although it's not so apparent to the naked eye, the moana, tidal mudflats and intertidal zones at the head of the harbour all support a range of significant native flora and fauna, including shellfish and cockles, which are valuable for mahinga kai (food gathering).

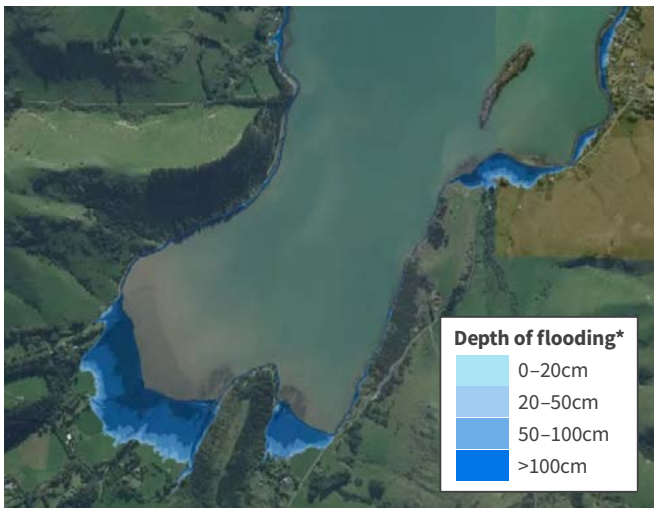
The rūnanga are actively planning for the future of their hapū (community) as sea levels rise, including the impacts coastal hazards will have on their private properties. They are considering a range of adaptation options, including whether they need to retreat from the hazards. We're working to support the rūnanga with technical information and expertise and we'll also work to align plans for public assets in the area, such as roads, with the rūnanga's plans.

The risk

There are several private properties along Pa Road that are at risk from coastal hazards, some of which already flood from the Koukourarata and Oiri streams during heavy rainfall. Te Rūnanga o Koukourarata, Christchurch City Council and Environment Canterbury are working together to reduce these impacts through planned upgrades to stormwater systems and plantings for Oiri Stream. Sections of Purau Port Levy Road, Fernlea Point Road and Pa Road – and the lesser-used Wharf and Old Port Levy roads – are at risk of coastal erosion, flooding and rising groundwater. The wharf is already over-topped by king tides and during storm events, and it'll only get worse as sea levels continue to rise. There's also a public toilet which is exposed to coastal hazards.

Current sea level

1m sea-level rise



These images show how this area is likely to be affected by coastal flooding, as sea levels rise, during a 1-in-100-year storm event.
**In many places, the areas at risk from flooding are also at risk from rising groundwater.*

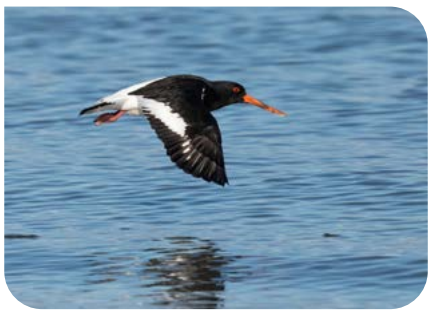
What we're planning for

We're planning for six public assets in Koukourarata:

- The wharf
- Wharf Road
- Pa Road
- Fernlea Point Road
- Jetty Road
- the public toilet.

An aerial view showing the location of key assets.

Reef heron.



A South Island pied oystercatcher in flight.

At the head of Port Levy Bay, tidal mudflats and inter-tidal zones support a range of native salt-tolerant plant species, such as sea rush and glass wort, and shellfish such as cockles, which are significant for their mahinga kai (food gathering) value.

The mudflats merge into a diverse saltmarsh ecosystem as the land rises. These ecosystems are nationally rare and threatened because humans have changed many of the natural environments they live in. Together with the shingle fans that form around stream outlets across the bay, the saltmarsh provides important habitat for the estuarine birds and seabirds that feed and roost in the area. A range of bird species can be found here at any time, including the South Island pied oystercatcher and the reef heron, a nationally endangered species. A decision to avoid the long-term protection of coastal roads would mean this environment could respond to changing conditions and migrate inland as sea levels rise.

The wharf

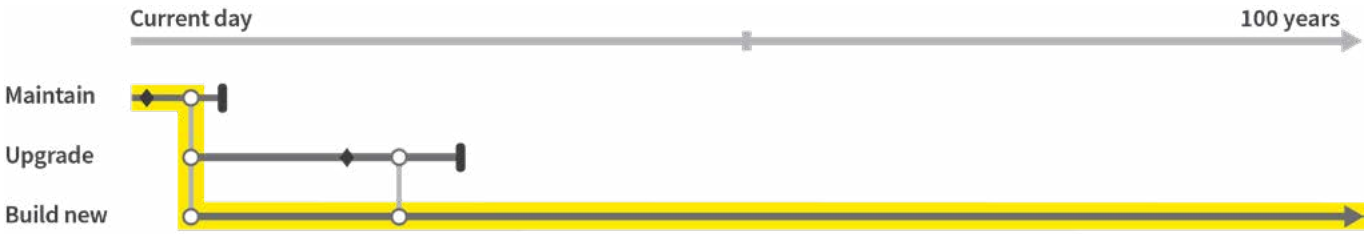
The Coastal Panel's preferred adaptation pathway is to replace the wharf with a new one.

Having a wharf in Koukourarata is important for marine access, recreation and mahinga kai (food gathering). It's also a part of the wider marine infrastructure network across the harbour, which could have a more strategic importance in the future, particularly in this isolated location. A new wharf would support more reliable access to and from the community during emergencies and may also provide a means for future economic opportunities.

The existing wharf already floods and is in need of repairs, some of which may be needed to keep it open in the short term.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining, upgrading and then building a new wharf.



Key: ◆ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• Sea levels nearing the wharf deck • erosion around the wharf • condition of the wharf.	We want to act before the wharf becomes unsafe or unable to be used.	The wharf is already in poor condition and it's sometimes unusable during large tides. We need to take action now because we're at the threshold.	It could cost about $7 million to replace the existing wharf with a new one.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The alternative options are to upgrade the existing wharf or close it. To upgrade the wharf, we could raise the deck level to reduce the flooding and do some repairs to the wharf's structure at the same time. This would buy some time, but it'd be costly because a lot of work would be needed to make the wharf more resilient, as well as ongoing maintenance.

Closing the wharf hasn't been included as an alternative option in the pathway because of its role as a lifeline for access in the event of an emergency. This is particularly important because Koukourarata is quite isolated. However, closure is possible for all public assets in the future and could be considered here if conditions change.

Wharf Road

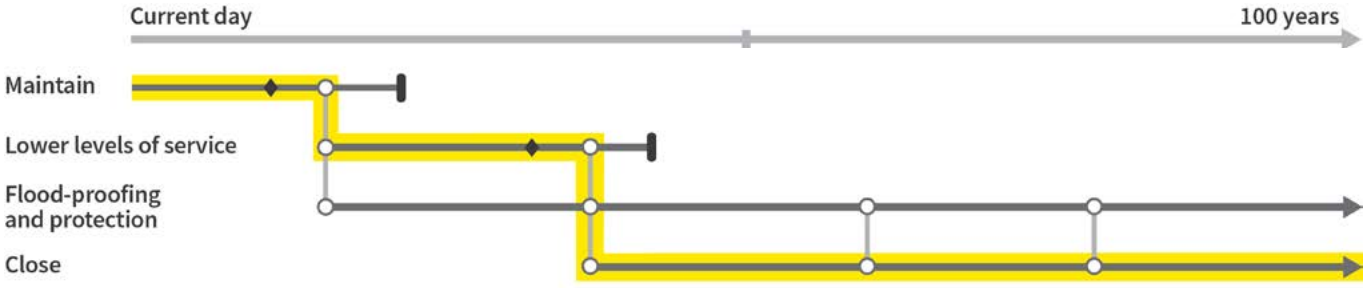
The Coastal Panel's preferred adaptation pathway is to lower the level of service for Wharf Road over time. This would lead to more significant flooding and coastal erosion. As these impacts increase and the road becomes unsafe or unable to be used, we'd need to explore the partial or full closure of the road.

The Coastal Panel recognises that Wharf Road is mainly used by a small number of private landowners. Accepting a lower level of would service mean the road could stay open for as long as possible without significant investment of public funds. Eventually, it'll need to be closed to some or all types of traffic.

We recognise that the closure of this road would impact some private property owners. Where possible, we would support these owners in exploring alternative access options.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining the road, lowering its level of service and, eventually, closing it, with one alternative option of flood-proofing and protecting the road.



Key: ◆ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• The frequency of coastal flooding or groundwater impacts causing temporary road closures • the rate of erosion increasing damage and/or maintenance costs • safety concerns around driving in water.	We'll need to monitor the road as levels of service are lowered. When the road becomes unsafe or unable to be used, we'll need to explore its closure. This could look like closing one or both lanes of the road, or limiting access to certain vehicles or users.	As levels of service are lowered, the road will be increasingly flooded over the next 20 to 40 years, particularly around the head of the harbour where the road is low-lying. At this point, the partial or full closure of the road will need to be explored.	There are no construction costs involved in lowering the level of service and then closing the road. There will, however, be costs involved in maintaining the road while it's open, even at a lower level of service.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

An alternative option for Wharf Road is to flood-proof and protect it to limit the coastal hazard impacts on the road and on the access it gives. This isn't the panel's preference because of the high cost and environmental impacts involved in keeping the road in place long term.

Relocating the road isn't considered workable because of the high costs and low number of people using it on a regular basis, so it hasn't been included as an alternative option.

Koukourarata

Pa and Fernlea Point roads

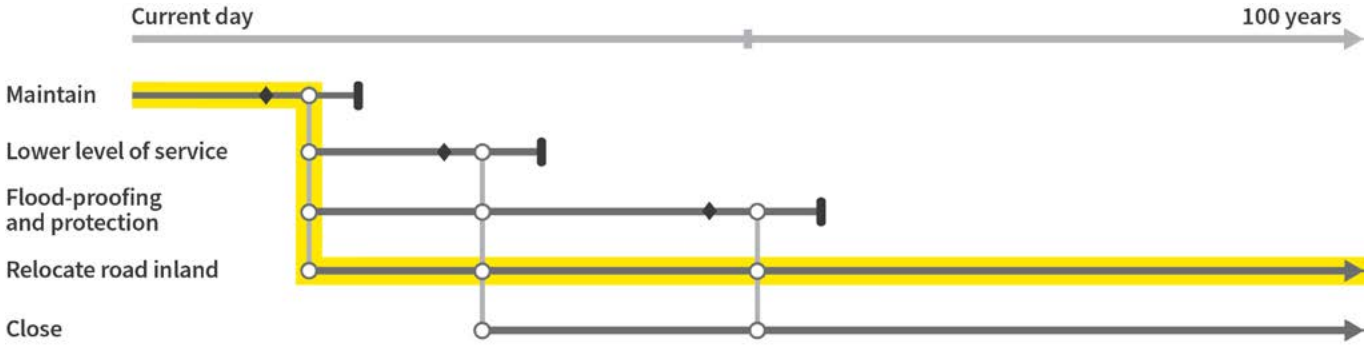
The Coastal Panel's preferred adaptation pathway for Pa Road and Fernlea Point Road is to move them further inland.

This is the preferred pathway because moving the roads will mean they're no longer at risk from coastal hazards. It'd be costly to move them, but it'd support better ecological outcomes, reduce ongoing repair and maintenance costs after storm events, and maintain access to the community and wharf, which will be an increasingly important lifeline in the future. Further work will be needed to identify suitable relocation routes that align with the rūnanga's own planning for the area.

Until the roads can be moved, some work will be needed to manage flooding and to maintain the existing level of service, particularly around low-lying sections of Pa Road. Some of this work is already planned.

The pathway

The diagram below shows the preferred pathway through the adaptation options of maintaining, lowering the level of service and then relocating parts of the roads.



Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

Koukourarata

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
• The frequency of coastal flooding or groundwater impacts causing temporary road closures • the rate of erosion increasing damage and/or maintenance costs • safety concerns around driving in water.	We want to act before the roads are significantly damaged or access is significantly impacted by exposure to coastal hazards. Access could be impacted by road closures after coastal flooding or high groundwater, or due to road repairs if vehicles damage the weakened road.	Action could be needed within 15 years to either move the roads or, if necessary, improve their resilience until they can be moved. Pa Road will probably need work soonest to address flooding and coastal erosion.	It could cost about $35 million to relocate the roads.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The Coastal Panel considered the option of protecting the roads, both as a short-term option to maintain access until the roads could be relocated, and as its own long-term option. However, this option would have an impact on the surrounding environment, would be costly, and wouldn't resolve the risk as well as relocating the road. Works to manage flooding on Pa Road have been undertaken in recent years and further works are planned to improve drainage. This work will not include shorefront protection, so it's in alignment with the panel's preferred pathway. The extent of planned flood management might impact when Pa Road needs to be moved.

Closing the road is not a preferred option because it's currently the only way to access the community. While not a preferred option, it remains on the table and could be considered in the future.

Although we don't have an adaptation pathway for Jetty Road, we know that, over time, it'll also be impacted by coastal hazards. Options for Jetty Road are limited and we may need to accept a lower level of service in the future.

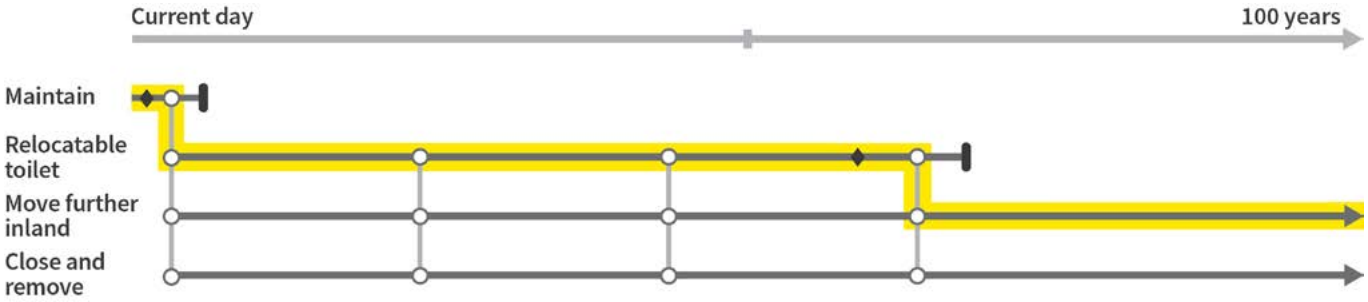
Public toilet

The Coastal Panel's preferred adaptation pathway is to remove the existing toilet and to replace it with a temporary, portable one along the shorefront. This is a short-term option until another location for the toilet can be found further inland.

The public toilet in Koukourarata is in an area often flooded by the sea and the Coastal Panel would prefer to find a new site for it. This was echoed by the local community and the rūnanga. As an in-between step, the panel prefers placing a portable toilet near the wharf, before a more permanent, relocatable toilet can be built further inland.

The pathway

The diagram below shows the preferred pathway through the adaptation options of having a portable toilet on the shorefront and then moving a permanent one further inland. The alternative option is to permanently close and remove the toilet.



Key: ♦ Signal ○ Change of option ▮ Threshold Preferred pathway (see page 13 for a detailed explanation of these symbols)

The table below explains some of the different parts of the pathway, as well as its estimated cost.

Signals Indicators we could use to make sure we act at the right time	**Threshold** What we're trying to avoid	**Timing** When the steps in this pathway might happen	**Estimated cost*** What it could cost to put this pathway in place
The toilet (or access to it) is regularly affected by flooding and rising groundwater.	We want to act before the toilet is significantly impacted by coastal hazards, making it unsafe or unable to be used, or before there's any risk of environmental contamination.	The toilet is currently out-of-service and the signal has already been met, meaning a new toilet is needed now. The toilet may be moved further inland in the future when a suitable location has been found.	It could cost about $380,000 to remove the existing toilet, get a portable toilet in the short term and build a permanent toilet once a site has been found.

*This estimate is based on how much it would cost today and doesn't include the costs to maintain or renew over time. We don't yet have enough information to understand exact costs, so this should only be used as a guide.

Alternative options

The alternative options are to relocate the toilet away from the shorefront in the first place, or to permanently close and remove it without providing another toilet. The first alternative isn't preferred by the Coastal Panel because the toilet would then be located away from where it's currently needed, and because a suitable location hasn't been found. Permanently closing and removing the toilet isn't preferred because the toilet is well used, particularly in the summer months.

Next steps

The planning undertaken by the Coastal Panel provides the Council with an invaluable understanding of how we should be looking to adapt public assets to rising sea levels. Once adopted by the Council, the focus will shift to implementation, which will involve consideration of several things:

Prioritisation

There are many actions captured in this plan. As the Council undertakes adaptation planning across the district, our understanding of the desired investments will only grow. Some tough calls will need to be made, and it's likely we'll need to prioritise which actions we look to implement across the district. The actions that are likely to be prioritised are those that relate to essential services such as access, drinking water and wastewater.

More planning

When planning is completed in Whakaraupō Lyttelton Harbour and Koukourarata Port Levy, it will start in another section of the district. Where we go next will be determined by the Council after we complete and then review the process we piloted here in the harbour.

Monitoring

Moving through these adaptation pathways as planned relies on signals, triggers and thresholds. Preliminary signals and thresholds have been identified in this plan. For these indicators to work as planned, they need to be monitored. Work is under way to develop a monitoring framework and to understand the roles of local, regional and central government. Once up and running, it's likely that the preliminary signals and thresholds identified in this plan will need to be revisited to ensure they can be effectively monitored.

Funding and financing

Funding the costs of adaptation to climate change is a significant global, national and local challenge. In the Christchurch district, with just 20 centimetres of sea-level rise, around $3.2 billion of Council roads and water network pipes are at risk from coastal hazards over the next 25 years. This number doesn't cover all Council-owned assets or include the impacts of other climate risks such as high wind, river flooding or wildfires. Using the same scenario, around $14 billion of private properties are also at risk.

While the Council started adaptation planning in the Whakaraupō Lyttelton Harbour and Koukourarata Port Levy area, we need to be mindful of the fiscal challenges ahead for ratepayers as we invest in adapting infrastructure in at-risk areas right across the district, from Brooklands to Southshore, the Sumner estuary, along the three river catchments and across Banks Peninsula.

In the identification of preferred pathways, the Coastal Panel has kept ratepayers front-of-mind. In total, the capital investments required over a 100-year period to act on the Coastal Panel's preferred pathways would cost around $214 million (see the table opposite). Where possible, extremely high-cost interventions, such as moving roads inland over difficult terrain and/or requiring the purchase of private properties to do so, have been avoided, saving around $300 million.

Over the next decade, the Coastal Panel's preferred adaptation pathways would require investment of around $15.4 million (of the total $214 million) to raise Gallipoli Wharf and rebuild the Koukourarata wharf, protect the Rāpaki beach track and provide short-term protection for the Allandale foreshore track, replace public toilets in Purau and Koukourarata, protect roads and pipes in Charteris Bay and Purau, and protect and monitor the Allandale landfill in the short term while undertaking a feasibility study to determine if it needs removal.

To put this investment in perspective, providing core infrastructure across Banks Peninsula for the 2023-2025 period cost ratepayers almost $82 million. The rates impact of $15.4 million is estimated at a 0.01per cent rates increase each year, from financial year 2026 to 2035.

In some cases, existing funding set aside in the Council's Long-Term Plan could be invested in these adaptation actions. In other cases, bids will need to be made through the next Long-Term Plan.

Looking ahead, an inter-generational Climate Resilience Fund has been established through the latest Long-Term Plan to start saving for actions that'll be needed down the track. This fund is likely to subsidise actions needed in 20 to 30 years' time, but it won't be enough to fully cover the costs of adaptation across the district, so the Council's capital investment programme will likely also need to expand.

As noted throughout this document, future ratepayers and councillors will need to re-prioritise and re-assess adaptation investments over time through Long-Term and Annual Plan cycles, where competing demands are considered through public consultation processes. Hard choices will need to be made by all of us, and that may mean some actions identified are not funded due to other priorities and affordability.

Location	Asset	0–10 years	10–30 years	30+ years
Rāpaki	Gallipoli wharf	1,000,000	4,500,000	
	Wastewater pipes			200,000
	Beach access track	750,000		
	Pumping station and parking area		1,500,000	
Allandale	Allandale landfill	1,600,000	82,000,000	
	Governors Bay to Allandale foreshore track	500,000	500,000	
	Governors Bay Teddington Road (Allandale)			750,000
	Allandale Hall		630,000	
	Allandale Domain		1,000,000	
	Public toilet			500,000
Teddington	Governors Bay Teddington Road (Teddington)			8,000,000
	Gebbies Pass and Charteris Bay roads			25,000,000
Charteris Bay	Marine Drive north (and pipes)		17,000,000	
	Marine Drive south (and pipes)	800,000	9,200,000	
	Boat ramp		2,000,000	350,000
Purau	Purau Avenue and Camp Bay roads	2,000,000		
	Purau Avenue (north)		3,500,000	
	Jetty	1,000,000	4,000,000	
	Boat ramp		2,000,000	
	Purau Reserve		1,200,000	
	Public toilet	500,000		
Koukourarata	Pa Road		16,000,000	
	Fernlea Point Road		19,000,000	
	Wharf Road			
	The wharf	7,000,000		
	Public toilet	230,000		150,000
Sub-totals		**$15.4m**	**$164m**	**$35m**
Total				**$214.4m**

Help us prepare for sea-level rise

Tell us what you think about the draft plan for your community by 17 November 2024.

Your feedback will help guide the management of public facilities over the coming decades, so it's important we hear from you – whether you agree or disagree.

Spread the word and make sure your friends and whānau living in the area also have a chance to shape their futures.

Online (preferred): **letstalk.ccc.govt.nz**

Email: **letstalk@ccc.govt.nz**

Deliver to:
Attention: Krystle Anderson, Engagement Advisor
Te Hononga Civic Offices
at 53 Hereford Street

by 17 November 2024

Post to: Freepost 178 (no stamp required)
Adapting to sea-level rise
Attn: Krystle Anderson, Engagement Advisor
Christchurch City Council
PO Box 73016
Christchurch 8154

* Please include your full name and postal address. If you wish to speak at the public hearings, please also include a daytime phone number.

If your feedback is on behalf of a group or organisation, you must include your organisation's name and your role in the organisation.

Hearings

If required, we expect public hearings will be held later this year.

Please note

We require your contact details. Your feedback, name and address are provided to decision-makers. Your feedback, with your name only, will be available on our website. However, if requested, we will make your feedback, including contact details, publicly available. If you feel there are reasons why your contact details and/or feedback should be kept confidential, please contact the Engagement Manager by phoning 03 941 8999 or 0800 800 169.

Webinars

We'll be hosting an online webinar to talk about the Draft Adaptation Plan and to answer your questions.

Wednesday 30 October, 6pm

The webinar will be recorded and uploaded to our webpage and can be watched any time.

Register online **letstalk.ccc.govt.nz**

Talk to the team

Governors Bay Fete
Sunday 20 October

Orton Bradley Fair
Sunday 27 October

We'll be at different community meetings across the harbour. Head online to find out more.

Krystle Anderson
Engagement Advisor
letstalk.ccc.govt.nz
03 941 8096

Korero mai | Let's talk

letstalk.ccc.govt.nz

INF7322 October 2024

Christchurch City Council