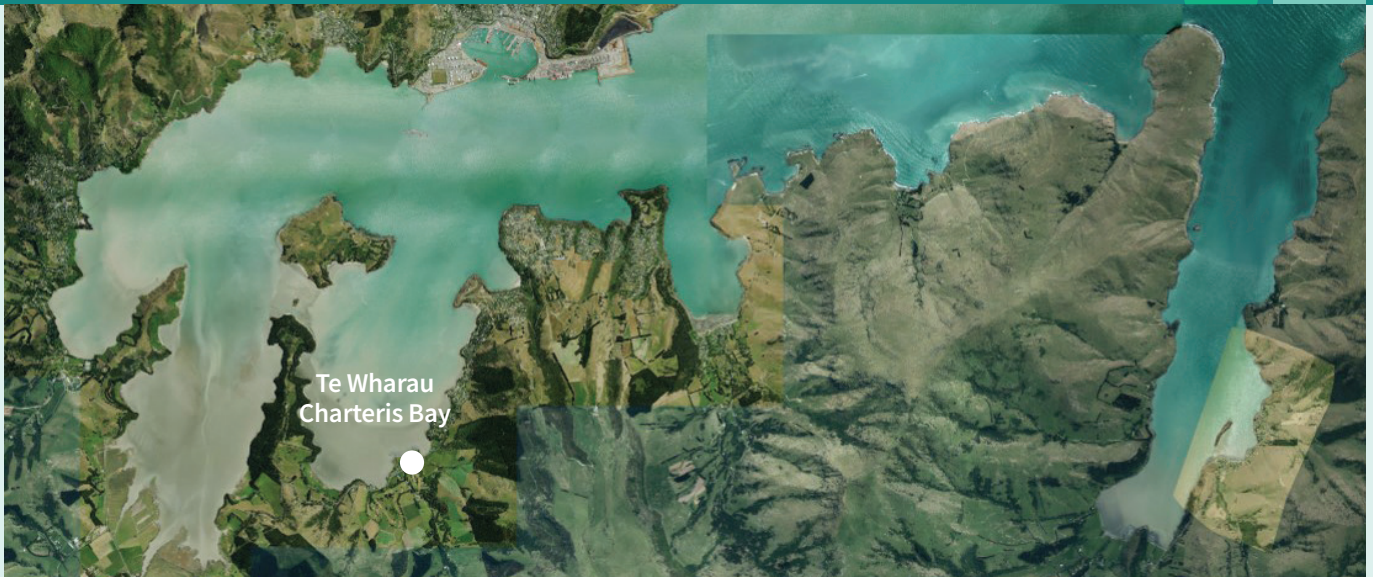


Te Wharau-Charteris Bay



Some low-lying parts of **Te Wharau-Charteris Bay** are currently affected by coastal erosion, coastal flooding and rising groundwater and impacts from these hazards will increase as sea levels rise.

The extent and depth of coastal flooding is expected to increase, particularly in southern parts of the bay (near Orton Bradley). Groundwater levels are also expected to rise. Coastal erosion and overtopping (flooding) of Marine Drive will also become more common. Marine Drive is located next to a regionally significant area of mudflats and a location of mahinga kai (a food gathering site), so management of the road will need to consider impacts on this environment.

A range of public assets, including the road and three waters (drinking water, stormwater, wastewater) infrastructure are at risk, as are residential properties. These assets and places of value will be increasingly impacted by coastal erosion, coastal flooding and rising groundwater.

Te Hapū o Ngāti Wheke Inc is the Papatipu Rūnanga legal entity that represents Ngāti Wheke, the hapū with manawhenua status over the Whakaraupō basin and surrounding areas as outlined in the Port Cooper Deed. This entire area is culturally significant to Ngāti Wheke and sustains the hapū. Te Hapū o Ngāti Wheke has a strategic plan, a key part of which is the protection and enhancement of the whenua, moana and awa. Ngāti Wheke hopes to be a part of the leadership in climate action for future generations.

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

Christchurch City Council recognises the rangatiratanga of Ngāti Wheke over its whenua and is working in partnership to plan for impacts on public assets and places of value.

	Short-term	Long-term
Coastal flooding	Orange	Red
Coastal erosion	Orange	Red
Rising groundwater	Orange	Red

The colours in this table* show how exposed this area is to each of the coastal hazards and are indicative only. Orange refers to moderate exposure and red to high exposure.

Environmental setting

Located near the head of Whakaraupō-Lyttelton Harbour, Te Wharau-Charteris Bay is comprised of a large area of tidal flats that has been formed by the supply of silt from the surrounding hills. The landward area is low-lying in the south (near Orton Bradley) and elevated to the north, towards Hays Bay. The tidal flats support mahinga kai - areas of food gathering, valued habitats and diverse ecosystems.

The mudflat areas located at the head of Whakaraupō-Lyttelton Harbour are classed as regionally, nationally and internationally significant as a bird habitat and also support a variety of native mollusc, worms and crustacea species.

It is recognised that the natural environment, including the mudflats, saltmarsh, beaches and banks act to mitigate coastal hazards by reducing wave energy, storing water and stabilising sediments.

* The table is intended to provide a sense of what hazards are most relevant to the location and how severe the impacts might be. The colouring has been informed by Christchurch City Council's 2021 Coastal Hazard Assessment and data held by the Council about risks to assets.

Rising seas

Sea level rise

The long-term record at Lyttelton Port tells us that sea level rose by around 30cm between 1901 and 2018, at a rate of 2.2mm/year. Over this period the rate of sea level rise increased slightly.

Projections from the Intergovernmental Panel on Climate Change (IPCC) indicate that we should expect between 17-23cm of sea level rise to occur by 2050, and 52cm-1m by 2100 depending on how significantly we are able to reduce greenhouse gas emissions.

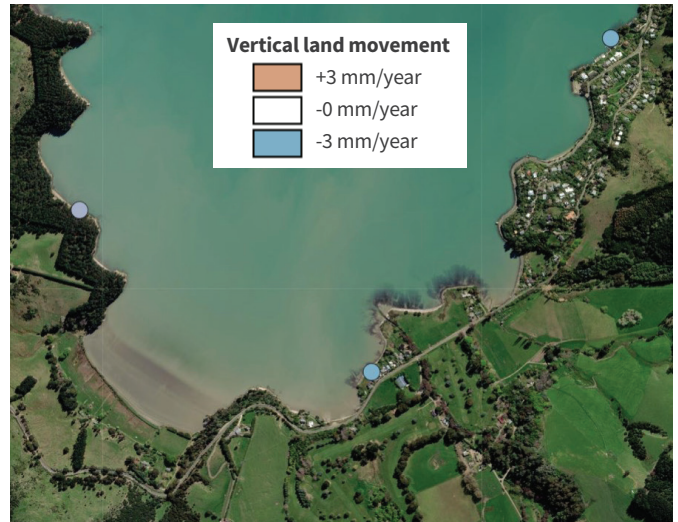
The amount of sea level rise that we experience can also depend on where we are located within New Zealand, because the land that we stand on also moves.

Vertical land movement

The NZ SeaRise Programme (www.searise.nz/) has estimated local rates of land motion to help us understand where land is going up (uplift) and where it is going down (subsidence). These changes in land level, known as vertical land movement, can slow local rates of sea level rise in areas experiencing uplift and speed up sea level rise where land is subsiding.

When thinking about how we can adapt, it is useful to understand ‘relative sea level rise’ which includes the effects of local vertical land movement.

Historically, the areas around Te Wharau-Charteris Bay have experienced subsidence (shown in image above). The rates of subsidence for this area are around -1mm/year. If these rates of subsidence continue over the next 30 years (to 2050), we would expect to see the rate of sea level rise accelerated by roughly 10 percent, from around 6.5mm/year to around 7.5mm/year.



Land is shown to be subsiding, as per blue-coloured dots (Source: NZ SeaRise). There is uncertainty associated with this data, so this information should be considered indicative only.

Coastal hazards in Te Wharau-Charteris Bay – today

Coastal flooding & rising groundwater

Te Wharau-Charteris Bay is relatively sheltered due to its location at the head of the harbour. However, this area can be affected by storm surge, which is a temporary rising of water levels that results from a low-pressure weather system. Spring and king tides, can also result in coastal flooding, particularly when these conditions occur at the same time as storm surge and/or heavy rainfall.

The low-lying area at the southern-end of the bay is most likely to experience flooding and elevated groundwater levels. Areas to the north are generally elevated and out of reach of coastal processes. However, the main road is located at the base of the hillside and can be impacted and overtopped during storms/large tides.

Coastal erosion

The sheltered location and relatively shallow water depths in this area mean Te Wharau-Charteris Bay is not heavily impacted by swell waves from the open ocean. Waves generated locally (within the harbour) by wind are more likely to affect this area, although wave energy is limited by the shallow water depths in the bay and by the sheltering effect of Ōtamahua-Quail Island. As a result, the potential for coastal erosion is lowered and likely limited to spring or king tides and during storm surge, when air pressures are low and winds are high.

You might have photos or stories about previous storms in this area. If you would like to share these with us then please get in touch at coastalcommunities@ccc.govt.nz



Coastal flooding extent and depths with 40cm (left) and 1m (right) of sea level rise during a rare (1 in 100 year) storm event – sourced from Coastal Hazard Assessment 2021 (Tonkin & Taylor).

Coastal hazards in Te Wharau-Charteris Bay – the future

Coastal flooding & rising groundwater

The southern area of Te Wharau-Charteris Bay will be increasingly impacted by coastal flooding and rising groundwater. As sea levels rise, coastal flooding events (storm surge and large tides) will be able to reach further inland, particularly in the southern part of the bay. This will result in increased flood depths and will mean that day-to-day water levels will be higher, drainage will be slowed and surface water (ponding) will remain in place for longer.

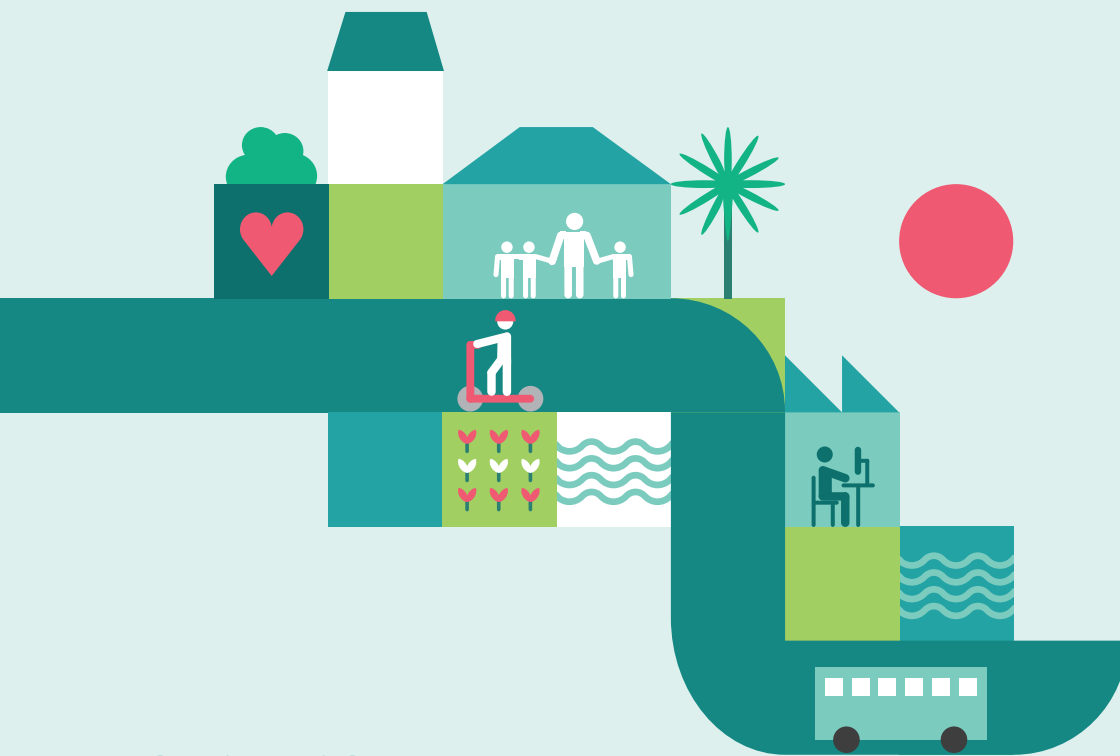
Marine Drive will experience more frequent flooding as coastal defences are overtopped. The images above show the projected coastal flooding extents and depths with 40cm of sea level rise (left) and 1m of sea level rise (right). The extent of coastal flooding will increase as sea levels rise, but the most significant change is that flood depths will increase.

Coastal erosion

With higher sea levels in the future, waves will impact the Te Wharau-Charteris Bay shorefront more often and to a greater extent. This will mean the shorefront will have less time to recover between storm events and is likely to erode as a result. Coastal defences and the main road that sits in behind these, will be increasingly impacted during storm events. The images below show the erosion distances we can expect with 40cm and 1.5m of sea level rise. The maximum erosion distances are around 25m, meaning that this much land could be lost to coastal erosion. Some areas will erode more because they are made of sand, while other areas are protected by coastal defences.



Coastal storm erosion distances sourced from Coastal Hazard Assessment 2021 (Tonkin & Taylor). The images show erosion distances with 40cm (left) and 1.5m (right) of sea level rise. The dashed orange lines represent the area of cliff prone to future instability. The solid orange line shows an area potentially prone to erosion. The brown areas are where a more detailed assessment has been undertaken and show the probability of short-term storm erosion.



What is at risk?

Coastal hazard impacts will increase as sea levels rise. A range of public assets and places of value are likely to be impacted, including: Marine Drive, green spaces, coastal defences, three waters infrastructure and the Bay View boat ramp. It is recognised that Marine Drive provides important access for a range of communities around Whakaraupō-Lyttelton Harbour and Koukourarata-Port Levy.

Residential property will also be impacted in the southern area of Te Wharau-Charteris Bay. In the near-term, residential property is most likely to be impacted by flooding and raised groundwater at the southern-end of the bay. Over time these properties are likely to become increasingly impacted by erosion as well.

Where to find out more:

- Christchurch City Council webpage on coastal hazards and adaptation planning ccc.govt.nz/adapting-to-coastal-hazards/
- Christchurch City Council coastal hazards portal gis.ccc.govt.nz/hazard-viewer/
- NZ SeaRise webpage, for information on sea level rise and vertical land movement www.searise.nz/