

Lyttelton



The community at **Lyttelton** is significantly elevated and generally out of reach of coastal hazard impacts. However, low-lying areas such as Naval Point will be increasingly impacted by coastal hazards as sea levels rise.

Coastal defences reduce the risk of erosion and flooding in this area, but as sea levels rise these defences will become less effective and flooding and erosion will occur more often. It is recognised that coastal hazards are likely to impact private assets as well as public and that residential property is generally out of reach of direct coastal hazard impacts. Public assets at risk include, three waters infrastructure, The Naval Point Recreation Ground and the local boat ramp.

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	Yellow	Orange
Coastal erosion	Orange	Red
Rising groundwater	Yellow	Orange

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

Environmental setting

Located on the northern side of Whakaraupō-Lyttelton Harbour, Lyttelton is made up of a heavily modified coastal edge and a marine area that has been affected by a history of dredging and land reclamation. Despite the human-induced changes, the coastal edge provides habitat for a number of wildlife species, namely roosting locations for birds.

The majority of Lyttelton is elevated on a hillside, with some areas of the surrounding hills being at risk of rock fall hazard.

* 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.

In terms of the future, the Intergovernmental Panel on Climate Change (IPCC) provides global projections of sea level rise. The New Zealand projections indicate that between 17cm and 23cm of sea level rise will occur by 2050 and between 52cm and 1m will occur by 2100.

The amount of sea level rise that we experience can depend on where we are located in 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 movement to help us understand where land is going up (uplift) and where it is going down (subsidence). These changes in the land level, known as vertical land movement, can decelerate local rates of sea level rise in areas experiencing uplift and accelerate 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 ground surface at Lyttelton has been relatively stable. Some areas have experienced minor uplift, while other areas have experienced minor subsidence. In areas experiencing uplift the onset of coastal hazards will be slowed whereas subsidence accelerates the relative rate of sea level rise and therefore increases impacts from coastal hazards.

Coastal hazards in Lyttelton – today

Lyttelton can be affected by storm surge, which is a temporary rising of water levels that results from a low-pressure weather system. The conditions most likely to cause overtopping and flooding of the coastal edge are when spring or king tides occur at the same time as storm surge. Currently the coastal flooding hazard is relatively low, even at Naval Point where the land is most low-lying. There is likely to be a high groundwater table around the coastal edge, where groundwater is also affected by tides.

Most parts of the Lyttelton shorefront are sheltered from swell waves that enter through the harbour. However, eastern parts of the Port are impacted by the largest waves. Waves generated by wind in the harbour also impact the shorefront and can impact the sea walls and other coastal defences. As with coastal flooding, the risk of coastal erosion is highest when spring or king tides occur at the same time as storm surge.

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



Some areas are shown to be subsiding and others to be uplifting (Source: NZ SeaRise). There is uncertainty associated with this data, so this information should be considered indicative only.

Coastal hazards in Lyttelton – the future

Coastal flooding & rising groundwater

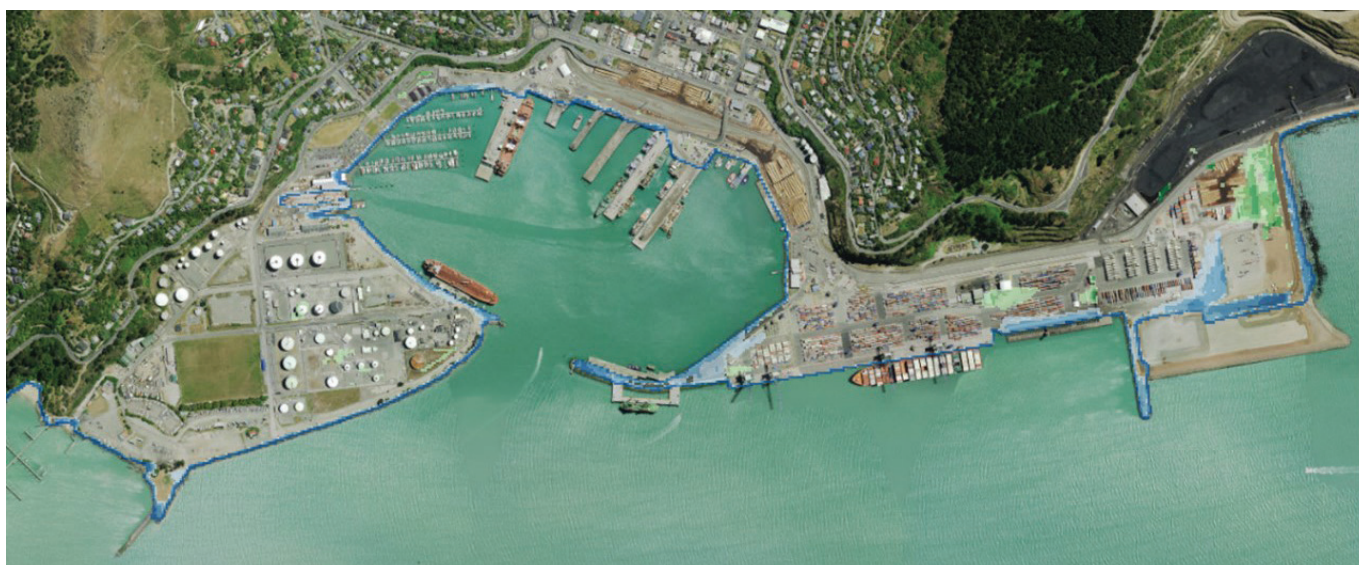
As sea levels rise it will become more likely that coastal defences at Lyttelton are overtopped and the inland area is flooded during storms. With higher sea levels, the flooding depths will increase and flood waters will reach further inland. The condition of the shorefront (sea walls) will contribute to the depth and extent of coastal flooding. Despite the Lyttelton shorefront being partially protected, groundwater levels will rise in the future. This effect will be most severe in low-lying areas such as Naval Point where the groundwater table is likely to be influenced by sea and tide levels.

The images below show the projected coastal flooding extent and depths with 40cm (top) and 1m (bottom) of sea level rise. Coastal flooding is shown to extend further inland with more sea level rise, as per the lower-most image.

Coastal erosion

With higher sea levels in the future, storms will impact the Lyttelton shorefront more often and to a greater extent. When storm surge conditions occur at the same time as king or spring tides the potential for erosion will be highest. Lyttelton is partially sheltered from waves that approach through the harbour entrance, whereas waves generated within the harbour can impact the shorefront directly. Because the Lyttelton shorefront is made-up by engineered defences, their condition will also contribute to the amount of erosion that takes place, as will the timeliness of repairs, following damage.

The image on the next page shows the storm erosion distances we can expect with 40cm of sea level rise. The erosion distances are quite small because they show the area affected by short-term erosion were the seawall to fail.



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



This image shows the probability of storm erosion occurring with 40cm of sea level rise, sourced from Coastal Hazard Assessment 2021 (Tonkin & Taylor). The brown areas show the probability of short-term storm erosion. The dashed orange line shows the area of bank/cliff prone to future instability.

What is at risk?

Over the next few decades coastal hazard impacts are likely to be minor. As sea levels rise, coastal storms will more readily erode and flood the area. A range of public assets and places of value are likely to be impacted, including the Naval Point Recreation Ground, the local boat ramp and a range of three waters infrastructure.

A number of private assets are exposed to coastal hazard impacts, including port infrastructure, mobile towers and industrial facilities.

Residential property in Lyttelton is out of reach of direct coastal hazard impacts.

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/