

## SOUTH NEW BRIGHTON AND SOUTHSHORE FACT SHEET

### FLOODING

This Fact Sheet gives an overview of why the Canterbury earthquakes have led to increased flooding, and a higher risk of future flooding, in some places in Southshore and South New Brighton. Other Fact Sheets in this Southshore and South New Brighton series provide more detail on specific flooding issues.

This Fact Sheet provides supporting information for the Southshore and South New Brighton Earthquake Legacy Issues Project. It is not about increased flooding risk due to climate change and rising sea levels. The Tonkin and Taylor report [Effects of Sea Level Rise for Christchurch](#) includes information about the impact of climate change and rising sea levels on flooding.

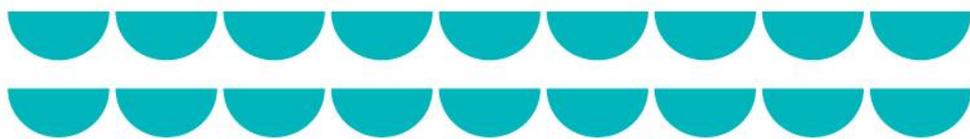
#### How the Canterbury earthquakes have increased flooding in Southshore and South New Brighton

Many areas of Christchurch have experienced increased flooding since the Canterbury earthquakes. The earthquakes changed the land **across the city**, and the Ōtākaro/Avon and Ōpāwaho/Heathcote Rivers, in ways that can increase flooding risks.

The earthquakes caused some of the land in Southshore and South New Brighton to drop, lift, tilt and/or spread. This means:

- Increased erosion is likely where the open coastline or estuary edge has dropped. Erosion of the estuary edge and open coastline means high tides, storm surges and higher than normal storm waves can reach further inland and cause flooding.
- Stormwater systems cannot drain rainfall or water from high tides as well as they did before the earthquakes, for example some drainage systems are much lower than they were relative to tide levels. This leads to flooding during high rainfall or high tides. A high tide during rainfall makes drainage even more difficult and flooding more likely.
- Groundwater (the water table that is under the land) is now generally closer to the surface in South New Brighton. Shallow groundwater can contribute to flooding when there are high tides or rainfall as the additional water cannot be absorbed into the soil.
- Changes in the location and consequences of flooding due to changes in land levels. The changed land levels create new or different flow paths and/or increase the potential depth of floodwaters.

The areas most at risk from increased flooding since the earthquakes are the reserves and red zone land along the estuary edge, and streets which are designed to flood and slowly drain out through the stormwater system.



Since the earthquakes we have also experienced three separate extreme high tide events which have been the highest ever recorded at Bridge St. These natural events are not related to earthquake changes. However, due to the increased flood risk in some places since the earthquakes, the effects of these extreme tide events were more widespread.

## **The impact on people and places in Southshore and South New Brighton**

As Southshore and South New Brighton are located on the coast and next to an estuary they have more sources of flooding than many other Christchurch suburbs: tides, storm surges, shallow groundwater and rainfall. Residents in these areas also report concern about flooding.

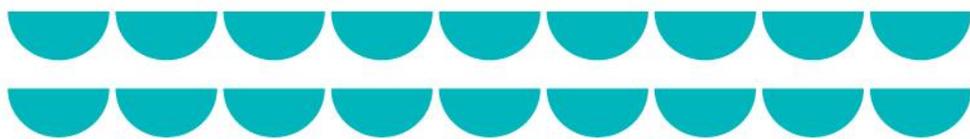
People who live in Southshore and South New Brighton want protection from increased flooding that has resulted from earthquake-related changes. The specific needs identified by the community are the:

- Protection of houses in Southshore and South New Brighton from any increased flooding risk.
- Protection of the South New Brighton Park and playground, South New Brighton School, South New Brighton Tennis Club, South Brighton Playcentre and the South Brighton Holiday Park.
- Addressing street flooding in all areas including Jervois Street, Tovey Street and the Ebbtide Street end of Rocking Horse Road.
- Prevention of stormwater from Halsey Street flooding the South Brighton Holiday Park and South New Brighton Tennis Club and impacting on surrounding homes.
- Ensuring functioning stormwater outlets across Southshore and South New Brighton.

## **What the Council does to address flooding**

Under the Council's Service Plan for Stormwater Drainage the stormwater network is managed to reduce the risk of flooding houses above floor levels. Since the Canterbury earthquakes the Council has completed the following to address flooding in Southshore and South New Brighton:

- Cleaning and clearing of liquefaction, silt and sediments from stormwater pipes.
- Repair and replacement of damaged stormwater pipes, and replacing ineffective outfall flap gates with duckbill ends to improve backflow as part of the Stronger Christchurch Infrastructure Repair Team (SCIRT).
- Construction of a new stormwater pump station and basin in Bridge Reserve north of Bridge St.
- Installation of rocks to protect the stopback at Ebbtide St, and the stopbanks at Kibblewhite St and Evans Ave.



- Emergency works during the July 2017 and January 2018 flood events such as filling in gaps in bunds and constructing new bunds to keep water out.
- Use of temporary pumps during extreme tides and heavy rain.
- Strengthening and raising the stopbanks from Evans Ave to Bridge St.
- Extension of the Ōtākaro/Avon River stopbank to the south of Bridge St (in construction from July to September 2019).

Land Information New Zealand has also built an earth bund in Southshore to help manage flooding. Further emergency works have been undertaken by Council to fill gaps in the bund at the road ends and private property.

## Why do we dredge in the Ōpāwaho/Heathcote River, but not in the Ōtākaro/Avon River or the Ihutai/Estuary?

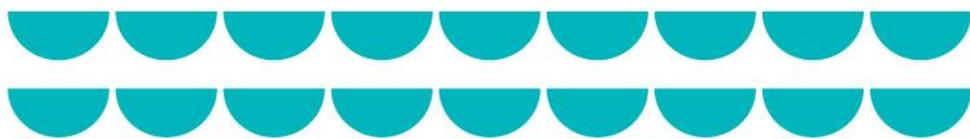
Until the mid-1980s, the Christchurch Drainage Board dredged the Ōpāwaho/Heathcote River on a reasonably frequent basis. However, regular dredging stopped in 1989 for ecological reasons and concerns it was affecting bank stability. We've only started doing it again recently, and in conjunction with bank stabilisation and ecological works, because the earthquakes changed the channel levels, and filled the riverbed with liquefaction and silt. This reduced the river's capacity to handle increased volumes of water during storm events.

The Ōpāwaho/Heathcote River is what's called a 'terraced' river – its banks have been formed by water carving away the soil to create a channel that is below the land around it. As the city has developed, we've built roads and properties right up against these river banks, which limits where the water can go when it floods (the 'floodplain'). It also reduces our ability to build things like stopbanks, because there often just isn't enough room.

While dredging can help increase the river's capacity, it comes with quite a few issues, which is why it's something we do when there aren't many other possible options for the area. Dredging has benefits for managing frequent storm events (for example, a one in 10 year storm) but it's less effective for more extreme events (for example, a one in 50 year storm), and it will become increasingly less effective as sea level rise affects water levels in the river. It also has significant ecological and cultural challenges that need to be managed and overcome.

By comparison, the Ōtākaro/Avon River has a different kind of floodplain. We know that's stating the obvious – it flows through a different part of the city – but it's also wider and has banks that are often less steep. Historically (and more recently) we've been able to use stopbanks to manage its flooding. Changes to the river caused by the earthquake have not reduced its capacity as significantly as the Ōpāwaho/Heathcote River so dredging at the same scale is not required (although removal of localised sections of sediment does occur). And the plans for the Ōtākaro/Avon River Regeneration Area offer even more options for flood management in the future.





The Ihutai/Estuary is different again. Flooding in the Ihutai/Estuary is almost entirely to do with the tides. The estuary levels definitely changed during the earthquake, but the channel itself appears to have settled back to near its pre-earthquake shape. Dredging the Ihutai/Estuary would be futile – creating a deeper channel would simply mean more sea water would flow in and out. And it's likely that any gains in channel capacity would quickly be undone by the tides bringing the sediment back in again. Dredging would also be very damaging to an area that's of such significant ecological importance.

### **Does all this work upstream to reduce the risk of flooding actually end up increasing flooding in the estuary?**

No – the land drainage recovery work does not increase flooding in the estuary. As we mentioned, flooding in the Ihutai/Estuary is almost entirely to do with tides. Stormwater discharge into the estuary via the rivers, even in a flood event, has very little impact on the water level of the Ihutai Estuary.

During a major flood, water from the Ōtākaro/Avon and Ōpāwaho/Heathcote rivers flows into the Ihutai/Estuary at a maximum total rate of about 60 cubic metres per second. However, the estuary mouth is capable of flowing out at 700 cubic metres per second.

The work done under the Land Drainage Recovery Programme to upgrade drains and pipes, etc, doesn't mean more water is discharged into the Ihutai/Estuary during a storm event. That stormwater would be discharging into the estuary regardless of the infrastructure, but would just be doing more damage upstream to more properties in the process. If anything, the improved infrastructure means a more controlled discharge. Stormwater can be held back in retention basins and then released when water levels downstream have dropped. There is also an environmental benefit – retention basins help remove sediment and contaminants, to improve the water quality of the water that enters the estuary via the Ōpāwaho/Heathcote and Ōtākaro/Avon rivers.



## Southshore and South New Brighton Fact Sheets

The Southshore and South New Brighton Fact Sheet series cover a range of issues:

Fact Sheet title	What it covers
Flooding	Why the Canterbury earthquakes have led to increased flooding risk in Southshore and South New Brighton.
Groundwater	What groundwater is and why it causes issues in Southshore and South New Brighton.
Stormwater	What stormwater is and why it causes issues in Southshore and South New Brighton.
Planning and approvals	How the planning and approvals process can impact the timing, cost and requirements for options in this area.
Christchurch drainage datum and levels	What the Christchurch drainage datum is, and how we use it and other levels in our planning.
2018 new high tide statistics	Information on the record high tides experienced in Christchurch coastal areas and the 2018 review and update of tidal statistics which has occurred following these events.
Stopbanks, bunds and other structures	Explanations of some of the different structures that can be used for flood and erosion mitigation.
What is a 1 in 100 year flood?	How we describe the probability of flooding.