

# Stronger Canterbury

Earthquake Recovery.

## 4 SEPTEMBER EARTHQUAKE FACTSHEET

UPDATED 1 OCTOBER

- The fault that caused the earthquake on 4 September 2010 has been named the Greendale Fault. It is a previously unknown fault under the Canterbury Plains.
- The rupture on the fault broke through to the ground surface from many kilometres below and created a 29 km long east-west running scarp in the land between the Hororata River and Railway Road near Rolleston.
- Up to 4.6 metres horizontal and 1.5 metres of vertical of permanent offset has been recorded across the fault at the ground surface.
- This is thought to be the first time that this fault has moved in several thousand years. It is highly unlikely that it will move again, producing another large earthquake, within the next few thousand years.
- Aftershocks are continuing to be less frequent but they will continue for several more weeks. They may occur in clusters. This is normal and expected. Scientists cannot say for sure whether we will get more large aftershocks of magnitude 5 or more, but as time goes on the likelihood of these larger aftershocks happening decreases.
- The earthquakes that have occurred in Kaikoura and other parts of the country over the last few weeks are not related to this earthquake or its aftershocks.
- It is unclear at this stage how this earthquake has affected other faults in the region. The chance of another major earthquake in the central South Island is not likely to have changed.
- Liquefaction occurred in some specific areas where there were saturated, unconsolidated (loose) soils. This caused water and silt or sand to be ejected to the ground surface, resulting in subsidence and lateral spreading (sideways movement) of the ground. This has led to damage to houses and underground services.
- In general, liquefaction occurred in areas known to be susceptible. However, because soil properties vary greatly across the greater Christchurch area, and different earthquakes have different ground shaking patterns, it is very difficult to predict exactly where liquefaction will occur in a particular earthquake.
- There may be some further minor subsidence in areas of severe liquefaction. This is normal and may continue for several weeks.
- Decisions around rebuilding in areas affected by liquefaction need to take into account many factors. There are a number different methods for reducing the likelihood of liquefaction and its effects on buildings in future. The best combination of measures for a particular area will depend on the size of the area, its soil characteristics and the cost involved.
- Cracks seen in the ground in areas of Waimakariri district, Christchurch city and lower Selwyn district are not faults. They are where the ground has cracked, often because of liquefaction, during the earthquakes. These cracks only go down to a depth of up to several metres. The Greendale Fault itself continues down kilometres into the earth's crust.

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- Building codes for modern buildings are intended to prevent collapse. Initial surveys suggest that modern buildings generally performed as expected, or better, in the earthquake and aftershocks. In general, residential houses suffered very little structural damage, except for that caused by chimneys falling and in areas of liquefaction. It is unlikely that earthquake design standards will need to change as a result of the earthquake.
- Older buildings that have had earthquake strengthening work undertaken on them generally performed very well in the earthquake, and suffered significantly less damage than nearby similar unstrengthened buildings.
- Parts of the Waimakariri River stopbank system downstream of State Highway 1 were damaged during the earthquake. At present there is approximately 1 in 15 year protection for this area. A programme of repairs is now being undertaken by Environment Canterbury staff, and 1 in 30 year protection is expected by mid October. Flood protection upstream of State Highway 1 has not been compromised and remains at 1 in 500 years.
- Liquefaction and lateral spreading within the Halswell catchment has affected the capacity of the Halswell river and drainage system, and water levels are raised. Environment Canterbury staff are currently dredging the Halswell River channel and digging out side drains, and will move on to stabilising river banks. This work will take several months.
- The level of flood protection on the Avon River has not been significantly affected by the earthquake. Christchurch City Council investigations show that the risk of flooding from the Avon and Heathcote rivers is no greater than before the earthquake. However, heavy rainfall could cause localised surface flooding in areas affected by liquefaction because of damage to stormwater systems.
- There was no tsunami associated with the earthquake because it happened on land, and involved no displacement of the sea floor.
- Banks Peninsula is an extinct volcano and the earthquake activity is not related to it. Volcanic earthquakes are very different in style to the Darfield earthquake and subsequent aftershocks. Measurement of warm springs in the Lyttelton Harbour basin show an increase in flow, but no significant increase in temperature after the earthquake.
- Scientists have been working since the earthquake occurred to understand how it happened and what its effects are. Our understanding will continue to improve as we analyse more information over the coming weeks.

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