



Hazard assessment for a submarine landslide generated local-source tsunami from Kaikoura Canyon

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The Kaikoura Canyon, sediment sink for the Canterbury rivers north of Christchurch, comes to within 500 meters of shore at Goose Bay and accumulates approximately 1.5×10^6 m³ of sediment each year (Lewis and Barnes, 1999). This sediment, which has accumulated to about seventy meters in thickness (Walters et al., 2006), exhibits tensional fractures, is located in a tectonically active area and could result in catastrophic failure and potentially a local-source tsunami (Lewis and Barnes, 1999; Lewis, 1998; Walters et al, 2006). Evidence suggests that this may have happened in the last two hundred years (Lewis, 1998; Lewis and Barnes 1999) and with a return period on the nearby Alpine and Hope faults also in the range of a one to two hundred years (Walters et al, 2006) could happen again relatively soon.

A review of the historical record and oral traditions for Kaikoura shows that historically Kaikoura has been affected by 11 events of which 10 are from distant sources and one, though debatable, is possibly from a local source. There are some preserved traditions for the Kaikoura area. These taniwha stories from near Oaro and from the Lyell Creek have been repeated and changed though time though the general essence remains the same. These taniwha legends, though not conclusive, indicate a dangerous shoreline where people have been killed in the past, possibly by flooding or tsunami.

Archaeological investigations at Kaikoura found evidence of a Maori occupational layers interrupted by water-worn stones, a “lens of clean gravel between occupation layers” and in other areas of the excavation, the gravels separate discontinuous periods of occupation (Fomison 1963; Foster, 2006). Additionally “pea-gravel” sized greywacke pebbles were found dispersed throughout sections of the South Bay shore platforms, though they were attributed to slopewash (Duckmanton, 1974) this is less likely since the nearby hills are limestone. A geological investigation along the Kaikoura Coast, at five sites from South Bay to Oaro, corroborates this. At four of the sites a similar greywacke pebble bearing layer was found which was not present at test sites to the North and South of the peninsula (Kiwa Rd Campsites and Claverly respectively). These deposits contain diatoms indicating marine provenance.

Surveys of Kaikoura peninsula households and businesses showed low levels of preparedness for a local source event. In regards to local-source tsunamis the district council has indicated that they “are unpredictable [and] it is impractical to include rules to mitigate their effects. Instead, the Council is committed to a Civil Defence network which provides an educative role and which sets in place a process for dealing with the results of any tsunami” (Kaikoura District Plan, 2010). Plans and an education strategy need to be formulated and implemented. They need to address considerations such as the fact that about 60% of those surveyed expect some sort of siren warning and the limitations inherent in such a warning system along with signage and public tsunami hazard maps and evacuation zones.