

# TSUNAMI EVACUATION ZONES FOR THE GISBORNE DISTRICT

GISBORNE, NEW ZEALAND



(L to R) Red, orange and yellow tsunami evacuation zones for Poverty Bay, Tolaga Bay and Tokomaru Bay.

## INFO:

**Location:** Gisborne District, East Cape, New Zealand

**Client:** Gisborne District Council

**Project Date:** 2018-2019

## SCOPE OF SERVICES:

- Literature review, historical analysis
- Numerical Modelling
- Validation of ComMIT Tsunami Model
- Detailed Inundation Assessment

## PROJECT DESCRIPTION:

We worked for the Gisborne District Council to update the tsunami inundation and evacuation zones and make them compliant with the most recent guidelines from the New Zealand Ministry of Civil Defence and Emergency Management. The objective was to create three evacuation zones (red, orange and yellow) as opposed to the single evacuation zone which had been previously adopted.

To accomplish this, a numerical modelling study was conducted that considered both near, regional and distant source tsunami events. Detailed numerical modelling grids were developed based on the best available offshore bathymetry and high-resolution coastal LiDAR data. For the hydrodynamic modelling we used the MOST hydrodynamic model within the ComMIT modelling system.

To define the most extreme 'Yellow' inundation zone, we developed candidate source models targeting a tsunami height representative of a 2500-year recurrence interval event at the 84th percentile uncertainty level as defined by the New Zealand probabilistic tsunami hazard model. In all cases this source was a large magnitude earthquake, with slip amount of 15-20 m occurring directly offshore of the target study area.

For defining the Orange Zone, we focussed on distant source events emanating from South America. This area was chosen since it is the region that has regularly produced the strongest tsunamis known to have affected New Zealand and is a likely candidate for future events. A sensitivity study comparing the tsunami heights produced by equivalent earthquake sources positioned along the west coast of South America suggested that the region just north of the Peru-Chile border and in far southern Chile produce the strongest response in Poverty Bay. This was then extended by using very large tsunami sources ( $M_w$  9.0 – 9.4) positioned at these 'hot spot' locations. The sources were varied according to magnitude and slip-distribution to produce the strongest inundation at the target sites.

Once the appropriate source mechanisms were determined, detailed inundation modelling was conducted for each of the 15 sites along the Gisborne District from Hicks Bay in the north to Poverty Bay in the south. The Yellow Zone – the most extensive inundation area – was based on the inundation extents caused by the most extreme near source tsunami. The intermediate Orange Zone was based on aggregating model results from the distant source events while the Red Zone was based on the +2.0 m MHW height contour.