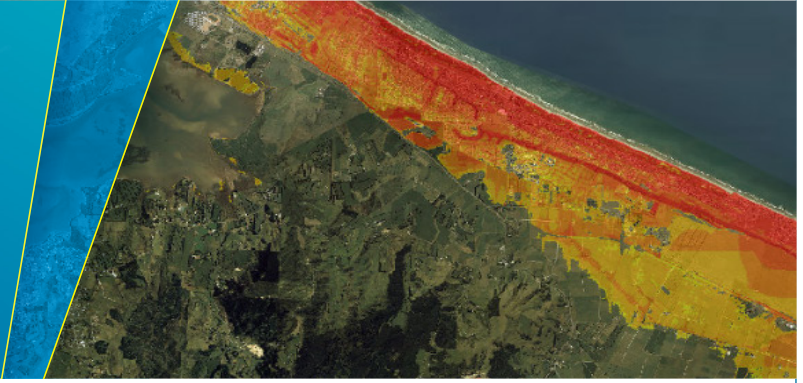


# Tsunami Hydrodynamic and Evacuation Modelling, Tauranga Assessment



## Client

Tauranga City Council

## Project overview

More than 46,000 Tauranga people live on the coastal plain spanning from Mount Maunganui (Mauao) to Pāpāmoa (Wairākei). In the warmer months, the population is swelled by thousands of visitors. A tsunami generated by an earthquake in Japan, Alaska or South America takes more than 12 hours to reach New Zealand, allowing plenty of time for warnings and planned evacuations. A wave generated by a very large earthquake resulting from a local source - such as a rupture of the Kermadec Trench - would potentially inundate parts of Mauao and Wairākei within 60 minutes. Until recently, tens of thousands of lives would have been at risk from a local source tsunami - particularly at Wairākei, where a considerable part of the back dune landforms have been levelled by development earthworks. This project involved hydrodynamic (nearshore tsunami propagation) modelling of a maximum credible tsunami event, and subsequent tsunami evacuation modelling to evaluate and optimise evacuation times/routes to reach safe areas. A high-resolution model domain of the Tauranga City region was constructed using the bathymetric and LiDAR data and the design tsunami simulated approaching shore and flowing overland. Hazardous flows were found to reach up to 2km inland. Safe areas above the maximum flow extents were identified and a pedestrian-based evacuation network developed. Evacuation modelling was undertaken using a modified version of the ArcGIS Network Analyst evacuation routing

extension ArcCASPER to obtain safe zone population catchments, route densities and evacuation times.

Results showed that evacuation times to reach safe areas was up to 180 minutes for the existing network due to the extremely flat inland topography, long distances to designated safe areas and roading configurations. Evacuation was optimised using a combination of additional evacuation routes and connectors and new safe zones including the use of vertical evacuation structures (both natural and manmade). Evacuation times were reduced to less than 70 minutes for all areas, which is considered acceptable for the modelled tsunami event.

## Services provided

- Hydrodynamic modelling of nearshore tsunami
- Tsunami evacuation modelling
- Development of evacuation/safe zone extents
- Constraints and opportunities assessment to prioritise additional mitigation measures to optimise evacuation
- Optimisation of evacuation network
- Consultation

## Performance

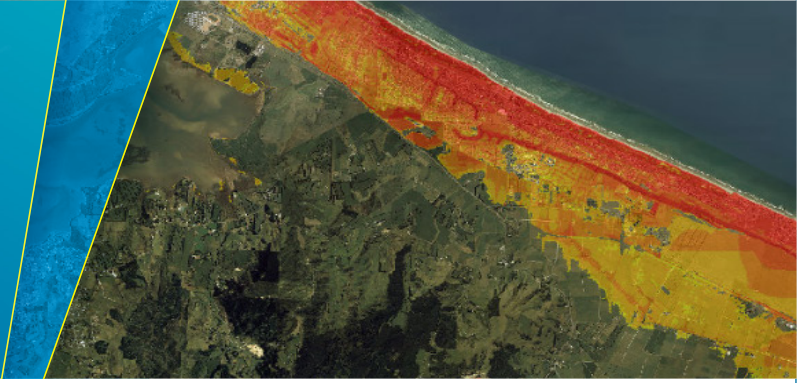
Tauranga City Council's (TCC) dedication to the task and considered judgement in developing a "start to finish" tsunami risk management process - without benefit of established standards or guidelines to refer to - has assured the safety of its coastal population while creating a credible blueprint for others to follow. Tonkin + Taylor (T+T) worked alongside TCC, Emergency Management Bay of Plenty, New Zealand Police and the New Zealand Transport

**Exceptional thinking together**

[www.tonkintaylor.co.nz](http://www.tonkintaylor.co.nz)



# Tsunami Hydrodynamic and Evacuation Modelling, Tauranga Assessment



Agency (NZTA) to drastically reduce the risk to lives. T+T’s modelling also gave TCC a solid foundation for decision-making on continued development of land in eastern Pāpāmoa. A pedestrian-based evacuation network was developed using the existing roading network, walkways, reserves and cycleways to reach safe areas. It was vital that evacuation stations could be reached quickly, on foot, as NZTA modelling revealed vehicular traffic would gridlock the roads within minutes. Footbridges along the evacuation route were designed and built to Importance Level 4. Sixteen safe assembly locations were developed at strategic points. Some use distance to keep residents safe, while Vertical Evacuation Stations employ the raising of land (earth bunds) and are the first of their kind to be constructed outside of Japan and Pacific North-West America. In 2017, this project was officially recognised for excellence when it picked up the [Civil Defence Emergency Management “Director’s Award”](#) for *“exceptional innovation/creativity that has pushed the boundaries of current CDEM practice in NZ”*.

## Key personnel

- Sector Director Natural Hazards Resilience, Water Engineering – Richard Reinen-Hamill
- Dr Tom Shand
- Kevin Ng
- Reuben Hansen
- Nick Russ