

A Single Adjustment of all New Zealand's Geodetic Observations

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SUMMARY

New Zealand's National Geodetic Adjustment enables the calculation of homogenous coordinates in terms of official geometric and vertical datums. Consisting of approximately 1 million observations and 100,000 stations, the adjustment has been built up over a number of years and contains geodetic observations spanning a period of 150 years. Supplementing the Global Navigation Satellite System (GNSS) observations are geodetic triangulation, terrestrial control traverse and precise levelling data.

The adjustment is carried out using the freely-available SNAP (Survey Network Adjustment Package) software, developed by Land Information New Zealand. The SNAP software utilises New Zealand's deformation model to bring contemporary and historic observations to a common reference epoch, accounting for the effects of numerous earthquakes. It also uses the New Zealand Quasigeoid 2016 model to enable precise levelling and GNSS observations to be adjusted together. Time-dependent Helmert transformations are applied where required to account for the differences between global and local reference frames.

Having all observations in a single adjustment has provided a number of insights into the state of New Zealand's geodetic network. For the first time, it has been possible to identify and resolve conflicts among different geodetic surveys in the same area, leading to a significant improvement to coordinate accuracy. This improved accuracy flows into other datasets that utilise geodetic control, such as the digital cadastre.

The national adjustment has also expedited earthquake recovery efforts. As well as providing accurate coordinates (with reliable uncertainties) for comparison with post-earthquake survey results, it enables efficient updating of geodetic coordinates over the affected area once a

deformation model of the earthquake is available.

Overall, the existence of a single national adjustment has produced a step-change in the accuracy and reliability of geodetic coordinates. Datum management in New Zealand is now more efficient and users experience fewer conflicts and problems with geodetic data.

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