Chairman and Chief Executive's Review
continued

The Canterbury earthquakes

The Canterbury earthquake sequence was obviously the most prominent component of our hazards activities during the year. Of particular importance has been the transfer of knowledge to other sectors.

The sequence started with the Darfield earthquake of 4 September 2010, which was followed by the devastating Christchurch earthquakes of 26 December 2010, and 22 February and 13 June 2011, together with thousands of smaller aftershocks that are still in progress. The February event gave rise to the Minister of Civil Defence declaring the first National State of Emergency for a civil defence emergency in New Zealand's history. It was not lifted until the end of April.

Our work was therefore closely integrated with that of the Earthquake Recovery Minister, Ministry of Civil Defence and Emergency Management and the Canterbury Earthquake Recovery Authority (CERA). For each event this commenced with the rapid detection and dissemination of the earthquake data from our GeoNet monitoring system funded by EQC and LINZ, followed by the mapping of surface ruptures, assessing the hazards of further landslides and rockfalls, interpreting GPS and remotely sensed satellite data, estimating tsunami potential, and documenting the societal impacts.

This major effort has been undertaken jointly with our science partners in the Natural Hazards Research Platform that we host, namely the University of Canterbury, The University of Auckland, Massey University, NIWA, and Opus International. Other public organisations have also contributed to this effort, especially Victoria University of Wellington, University of Otago, ESR, BRANZ, Christchurch City Council, Department of Building and Housing, and overseas universities, as well as many private consultants.

Throughout, we provided advice to central and local government in close collaboration with the geotechnical, engineering and construction industries based in Christchurch. While this is our prime duty, to advise government on questions of science, we also provided answers to a huge number of questions from the news media and the public. In this context we wish thank the scientists from the University of Canterbury and Victoria University of Wellington who had the capacity to help us with the task of public communication.

One key and immediate post-event outcome has been providing the Department of Building and Housing with the seismic inputs required to raise the construction standards for Christchurch because of ongoing aftershocks and the possibility of other large earthquakes.

There are currently some 22 new research projects being undertaken in the Canterbury region to support the rebuild of the city and neighbouring areas. The Canterbury earthquakes have also provided new data that are being used to improve our hazard models on a New Zealand-wide basis, and have stimulated new research into liquefaction causes and probabilities. The learning from the Canterbury disaster is influencing hazards considerations not only throughout New Zealand, but also overseas.

As well as providing meaningful help to the people of Christchurch, our staff involved in that response have, by their professionalism, greatly enhanced our reputation and standing among the New Zealand public, the science community, and the construction and insurance industries.

Other science achievements for our user sectors

In addition to this crisis work in Canterbury, other major advances have been improvements to our warning systems for tsunamis and volcanic eruption, and our ongoing work with The University of Auckland on volcanic risk in Auckland. We have also worked with the MetService and the Civil Aviation Authority on volcanic ash advisory services, the importance of which was emphasised by the Icelandic and Chilean eruptions in the past year.

Our hazards work in the Pacific region has been highlighted with Dr Ken Gledhill, our GeoNet project director, being elected Chair of the Pacific Tsunami Warning and Mitigation System group for the next two years. In addition, the Ministry of Foreign Affairs and Trade asked us to lead a project of building awareness of and preparedness for tsunami threats in Samoa, as part of a package for disaster risk reduction in the Pacific.

The New Zealand Petroleum and Minerals branch of the Ministry of Economic Development commissioned us to help make data from many agencies available to the oil exploration industry in order to promote exploration opportunities within New Zealand's extended continental shelf. Our Stable Isotopes Laboratory also completed compound-specific carbon and hydrogen isotope analyses for this project.

Our technology transfer to the geothermal energy industry continues to be of great benefit to that industry and to New Zealand. Our work for Contact Energy as part of the consent process for a 250 megawatt geothermal power station at Tauhara was highly commended by the Board of Inquiry.

$1.8 million
profit - up $0.8 million on 2010

In the environmental arena, we have updated estimates of the total volume of the nation's groundwater resource for Statistics New Zealand as part of its update of the national water-stock accounts. Our Stable Isotopes Laboratory has made major improvements in the analysis of these isotopes in nitrates. We now have a strong understanding of how these isotopes can be used to identify the sources of nitrate in New Zealand freshwater.

Our air particulates team has presented their latest analysis of Auckland air pollution data to Auckland Council, based upon four years of sampling. This type of information enables Auckland Council to engage with industry on questions of pollution on a sound basis. Together with our industry partner Aeroqual Ltd, we are developing a range of low-cost, high-volume gas sensors for environmental monitoring.

We have greatly improved the efficiency of our radiocarbon dating laboratory by automating the critical combustion step for radiocarbon dating. This improvement is complementary to the gains from speed, precision, and smallness of sample size used by the new accelerator mass spectrometer that we installed last year. This is dramatically increasing the number of users of this facility in the geoscience, archaeological, and antiquities sectors.

Our expertise in radiation safety continues to meet the high demand for radiation safety training for a wide range of New Zealand industries. The demand is driven by companies needing renewed and new licences to be able to operate equipment that contains radiation sources.

Discovery science

A major achievement in our underpinning discovery science was our completion of the three-year Hikurangi seismic project to image and model the subduction interface beneath the lower North Island. The project was undertaken in collaboration with Victoria University, the Tokyo Earthquake Research Institute and the University of Southern California, with over 60 personnel coming from these organisations. This has provided unprecedented exploration and imaging of a subduction interface, which is of global significance.

The Alpine Fault drilling project had great success with cores from two drill holes acquired through the fault zone. This multi-institution project is the first stage in a deep-drilling campaign to investigate and monitor earthquake activity on the Alpine Fault and to understand how the fault moves during an earthquake. The project attracted significant media coverage.

Another project with great appeal to the public imagination was our minerals team re-discovering parts of the Pink and White Terraces under Lake Rotomahana. Described over a century ago as "the eighth wonder of the world", they were thought to have been completely destroyed by the 1886 eruption of Mount Tarawera. Their re-discovery, therefore, attracted a large amount of media attention from New Zealand and overseas.

Taskforce recommendations

During the year we worked closely with the relevant government agencies to embrace the recommendations of the CRI Taskforce. The process of developing a Statement of Core Purpose (SCP) was a valuable opportunity to re-examine the relevance of everything we do. However, we were pleased when Cabinet formally approved a document which reconfirmed the fundamental purpose, scope of work, and strategic direction in which GNS Science was already engaged.

As part of this new regime, from 1 July 2011 a large portion of our revenue from existing contracts with Ministry of Science and Innovation was defined as core funding which we will now receive directly from the Crown. We remain fully responsible for defining, planning, and undertaking a portfolio of work within our SCP, for which this funding will provide partial support. We see this as a distinct improvement over the former fully contestable system that tended to reward promises rather than outcomes.

Acknowledgements

We wish to thank John Hercus, who retired from the Board at the end of June 2011, for his contributions to Board deliberations over the past three years. These were always based upon his sound knowledge of both science and governance.

We also wish to welcome Belinda Vernon, who was appointed to the Board from 1 July 2011. She brings to the Board a strong background in finance, environment, and government affairs.

Finally, we wish to thank and congratulate our staff for their personal contributions to what has been the most important year of achievement for GNS Science.

Tom Campbell
Chairman

Dr Alexander Malahoff
Chief Executive