GLOBE

Institute of Geological & Nuclear Sciences Newsletter

14

JULY 2000

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Circulation

Globe is distributed free of charge. Additional copies may be obtained from the Institute of Geological & Nuclear Sciences, PO Box 30-368, Lower Hutt, Wellington, New Zealand.
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Cover photo: Maui B platform, Taranaki.
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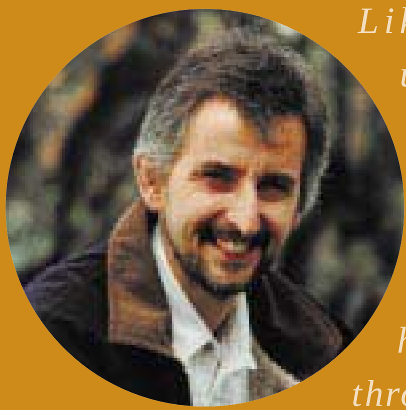
ISSN NO: 1172-8922

From the Chief Executive



Like many other developed nations, New Zealand is increasingly unenthusiastic about using its mineral resources. This is despite the fact that each and every New Zealander relies on minerals-based materials in almost every one of their daily activities, from cleaning their teeth to driving their car, to preparing and eating food. Minerals constitute the foundation and physical fabric of a modern society. They range from humble aggregates for building roads, bridges and commercial buildings through sophisticated industrial materials such as titanium and rare earth elements to fashion materials such as gold, silver and platinum.

As a nation we seem to have adopted an import approach to the whole industry – we'd rather see it located offshore unless the cost of importing minerals such as aggregate becomes unacceptably high. The problem with this philosophy is that we are leaving the mining and development of minerals to nations that may not have the strict environmental standards that New Zealand enforces. This is ironic, as New Zealand is internationally viewed as a world leader in environmental mining standards and practice. While a decision has been made to effectively limit access to minerals in New Zealand, no one is prepared to advocate one of the corollaries of this stance – that we abandon the use of minerals-based materials.

To me this is the reverse of New Zealand's Kyoto position, which is that even though New Zealand contributes relatively little to global climate change it is important that we shoulder the economic and social burden of helping mitigate the change. For the minerals sector, the equivalent is to allow rational access to minerals while maintaining strict standards for low-environmental impact mining and sophisticated rehabilitation. This philosophy does not deny the need to reduce consumption of minerals. It simply accepts that while consumption of new minerals continues, New Zealand must shoulder some of the environmental effects of supplying them.

There are two important social and economic benefits emerging from this thesis. Firstly, some mineral deposits are located in regions of high unemployment. If New Zealand is to stimulate growth in its regions then intelligent use of our natural resources will form the backbone of such growth. It is unlikely that sophisticated genetic engineering or dot-com companies will choose to locate in Hokitika, Wairoa or Dargaville. Forestry, wine and tourism are not the complete answer in each and every area requiring regional growth. The minerals sector has the potential to grow from 12,000 to 20,000 jobs and from $1 billion to $2 billion annual turnover. It has great potential to employ New Zealanders in the provinces.

The minerals sector has the potential to grow from 12,000 to 20,000 jobs and from $1 billion to $2 billion annual turnover

Secondly, simply knowing that we have valuable mineral reserves – without even using them – provides New Zealand with a strong base of net tangible asset backing that may help reduce interest rates. For example, GNS estimates that New Zealand has at least NZ$86 billion worth of metal resources in known and undiscovered deposits. Moreover, many of our minerals are valuable, niche materials such as zeolite, perlite and diatomite. They will earn valuable export revenue and some can be used as the base for developing knowledge-intensive firms producing new materials such as ceramics.

Consequently, the minerals industry has a lot to offer New Zealanders. Local, regional and central government should help unlock its potential social and economic contribution.

Dr Andrew West, Chief Executive
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New Zealand metallic mineral resources valued at $86 billion

*Given the right legislative, economic, and investment climate, New Zealand could double its annual production of minerals from NZ$1 billion to NZ$2 billion a year – according to a recent GNS report. **The Mineral Potential of New Zealand** shows that known plus estimated undiscovered metallic mineral deposits in New Zealand have an estimated value of $86 billion. If developed, these deposits could produce minerals valued at $2.2 billion annually.*

The estimated deposits cannot be transformed into potentially productive resources without a significant investment in exploration. The report concludes that New Zealand's non-metallic resources, including coal, phosphate, silica, aggregate, limestone, clay, dolomite and bentonite can readily support increased and new production for export. There is also potential for increased production of metallic deposits such as gold, silver, iron, vanadium, titanium, and platinum.

In the longer term, production of copper, zinc, lead, antimony, and tungsten could add to the mix. The value estimate of $86 billion is intentionally conservative.

GNS is also gathering intelligence on the occurrence and distribution of mineral resources on the seafloor within and beyond New Zealand's Exclusive Economic Zone. This research is an integral part of New Zealand's bid under the United Nations Convention on the Law of the Sea.

The Mineral Potential of New Zealand is available from GNS for $45. Please phone Janice Wright on +64 4 570 4866.

More information on New Zealand's minerals can be seen at:
www.minerals.co.nz
www.waihigold.co.nz
www.med.govt.nz/crown_minerals

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Minerals research

New insights into old mines

Reefton, on the West Coast of the South Island, was once a major centre of quartz-lode gold mining, with more than 2 million ounces of gold extracted from 84 mines.

Mining of the Reefton Goldfield began in the nineteenth century gold rush but stopped in 1951. GNS geologists are now identifying new exploration targets, giving new hope to the mining industry – and the West Coast economy.

The Reefton deposits have considerable potential, but are difficult to explore because the quartz lodes "pinch and swell" along major fault structures. Understanding the overall structure of the deposits is therefore fundamental to locating the quartz lodes.

Exciting new results emerged when data on structure and lode width were analysed, along with gold grades from historical mine plans, in a Geographic Information System (GIS). The geometry of the Birthday Reef and other lodes in the Reefton Goldfield appears to be strongly controlled by the pattern of folding in the host sedimentary rocks, with lodes forming in areas where folding is tight. The study of GNS geologists Simon Cox and Mark Rattenbury will help to identify new exploration targets close to the once busy Blackwater Mine.

In a parallel project, GNS geologists Tony Christie and Bob Brathwaite examined the rocks surrounding the quartz lodes to identify alteration features resulting from the passage of ore-forming fluids through the veins. They found the geochemical and mineralogical changes extended for tens of metres from some lodes, providing a bigger target for locating new lodes.

GNS collaborated with the US Geological Survey and Dalhousie University in Canada to date the mineralisation age of the Reefton deposit. GNS is also collaborating with universities in Australia and the Nova Scotia Department of Natural Resources to compare the Reefton deposits with similar deposits in Victoria, Australia and Nova Scotia, Canada. The three-region comparison is providing a better understanding of the characteristics, geometry and formation of these deposits – and will help exploration of turbidite-hosted mesothermal gold deposits not only in New Zealand, but in many parts of the world.

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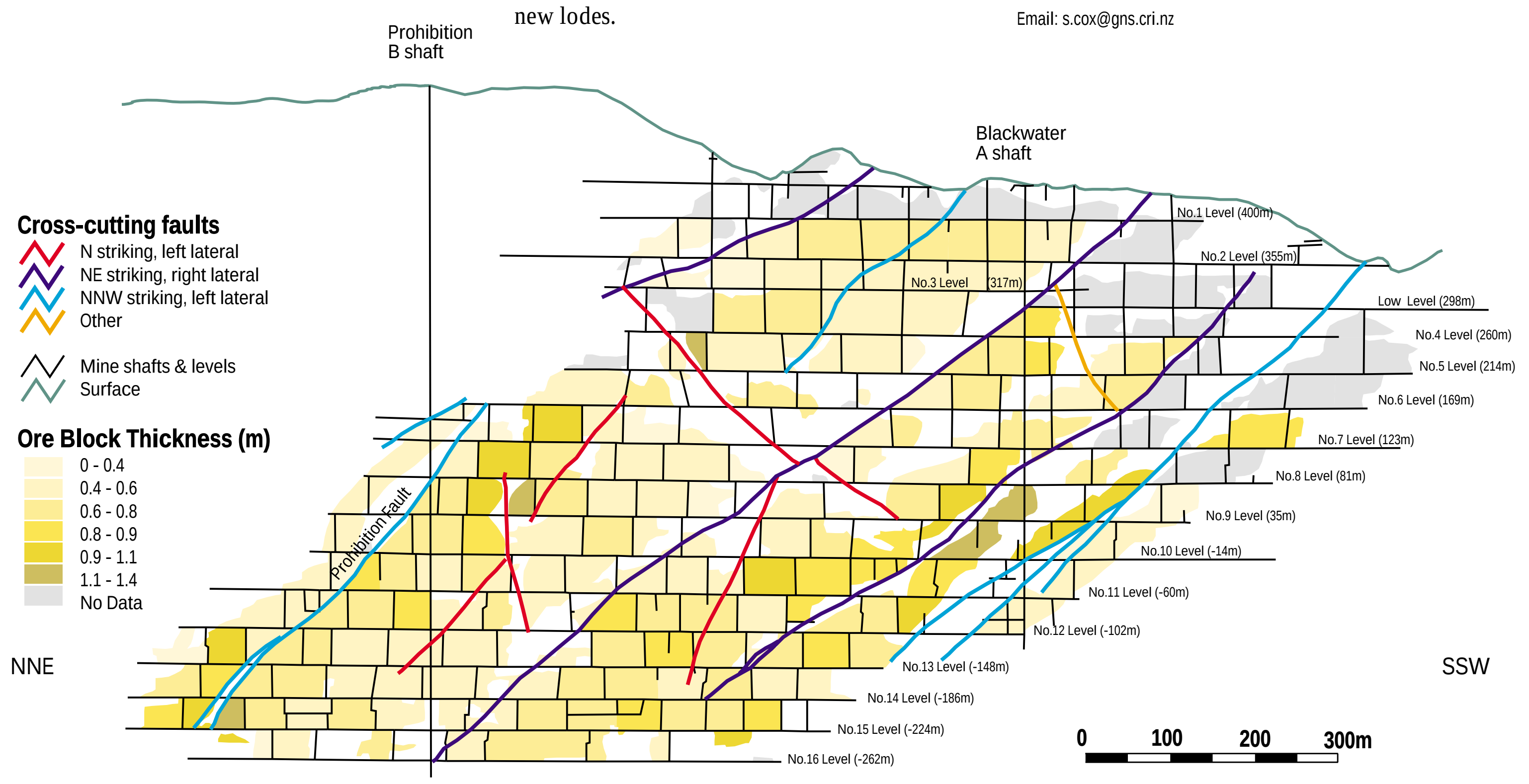
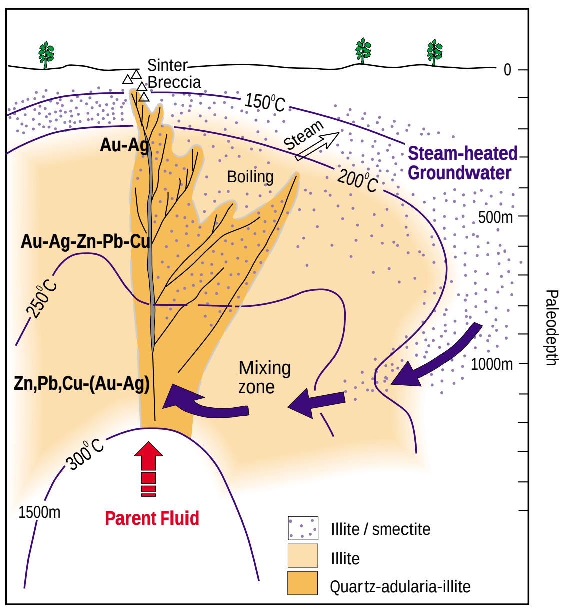
Blackwater Mine long-section

Vertical slice through the Blackwater Mine with ore blocks and faults coloured according to their width and orientation. From Arc-Info GIS developed by GNS.



More knowledge on the Waihi gold-silver deposit

The Waihi deposit, in the southern Coromandel, is a giant in its class, with total production of more than 7.48 million ounces of gold and 33.74 million ounces of silver. Production continues from Waihi Gold Company's open pit mine at Martha Hill. GNS research into the key factors responsible for the formation of epithermal gold-silver deposits will improve the effectiveness of future mineral exploration.



Temperature of the Waihi epithermal system, showing zone of metal deposition and mineral alteration with temperature and depth.

The gold-silver-quartz veins at Waihi were deposited from hot fluids in a geothermal system associated with active volcanism seven million years ago. There are similar volcanic-hosted gold-silver deposits elsewhere in the Coromandel region, and overseas, though the Waihi economic gold-silver ore deposit has a vertical extent of 600m compared to 200–300m in typical epithermal deposits.

By microscope observation of tiny inclusions of fluid trapped in vein quartz, GNS scientists are able to determine the temperature and salinity of the mineralising fluid. GNS geologist Bob Brathwaite has measured the trapping temperature of about 500 fluid inclusions in samples collected from drill holes and mine workings. These measurements indicate the presence of a deep 300°C parent fluid of moderate salinity that deposited economic concentrations of gold as the fluid boiled and cooled from 250 to 180°C in rising toward the surface.

The deep parent fluid is diluted when it mixes with a lower salinity heated groundwater. This increases the depth range over which economic grade ore can be deposited within the 250-180°C window of gold deposition. A similar model can be applied to exploration for other epithermal deposits with large depth extents of economic ore in New Zealand and overseas.

GNS geologists are also studying ore controls at gold deposits at Wharekirauponga and Thames, also in the Coromandel region, as part of GNS' research on improving the effectiveness of mineral exploration.

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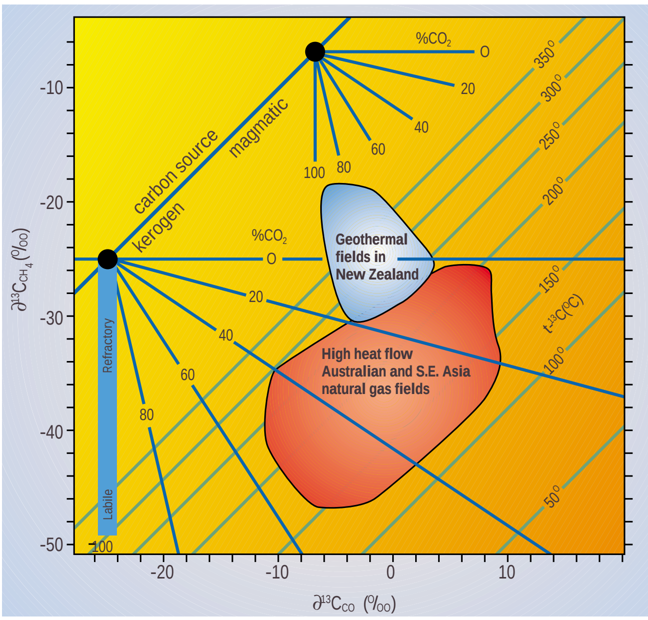
Oil & Gas

Predicting CO_2 in high temperature natural gas fields

A GNS-developed thermal modelling technique that predicts the carbon dioxide (CO_2) content of high heat-flow basins is proving particularly useful for natural gas (CH_4) exploration in South East Asia. Until now, understanding the distribution of CO_2 in natural gas fields has been one of those hard-to-solve problems. The ability to predict the CO_2 content of a reservoir before a decision is made to drill at a particular site lowers risk and leads to potential savings for the exploration company.

The new thermal technique stems from GNS' strength in geothermal gas chemistry and, in particular, from work by the late Dr Werner Giggenbach. GNS scientists have developed the technique – combining basin modelling with gas geochemistry and an understanding of the water-rock interaction within natural gas reservoirs – specifically to solve problems in the gas exploration industry.



Isotopic compositional pathways for carbon-gas sources and varying fractions of carbon dioxide. This graphic presents the fractionation of ∂¹³C between CH_4 and CO_2 for several fields assuming equilibrium reservoir conditions.

The pressure/temperature conditions of the reservoir and the mineralogy of reservoir rocks control the relative proportions of CO_2 and CH_4. This technique for predicting CO_2 content is most applicable to high temperature sedimentary basins such as those in South East Asia. GNS scientists have successfully applied it to a number of basins in the region.

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New era in modelling

The exploration industry is showing strong interest in David Darby's fluid modelling study of the East Coast Basin. David is using Petromod™ basin modelling software to analyse fluid migration in all of New Zealand's main sedimentary basins, releasing his findings to the exploration industry as he completes each study.

Fluid modeller David Darby uses Petromod™ software to help predict which areas in New Zealand's sedimentary basins are likely to be oil- or gas-charged.

David has considerable experience in modelling structurally complex regions in many parts of the world, with specialist skills in overpressure analysis. Overpressure, common in New Zealand basins, develops in rapidly deposited sediments that are sealed by impermeable layers, preventing the escape of fluids. Drilling into overpressured layers can cause dangerous and costly blow-outs. By using sophisticated computer modelling techniques to synthesise seismic and drillhole data with GNS' extensive geochemical data, David has been able to rank regions of the East Coast according to risk.

Although the East Coast has a world-class source rock in Waipawa Black Shale, and excellent reservoir rocks, they are separated by low-permeability shales that form significant migration barriers. David has modelled the conditions under which the shales fracture or open up to allow migration of hydrocarbons into reservoir rocks. He has simulated the controls on oil and gas migration, which will help predict which areas of the basin are likely to be oil- or gas-charged, and which are likely to be dry. He has also made an in-depth study of the occurrence, distribution and origin of overpressure systems in the East Coast and Taranaki basins. This helps exploration companies select equipment and engineer their wells to minimise the hazards of overpressure.

Petromod™, regarded as the world's number one basin modelling software, is used by more than 100 exploration companies worldwide. GNS is the only player in the New Zealand scene using Petromod™. It will help significantly in understanding the factors influencing fluid and gas migration and the distribution of dry and successful wells and is expected to change the way the exploration industry views New Zealand's sedimentary basins.

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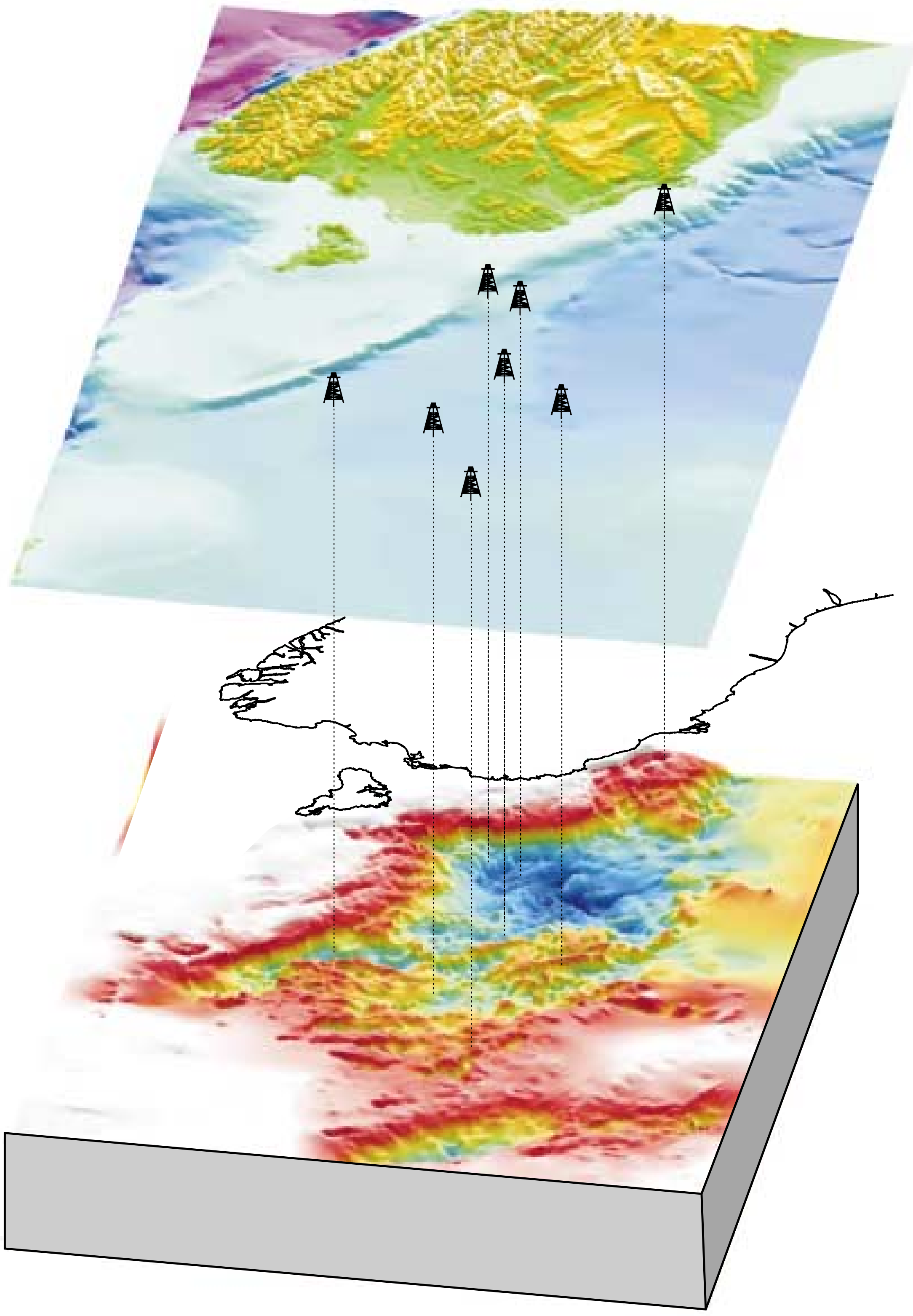
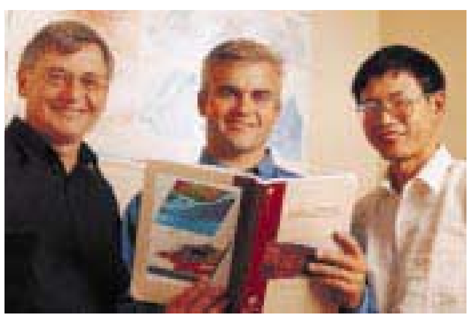


Location of the eight exploration wells drilled in the Great South Basin during the 1970s and 1980s. Four of these wells produced shows of gas condensate.

Great South Basin revealed in new publication

The final monograph in the 25-year Cretaceous-Cenozoic Project is a comprehensive study of the geology and oil and gas prospectivity of the Great South Basin, southeast of New Zealand.

Though some of the information has been released independently during the past 10 years, the publication – *Cretaceous-Cenozoic geology and petroleum systems of the Great South Basin* – marks the first time all the information has been presented in a single bound volume. The Great South Basin (GSB) contains many large untested geological structures, some potentially larger than Taranaki's Maui natural gas field, that have all the right components for oil and gas. There are currently no exploration permits in the GSB – an area that geologists describe as moderately high risk with the potential for high returns.



The GSB covers 100,000km^2, or about 66 percent of the area of the South Island. It extends from offshore Otago to sub-Antarctic waters 300km south of Stewart Island. Water depth in the GSB ranges from 100m to 1250m, with an average depth of about 700m. Even the deepest parts of the basin are well within the capabilities of today's drilling and production technology. Four of the eight exploration wells drilled in the basin since the 1970s have produced sub-commercial quantities of gas condensate, providing ample evidence that the GSB contains significant volumes of liquid and gaseous hydrocarbons. Oil seeps on Stewart Island provide on-land evidence of the basin's worth.

Cretaceous-Cenozoic geology and petroleum systems of the Great South Basin will be an invaluable reference for exploration companies in coming decades. Lead author and petroleum geologist Richard Cook says contributors have drawn on a variety of sources including petroleum exploration company records, many unpublished studies, and GNS' own extensive research and interpretation.

The publication extends the understanding of the oil and gas prospectivity through improved interpretation of offshore seismic reflection survey data, which provides images of rock formations up to 8km below the seabed. Using source rock geochemistry and subsurface mapping, GNS scientists have produced computer models showing where oil and gas is likely to have accumulated.

Lead authors of the Great South Basin monograph Richard Cook (left), Rupert Sutherland, and Hai Zhu.

Cretaceous-Cenozoic geology and petroleum systems of the Great South Basin is GNS' eighth publication on New Zealand's main sedimentary basins. Earlier publications cover Northland, Taranaki, East Coast North Island, West Coast South Island, Canterbury, Western Southland, and the Chatham Rise. The Taranaki publication has so far helped oil exploration companies find and successfully extract billions of dollars worth of oil and gas.

The Great South Basin publication is available from GNS for $120. Please phone Janice Wright on +64 4 570 4866.

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Cretaceous-Cenozoic Project

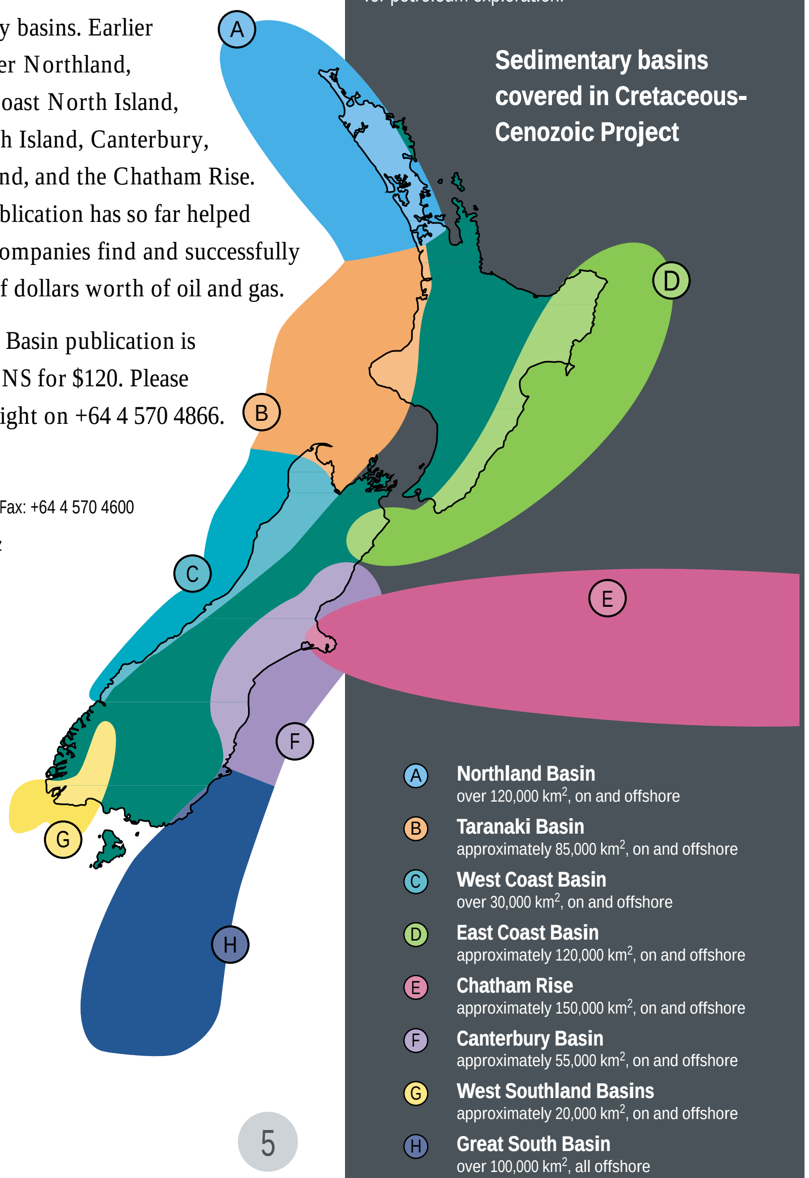
The publication of the Great South Basin monograph marks the completion of a long-term project, largely funded by the Foundation for Research, Science & Technology, to understand the sedimentary basins in the New Zealand region. The project had its beginnings during the "oil crisis" of the 1970s when high priority was given to developing New Zealand's energy resources to reduce dependence on imported oil.

Dr Pat Suggate, then director of the New Zealand Geological Survey (a predecessor of GNS), recognised that knowledge of New Zealand's sedimentary basins was essential for serious oil and gas exploration. He started a long-term programme, known as the Cretaceous-Cenozoic Project, to study rocks deposited during the last 120 million years. These deposits contain all New Zealand's known coal and petroleum deposits, as well as many non-metallic deposits.

In the 1970s knowledge of New Zealand's sedimentary basins was sparce. Overseas oil exploration companies had undertaken some seismic surveys, but much of their data was difficult to access. Scientists subsequently discovered there were major deficiencies in the processing and interpretation of these data. The Cretaceous-Cenozoic Project involved complete reinterpretation of a huge amount of seismic data resulting in an extensive knowledge of the sediments underlying New Zealand's continental shelf.

The project has played a major role in changing the way scientists think about the geology and evolution of New Zealand. But perhaps an even bigger contribution is the impact it has had on increasing our knowledge of source and reservoir rocks. It has involved the synthesis of industry seismic data, published maps and scientific papers, unpublished technical files, oil company drilling reports, university theses, and a number of specialist projects. As envisaged at the outset, the resultant database provides comprehensive knowledge of the sedimentary basins around New Zealand, and acts as a springboard for petroleum exploration.

Sedimentary basins covered in Cretaceous-Cenozoic Project



Understanding Antarctica

Fresh prospects for understanding Antarctic ice sheet behaviour

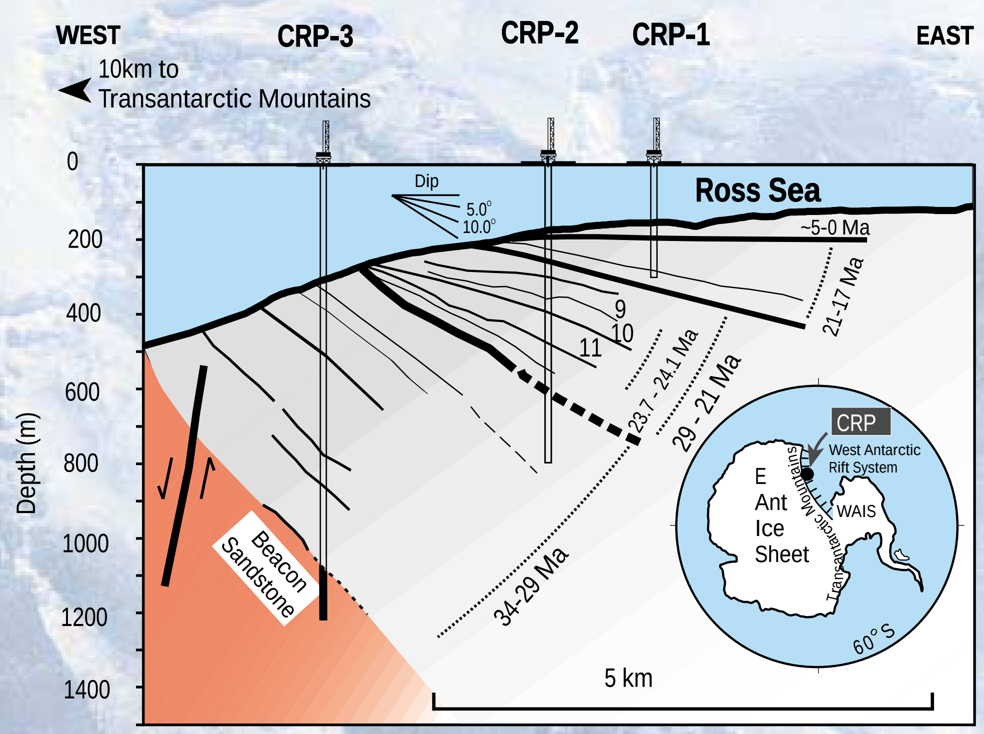
Scientists analysing sediment cores from under the western Ross Sea in Antarctica may have found compelling new evidence that the East Antarctic ice sheet has expanded and contracted many times from 34 to 17 million years ago. The cores were recovered in three seasons of drilling (1997-1999) by the multinational Cape Roberts Project (CRP).

It was already known that variations in Earth's orbit influenced the advance and retreat of the huge continental ice sheets that formed in the Northern Hemisphere during the ice ages over the past two and a half million years. In contrast, the ice sheet that has covered Antarctica for more than 15 million years has been considered to be more stable because of its size, its insulation by the Southern Ocean, and its extremely low temperature.

Drill cores from the Antarctic margin, however, indicate that prior to 15 million years ago, when planetary temperatures were 4 to 5°C warmer, the ice sheet was more dynamic, with large and possibly frequent variations in area and volume. The timing and scale of these oscillations, and their effect on the environment and climate has until now been poorly known. Analysis of Cape Roberts Project cores by GNS and Victoria University researchers will dramatically improve our knowledge of the nature and timing of these globally significant changes.

The Cape Roberts cores, representing 1500m of Cenozoic strata, provide the most detailed record of ice fluctuations for the Antarctic margin from this warmer period. Cape Roberts National Science Coordinator, Fred Davey, acknowledges that the real importance of these cores lies in the ages determined from radiometric dating, which are an order of magnitude better (± 0.05 million years in places) than for any other Antarctic offshore sequence. Preliminary analysis of cyclicity within the sediments indicates that these strata document major fluctuations in ice volume at the margin of the Antarctic ice sheet. It is estimated that such fluctuations could have driven global sea-level changes of up to 50m.

Location of the Cape Roberts drill holes and their relation to stratal geometry from seismic surveys. Numbers 9,10 and 11 identify the three sequences proposed for detailed study. (From Cape Roberts science team.)



GNS investigators Tim Naish and Stuart Henrys are working in close collaboration with Cape Roberts Project Chief Scientist Peter Barrett, of Victoria University. They propose to undertake more in-depth research into the best-dated set of ice advance-and-retreat cycles from the Cape Roberts drill core. The study is designed to quantify the frequency and magnitude of environmental changes recorded by the sediment cores. This work should identify the role of external climate forcing on past Antarctic ice sheet dynamics.

The behaviour of the Antarctic ice sheets is of wide interest because CO_2 emissions from human activity are expected to force a continuing rise in the Earth's surface temperature. Climate models project a significant planetary warming for the next 200 years with the temperature increases doubled in the polar regions. Such a temperature increase could lead to a move from the present relatively stable state of the Antarctic ice sheet to a more variable or dynamic state, resulting in large and rapid changes in climate and sea level, like those recorded in the Cape Roberts cores.

A more comprehensive version of this article can be seen at: www.gns.cri.nz/earthhist/antarctica/crp.html

More information on the Cape Roberts Project can be seen at: www.geo.vuw.ac.nz/croberts/

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New insights into Antarctic quake activity

Earthquake activity in Antarctica is not well understood, mainly because of the lack of instruments in the continent, and because seismometers in other parts of the world are too distant to accurately record Antarctic earthquakes. Recent work by GNS, however, shows that Antarctic earthquakes are more frequent than previously thought.

In collaboration with Australian National University, GNS geophysicist Stephen Bannister placed 10 solar-powered seismometers at intervals of 25 to 30km through the 3500km-long Transantarctic Mountain range. During the three months they were operating, the instruments picked up more than 50 local earthquakes of magnitude 2 to 4 – none of which were recorded outside of Antarctica. Dr Bannister says a few of the "earthquakes" were actually glaciers moving, or calving off icebergs at the Ross Sea – the rest, however, were signs of tectonic activity in the Transantarctic Mountains and along their eastern margin.

Solar-powered seismometers in the Transantarctic Mountains have provided proof that Antarctic earthquakes are more frequent than previously thought.

The distribution of some of the earthquakes may indicate a previously unknown fault in the Transantarctic Mountains. "The data collected during the summer of 1999/2000 provides the first accurate measure that earthquakes are occurring regularly in Antarctica. It will also provide the first ever three dimensional information on the crust beneath the central Transantarctic Mountains," said Dr Bannister.

The instruments also picked up 50 large distant earthquakes from locations such as the South Indian Ocean, Chile, Papua New Guinea, Indonesia, and Peru. Analysis of the seismic wavefields from the distant earthquakes will reveal the spatial and depth variation of lower crustal structure beneath the Transantarctic Mountains, to a depth of around 60km.

The new data, which will take months to fully analyse, will help geologists to understand the present-day processes occurring in Antarctica. Determining the deep structures of the mountain chain will help scientists understand why the mountains have been uplifted by more than 4km over the last 50 million years.

"Understanding how the Transantarctic Mountains have evolved is fundamental to understanding how earth processes work," Dr Bannister said.

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Frigid facts:

- The Antarctic ice sheet covers 13.72 million square kilometres and contains 90 percent of the world's ice and 70 percent of the world's fresh water.
- Antarctica is able to keep its cool because the permanent ice cover reflects about 80 percent of incoming sunshine. Oceans, because of their dark colour, absorb more than 90 percent of solar radiation.

Marine Volcanism

GNS scientists get front-row seat for fiery display

Two GNS scientists were part of an international team who recently witnessed the dramatic birth of a new volcanic island near the Solomon Islands. The rare observation was made during an investigation of seafloor volcanic activity and associated mineral formation in the Bismark, Solomon and Coral Seas north of Australia.

Marine geochemist Gary Massoth and geologist Cornel de Ronde, both of GNS, were invited to participate in the Australian-funded investigation because of their expertise in finding and analysing submarine hydrothermal plumes associated with active seafloor vents.

The pair were among nine scientists from around the world on the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) ship Franklin as it approached the underwater Kavachi Volcano, 30km south west of the New Georgia Group of islands in the Solomon Islands. This was a rare opportunity to study shallow marine eruptive activity.

Kavachi, which has been sporadically active in recent years, was spewing ash and erupting lava bombs up to 70m above the sea surface, with sulphurous steam clouds mushrooming up to 500m. During their 20-hour stay, the scientists witnessed eruptions as often as every two minutes, with each eruption lasting up to 30 seconds.

A roughly conical feature rising from a seafloor depth of 800m, Kavachi is a basaltic volcano about four kilometres in diameter at its base. During quiescent periods, scientists could see a swell breaking over the volcano's peak – suggesting the top of the volcano was less than two metres below sea level. Several times in recent decades a small island has formed at Kavachi, only to be eroded by wave action.

The ship initially kept 750m from the eruption centre, although once it was established that it would not be hit by lava bombs or sunk by large gas bubbles rising from the flanks, the team came within 400m to make a photographic record.

At a distance of 750m and roughly following the 500m isobath, the two GNS scientists used specialist equipment to sample the water column around the erupting volcano.

The many plumes they recorded were packed with extremely fine volcanic glass shards, similar to obsidian.

This led the scientists to believe that the upper flanks of the volcano were being violently shaken during the eruptions causing volcanic detritus to be expelled into the surrounding sea water. Glass shards were also found in plumes 5km from the volcano. Grain size of the shards became smaller further away from the summit of the volcano.

In contrast to the submarine volcanoes in the Kermadec Arc northeast of New Zealand, the GNS scientists detected no noticeable hydrothermal plumes at Kavachi. The submarine volcanoes in the Kermadec Arc pump large volumes of heat and elements such as iron and manganese into the sea.

The contribution that seafloor hydrothermal activity has on global ocean chemistry and the marine food chain was only recognised late last century, and is more significant than scientists initially believed. Between New Zealand and Tonga it is estimated there may be up to 50 active submarine volcanoes with associated hydrothermal vents and mineral deposits. The role these volcanoes play in influencing the chemistry of the Pacific Ocean is unknown, but thought to be considerable.

About 80 percent of the world's volcanism occurs under water, but only a small proportion of submarine volcanoes have been systematically surveyed with scientific equipment. Scientists estimate that many of the thousands of submarine volcanoes in the Pacific Ocean are volcanically and hydrothermally active. Fewer than 0.1 percent have been surveyed for signs of hydrothermal activity.

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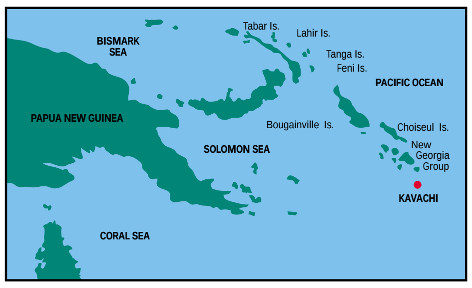
On 14 May Kavachi volcano was erupting with such force that scientists on the Franklin could feel the percussion blasts at a distance of 750m.

From left to right: Initial eruption dominated by lava bombs and ash being spewed up to 70m. This is followed by sulphurous steam plumes. In 3 & 4, a fresh eruption emerges from the steam plume.

More images of the Kavachi eruption can be seen at: http://www.syd.dem.csiro.au/research/hydrothermal/kavachi



Natural Hazards Management Conference

When: 16-17 August 2000

Where: War Memorial Conference Centre, Napier, New Zealand

Who: Emergency managers, utility managers, researchers, and those involved in mitigating natural hazards

What: Organised jointly by GNS, Hawke's Bay Regional Council, and the Ministry for Emergency Management, the conference is the fourth in a series started in 1994. The main themes are:

- overcoming the difficulties of compiling, assessing, interpreting and applying hazard information
- applying hazard information to solve planning, development, and construction problems, as well as emergency preparedness and response.

The conference includes a one-day field trip (August 18) to see successful hazard mitigation strategies in action.

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Preparing for a volcanic crisis in New Zealand

When: 16-17 October 2000 (Field trip 18 October)

Where: Wairakei Research Centre, State Highway 1, Taupo, New Zealand

Who: People involved in all aspects of natural hazards management, including planners, engineers, local and central government administrators, insurance managers, civil defence officers, and emergency managers

What: GNS and Massey University have developed this two-day course to explore the relationship between physical, social, and economic aspects of natural hazards and their management

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News update

Straight-A student wins earth science scholarship

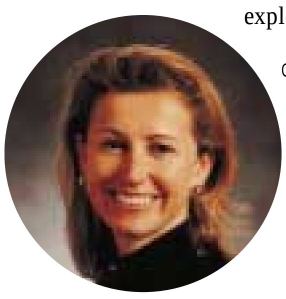
Straight-A geology student Alexandra Johansen, who has a special interest in the oil and gas potential of the North Island's East Coast, has won the Sarah Beanland Memorial Scholarship. The scholarship is valued at $20,000 a year while Ms Johansen works on her PhD. It is awarded annually to a top earth science graduate who, in the view of the judges, is likely to make a significant contribution to earth sciences in New Zealand.

The scholarship is funded by GNS and named after Sarah Beanland who died in a tramping accident in 1996. Dr Beanland, an earthquake geologist with GNS, contributed to internationally significant research on the deformation of New Zealand due to tectonic forces. She received many awards during her career and was widely regarded as a role model.

Ms Johansen gained a first class honours degree in geology at Victoria University in 1999. Her PhD thesis will focus on the hydrocarbon reservoir potential of sandstones and limestones which outcrop on land between the East Cape and Marlborough. The rocks were deposited between 10 and 20 million years ago and the potential for them to store commercial quantities of hydrocarbons is, as yet, only partly understood.

Ms Johansen's research will dovetail into GNS' work on the East Coast, and it is likely to be of strong interest to the oil exploration industry, particularly in light of the recent gas discovery near Wairoa. The East Coast Basin is regarded as the most geologically complex of all of New Zealand's sedimentary basins.

Once she has gained her PhD, Ms Johansen plans to continue working with the petroleum industry – either as a scientist carrying out applied research, or as an employee of an oil exploration company.



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Medal for geophysicist

Geophysicist George Risk recently won a New Zealand Science and Technology bronze medal for pioneering the use of electrical resistivity methods in geothermal and groundwater exploration. The medal also recognised George's energetic support for science in New Zealand.

Building on earlier research that found low resistivity values associated with geothermal fields, he developed new techniques for more detailed mapping of the subsurface extent of geothermal systems. His techniques are now regarded as essential in geothermal developments worldwide, and are being used to improve the understanding of volcanic areas by defining sub-surface structures.

George also applied resistivity prospecting techniques to glacialogical studies in Antarctica, the search for mineralised quartz veins in Otago, and conducted the first systematic resistivity studies of the groundwater systems in Hawke's Bay and Canterbury. This led to research on coastal aquifers in the Pacific islands which found, overlying the ubiquitous intrusions of sea water, freshwater aquifers that are valuable as drinking water supplies for Pacific communities.

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Medal for petroleum geologist

Petroleum geologist Peter King was recently awarded a New Zealand Science and Technology bronze medal for his landmark work on the geological and tectonic development of the Taranaki region over the past 80 million years. One of New Zealand's leading specialists in Taranaki Basin geology, he is the principal author of two monographs and a series of papers on this region. His work, regarded as highly original and of exceptional quality, has been used extensively in the search for oil and gas in Taranaki.

In 1998 Peter was awarded a comparatively rare DSc degree from Waikato University for his work in understanding the complex geology of the Taranaki Basin. He has been influential in integrating petroleum industry data with government-funded research and has been prominent in giving presentations at petroleum industry conferences and forums. At the 2000 New Zealand Petroleum Conference in Christchurch, Peter was awarded the prize for best paper content. He is currently using his broad range of skills, gained in part from his previous position as a production geologist in the Middle East, on a wide variety of fundamental and industry-applied research projects in Taranaki Basin and elsewhere.

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Keeping our electricity connected

GNS has been checking underground cable and soil temperatures for electricity distribution companies at a number of North Island centres. Where soil temperatures adjacent to the cable are found to be higher than recommended, the power company is able to take remedial action by reducing the loading in the cable, or by more stringent monitoring of the cable temperature.

The growing demand for air conditioned office space in cities has increased summer peak electricity usage, putting pressure on some underground cables. During summer the soil is drier and less efficient at conducting heat away from the cables. Cable overheating can trigger outages and blackouts such as occurred in Auckland City in 1998. GNS has recorded soil temperatures of more than 40°C at some sites – more than 15°C above the original rated working temperature of cables. As part of the service, GNS performs laboratory analysis on soil samples to test heat conductivity of the soil at various moisture levels from dry to saturated. The resultant conductivity profile gives the power company valuable information on the performance of the soil in all conditions. GNS' expertise comes from measuring underground heat flows in geothermal areas.

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New release...

With support from the Earthquake Commission (EQC), GNS has developed a new national seismic hazard model of New Zealand that will have a significant impact on engineering, design and construction. Replacing a model developed in the 1980s, the new version has a range of sophisticated and versatile products including:

- response spectra for any location in New Zealand for a range of return periods
- hazard curves for any location in New Zealand for a range of spectral periods
- maps of response spectrum values for three classes of site condition for a range of spectral and return periods.

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Coming up...

Groundwater Economics

A three-day course examining the total economic value of New Zealand's natural water supplies. The course will explore and evaluate groundwater management decisions and their impact on local and regional economies.

WHERE: Wairakei Research Centre, State Highway 1, Taupo, New Zealand

WHEN: 4 – 7 September, 2000

For more information contact:
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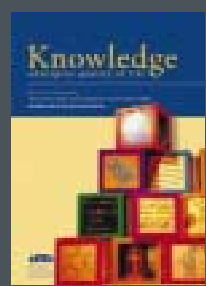
Publications...



The Association of Crown Research Institutes' (ACRI) recent publication *Knowledge Underpins Quality of Life* is available in pdf format at: www.gns.cri.nz/news/release/acri.pdf or can be obtained by phoning ACRI at 04 472 9979.

GNS geophysicist Tony Hurst measures soil temperature next to a high-voltage, gas-filled cable.