Land Information New Zealand

New Zealand Continental Shelf REPORT

Newsletter 8 April 2006

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Winding on the seismic cable aboard *RV Tangaroa*

Explanation Of Terms

- **Bathymetry:** the measurement of the land under the sea, done by measuring from the water surface down to the seabed
- **Seismic survey:** a survey which uses sound waves to scan below the seabed
- **UNCLOS:** United Nations Convention on the Law of the Sea
- **CLCS:** (UN) Commission on the Limits of the Continental Shelf
- **Article 76:** the criteria the United Nations sets for States to define the outer limits of their continental shelf

TIMELINE

1996	1997	1998	1999	1999	1999	2000	2000
NZ ratifies UN Convention on the Law of the Sea (UNCLOS)	Responsibility for NZ's Continental Shelf Project transfers to LINZ	Desktop Study completed and reviewed by independent experts	Government approves $44 million budget for data collection	LINZ project team established	*RV Tangaroa* carries out successful survey of Colville Ridge area	*RV L'Atalante* carries out successful survey of Resolution Ridge area	*RV Tangaroa* carries out successful survey of Southern and Western Regions

Introduction

New Zealand lodged its seabed boundary with the United Nations Commission on the Limits of the Continental Shelf (UNCLCS) on 19 April 2006, marking the culmination of a decade's work and scientific research.

The presentation of the Submission Report to the United Nations Commission in New York is the result of a $44 million cross-government project, led by Land Information New Zealand (LINZ) and the Ministry of Foreign Affairs and Trade (MFAT), and involving the Ministry of Economic Development (MED), National Institute of Water and Atmospheric Research (NIWA) and GNS Science (formerly the Institute of Geological and Nuclear Sciences).

LINZ was the lead agency for the technical aspects of the project and had responsibility for the survey programme, and the collection, processing, analysis and interpretation of data. MFAT has led the international boundary negotiations and will present New Zealand's submission to the United Nations, as well as attend future meetings of the UNCLCS. MED's Crown Minerals Division was contracted for the long-term management and storage of the New Zealand Continental Shelf Project-related data. NIWA and GNS Science supplied scientific expertise.

The Crown already receives more than $100 million per annum in royalties and energy levies relating to the seabed resources within the Exclusive Economic Zone. The project will enable New Zealand to exercise its rights over the Continental Shelf, allowing greater control and sustainable management of exploration and extraction activities on the seabed. We also stand to benefit scientifically from a greater understanding of such issues as climate change.

Brendan Boyle, Chief Executive of LINZ

I would like to congratulate the Continental Shelf Project Team on their efforts, and extend my appreciation to all those involved in this very significant project which will have substantial economic and scientific benefits for our country.

Brendan Boyle
Chief Executive

Deckhands aboard *RV Tangaroa* attaching streamer birds

Project Update

Since the last edition of this report in September 2004, the Continental Shelf Project Team has worked on the data analysis that formed the basis of New Zealand's submission to the UNCLCS.

GNS Science and NIWA completed their interpretation of gigabytes of data collected for the project. The Project Team worked hard to complete the reports which were collated together in four geographic regions.

Progress in this final phase of the project has included:

- Preparing, writing and printing the Submission Report and delivering it to the New Zealand Mission in New York (see page 4).
- Publishing the Executive Summary, the only publicly available document of New Zealand's submission.

2000	2000	2001-2002	2002	2002	2002	2004	2004	2006
Tenders called for deep seismic survey work	Extra desktop study of Ross Dependency and areas aligned with Australia	*MV Geco-Resolution* carries out successful deep seismic survey	Processing of data, analysis and interpretation	*RV Melville* carries out successful multi-beam surveys of Bollons Seamount and Wishbone Spur in March 2002	*RV Tangaroa* carries out successful Eastern Region survey in May 2002	Common boundary negotiations with Australia completed	Australia to submit its case	New Zealand to submit its case (MFAT to present)

Major Milestones

The New Zealand Continental Shelf Project (NZCSP) began in 1996 and was initially the responsibility of the then Ministry of Commerce, with Land Information New Zealand (LINZ) taking over in July 1997. Three phases were originally identified for the project, with a fourth added later.

The first phase – called the "Desktop Study" – took two years and involved an assessment of the existing data and its usefulness in supporting New Zealand's submission to the United Nations Commission on the Limits of the Continental Shelf (UNCLCS). The Desktop Study strategy was picked up by the Division for Ocean Affairs and the Law of the Sea (DOALOS) and is recommended as a starting point for other countries contemplating their continental shelf project.

Next was the strategic phase, which began in 1999. A peer review panel independently assessed the recommendations in the Desktop Study and the survey requirements were prioritised. Funding for the NZCSP was also secured at this point.

The third phase of the project was the assessment of industry capability, tendering of contracts, and the active gathering and processing of the additional survey data.

A fourth phase was introduced to consider the analysis and interpretation of the data collected. The fourth phase also included writing, collating and printing the final Submission Report to send to the UNCLCS.

Members of the Continental Shelf Project team with the submission report L-R: Russell Turner (LINZ), Vaughan Stagpoole (GNS Science), Kelly Lafoga (LINZ), Elana Geddis (MFAT), Ian Wright (NIWA) and Kevin MacKay (NIWA)

Surveying Completed

In 1996 a co-operative survey with Australia was undertaken around the Lord Howe and Norfolk Island Islands using the *RV Rig Seismic*. This joint survey shot deep penetration seismic lines aimed at collecting information on the nature and likely origin of the submarine geological structure in the area. This co-operative work reduced the cost of the survey and produced the shared data set upon which bilateral boundary negotiations have been based.

In October 1999 LINZ chartered NIWA's research vessel *RV Tangaroa* for the shallow, low-fold seismic, single-beam bathymetry, sea-floor sampling in the Northern Region (Louisville Seamount Chain excepted). The 34-day survey, along the western flanks of Colville Ridge and the eastern/northeastern flanks of Three Kings Ridge, was completed within time and under budget.

In January 2000 the project took advantage of the French research vessel *L'Atalante* as it returned from working for the Australian Government around Macquarie Island, below Stewart Island. The *L'Atalante* carried out a multi-beam survey on Resolution Ridge (off Fiordland) in water depths of up to 5,500 metres, before transiting back to Noumea. As deepwater multi-beam surveying is specialised and uses relatively new technology, LINZ hired an expert from the Canadian Hydrographic Service to act as one of our client representatives onboard. Operationally it was a successful voyage with excellent sailing weather enabling the survey to be completed within time and well within budget. Additional valuable data was also collected at no extra cost around the Norfolk/Three Kings Islands area on the way back to Noumea.

In May 2000 *RV Tangaroa* was chartered for a low-fold seismic, single-beam bathymetry, rock dredging survey in the Southern and Western Regions. Leg one of the 35-day survey acquired bathymetry, gravity, magnetic and sea-floor sampling data from the Bollons Seamount, Campbell Plateau and Macquarie regions. Leg two acquired the above types of data, including sea-floor sampling from Resolution Ridge, plus shallow, low-fold seismic data in the Challenger Plateau-Lord Howe Rise regions. While the vessel encountered some typical rough southern sea conditions, the survey was again successfully completed within time and under budget.

In November 2000 Geco-Prakla, now Western-Geco, was awarded the contract for the 10,000 kilometre deep seismic survey, which accounted for up to one-third of the $44 million budget. Western-Geco, a Perth-based deepwater oil exploration specialist, was selected from a strong field of eight contenders through a competitive tendering process. The seismic survey aimed to collect data from depths of up to 35 kilometres below the seabed – virtually the entire thickness of the continental crust.

Leg one of the deep seismic survey, around the Southern and Western Regions, was completed before Christmas 2000. To share the significant

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costs of mobilising the vessel from Singapore, Fletcher Challenge Energy used the vessel during January 2001 to carry out an oil field survey off Taranaki. The deep seismic survey restarted on 31 January, with the vessel undertaking two further legs to complete the full survey in May 2001.

Overall the survey was very successful, with only a few equipment problems, despite the seas being rough at times. In one instance a shark devoured a chunk from the seismic streamer, which was lost completely. The preliminary interpretation of the data collected looked promising.

In March 2002 the project took advantage of the availability of the Scripps Institution of Oceanography research vessel *RV Melville* which was transiting from New Zealand to Apia, Western Samoa. The *RV Melville* carried out multi-beam surveys near the Bollons Seamount and Wishbone Ridge regions in water depths of up to 5,500 metres, with an expert from the Royal New Zealand Navy acting as one of our client representatives onboard. Operationally it was a successful voyage with fair sailing weather enabling the survey to be completed within the eight days scheduled and on budget. Additional gravity and magnetic data were also collected.

In May 2002 *RV Tangaroa* was again chartered to undertake a low-fold seismic, single-beam bathymetry, rock-dredging survey in the Eastern Region. The 32-day survey was undertaken along the western flanks of Hikurangi Plateau and the southern flanks of the Campbell Plateau.

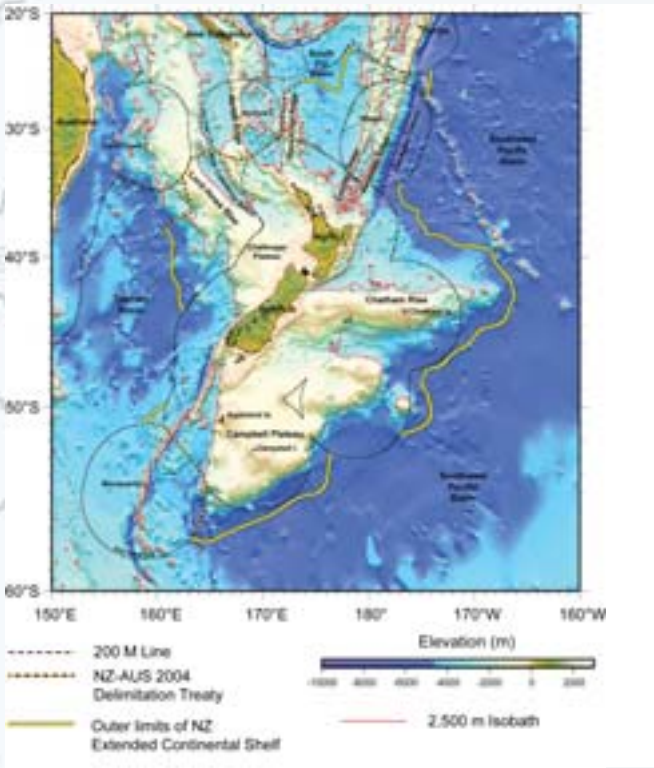
In November 2002 the *RV Sonne* was chartered for four days to undertake the final collection of rock samples on the flanks of the Lau Terrace. The rock samples were analysed in 2003 for continental affinity.

Rock Sample Analysis

During the recent surveys undertaken by the *RV Tangaroa* and *RV Sonne* a number of rock samples were successfully dredged from sites on the sea floor. These were analysed to establish which, if any, of the samples were continental in nature and could be used to support New Zealand's Continental Shelf submission. Some of the sophisticated tests needed to be done in laboratories overseas. A turnaround time for this type of analysis was up to twelve months, requiring good project management skills to keep on track.

Deep Seismic Processing

As the deep seismic survey collects the data in raw form, processing was necessary. The objective of data processing was to take the raw seismic data, improve the signal-to-noise ratio, and increase vertical resolution in order to obtain a precise and clear seismic profile of the subsurface geological structure. Robertson Research Australia was successful in winning the processing contract. Based in Perth, the company had experience processing UNCLOS data for the Australian Government. As deep seismic processing is specialised and uses relatively new



The outer limits of the New Zealand continental shelf beyond the EEZ, as contained in the submission to the UN Commission on the Limits of the Continental Shelf (UNCLCS).

technology, LINZ contracted experts from GNS Science (formerly the Institute of Geological and Nuclear Sciences) to act as our quality control and assurance client representatives. The processing was completed at the end of June 2002.

Data Analysis and Interpretation

Once the deep-seismic processing work was completed, LINZ turned its attention to the analysis and interpretation phase of the project and then to the presentation system.

From 2004, the project team's primary focus has been analysing and interpreting the data collected. New Zealand's scientists used the Technical Guidelines issued by the UNCLCS as a basis for formulating their interpretation. However, it was not long before the complex geomorphologic situation of New Zealand resulted in New Zealand's scientists having to look carefully at their interpretation of the data.

Over the years New Zealand's interpretations have changed as actual data (not theoretical as per the textbooks) was used to interpret the Commission's Guidelines. Even seemingly simple interpretations, such as 60 nautical mile bridging lines, required considerable discussion with New Zealand legal experts once all the options were evaluated.

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Finalising New Zealand's Submission

Ten years of dedicated teamwork has gone into New Zealand's submission to the United Nations Commission on the Limits of the Continental Shelf (UNCLCS).

Completion of the submission marks the end of Phase One of this massive project: to determine the outer limits of New Zealand's continental shelf. Now it's on to Phase Two, which begins in August when New Zealand presents its submission to the Commission. Team members call the current point "the end of the beginning".

Cross-agency teamwork is at the heart of both the work to date in preparing the submission and the work to come in Phase Two: steering it through the Commission's detailed processes.

Much is at stake for New Zealand. Dr Ian Wright of the National Institute of Water and Atmospheric Research's (NIWA) says that New Zealand's potential continental shelf is 1.7 million square kilometres. That is almost a 50 percent extension beyond New Zealand's existing 4 million square kilometres of Exclusive Economic Zone.

New Zealand is scheduled to present its submission when the Commission meets in August this year for a four week session. Elana Geddis is a key member of the Ministry of Foreign Affairs and Trade (MFAT) team presenting the submission, assisted by Ian and other representatives of NIWA and scientists from GNS Science (formerly the Institute of Geological and Nuclear Sciences).

MFAT team members will present New Zealand's opening statement, which will be an overview of the whole submission. The Commission will then establish a sub-commission of seven members to conduct the detailed analysis of New Zealand's submission. The sub-commission will come back with questions as they proceed through their analysis. GNS Science, NIWA and MFAT team members will be in New York to provide answers.

Elana says the sub-commission is expected to meet three or four times over a 12-18 month period to consider New Zealand's submission. "They make recommendations to the Commission, which then considers them and makes recommendations to New Zealand. While countries are not legally bound to follow the Commission's recommendations, they are expected to respect them. Once a country declares its continental shelf limits on the basis of the Commission's recommendations, they are described as 'final and binding' and other countries are bound by them."

Commission members are mostly scientists from a range of backgrounds – hydrographers, marine geologists and marine geophysicists – supported by a secretariat of legal and administrative staff.

"Given they're mainly scientists, we expect them to be pragmatic rather than legalistic in their approach," Elana says. "We also expect them to be very inquisitive, going through our reports in considerable detail."

RV Tangaroa surveying in the Ross Sea

Ian had an opportunity to talk informally with Commission members about New Zealand's submission at a recent UNCLOS workshop in Tokyo. "Twelve of the 21 Commissioners were at the workshop and I was able to talk to them all. It was a good chance to get them tuned in to New Zealand's submission."

So far Russia is the only country to receive final recommendations from the Commission on its continental shelf boundary. These recommendations always remain confidential to the country concerned. Three other countries – Australia, Brazil and Ireland – are in the process of presenting their submissions.

Elana says some useful lessons have been learned from the Australians' experience. "We've talked to the Australians and had some good advice, but we're all very much in a trail-blazing position. Other countries will be looking at how we present our case with the aim of learning from our experience."

Checking all the data, graphics and other content in the submission has been a huge job. GNS Science Senior Scientist Dr Vaughan Stagpoole says the collaborative approach has been valuable for ensuring there are no errors or contradictions in any parts of the huge documents. "Each agency has reviewed the other's work. You need that critical review, which has been really useful all the way through. We need to ensure every single detail is accurate. It's such an important project and we only get one shot at it, so we all have to ensure that what we present is the absolute very best that we can do."

Given the length of time involved in getting the submission together, the scientists have had to revisit some of the early research work done on the project. "It's been ten years since we started writing the reports for the project and over that time our ideas on how to define the continental shelf have changed a bit in some areas. Internationally, continental shelf

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Profile: Dr Vaughan Stagpoole

Full Commitment

Production of New Zealand's Submission to the United Nations Commission on the Limits of the Continental Shelf has occupied GNS Science Senior Scientist Dr Vaughan Stagpoole almost full-time over the past year. While it has been interesting and rewarding work, it has also had its moments.

"During the final stages of preparing the submission it was like being cut by a thousand razorblades," he says. "Every day there were 20 or more new things to deal with, everything from sorting out problems with the printing of the document to correcting the spelling in diagrams."

Vaughan's life in science began soon after leaving school – working as a science technician in the geothermal section of the old DSIR (Department of Scientific and Industrial Research) in Taupo. He quickly developed a strong interest in his work in geothermal and volcanic monitoring around the Taupo region.

His next role was in a very different environment, at the geophysical observatory in Apia, Western Samoa, which was then run by the DSIR. "It was a very interesting role," he recalls, "working with the local people and keeping the observatory instruments operating in the tropical climate."

Vaughan returned from Apia to Wellington, where he completed a Bachelor of Science (Hons) degree at Victoria University. He was awarded a scholarship to undertake his doctorate, shifting his research interests to petroleum-related basin research. That led to a job in GNS Science's hydrocarbon section, working on petroleum basins like Taranaki and the more remote "frontier" basins around New Zealand.

Vaughan has been involved in the UNCLOS project from early on, undertaking scientific research, writing and reviewing reports and in a coordination role, managing contracts and workflow at GNS Science. Over the past 18 months he has assumed a major coordination role for interaction between the various agencies and in assembling the New Zealand submission.

Vaughan Stagpoole of GNS Science.

"Working on this project has definitely been a highlight of my career because we're defining something that is going to be long-standing. It's different to the usual research we do, where you build on earlier research and expect that your work will be developed further in the future. With the Continental Shelf Project we've only got one chance to get it right. That's why we've put so much effort into this project, it's absolutely critical that we do."

With the completion of much of GNS Science's role in the UNCLOS programme, Vaughan is moving on to his next challenge. He is returning to the hydrocarbon section "to plan the next big push in hydrocarbon research".

While he enjoys and is committed to his research work, Vaughan's family plays an important part in his life. He has three boys, one of whom is already displaying an interest in science. "I believe it's very important to keep a balance in your life and ensure that you keep that balance no matter how demanding the work is that you're doing."

concepts and ideas have also developed over that time. We found that some parts of extended continental shelf in reports written just three or four years ago had to be changed when we came to incorporate them in the final submission documents."

A huge volume of work has gone into the submissions. Ian says the NIWA team has put together 1:1,000,000 scale charts for each of the four regional reports. "We've got 18 chart areas and each has four different sheets. With the multiple copies required for the sub-commission members, we've had to produce 864 map sheets." The appendices are also major undertakings, each typically comprising well in excess of 500 pages.

While attention to detail has been necessary to ensure accuracy, Elana says the team has also put a lot of thought into ensuring the submission is as comprehensible as possible. "The submission needs to be accurate, convincing, and also as easy as possible for the UNCLOS members to follow. Our aim is to get as few questions as possible."

The MFAT, NIWA, LINZ and GNS Science team members have been meeting fortnightly for the past eight months to make decisions on the submission as it progressed to its final form. Over the next two months the team will develop a PowerPoint presentation to accompany New Zealand's opening statement to the full Commission, along with other PowerPoint presentations for each part of the submission that will be considered by the sub-commission.

Elana speaks for other team members when she says how satisfying it has been to be involved in a project of such importance to New Zealand. "It is very satisfying in a personal and professional sense. It has been great working in a multi-disciplinary team environment with the four agencies working together so effectively. It's been challenging, but also very enjoyable."

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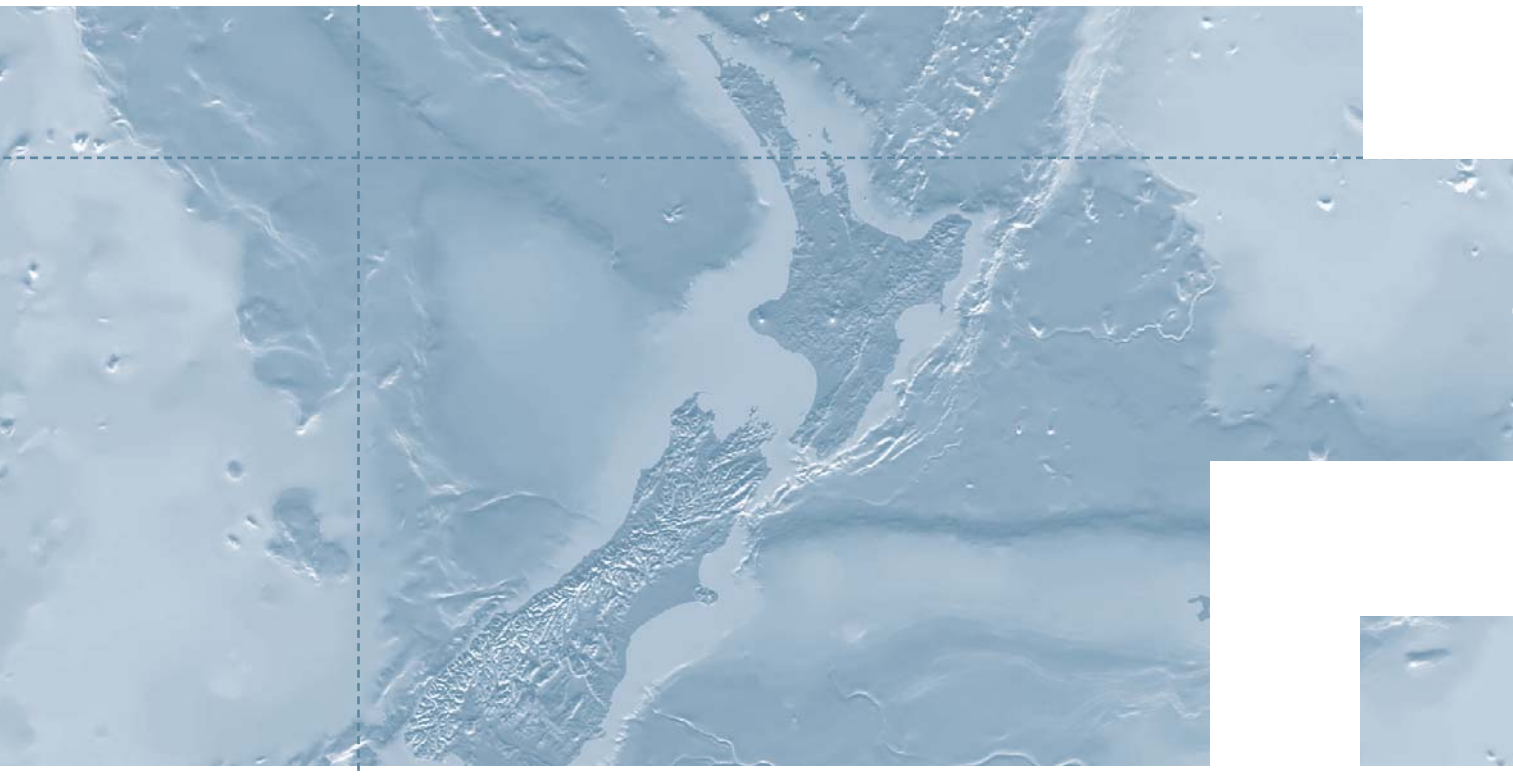

Toitu te whenua
Land Information
New Zealand

The purpose of the New Zealand Continental Shelf Project Report is to update key Government agencies on the progress of New Zealand's Continental Shelf submission to the United Nations. Land Information New Zealand (LINZ) is the lead agency in the technical aspects of the submission. For more information, contact Continental Shelf Project Leader Russell Turner at LINZ on (04) 460 0588, email rturner@linz.govt.nz, www.linz.govt.nz