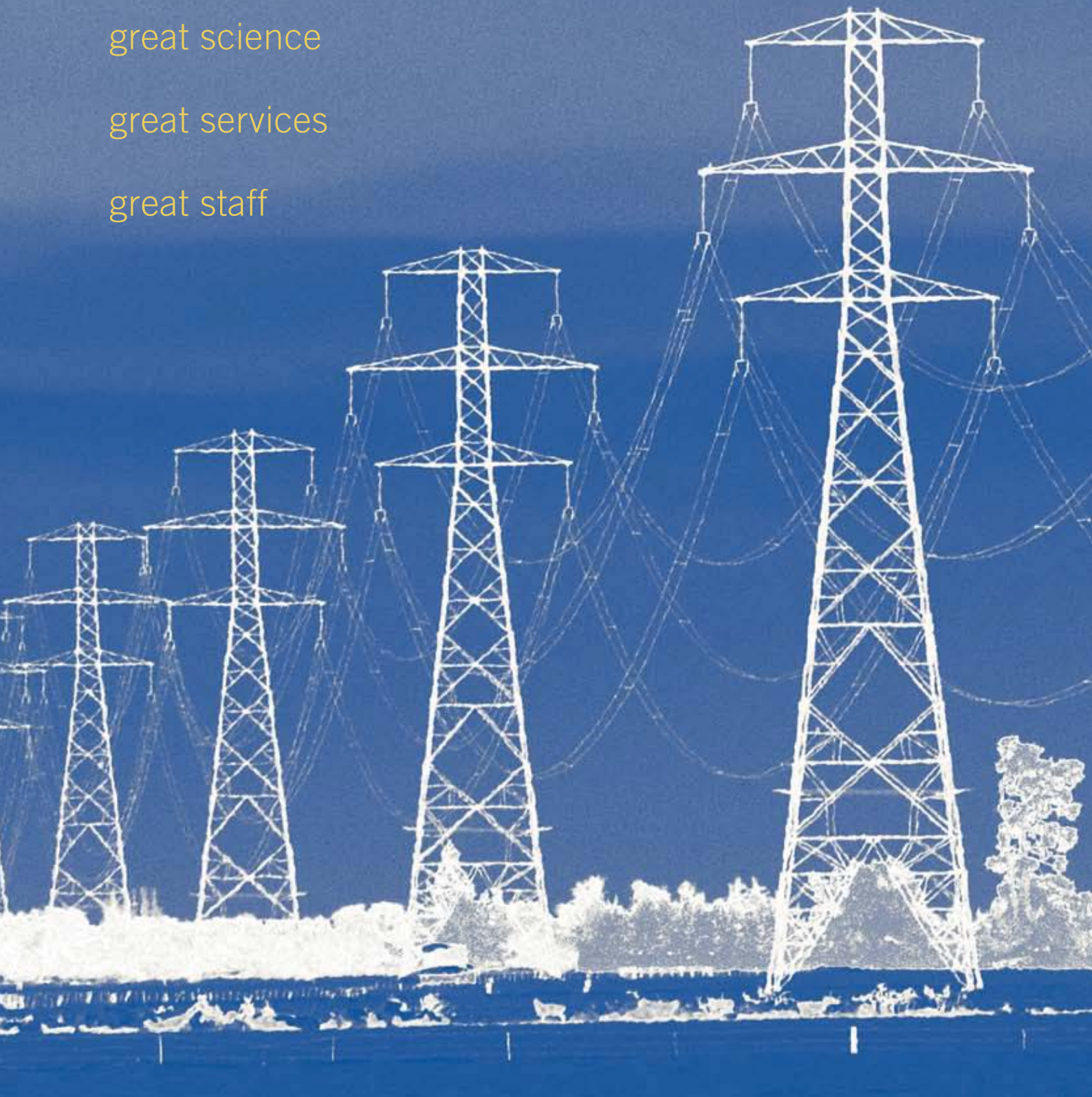
NIWA
Taihoro Nukurangi

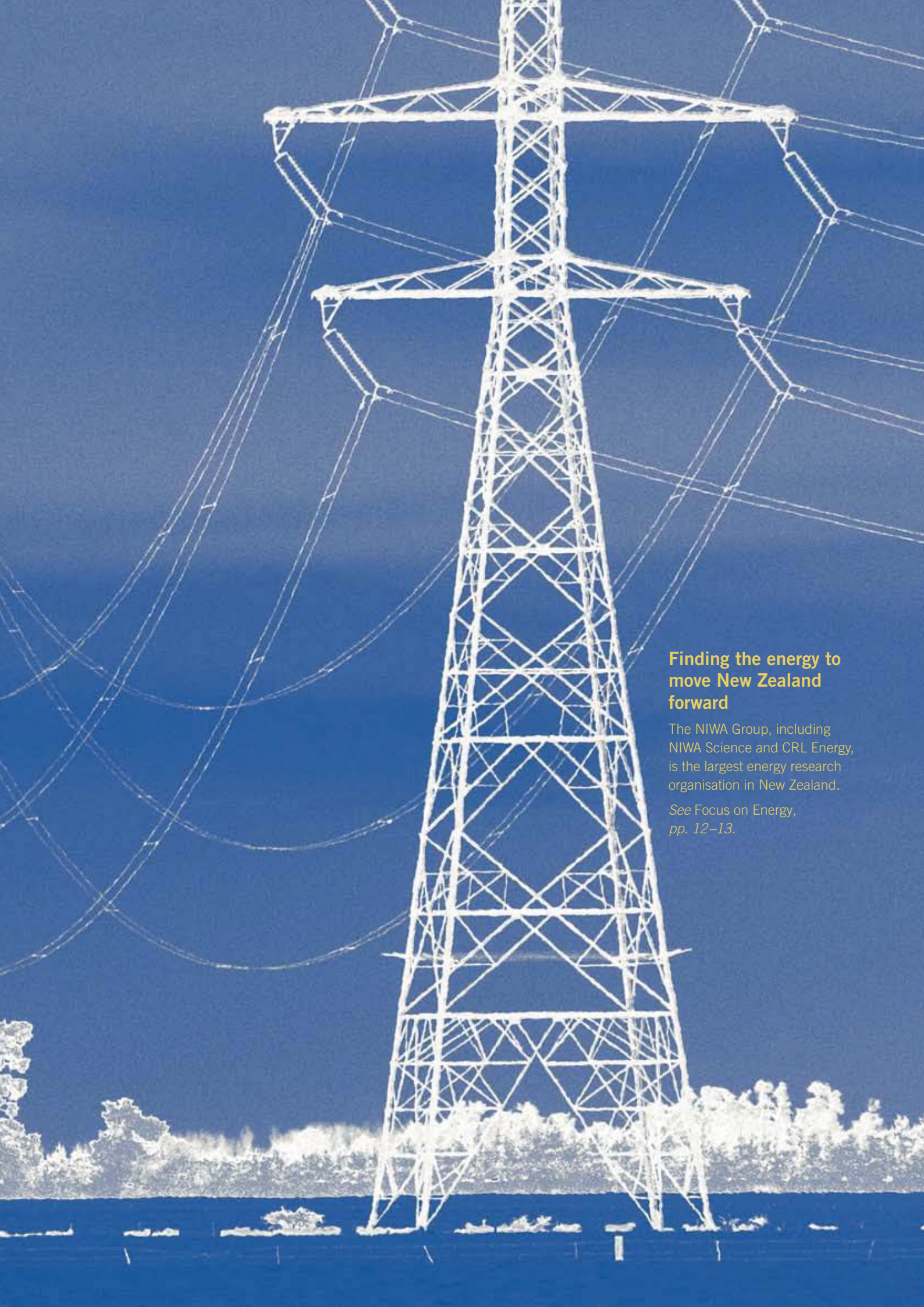
2006
Annual Report

great science

great services

great staff





Finding the energy to move New Zealand forward

The NIWA Group, including NIWA Science and CRL Energy, is the largest energy research organisation in New Zealand.

See Focus on Energy, *pp. 12–13.*

NIWA at a glance

NIWA is an internationally respected research organisation dedicated to creating and delivering innovative and unrivalled science-based products and services that enable people and businesses to make best use of the natural environment and its living resources, and derive benefit from them in a sustainable manner.
Our science provides the basis for sustainable resource management, and our consultancy services help clients solve problems on the use and management of:

- Atmosphere & Climate
- Natural Hazards
- Energy
- Freshwater
- Coast & Oceans
- Aquatic Biodiversity & Biosecurity
- Fisheries
- Aquaculture & Biotechnology

NIWA was established as a Crown Research Institute in 1992. It operates as a stand-alone company with its own board of directors and its shares are held by the Crown. In its establishment year, the company had 329 staff, revenue of $35.5 million, and assets of $20 million. Today, these measures have more than doubled or trebled: NIWA now has 651 staff at 15 sites around New Zealand and another 16 in Perth, Australia, revenue of $106 million, and assets of $69 million.

NIWA Group consists of NIWA Science (the parent company) and seven other entities.
NIWA Science is the source of our innovative ideas and leading edge science, the creator of most of our intellectual property, the foundation of our extensive consultancy services, and the generator of the bulk of our revenue;
NIWA Vessel Management Ltd provides vessels for charter for scientific research;
NIWA Natural Solutions Ltd commercialises products and technologies developed by NIWA;
NIWA Australia Pty Ltd provides scientific research and consultancy services in Australia;
NIWA USA (which has registered not-for-profit and commercial entities) provides scientific research and consultancy services in the USA;
Unidata Pty Ltd (80% owned by NIWA) creates new technologies for environmental monitoring and real-time decision support networks;
EcoConnect Ltd was established to deliver web-based environmental forecasts in association with the UK Met Office;
CRL Energy Ltd (50% owned by NIWA) is an energy research and consulting business.

NIWA's Māori name *Taihoro Nukurangi* describes our work as studying the waterways and the interface between the earth and the sky.
Taihoro is the flow and movement of water (from *tai* 'coast, tide', and *horo,* which means 'fast moving').
Nukurangi is the interface between the sea and the sky (i.e., the atmosphere). Together, we have taken it to mean 'where the waters meet the sky'.

www.niwa.co.nz

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2006 Annual Report of the National Institute of Water & Atmospheric Research Ltd

NIWA
Taihoro Nukurangi

science supporting sustainable development

A brief history

NIWA (The National Institute of Water & Atmospheric Research Ltd) is a Crown Research Institute. It was incorporated as a company on 1 July 1992. Ownership is held equally between two shareholding Ministers appointed by the New Zealand Government (the Crown).

NIWA is New Zealand's leading provider of atmospheric and aquatic research and associated products and services. NIWA's diverse range of activities and skills benefit New Zealand by fostering economic growth, enhancing human well-being, and ensuring the sustainable use and development of our natural resources.

The diagram shows the evolution of the NIWA Group which now consists of the parent company (NIWA Science) and seven other entities.

NIWA Science employs 602 staff spread across 15 sites. The main campuses are in Bream Bay, Auckland, Hamilton, Wellington, Nelson, Christchurch, and Lauder. Revenue is generated principally from fully contested government research contracts and consultancy services to a diverse array of clients.

NIWA Vessel Management Ltd, NIWA Australia Pty Ltd, NIWA USA (with registered not-for-profit and commercial entities), and NIWA Natural Solutions Ltd, and EcoConnect Ltd are all wholly owned by NIWA.

NIWA Vessel Management Ltd owns and operates two research vessels (*Tangaroa* and *Kaharoa*) and employs 32 staff. **NIWA Australia Pty Ltd** and **NIWA USA** provide similar services to NIWA Science, but are more targeted to the specific needs of those countries. **NIWA Natural Solutions Ltd** assists in the commercialisation of products and technologies developed by NIWA. It currently oversees three aquaculture businesses, and is a part-owner (50%) of Ensid Technologies Ltd, which develops and sells food-safe electronic tags. **EcoConnect Ltd** was established to deliver web-based environmental forecasts in association with the United Kingdom Met Office.

Unidata Pty Ltd is an instrument manufacturing company, located in Perth, Australia, which specialises in the creation of new technologies for environmental monitoring and real-time decision support networks. NIWA owns 80% of the shares in Unidata Pty Ltd. This company complements a similar service provided by NIWA Science in New Zealand.

CRL Energy Ltd is New Zealand's only research and consulting business that focuses solely on the energy sector. The company employs about 40 staff, with major campuses in Lower Hutt and Christchurch. Shares in the company are held equally by NIWA and the Coal Association of New Zealand. The research and services provided by CRL Energy Ltd complement those provided by NIWA Science.

NIWA's evolution

Our mission

NIWA is a Crown Research Institute which helps the Government achieve its environmental, social, and economic outcomes.

We do this through our great science, great services, and great staff.

Mission

NIWA is an internationally respected research organisation dedicated to creating and delivering innovative and unrivalled, science-based services and products that enable people and businesses to make best use of the natural environment and its living resources, and derive benefit from them in a sustainable manner.

Vision

We will fulfil our mission by:

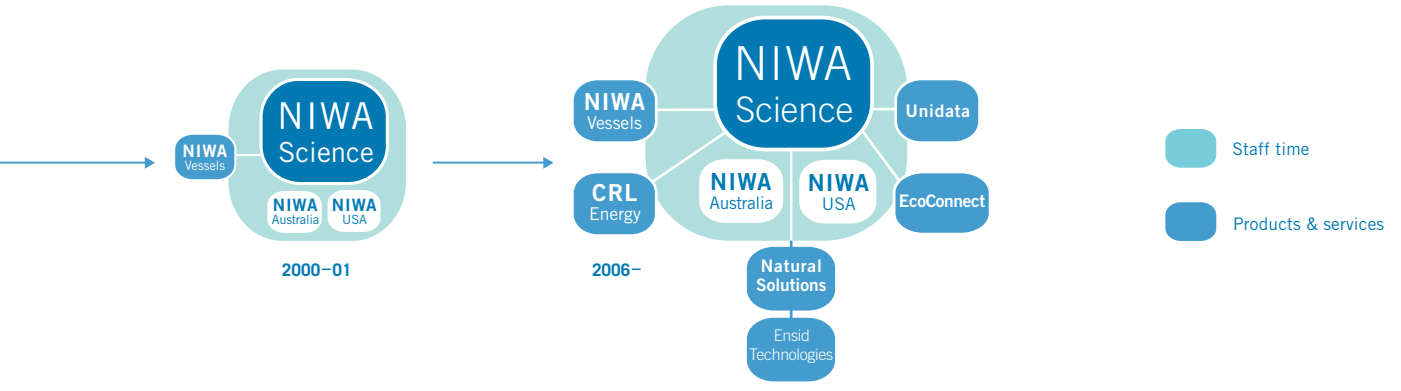
- maintaining and enhancing our national and international reputations for excellence in marine, freshwater, and atmospheric science;
- providing a sound scientific basis for the sustainable management and development of natural resources;
- producing new tools and services to enhance environmental management, improve business performance, and increase public safety;
- ensuring optimal value is obtained from all species harvested from, or reared in, marine and fresh water;
- developing and commercialising new products to boost economic growth;
- securing a diverse portfolio of clients and partnerships to broaden our source of revenue, increase our awareness of new commercial opportunities, and minimise the Crown's ownership risks;
- operating with financial efficiency to ensure that we generate the cash flow needed to develop our business and provide an appropriate return on shareholders' funds.

This vision is consistent with the Crown Research Institutes Act 1992, which requires all Crown Research Institutes to conduct scientific research for the benefit of New Zealand and to be financially viable.

Values

In support of our mission and vision statements we are committed to:

- promoting creativity, innovation, and teamwork;
- ensuring our core science areas are appropriately staffed and supplied with sufficient equipment and resources to conduct leading-edge science and deliver innovative and unrivalled products and services;
- maintaining a culture which is adaptable and seeks opportunities;
- being recognised for our integrity, skill, and professionalism in conducting all aspects of the company's business;
- attracting, retaining, and rewarding high quality staff;
- providing a safe and healthy working environment;
- ensuring that all staff are treated in a fair and equitable manner and that their work and private lives are appropriately balanced;
- taking social responsibility and valuing our environment;
- encouraging stakeholder participation in the setting of our research and business strategies;
- working collaboratively with other organisations and people to form partnerships that add value to our research, intellectual property, and products and services;
- honouring the principles of the Treaty of Waitangi.



The future

our strategic direction

Over the past 12 years, NIWA has developed into a successful research organisation and commercial consultancy, with a reputation for great science, great services, strong financial performance, and high staff morale.

In 1994, NIWA was restructured to embody the innovative 'One NIWA' concept. This removed the divisional barriers within the company, so that research policies and strategies could be applied evenly across the organisation, and multidisciplinary work could flourish. Since then, NIWA has developed into a very successful research organisation and commercial consultancy firm, with an excellent reputation for its science, services, strong financial performance, and high staff morale. Our growth has been based on strong revenue gains in both public good research and commercial projects. In 1992, NIWA had 329 staff, revenue of $35.5 million and assets of $20 million. Fourteen years later, these measures have largely doubled or trebled: NIWA Group now has 651 staff, revenue of $106 million, and assets of $69 million.

The evolution of the NIWA Group, with a parent company and seven other entities, has produced a much more robust, flexible, and responsive organisation. We are no longer a company that sells staff and vessel time only and bears all commercial risks solely. We have created new opportunities to sell a diverse range of products and services, and we are increasingly promoting ourselves, sharing risks, and leading new sector initiatives with others (e.g., our 80% shareholding in Unidata Pty Ltd, our 50% shareholding in Ensid Technologies Ltd, and the joint development of environmental forecasting with the United Kingdom Met Office).

A key challenge for NIWA in 2006–07 is to manage this portfolio of businesses well and invest wisely. This challenge places equal pressure on both the governance and management of NIWA. Whereas NIWA has good practices in place to develop its 'traditional' business, a more dynamic, commercial approach is required to grow the combined businesses of the NIWA Group effectively and ensure each component remains financially viable and competitive.

Over the last four years, NIWA's Board and management have formed a strong working unit which has fostered the skills and knowledge necessary to develop NIWA's subsidiaries. The emphasis in 2006–07 is to ensure that these tools are well employed to bring about the required transformation of NIWA. It is essential that NIWA maintains its excellent science, strong market focus, and leadership role in all relevant sectors.

Major strategic initiatives for 2006 to 2008

- Further enhancing our governance and management frameworks, relationships, and skills to ensure that all entities in the NIWA Group are developed efficiently and effectively.
- Ensuring that appropriate staff are recruited or retained to enhance NIWA's leadership capabilities, scientific prowess, and the development of products and services.

- Increasing the revenue and profitability of our research and consulting businesses (i.e., NIWA Science, NIWA Australia Pty Ltd, and NIWA USA) by improving our market image, brand, and reach; minimising expenditure that is not directly related to revenue generation; better targeting our research and services to clients' needs; and placing greater emphasis on selling the skills of NIWA versus those of individual staff.
- Forming effective partnerships with industry to enhance NIWA's developments in aquaculture, the design of new energy solutions, and environmental monitoring and forecasting.
- Enhancing the financial footing for our vessel company (NIWA Vessel Management Ltd) by building a more secure client base, actively pursuing overseas charters, maintaining appropriate daily charter rates, and ensuring the vessels are appropriately maintained and equipped to attract a diverse range of clients.
- Establishing NIWA Natural Solutions Ltd as an important vehicle in the commercialisation of products (particularly with early-stage investors).
- Strengthening the manufacturing capability and product range of Unidata Pty Ltd to enhance NIWA's position in environmental monitoring and the development of real-time decision-support tools.
- Establishing EcoConnect Ltd as a highly reputable environmental forecasting service.
- Expanding the services of CRL Energy Ltd to include development and construction of small-scale energy systems based on a variety of technologies from biofuels to hydrogen to liquified coal.

These initiatives will have a significant impact on the way we structure activities within the NIWA Group and on staff perceptions of NIWA as an employer. Hence, it is essential that over the next three years we find ways of achieving change while fostering high staff morale, encouraging innovation, and maintaining our strong work ethic.

Key staff issues across the NIWA Group include the need to reward staff well, recruitment and retention, and the maintenance of critical mass. Many of our core science areas have lost considerable research time over the last six years, and maintaining these capabilities (and associated morale and productivity) is an increasing challenge. The Capability Fund plays an important role in maintaining and fostering essential research capabilities and in developing new opportunities for growth [see p. 26]. Without the Capability Fund, we would struggle to be an innovative research and development company, and synergies between the different entities of the NIWA Group would largely end.

Hard work pays off

a report from the Chair & the Chief Executive

NIWA has had an outstanding year – scientifically, strategically, commercially, and financially. To succeed in all four categories has required a tremendous effort from our staff. Throughout the year they consistently went the extra mile to deliver the high quality science and professional services expected by our clients as the demand for their expertise grew to a record high.

Chief Executive Rick Pridmore and Chair Sue Suckling

During 2005–06, research revenue increased by 15% and commercial revenue increased by 29%. Overall, NIWA's revenue grew from $91 million in 2004–05 to $106 million in 2005–06 – an increase of 16%.

There is no doubt that an increase in research revenue has helped NIWA to deliver substantial benefits to New Zealand. During 2005, our people published 369 papers in international journals (22 more than last year and 62 more than the year before) and 102 papers in New Zealand journals. This science has been put to good use. It has helped to bring reared kingfish into commercial production, develop new renewable energy resources, safeguard communities from natural hazards, make best use of limited water resources, optimise the performance of climate-sensitive businesses, and ensure the sustainable management of our nation's fisheries.

We are particularly proud of NIWA's ability to assist Biosecurity New Zealand in dealing with the invasive algae *Didymosphenia geminata*, and of our recent acquisition of 50% of the shares in CRL Energy Ltd. NIWA scientists were at the forefront of the discovery of didymo in New Zealand and lead the world

in providing science services to help mitigate its spread and search for effective eradication or control methods. The acquisition of CRL Energy unites NIWA's renewable energy research with the carbon and hydrogen fuel research of CRL Energy and will provide a significant skill base to guide New Zealand's future energy developments.

Considerable effort has also been put into communicating our science and ensuring its use by others. During 2005, our staff gave 1020 presentations on our science, were involved in over 200 media releases, serviced over 100 000 requests for information, and had more than 21.5 million pages viewed on our website. On top of all this, they carried on with the routine production (bi-monthly) of newsletters from our seven National Centres and the quarterly production of our flagship magazine *Water & Atmosphere*.

Our science was also used to help educate others. During the year, our marine biodiscovery room at Kelly Tarlton's Underwater World attracted over 37 000 school children. NIWA was the major sponsor for five regional school science and technology fairs and participated in several international environmental education programmes involving more than 100

New Zealand schools. We also provided a wide range of external training courses to assist in the professional development of individuals working in the environmental sector, and 49 PhD and 9 MSc students were supervised by NIWA scientists.

Another major use of our science is consulting services. Individuals and organisations seek assistance from NIWA because of our strong scientific base, and this was confirmed by the client survey we conducted this year. During 2005–06 we delivered over 600 consultancy reports. This work has helped to improve forest harvesting activities, design flood forecasting systems to protect vulnerable communities, guide regional planning and development, identify new sites and sources for energy generation, obtain resource consents for new

Hard work pays off

businesses, mitigate potential environmental impacts, develop new technologies to enhance our primary production industries, and protect native species of economic and/or cultural importance. The value of these services to the country is immense. Their importance in refining our scientific knowledge and guiding our research programmes is considerable and essential to our long-term success.

A big strategic push within NIWA over the last two years has been the development of products that emanate from our intellectual property. Since the establishment of NIWA Natural Solutions Ltd in February 2004 a rigorous stage-gate commercialisation process has been put in place, an assessment of our intellectual property has been made, governance and management frameworks for spin-off companies have been developed, commercial targets have been set for existing businesses, and two new businesses have been started.

Through NIWA Natural Solutions Ltd considerable progress has been made in defining our niche in the seafood and marine natural product sectors. We are now confident we can help transform these sectors, rather than just assist them through fee-for-service contracts. Significant progress has been made in developing kingfish aquaculture in New Zealand. Our salmon, paua, and kingfish rearing businesses have made the leap from research-oriented ventures to professional services. Sales of these juveniles to commercial ongrowers in 2005–06 were $0.7 million and are forecasted to exceed $1.3 million in 2006–07. We have integrated our research in aquaculture and bioactive compounds, with the aim of producing a range of value-added products for each species that NIWA brings into aquaculture.

In 2006–07, we aim to see similar progress in the delivery of products and services related to real-time environmental monitoring and environmental forecasting. NIWA is now set to deliver real-time environmental information and forecasts over the internet through EcoConnect Ltd, which is currently running in demonstration mode and scheduled to go live in the last quarter of the 2006 calendar year. Unidata Pty Ltd was purchased in May 2004 to help NIWA manufacture new technologies for environmental monitoring and real-time decision support networks. During 2005–06, Unidata made incremental upgrades to four key products which have significantly increased both their marketability and utility. Good progress has also been made on the development of a novel integrated system for real-time data

collection, transfer, and reporting (called 'Neon'). These new products will also be used by NIWA (under the brand Instrument Systems) to design state-of-the-art environmental monitoring networks for a diverse range of clients, from farmers to regulatory authorities to energy companies, both in New Zealand and overseas. During 2005–06 sales from Instrument Systems exceeded $1.6 million.

NIWA Vessel Management Ltd also put in a strong performance during the year. Our two research vessels were used a total of 526 days (6 days more than last year). Despite their greater use, 25% less fuel was consumed, and CO_2 emissions declined by more than 1700 tonnes as a result of a reduction in target cruise speed.

In closing, we would like to re-emphasise our opening comments. The 2005–06 financial year has been a successful one for NIWA because of the exceptional effort put in by all – both staff and Board. During the year, NIWA established 34 new science positions and hired an additional 27 science staff to replace those who left. Many of these replacement scientists have brought new skills, or cover new areas, to meet changing client demand. We also hired over 185 fixed-term employees to assist with specific projects. Amidst all the work, all at NIWA have remained positive and dedicated to helping New Zealand. We thank the staff and the Board for their extraordinary efforts.

We would also like to thank Professor Carolyn Burns, who retired from the NIWA Board in June, for all her efforts over the last six years.
Last, but not least, our thanks go to all our collaborators (a very large number of individuals and organisations) and our stakeholders for their valuable contributions throughout the year. Together we have helped New Zealand science to be an integral part of the country's development and have shown the huge benefits that can bring. We look forward to continuing to make a very positive contribution to New Zealand through our science, and continuing to govern and manage a tightly run organisation.

Sue Suckling
Chair

Rick Pridmore
Chief Executive

great science

our science contributes to the sustainable development of the natural environment and its living resources

we operate in the following key areas:
Energy
Atmosphere & Climate
Natural Hazards
Coasts & Oceans
Freshwater
Aquatic Biodiversity & Biosecurity
Fisheries
Aquaculture & Biotechnology

www.niwascience.co.nz

this section reports on just a few examples of the science we conducted during 2005–06

Wearing flame-retardant clothing, Alan Thomas carefully inflates with hydrogen a balloon steadied by Hamish Chisholm at NIWA Lauder. The balloon carries an ozone sonde to an altitude of 30 km.

Focus on Energy

finding the energy to move New Zealand forward

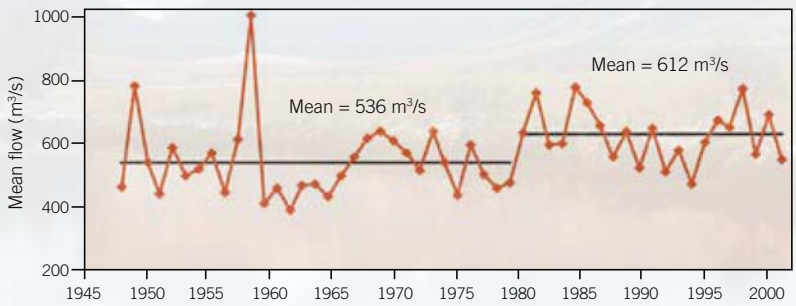
great science

The effect of future climate on hydro inflows

NIWA research into climate variability and change provides important insights into likely future hydro inflows, helping industry to understand and manage changing levels of dry-year risk.

The period 1977–98 was relatively wet on the South Island west coast and in the headwaters of key southern lakes compared with the preceding 30 years. Such long-term variability is related to alternating phases of the Interdecadal Pacific Oscillation (IPO). The IPO may be changing phase, back to a state where La Niña events are more frequent, and generally mild, less windy conditions prevail. If this occurs, low inflow periods for South Island lakes will be more frequent, and possibly more severe, over the next 20–30 years than in recent times.

In the longer term, however, climate change may mean stronger westerly winds, more rain in western and alpine regions, and more reliable flows into our hydro lakes. The accumulation and melt of snow in the Southern Alps is likely to change, altering the seasonality of hydro inflows. NIWA research aims to quantify these effects.



Annual flows recorded for the Clutha River at Balclutha, 1 October 1947–30 September 1999. The mean flow is substantially higher during the recent positive phase of the Interdecadal Pacific Oscillation.

Wave energy device under development

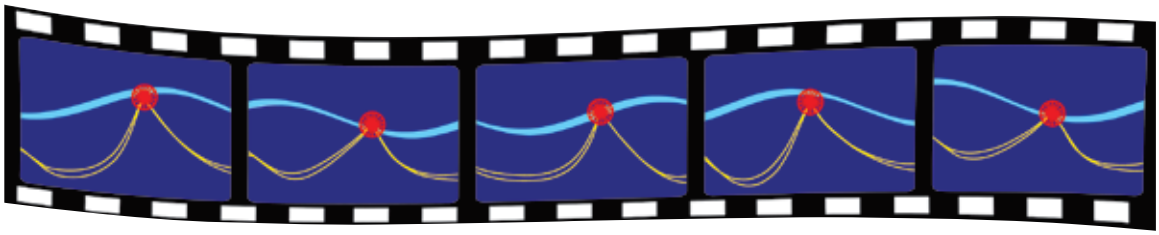
NIWA is part of a collaborative R&D project which aims to develop, test, and deploy a proof-of-concept wave energy converter in New Zealand by 2008. The research partners are Industrial Research Ltd (IRL), NIWA, and Power Projects Ltd.

We are aiming to make a lightweight, compliant device, which is small in mass but 'thinks big'. The device will have controls that forecast incoming waves and 'tune' its response to changing wave patterns. The consortium is currently applying for patents.

NIWA's role is in hydrodynamics and investigating likely locations for a test deployment. IRL has developed concepts for direct drive power take-off. Power Projects is responsible for industry liaison and developing an 'economic benchmarking procedure' to assess the financial viability of design options.

The project is funded by the Foundation for Research, Science & Technology.

www.wavenergy.co.nz



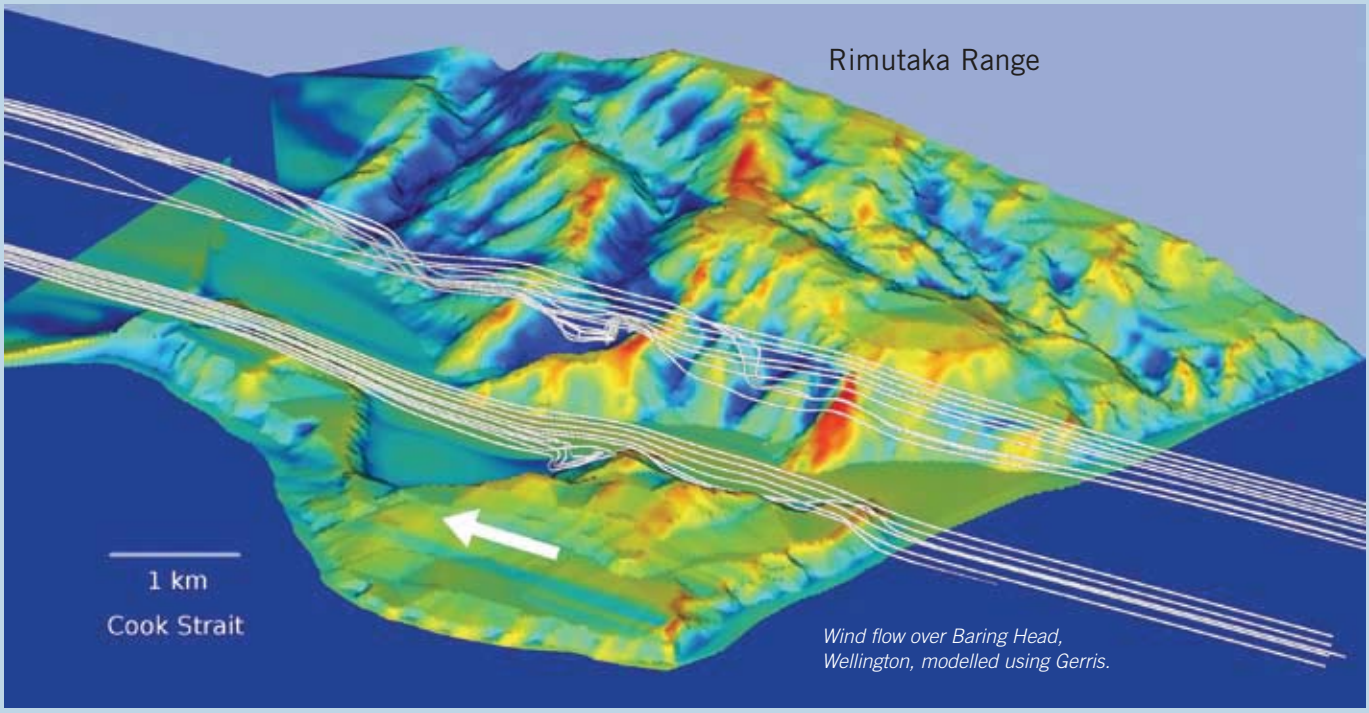
Stylised representation of wave energy device (red) riding a wave (light blue). The detailed design is confidential due to patent application.

Our wind energy toolbox

NIWA uses a robust combination of measurements and modelling to help clients assess potential wind energy sites.

To select suitable locations for further investigation, we use our extensive climate database to produce site specific estimates, and have derived gridded wind speed data for the entire country at 500 m resolution. We also use a 6-year archive of data from our mesoscale model.

For detailed assessments at specific sites, the 'gold standard' is still measurements made by anemometers mounted on a tall mast. To cover the territory more quickly, we also use a portable SODAR (sonic detection and ranging – similar to radar). At the same time, we can combine a digital terrain model with the very smart, high resolution 'adaptive flow solver' called Gerris developed at NIWA. This microscale modelling is detailed enough to simulate individual eddies. It can be used to precisely site turbines to benefit from the strongest winds while minimising turbulence.



Wind flow over Baring Head, Wellington, modelled using Gerris.

NIWA Group – *New Zealand's leading energy research provider*

NIWA Science

SCIENTIFIC SERVICES

Assessment of renewable resources (measurement & modelling of hydro, wind, wave, tidal, solar)

Nationally significant databases: water resources & climate

Environmental effects assessment for consenting & other purposes

Environmental monitoring instruments & services

Daily operational forecasting of renewables

Marine geological services for offshore structures & cables

KEY RESEARCH PROGRAMMES

- Climate-related risks for energy supply & demand
- Improving rural Māori communities through new energy technologies
- Recovery of energy from wastewater: biomass
- Wave Energy Technology-New Zealand (with IRL & Power Projects Ltd)

CRL Energy

SCIENTIFIC SERVICES

Geological, geotechnical engineering, & hydrogeological services

Solid fuels analysis & combustion testing

Bioenergy & biofuels

Internal combustion engines, fuels, & emissions

Vehicle technologies

Environmental monitoring & remediation

Energy modelling with the Energy Efficiency & Resource Assessment (EERA) model and database

KEY RESEARCH PROGRAMMES

- Clean coal technologies (advanced gasification & combustion)
- Carbon capture & storage
- Hydrogen energy systems (with IRL)
- Causes, impacts, & remediation of acid mine drainage

Atmosphere & Natural Hazards

Helping councils meet air quality standards

In 2004, the Ministry for the Environment introduced new regulations setting national environmental standards for air quality. NIWA is leading an applied research programme to help local authorities meet standards for particulate air pollution. It is multifaceted, collaborative research, and we outline just one example here.

Fine particles (PM_{10}) are a public health hazard. The regulations require councils to ensure PM_{10} concentrations are at or below a prescribed level by 2013.

PM_{10} are emitted from motor vehicles, domestic fires, and industrial processes. NIWA is working with GNS Science and the Auckland and Hawke's Bay Regional Councils to quantify these sources. Air samples are being analysed for their chemical composition and particle size. This will help councils develop effective pollution mitigation policies, targeted at the correct sources.

This research is funded by the Foundation for Research, Science & Technology.

'Watching the Earth breathe'

That's the catch-phrase of NASA's Orbiting Carbon Observatory, due to be launched in 2008. The satellite will collect global measurements of carbon dioxide in the Earth's atmosphere, looking down from space.

Meanwhile, NIWA is watching the Earth breathe from the ground up. Our atmospheric research station at Lauder is one of five charter sites for the global Total Carbon Column Observing Network (TCCON). Each site uses a Fourier Transform Spectrometer to determine the density of greenhouse gases in a 'column' from the Earth's surface to the sun.

TCCON measurements will provide vital validation of satellite measurements, and will improve inferences about the amount of greenhouse gases entering and leaving the atmosphere. This is important for predicting future greenhouse gas concentrations and, ultimately, better understanding the timing and severity of climate change.

NIWA's participation in the TCCON is funded by the Foundation for Research, Science & Technology, with support from NASA and the California Institute of Technology, and the cooperation of the University of Wollongong.

First regional climate model for New Zealand

How much more extreme could the weather get with climate change? Will there be more droughts or floods, and where would be worst affected?

NIWA has adapted a regional climate model, developed by the UK Met Office, to study the effects of climate change and variability on the New Zealand region, including some islands in the South Pacific.

Modern climate models represent as accurately as possible the conditions and forces which influence the climate. Our regional model is 'nested' inside the UK Met Office's global model, but produces much more detailed results over New Zealand. How complicated is that? Each point in the model's three-dimensional grid is described by hundreds of variables; it takes our supercomputer about one day to simulate a year of New Zealand's climate.

Recently we used the model to simulate New Zealand's climate from 1970 to 2000, and found it accurately reproduced the average regional distributions of temperature and rainfall of that time. We are now running climate change simulations for the end of this century.

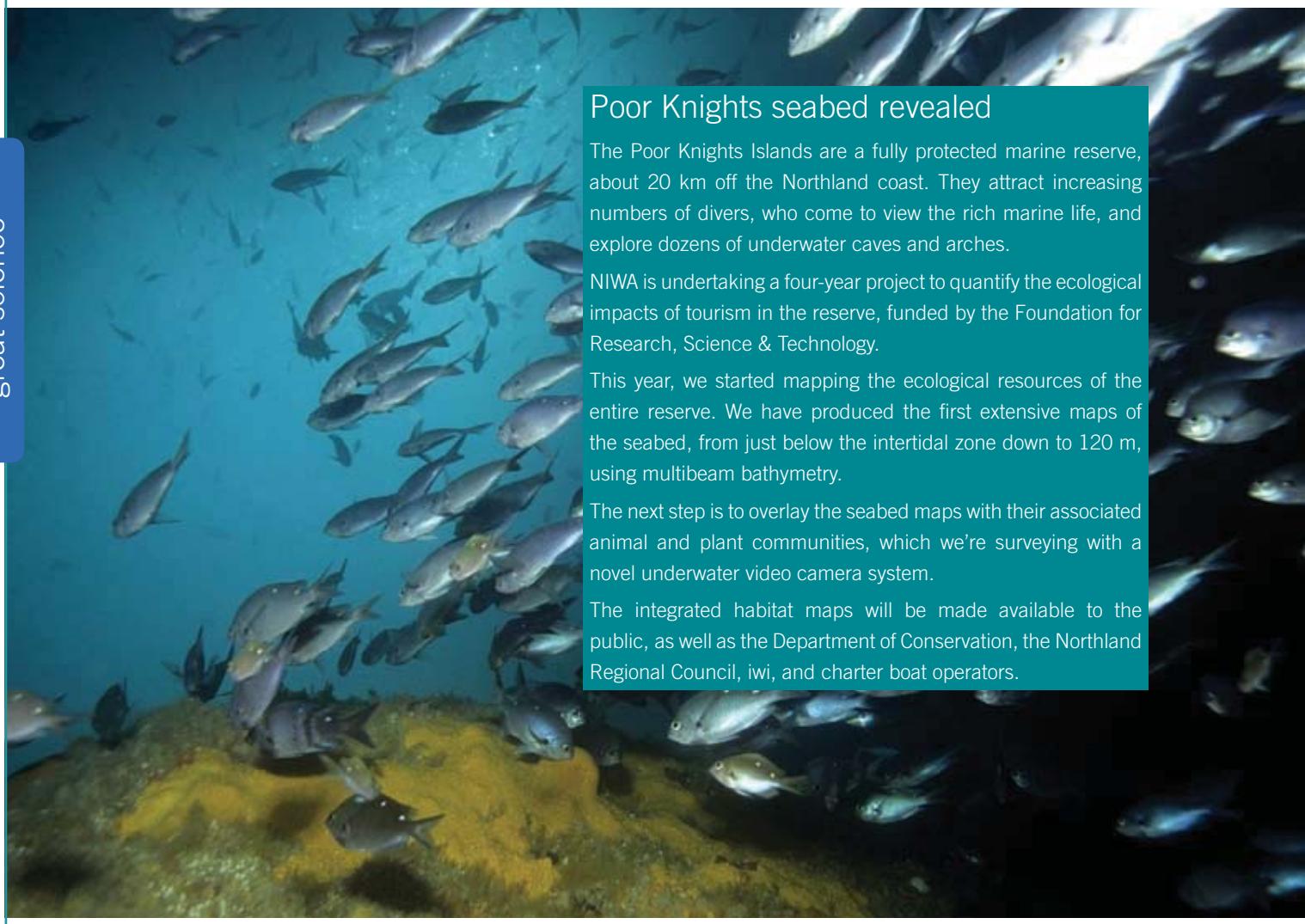
Predicting future flooding on the Clutha Delta

Faced with today's extreme weather and future climate change, local authorities need good information to predict flood inundation.

This year, NIWA investigated a range of scenarios for future flooding of the Clutha River, combined with different sea levels, for the Otago Regional Council. The modelled flow of water ranged from a 1 in 10 year (average return interval) flood to a 1 in 500 year event. The sea level scenarios ranged from the present mean sea level to 0.9 metres above the current mean sea level.

To do the work, we used LiDAR (using lasers to scan the topography from a light aircraft), and river bathymetry, as well as high-resolution, 2-dimensional hydrodynamic modelling.

Predicted inundation on the Clutha Delta during a 1 in 200 year flood with sea levels as forecast for the year 2100 (0.5 m higher than the present mean sea level). The water has gone over the top of many banks, and a floodbank on the Koau (western) branch of the river has broken due to overtopping-induced scour.



Poor Knights seabed revealed

The Poor Knights Islands are a fully protected marine reserve, about 20 km off the Northland coast. They attract increasing numbers of divers, who come to view the rich marine life, and explore dozens of underwater caves and arches.

NIWA is undertaking a four-year project to quantify the ecological impacts of tourism in the reserve, funded by the Foundation for Research, Science & Technology.

This year, we started mapping the ecological resources of the entire reserve. We have produced the first extensive maps of the seabed, from just below the intertidal zone down to 120 m, using multibeam bathymetry.

The next step is to overlay the seabed maps with their associated animal and plant communities, which we're surveying with a novel underwater video camera system.

The integrated habitat maps will be made available to the public, as well as the Department of Conservation, the Northland Regional Council, iwi, and charter boat operators.

Land use affects marine life

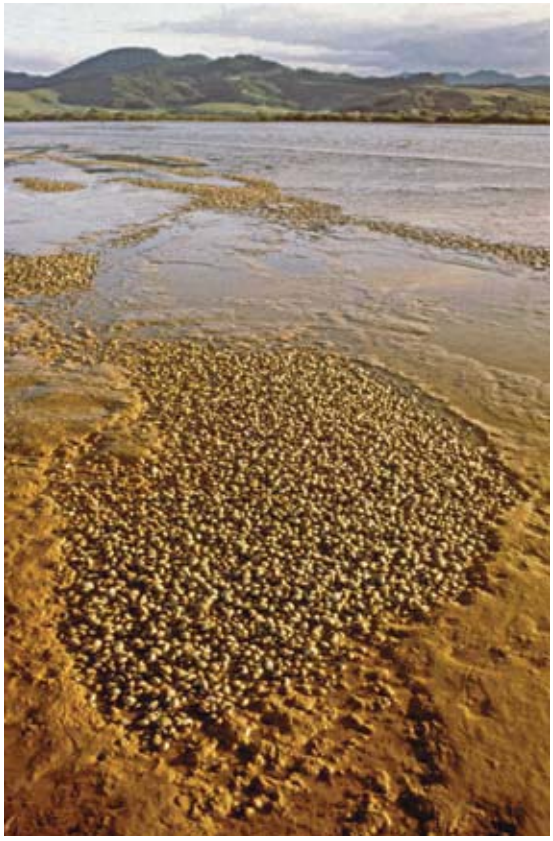
Changes in land use associated with human population growth have altered the amounts and types of sediments from land that have been deposited in coastal areas, often to the detriment of marine communities. This is a worldwide issue.

NIWA researchers have quantified the impacts of land-based sediments on marine communities in the Auckland region by following experimental deposits of sediment placed on the sea floor.

Despite tidal currents and waves that were expected to reduce the impact of these test sediments, we found that the increased sediment load had significant adverse, long-lasting effects on marine life. These ranged from killing sediment-dwelling organisms – including shellfish, snails, and marine worms – to reducing the feeding and growth rates of filter-feeders such as cockles and pipis.

This research highlights the need for policies that minimise sediment loss to the coastal zone.

The project was funded by the Auckland Regional Council and the Foundation for Research, Science & Technology.



Mud deposited on this estuary after heavy rainfall smothered seagrass and shellfish beds.

Measuring ocean nitrate from space

Nitrate is a key nutrient in the world's oceans, and has a major influence on ocean productivity.

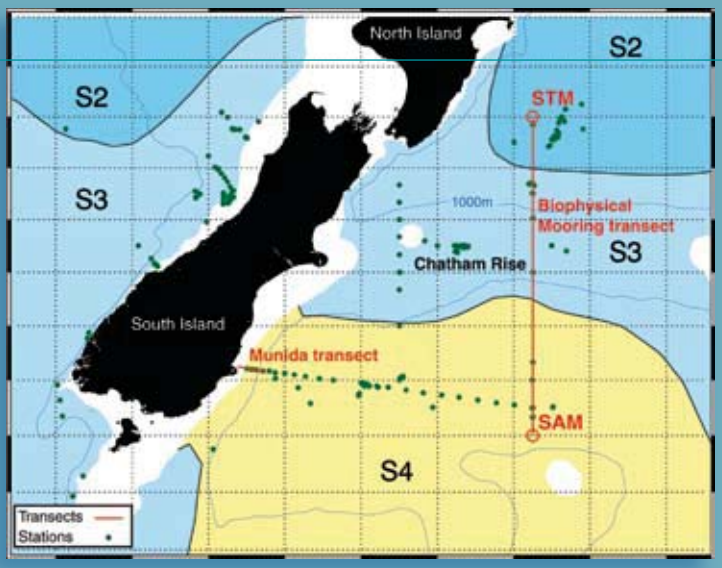
Measuring ocean nitrate levels directly is difficult and costly, because they vary greatly over time and space. This is particularly so around New Zealand, where subantarctic and subtropical water masses meet.

Scientists instead rely on satellite measurements of sea surface temperature (SST) and chlorophyll (the green pigment found in plants) to estimate surface nitrate concentrations.

NIWA scientists have tested how well these estimates match reality, using a unique set of repeat temperature and nitrate measurements taken from NIWA and Otago University vessels.

They found that, while SST alone captured much of the actual variability in nitrate levels, the inclusion of chlorophyll data improves our ability to predict nitrate concentrations.

This represents a major breakthrough in our ability to predict ocean nutrient levels from space. The study was funded by the Foundation for Research, Science & Technology.



Repeated measurements of temperature and nitrate concentrations were made on transects sailed by Tangaroa *and* Munida *in subtropical (S2) and subantarctic (S4) waters and the Subtropical Front (S3) southeast of New Zealand.*

Unlocking secrets of the seabed

Marine geologists from NIWA and France are leading a major international collaboration to explore New Zealand's seabed for clues to past climate change.

Lying at the junction between northern-tropical climate influences and those of the Southern Ocean, the New Zealand region is internationally recognised as an ideal location to investigate past 'abrupt' climate change. It is also renowned for giant submarine landslides, some of which may be triggered by sea level rise.

The researchers used the unique capabilities of French oceanographic research vessel *Marion Dufresne* to take 30–50 m long cores of seafloor sediments at key places around New Zealand.

They will analyse the nature of the sediments, and the microscopic fossils trapped within, to get a picture of past climatic and oceanic conditions. This will help shed light on interactions between climate, land, and ocean processes, and to understand the causes and timing of submarine landslides.

Marine geologists Geoffroy Lamarche (NIWA) and Jean-Nöel Proust (CNRS-Géosciences Rennes, France) study a seafloor map onboard RV Marion Dufresne.

Freshwater

Win:win really is possible

Collaborative research is showing how land use changes can improve the economic as well as the environmental performance of a hill country farm. It's the product of cooperation between three Crown Research Institutes (NIWA, AgResearch, and Landcare Research), Tainui, the Department of Conservation, regional and district councils, and farmers.

The research takes place on a 296 hectare study farm, owned by Tainui, in the headwaters of the Mangaotama catchment, near Whatawhata in the Waikato. In the late 1990s, the farm was struggling financially. The steep farmland was eroding. Stream habitat and water quality were degraded.

A catchment management group set the new direction for the farm, informed by extensive background research. It opted for conversion of the steepest land into pine plantation, some native planting especially along stream banks, and selective intensification of farming on the remaining land.

Experimental flow channels used to test the effects of various land uses on streams.

Five years later, we are seeing improved soil fertility, reduced pollutant loads in streams, improved stream habitat and biota, and improved plant diversity. Alongside this, the financial results have also been positive, with marked improvements in animal productivity.

The project is funded by the Foundation for Research, Science & Technology.

Te Waihora – an icon under stress

Te Waihora (Lake Ellesmere) is one of New Zealand's most important wetland systems, internationally recognised as an outstanding wildlife habitat. Despite pollution, sedimentation, and overfishing, the lake is not dead – but it is stressed. NIWA and Ngāi Tahu have begun a three-year research programme to help bring the lake back from the brink. The programme includes:

- the development of Māori capability, including a set of indicators for monitoring lake and fish health;
- food availability and feeding relationships, focusing on the midges which form the basic food source;
- the status of the main mahinga kai (customary food) species of eel, flounder, whitebait, and bullies;
- habitat issues, stock enhancement and management, such as whether native weed beds in the lake should be replanted.

The research is funded by the Foundation for Research, Science &Technology/Health Research Council and MFish.

Get the best from flushing flows

Floods are important in maintaining river channels and ecosystems. Dams generally prevent all but the largest floods from moving downstream, so dam operators sometimes create intentional floods or 'flushing flows'.

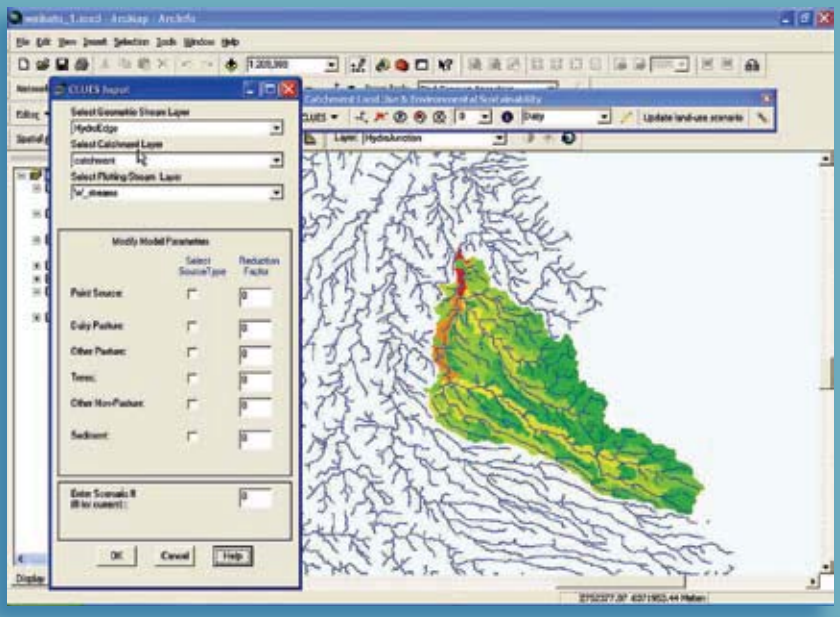
Flushing flows are costly in terms of lost power or irrigation potential so they need to be very precisely designed. NIWA researchers are studying 'flushes' of different sizes from the Opuha Dam, looking at the response of the downstream ecosystem.

So far, we have monitored small to moderate-sized floods, released from the dam after long periods without a flood. These flows were partially effective at removing large proliferations of algae, but did not cause substantial movement of the riverbed. Both these changes would improve the habitat for invertebrates which provide food for fish. The next experimental flushing flow will be much larger. Results will be of particular value to the irrigators, energy companies, and regional councils.

The research is funded by the Foundation for Research, Science & Technology and Alpine Energy Ltd.

Sampling invertebrates on algae-covered rocks.

CLUES to the big questions



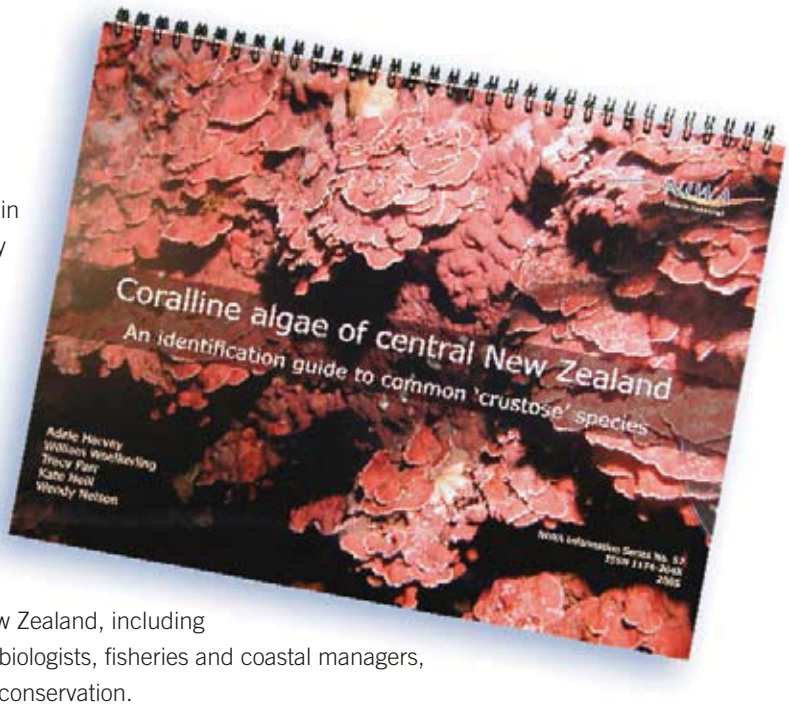
If we allow large-scale conversion of forestry to dairying here, what would be the effect on water quality and on local living standards? It's a big question for regional resource planners. To answer it requires tools for predicting the cumulative effects of multiple nutrient and sediment inputs at a larger catchment scale, while also incorporating an economic and social dimension. No such tools existed in New Zealand until CLUES (Catchment Land Use for Environmental Sustainability).

A team of scientists led by NIWA, with input from AgResearch, HortResearch, Landcare Research, Aqualinc, and Harris Consulting, has spent the past three years developing CLUES. The project is sponsored by the Ministry of Agriculture & Forestry, with support from Environment Waikato.

The system currently has predictive models for nitrogen runoff linked to catchment and socioeconomic models, and supported by national landuse, climate, and soil databases. We are now working with regional and industry interests throughout the country to include phosphorus and sediment runoff, and to implement the system more widely.

Aquatic Biodiversity & Biosecurity

Unique guide to coralline algae

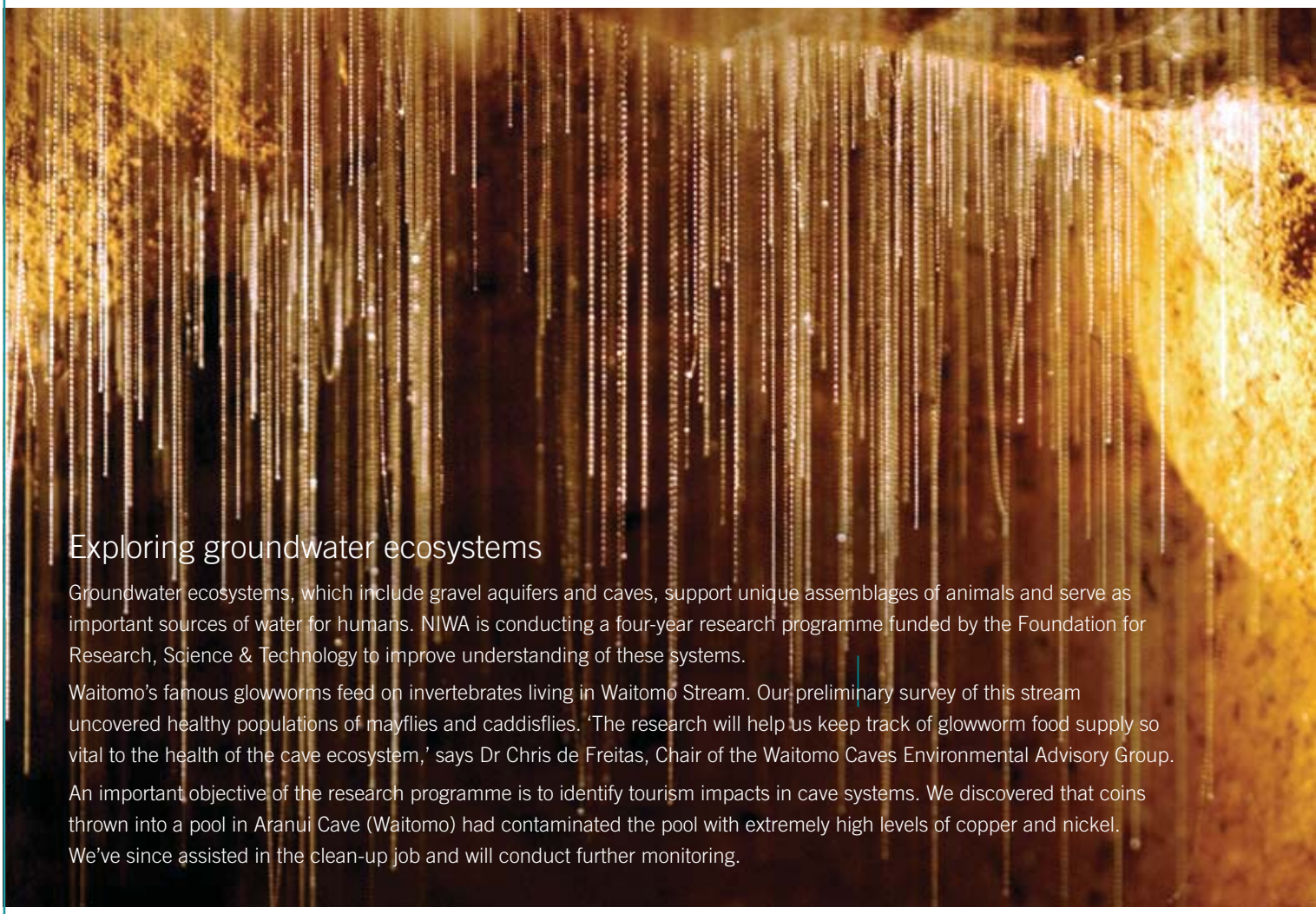


NIWA scientists and colleagues at La Trobe University in Melbourne have produced a unique identification guide to 'crustose' coralline algae, a diverse group of calcified red algae. The guide represents a critical step in understanding these little-studied seaweeds, which play an important role in coastal ecosystems.

Coralline algae can produce chemicals that promote settlement of invertebrate larvae, including paua, and some form intricate reefs that may serve as nursery grounds for fish. However, basic information – including how many species we have, where they grow, and their interactions with other organisms – is sparse or completely lacking.

The guide, which comes in CD and book form, profiles 20 common 'crustose' species from central New Zealand, including the Chatham Islands. It provides a useful reference for biologists, fisheries and coastal managers, and those with responsibility for marine protection and conservation.

The project was funded by the Ministry of Fisheries' Biodiversity Programme.



Exploring groundwater ecosystems

Groundwater ecosystems, which include gravel aquifers and caves, support unique assemblages of animals and serve as important sources of water for humans. NIWA is conducting a four-year research programme funded by the Foundation for Research, Science & Technology to improve understanding of these systems.

Waitomo's famous glowworms feed on invertebrates living in Waitomo Stream. Our preliminary survey of this stream uncovered healthy populations of mayflies and caddisflies. 'The research will help us keep track of glowworm food supply so vital to the health of the cave ecosystem,' says Dr Chris de Freitas, Chair of the Waitomo Caves Environmental Advisory Group.

An important objective of the research programme is to identify tourism impacts in cave systems. We discovered that coins thrown into a pool in Aranui Cave (Waitomo) had contaminated the pool with extremely high levels of copper and nickel. We've since assisted in the clean-up job and will conduct further monitoring.

Combating didymo – *know your enemy*

The invasive freshwater alga *Didymosphenia geminata* (didymo) threatens New Zealand's hydroelectricity generation, angling, tourism, and clean green image. The economic impact of the incursion is estimated at between $58 and $285 million over the first eight years. First identified by NIWA scientist Cathy Kilroy in the lower Waiau River in October 2004, didymo has since been found in several South Island rivers.

NIWA has been providing research and advice to Biosecurity New Zealand on the biology, impacts, and control of this tenacious pest. We discovered that didymo will grow in a very broad range of river conditions and can withstand large floods. We estimate that more than 50% of our rivers provide suitable conditions for didymo, mostly in the South Island.

Trials at a specially-designed facility at the Monowai Power Station in Southland have identified several promising chemicals for the control of didymo. These are now undergoing rigorous testing to determine their effects on didymo and other organisms.

NIWA researchers Cathy Kilroy and Elliot Tuck check for didymo at the Ahuriri River, Otago, watched by Royal Society Teaching Fellow Dave Ward.

Identifying marine pests

The ability to identify marine species is fundamental to protecting New Zealand's waters and marine industries against pests. NIWA is now handling all identifications of marine species for Biosecurity New Zealand under a four-year contract.

The Marine Invasives Taxonomic Service performs urgent identifications of suspected invasive species from diverse sources, and non-urgent identifications from routine survey work.

This involves receiving, identifying, cataloguing, and dispatching specimens to experts in New Zealand and overseas, and storing large volumes of both data and specimens for Biosecurity New Zealand projects. These include baseline surveys of species in New Zealand ports and biological fouling on vessel hulls, plus surveillance for particular pest species.

Several thousand samples have been received since the service was set up in October. About 20% of the species so far identified are non-native, 6% are new records for New Zealand and several new species have been identified.

NIWA biologists Andrew Hosie and Shane Ahyong examine specimens collected during marine biosecurity surveys.

Fisheries

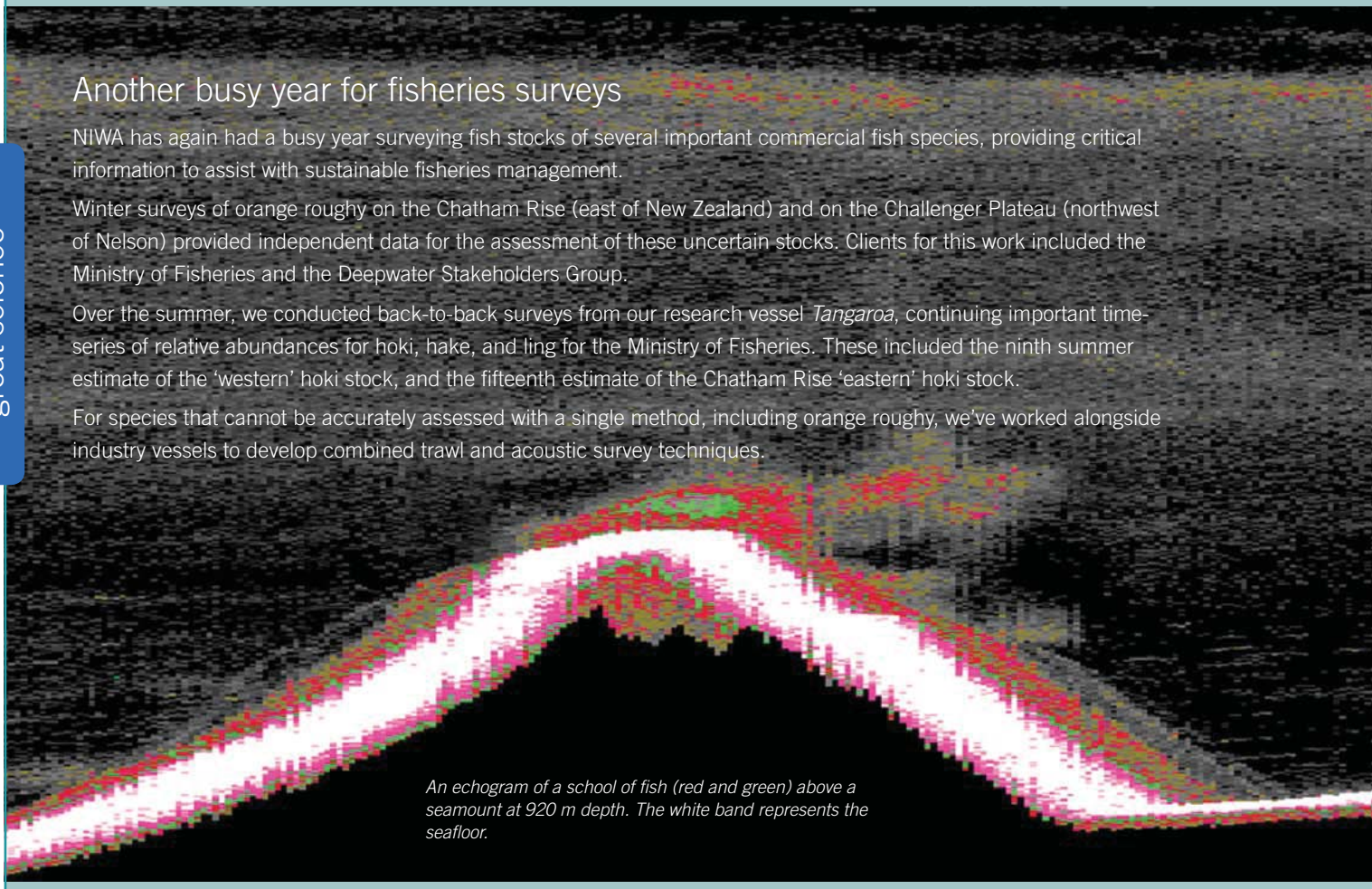
Another busy year for fisheries surveys

NIWA has again had a busy year surveying fish stocks of several important commercial fish species, providing critical information to assist with sustainable fisheries management.

Winter surveys of orange roughy on the Chatham Rise (east of New Zealand) and on the Challenger Plateau (northwest of Nelson) provided independent data for the assessment of these uncertain stocks. Clients for this work included the Ministry of Fisheries and the Deepwater Stakeholders Group.

Over the summer, we conducted back-to-back surveys from our research vessel *Tangaroa*, continuing important time-series of relative abundances for hoki, hake, and ling for the Ministry of Fisheries. These included the ninth summer estimate of the 'western' hoki stock, and the fifteenth estimate of the Chatham Rise 'eastern' hoki stock.

For species that cannot be accurately assessed with a single method, including orange roughy, we've worked alongside industry vessels to develop combined trawl and acoustic survey techniques.



An echogram of a school of fish (red and green) above a seamount at 920 m depth. The white band represents the seafloor.

Sounding out Cook Strait hoki

The results of NIWA's acoustic surveys are vital to establish the status of the Cook Strait hoki fishery, in one of the two main hoki spawning grounds. Hoki form New Zealand's largest fishery, but quotas have been greatly reduced in recent years to protect declining stocks.

This year, we completed the twelfth in a time-series of acoustic estimates of hoki abundance in Cook Strait for the Ministry of Fisheries. The six-week survey involved nine 'snapshots' of the main Cook Strait spawning ground, using sophisticated echosounding equipment on our research vessel *Kaharoa*.

Catch rates in the Cook Strait fishery have not declined as they have in other areas, but our estimates of hoki abundance suggest a different picture. In 2005, we estimated that there were fewer hoki in Cook Strait than any time since acoustic surveys began in 1991, down 40% on the previous estimate in 2003.

NIWA fisheries scientist Richard O'Driscoll explains survey procedures to MFish Chief Executive John Glaister onboard RV Kaharoa.

Keeping a watchful eye on toheroa

NIWA, in conjunction with local iwi, has been active in monitoring toheroa populations in their last remaining strongholds, in Northland and Southland, for the Ministry of Fisheries. Population declines of toheroa in the 1960s resulted in the prohibition of harvesting in 1981, except for Māori customary take and occasional one-day recreational seasons.

Our surveys at Oreti and Bluecliffs Beaches in Southland have shown a steady decline of toheroa over the last 20 years, particularly at Bluecliffs, with numbers only a small fraction of those in the 1960s. Populations fluctuate greatly because of variable recruitment and mass mortality events, but the sustained low abundance is puzzling.

Studies of beach profile and substrate at Bluecliffs, commissioned by Meridian Energy, pinpointed erosion of fine sand substrates as the likeliest cause of declining toheroa populations there.

Further north, densities of toheroa on Ninety Mile Beach remain low.

Untangling Antarctic ecosystems

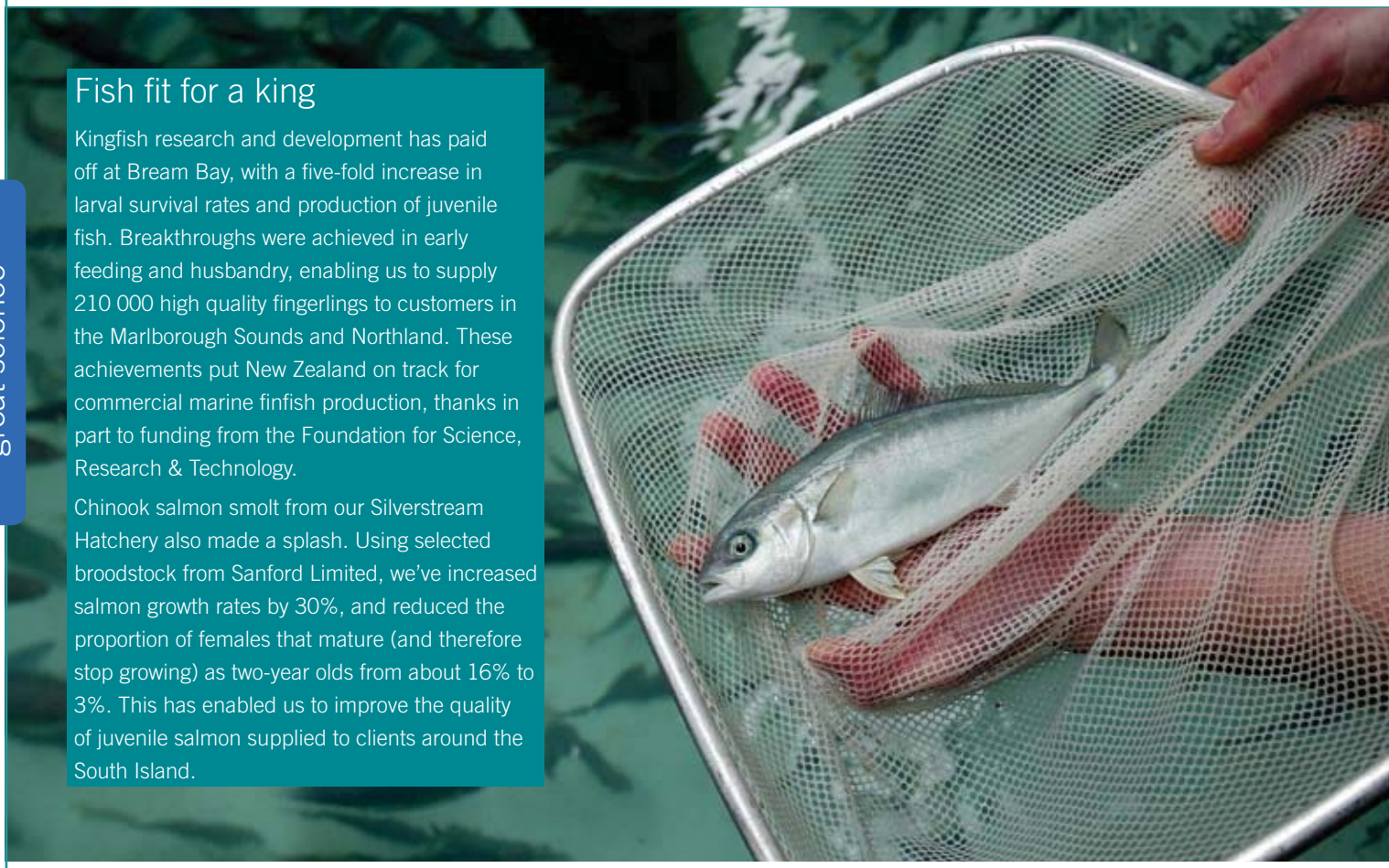
NIWA scientists are working out the relationships among marine organisms in the Ross Sea shelf and slope ecosystems. Our aim is to provide robust scientific advice on the likely response of these unique ecosystems to impacts such as climate change and fishing, particularly for the toothfish fishery.

This year, we constructed a preliminary food web that shows the feeding relationships among all the Ross Sea organisms, from phytoplankton and bacteria to penguins and whales. We are now working out how much carbon flows through each part of the food web to get a better idea of inter-relationships and abundances.

Development of the food web model is continuing under a four-year Foundation for Research, Science & Technology-funded project. We are also analysing the ratio of carbon and nitrogen isotopes in samples of fish collected by industry vessels this season, funded by the Ministry of Fisheries. This helps to show where a particular species sits in the food chain, complementing ongoing feeding studies.

Aquaculture & Biotechnology

great science



Fish fit for a king

Kingfish research and development has paid off at Bream Bay, with a five-fold increase in larval survival rates and production of juvenile fish. Breakthroughs were achieved in early feeding and husbandry, enabling us to supply 210 000 high quality fingerlings to customers in the Marlborough Sounds and Northland. These achievements put New Zealand on track for commercial marine finfish production, thanks in part to funding from the Foundation for Science, Research & Technology.

Chinook salmon smolt from our Silverstream Hatchery also made a splash. Using selected broodstock from Sanford Limited, we've increased salmon growth rates by 30%, and reduced the proportion of females that mature (and therefore stop growing) as two-year olds from about 16% to 3%. This has enabled us to improve the quality of juvenile salmon supplied to clients around the South Island.

More value from kina

NIWA's collaboration with Kiwi firm Sea Urchin New Zealand (SUNZ) has led to improvements in the quantity and quality of kina (sea urchin) roe, giving fishers a better income from the same number of animals.

Roe yields in wild-caught kina have been consistently doubled by feeding them a protein-rich diet developed by NIWA from fishing byproduct. The kina are held in either land-based tanks or sea-cages for 10–12 weeks and are fed on kelp (their natural food) for the last 5–7 weeks to improve taste.

Commercial-scale sea trials in the Marlborough Sounds showed that the switch from land-based to sea-based operations hugely reduced infrastructure costs, and reduced labour and feeding costs by about 80%.

Roe taste has also been greatly improved. 'All the product was taste tested by our regular clients, who came back with positive feedback ... a great success in itself,' says Peter Herbert, managing director of SUNZ.

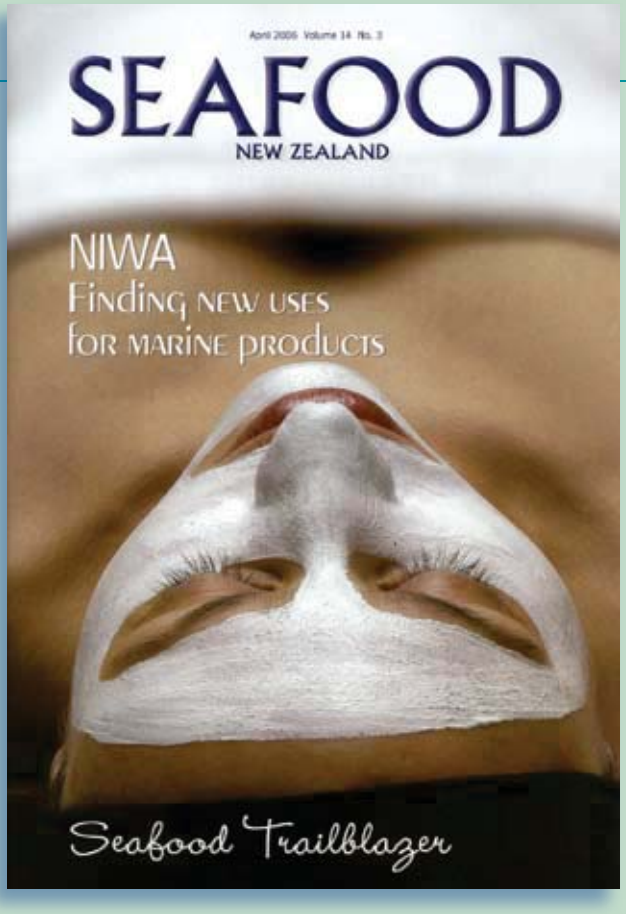
The recent trials were co-funded by SUNZ and the Technology for Business Growth scheme.

Healthy skin from fish waste

Our biotechnology team continues to make good progress with identifying biologically active compounds from seafood processing byproduct and bycatch. *Whatukura a Takaroa: Nutraceuticals from Seafood* is a five-year Foundation for Research, Science & Technology-funded project with Ngāi Tahu Seafood Ltd to develop high-value products from fish species or parts of fish that are normally discarded or turned into fishmeal.

We have so far tested more than 2700 samples from 130 different fish species, and have discovered some form of bioactivity in 146 of those samples. Among the low-value fish species identified by Ngāi Tahu Seafood as targets for adding value, we found 43 bioactive extracts that stimulated skin cell growth and/or had UV-protective or antioxidant properties.

The UV-protectants look promising for developing a product that actually penetrates into cells to work at a biological level, rather than acting as a screen on the skin's surface.



TerraMarine identifies natural gout relief

A joint initiative between NIWA, Crop & Food Research, and the Malaghan Institute of Medical Research has identified two promising anti-inflammatory compounds from native marine organisms.

The three institutes formed TerraMarine Pharmaceuticals in 2002 to discover and rapidly commercialise new non-steroidal anti-inflammatory drugs from native plants and marine life. NIWA has been collecting, identifying, and screening a wide range of marine organisms, from pelagic fish to deepsea bacteria. The group patented their first anti-inflammatory compound in September 2005. Tests show it reduces gout-induced inflammation in tissue cultures and in mice. A second compound is undergoing further development before a patent application is lodged.

These discoveries indicate what a tremendous resource New Zealand's unique marine and terrestrial biota is for treating the growing number of people suffering from inflammatory diseases, including approximately 1 in 20 New Zealanders who suffer from gout.

Capability funding

Capability funding is provided to Crown Research Institutes (CRIs) through the Ministry of Research, Science & Technology to support and enhance long-term research capability. Each CRI's capability funding is based on its proportion of the total government research investment. In 2005–06, NIWA received $7.5 million (excluding GST) in capability funding and used it to support over 200 scientific projects.

	$'000 (excl GST)	Percentage
Support core skill bases that are at or below critical mass	847	11
Advance new areas of science and innovation	2,908	39
Increase the transfer of science to end-users	621	8
Build future research capacity in areas of high national need	903	12
Provide training opportunities and keep existing staff at the forefront of their area of expertise	663	9
Re-position NIWA science to respond to future opportunities and emerging stakeholder needs	398	5
Bridge the gap between research and commercialisation of new products	1,160	15

The magnificent journeys of great whites

Capability funding to maintain fisheries science expertise is improving our understanding of New Zealand white sharks. These awe-inspiring creatures are at risk from trophy hunters and fishing operations, and moves are underway to protect them in New Zealand.

NIWA scientists Dr Malcolm Francis and Michael Manning are collaborating with the Department of Conservation and scientists formerly affiliated with the Wildlife Conservation Society in the US in a white shark tagging project. So far they have analysed data from sophisticated electronic tags attached to three white sharks off the Chatham Islands in 2004–05. The sharks remained near the Chathams for up to five months, then headed north to tropical waters, swimming fast and mostly in surface waters, but occasionally diving hundreds of metres into the deep. They were tracked travelling up to 3000 kilometres in five to six months.

Unfortunately, efforts to tag more white sharks off the Chathams this year were unsuccessful. The weather was atrocious and the sharks weren't keen. In 2006–07, the team will attempt to tag white and porbeagle sharks near Stewart Island.

Securing real-time access to satellite data

Capability funding for advancing new areas of science has supported preparations for NIWA's purchase and implementation of a new high data-rate X-band satellite receiver system. The new system will download, process, and archive about 60 gigabytes a day, equivalent to well over 1000 times the complete works of Shakespeare.

Satellite data are vital to a wide range of research, and to services such as our sea surface temperature and ocean colour analyses used by fishers, and environmental forecasting. The new system will help guarantee real-time access to key current and future satellite data streams.

A true colour image of the South Island, typical of the data sets trunked through high speed X-band satellite receiver systems.

Capabilities maintained, enhanced, or developed with Capability Fund in 2005–06 include:

Areas of nationally recognised expertise	Forecast	Achievements
Sustainability of freshwater environments & resources	■ maintain core capabilities in urban stormwater and wastewater science ■ recruit staff in key areas of increasing stakeholder need (water allocation, water-borne pathogens, contaminant modelling) ■ improve access to national water resources data by developing a web-based interface ■ develop real-time environmental data capture, transfer, and forecasting systems	■ research on toxicity of zinc and polycyclic aromatic hydrocarbons from stormwater on marine biota ■ postdoctoral fellows recruited to study environmental effects of water regulation, natural processes for reducing faecal microbiota, and wetland-based water treatment ■ 'River Explorer' being tested on NIWA's website ■ river flow data now collected in real-time, and river flow models operational
Sustainability of nearshore marine environments & resources	■ recruit new staff to rebuild capabilities in coastal and estuarine science ■ strengthen near-shore habitat mapping capabilities ■ improve monitoring, prediction, and decision support tools for coastal and estuarine environments	■ new postdoctoral fellows in coastal physical oceanography and rocky reef ecosystems recruited ■ technology improvements through mapping case studies ■ completed first stage of a buoyed monitoring system, developed wave forecasting model, and improved web-based tide forecaster
Sustainability of oceanic environments & resources	■ develop planning and prediction tools to assist in formulating ocean policy ■ enhance performance of current trophic models to better represent ecosystem dynamics and sustainable resource use ■ strengthen capability associated with the use of satellite data to research, monitor, and forecast ocean properties	■ developed models to predict ocean currents and initiated a regional ocean climatology for New Zealand ■ enhanced models that link ocean physics, primary production, fish populations, and aquaculture ■ evaluated the use of satellite ocean colour data to measure coastal productivity and further developed algorithms to estimate open ocean productivity
Fisheries	■ develop a shared research strategy with central government agencies to guide development of future ecosystem management tools ■ recruit new staff to strengthen capability in fisheries modelling and shellfish population biology ■ develop training courses to upskill stakeholders on fisheries research concepts and technologies	■ fisheries-related ecosystem proposals developed in collaboration with MFish ■ two new fisheries population modellers and an expert in shellfish fisheries and ecology recruited ■ completed planning of courses on fisheries concepts, research, and technology with MFish for implementation in 2006-07
Māori development	■ enhance science capability and profile of Māori staff by supporting paper writing and conference presentations ■ recruit new staff to enhance capability in qualitative and kaupapa Māori research methodologies ■ develop tools to assist Māori with aquatic biodiversity management ■ enhance partnerships with iwi by assisting in the development of iwi research plans	■ five Te Kūwaha staff presented papers at international conferences, three papers submitted to peer reviewed scientific journals ■ recruited two new staff with expertise in marine ecology and Māori resource management ■ developed habitat maps of offshore Mahia Peninsula for Rongomawahine ■ plans developed for Ngāti Porou and Ngāti Whatua
Mitigating human impacts on the atmosphere	■ recruit new staff to develop novel technologies to quantify and identify the source of greenhouse gas emissions ■ develop policy-relevant models and tools related to greenhouse gas emissions and renewable energy ■ recruit new staff and support studies to rebuild capability in air dispersion modelling	■ postdoctoral fellow recruited to develop measurement techniques for methane source attribution ■ enhanced NIWA's climate model in relation to radiative forcing and circulation in relation to greenhouse gas emissions to improve information for national climate change policy ■ recruitment process initiated and three new air quality staff appointments anticipated in 2006–07
Natural hazards	■ adapt remote sensing infrastructure to the next generation of satellites to maintain ability to obtain remotely sensed data ■ recruit additional staff to attain critical mass in social planning and economic aspects of hazard mitigation	■ purchased a new high data-rate X-band satellite data receiver system, and scoped and completed an implementation plan ■ social scientist employed to undertake research associated with climate and natural physical hazards
Climate variability & change	■ accelerate development of regional climate models ■ produce monthly climate summaries and outlooks and disseminate via the media, internet, public presentations, and *The Climate Update* ■ recruit additional staff to develop climate-related products and services for selected end-user sectors	■ new climate modeller employed and the sensitivity of a regional climate model to soil moisture and vegetation characteristics determined ■ monthly climate summaries and outlooks disseminated in over 100 media interactions, publications, and presentations ■ postdoctoral fellow employed to advance rainfall modelling for predicting climate risks to energy supply and demand
Aquaculture & biotechnology	■ accelerate research on new species aquaculture ■ enhance capability in core areas of aquaculture that are below critical mass ■ recruit new staff to advance added-value product development	■ researched methods to extend kingfish spawning season to enable year-round fingerling production ■ supported visiting scientist to provide transfer of technology for commercial kingfish culture and recruited expertise to advance improvement of the bulk algal production system ■ postdoctoral fellow recruited to research novel microbial sources of marine oils
Aquatic biodiversity & biosecurity	■ build team in aquatic biosecurity to address expanding stakeholder needs ■ increase staff skills in taxonomy through training courses ■ improve utility of biodiversity data by developing better analysis and mapping tools	■ recruited postdoctoral fellow to study marine algae and supported freshwater pest fish and algae research team ■ four staff trained offshore in invertebrate parataxonomy (asteroids, echinoids, holothurians, and hydroids) ■ advanced use of statistical techniques for mapping EEZ biodiversity to aid identification of marine protected areas

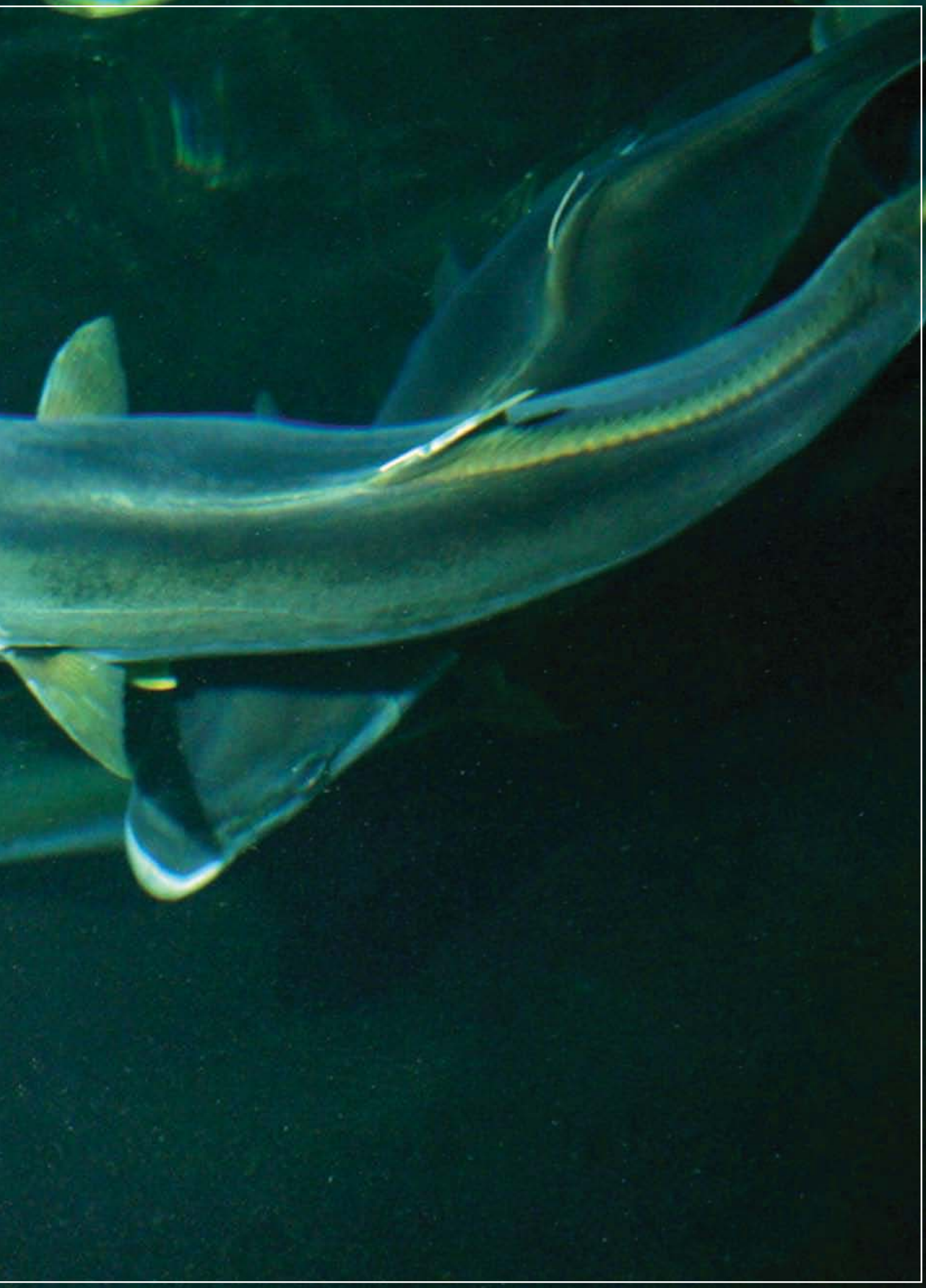
great services

we provide scientific products and services through our national centres and specialist service centres in NIWA Science and through our subsidiaries

www.niwa.co.nz

this section profiles a few of the products and services we provided during 2005–06

Kingfish broodstock at Bream Bay.



National Climate Centre

guiding responses to global change

ClimateExplorer – climate information your way

Imagine a farmer considering whether to send more stock to the works during a drought. The farmer logs on to the web for the current soil moisture status and forecasts of the probability of rain in the next 15 days. The farmer combines this with other information (e.g., meat prices, booking schedules for local meatworks) to decide what to do.

NIWA ClimateExplorer, which went live this year, makes good quality, timely climate analysis readily available over the web. ClimateExplorer is an example of Crown-funded science supporting sound business decisions.

http://climate-explorer.niwa.co.nz

Making the most of the climate

As part of our efforts to help farmers make the most of the climate, we have been working with Chris and Jane Earl at Scargill, North Canterbury. Their property is a Meat & Wool New Zealand monitor farm. We have installed a NIWA compact climate station there, estimated a long-term climate record for the farm, and developed software to help farmers use the data – approaches which can be applied to any farm in the country. Farm advisor, Phill Everest, says that the climate station is collecting good value data which is now being implemented into management strategies.

helping people prepare for and deal with the climate – now and in the future

- climate measurement & monitoring
- climate data & summaries
- climate maps & GIS layers
- climate forecasts & seasonal outlooks
- influences on climate, including El Niño, sea surface temperatures
- future climate
- effects of climate – present & future
- climate-related hazards

www.niwascience.co.nz/ncc

National Centre for Climate–Energy Solutions

finding the energy to move New Zealand forward

providing practical solutions to energy problems

- renewable energy
- energy efficiency
- greenhouse gas reductions
- reducing the environmental effects of energy use
- energy for remote communities

Getting renewables right

How do you provide a reliable energy supply which meets people's needs out of diverse, variable renewable energy sources?

On a national scale, New Zealand's electricity system has a very high proportion of renewables and a long 'stringy' transmission system. This can lead to security-of-supply scares, and resulting high electricity prices, even when there is adequate thermal fuel capacity to bridge the gap. The question of how to stabilise the system is exceptionally complex and needs good science. Our research programme, *climate-related risks for energy supply and demand*, is providing some of the building blocks by, for example, understanding the effect of climate cycles on the hydro resource.

On a regional scale, this year we used our extensive climate and hydrometric databases to find locations in a region where wind generation can be sited to complement hydro, even though wind and rain generally coincide across the region as a whole.

On a local scale, NIWA's Māori Development Unit, Te Kūwaha, is working alongside the remote Māori communities of Waipoua (Northland) and Waihi (Lake Taupo). The project involves all partners learning together and from one another. Key features include needs assessments, resource monitoring, retrofitting for energy efficiency, installation of small-scale technologies (solar, wind, micro-hydro), and the establishment of systems to support these. The work is funded by the Foundation for Research, Science & Technology, with support from EECA. We are working with subcontractors EcoInnovations and Negawatt Resources Ltd.

CRL Energy joins National Centre

The National Centre for Climate-Energy Solutions has expanded into a joint enterprise between NIWA and CRL Energy, following NIWA's purchase of a 50% stake in CRL Energy in April 2006. The centre will provide one-stop access to both organisations' research, consulting, information, and resources on the intertwined issues of energy, climate, and emissions reduction.

www.niwascience.co.nz/ncces

great services

National Centre for Coasts & Oceans

guiding sustainable development

Defining New Zealand's boundaries

NIWA has made a major contribution to New Zealand's 2683-page submission to the United Nations on the limits of our extended continental shelf.

This project is of key strategic and economic importance, as it will extend New Zealand's rights over seabed resources to the outer continental shelf boundary.

Defining that boundary has required painstaking underwater detective work. We have contributed detailed surveys and mapping of the seabed, analysis, and documentation.

This 10-year, $44 million project has involved a mammoth collaborative effort between NIWA, Land Information New Zealand, the Ministry of Foreign Affairs and Trade, and GNS Science.

When paua seek a home

To help decisions on the location of marine reserves, NIWA has been working with the Department of Conservation to provide information on how far paua larvae disperse.

We have used numerical modelling to study how currents carry larval paua on the open coast near Gisborne. Our results show that an ideal paua management system would space marine reserve areas at intervals of 10–30 km along the coast to ensure larval supply to areas between reserves.

This work was funded by the Foundation for Research, Science & Technology.

guiding exploration, management, and protection of coastal and marine resources

- mapping seafloor resources
- environmental assessments & surveys – sedimentation, pollution, erosion, restoration
- forecasting for the marine environment
- oceanography & ocean productivity
- coastal ecology
- environmental monitoring & modelling

www.niwascience.co.nz/ncco

National Centre for Water Resources

making every drop count

providing tools and information for the sustainable use of water

- water allocation
- water quality
- environmental monitoring & modelling
- pollution control & prediction
- lake, wetland, & river restoration
- flow forecasting
- land-use effects
- wastewater treatment

A powerful urban planning tool

NIWA's USC-2 (Urban Stormwater Contaminant) model predicts long-term accumulation of contaminants in estuaries, and can test the effects of alternative development strategies.

Recently, the model highlighted some tricky tradeoffs for the Upper Waitemata Harbour. One subcatchment, for example, not only supplies the most zinc to the middle main body of the harbour, but also a substantial sediment load which dilutes contaminants, pointing to a need to control contamination at its source. Such information helps councils plan for sustainable development.

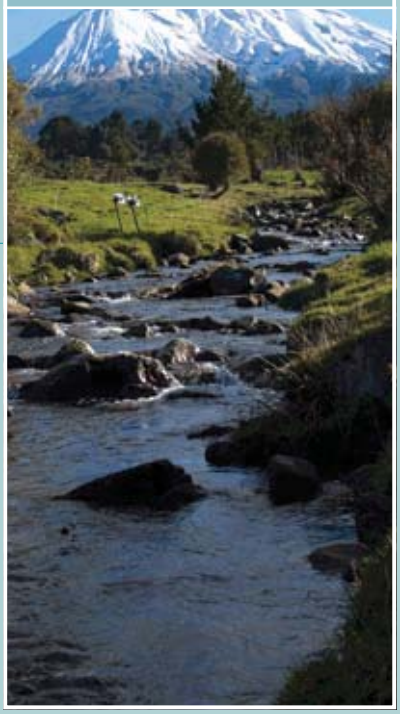
We are also applying the model for the Middle Waitemata Harbour, and are assessing the feasibility of packaging it in a desktop tool for managers.

Funding has come from local and regional government, Transit New Zealand, and the Foundation for Research, Science & Technology, through the Envirolink Fund.

New wetland provides hope for Rotorua lake

Lake Okaro in the Rotorua district is popular with water skiers, but experiences persistent blue-green algal blooms in most summers. The regional council, Environment Bay of Plenty, puts it in the second-worst lake water quality category. Now a wetland has been constructed to help improve water quality by filtering nutrients from farm run-off to the lake.

NIWA managed the wetland project throughout. It was built on land from a local farming family, the Birchalls, and the Rotorua District Council. Once mature, the wetland is expected to achieve roughly one-fifth of the nitrogen reduction target set in the community action plan for the lake.



www.niwascience.co.nz/ncwr

National Centre for Aquatic Biodiversity & Biosecurity

protecting our natural heritage

Nationwide searches for foreign invaders

NIWA is providing critical information on the presence and spread of key freshwater and marine pests to Biosecurity New Zealand.

Following discoveries of new incursions of didymo in September 2005, Biosecurity NZ enlisted NIWA's expertise to check susceptible rivers nationwide. We quickly mobilised field teams and used field laboratories for on-site testing. The survey was assisted by staff from Fish & Game NZ, the Department of Conservation, AgriQuality, and several regional councils.

In another rapid response for Biosecurity NZ, we also mobilised expert teams to survey 26 ports and marinas around New Zealand for the invasive sea squirt *Styela clava*, first discovered in Auckland's Viaduct Harbour in August 2005.

Practical aquarium plant guides

Aquarium hobbyists now have additional resources to guide them in selecting and culturing benign plants in the place of pest plants.

NIWA has worked with hobbyists, growers, the pet trade industry, and the Department of Conservation to produce two pictorial plant guides for this purpose. One shows ten species that are at high-risk of becoming pests if established in New Zealand. The other outlines 54 alternative native or low risk non-native plants to grow in their place.

The project was jointly funded by DoC and the Foundation for Research, Science & Technology.

Download the guides for free at: www.niwascience.co.nz/ncabb/tools/

providing advice on freshwater and marine biodiversity and biosecurity

- biodiversity surveys – what lives in the area, including species new to science & species new to the area
- aquatic pests – identification, prevention, control, eradication
- human impacts on biodiversity
- strategies for sustainable management
- advice on habitat & biodiversity restoration
- toxic algae – identification, spread, potential risks
- practical training, identification guides

www.niwascience.co.nz/ncabb

National Centre for Fisheries & Aquaculture

generating wealth for New Zealand

working with industry to increase the value and sustainability of seafood and aquaculture

- fish abundance & productivity
- population modelling & risk analysis
- estimation of sustainable harvest levels
- fish biology & ecology
- fish & shellfish culture
- research & development for commercial application
- effects of aquaculture on the environment

Enhancing Foveaux fisheries

NIWA is working with the Bluff Oyster Management Company (BOMC) and a broad range of community and government stakeholders to improve two important Foveaux fisheries, Bluff oysters and blue cod.

Our oyster population model is helping the industry make projections of future harvests, and we are modelling how the disease bonamia affects oyster populations.

With BOMC, we've made great progress in trialling shell reefs formed from shucked oyster shells as habitat for both oysters and juvenile blue cod.

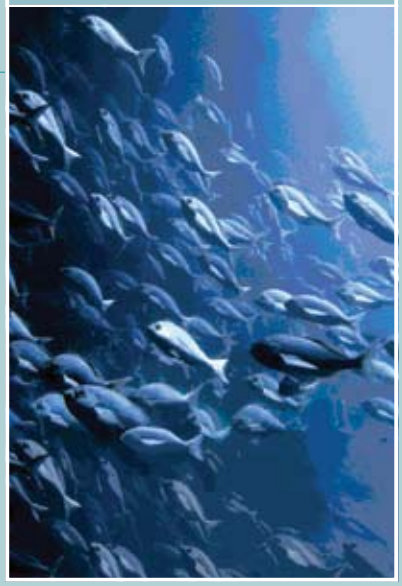
'NIWA's scientific expertise is invaluable in working out how and where to enhance seabed habitats for oysters', says BOMC Chairman Warren Conway.

Cleaner water for better paua

Our tailor-made recirculation systems are leading the way in the culture of paua, a high-value species for New Zealand aquaculture.

Recirculation systems allow paua farmers to maintain constant temperatures and provide optimum conditions for growth. But badly designed systems fail to supply enough oxygen to the paua and suffer from acid build-up, which slows paua growth and dissolves their shells.

Our aquaculture specialists have helped to design a recirculation system that overcomes these problems. 'NIWA's assistance has been crucial to our achieving a world class system with consistent high quality water,' says Doug Lloyd, Managing Director of OceaNZ Blue Ltd.



www.niwascience.co.nz/ncfa

National Hazards Centre

setting the foundation for a safer future

Auckland tsunami hazard assessed

The Auckland region may experience a large tsunami (greater than 5 metres) about once every 900 years on average. This is one finding from our overview of the tsunami hazard for Auckland Regional Council.

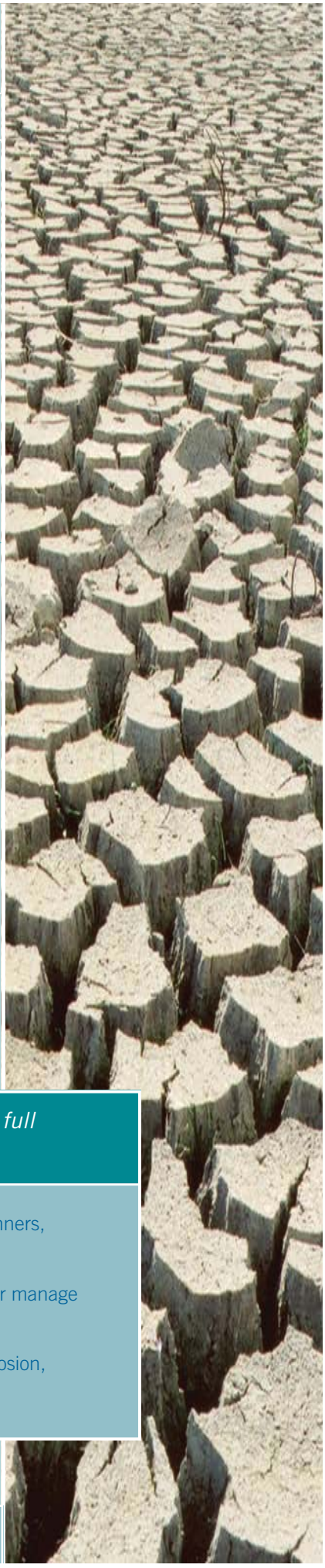
Our modelling, verified by geological evidence, indicates that a subduction earthquake along the Tonga–Kermadec Trench could be one of the most damaging tsunami sources for Auckland. A subduction earthquake there could produce a tsunami affecting a large section of coast. Waves would vary in height, but could be over 7 metres. The tsunami would hit Great Barrier Island about 70 minutes after the quake.

Help for fighting floods

When regional councils and emergency managers receive a flood forecast, they know it won't be correct to the last cubic metre per second. But, until now, the tools for estimating how big the range of 'correct' results might be, or what is the best case and worst case, have not been available.

This year we have developed and tested tools for calculating uncertainty limits in flood forecasting models we built for the Manawatu and Wairau (Marlborough) Rivers. Assuming accurate rainfall forecasts, preliminary tests show flood forecast accuracies of ± 20% are achievable.

The work was funded by the Foundation for Research, Science & Technology.



bringing together the expertise of NIWA and GNS Science on the full range of natural hazards

- providing information for policy managers, planners, emergency managers
- helping people improve their resilience & better manage the risks
- floods & droughts, extreme weather, coastal erosion, landslides, earthquakes, volcanoes, tsunamis

www.naturalhazards.net.nz

Te Kūwaha

promoting Māori development

E ngā hau e tāwhio ana huri noa i te motu, tēnei te mihi maioha o Te Kūwaha ki a koutou ngā iwi e ngākaunui ana ki ngā āhuatanga o tō tātou nei taiao. Ko mātou nei te roopu rangahau Māori o roto o NIWA e mahi ngatahi ana i te taha o ō mātou hoa kaipakihi Māori. Ānei rā ētehi o ngā mahi rangahau e whakahaere ana i tō mātou nei roopu i tēnei tau, nō reira tēnā rā koutou katoa.

Willy Emery (seated) and his son Wiremu using a tau to harvest koura from Lake Rotoiti.

Traditional method adapted to monitor lake koura

Koura or freshwater crayfish are important traditional food for Māori. Anecdotally, deteriorating lake conditions appear to have reduced koura abundance. But a lack of quantitative information on these trends hinders sustainable management. A key obstacle is the lack of suitable sampling methods.

We are working with Te Arawa and Ngāti Tūwharetoa to turn their traditional fishing method, tau koura, into a monitoring tool. The Te Arawa/Ngāti Tūwharetoa tau koura method involves resting bundles of bracken fern fronds on the lake bed for koura to take refuge in, and then retrieving the bundles and harvesting the koura. Now iwi and NIWA are successfully using the method to research and monitor lake koura populations. Special thanks to Ian Kusabs (Fisheries Consultant, Ngāti Tūwharetoa, Te Arawa) and Willie Emery (Kaumātua, Ngāti Pikiao & Te Arawa Māori Trust Board, Rotoiti).

Seaweed aquaculture opportunities explored

Lessonia variegata is a brown seaweed found only in New Zealand. It belongs to a group of kelps which is widely used overseas in health and beauty products.

In partnership with Aotearoa Seafoods Ltd (owned by Wakatu Incorporation), we have begun to explore the potential of *Lessonia* as an aquaculture crop. Our preliminary work has focused on spore settlement and growth, and some initial farm trials. Further research is planned.

The project is funded by a Technology for Business Growth grant through the Foundation for Research, Science & Technology.

www.niwascience.co.nz/maori

NIWA Instrument Systems

accurate and dependable data for science

NIWA Instrument Systems is a specialist instrumentation group within NIWA Science. We provide hardware and software for environmental monitoring and a full package of design, construction, and installation services.

Wind energy assessment made easier

A device constructed by Instrument Systems is proving its worth in assessing potential wind farm sites.

The trailer-mounted Remtech 'SODAR' (sonic detection and ranging) unit is much more mobile, quicker, and cheaper than conventional mast-mounted technology. More importantly, the data collected are proving just as reliable. This year we achieved correlations of 97% between SODAR and mast-mounted measurements at one proposed turbine site. (A 100% correlation is impossible because the mast and SODAR trailer cannot be in precisely the same place at the same time.)

In addition, the SODAR's analysis systems derive some statistics which are not readily available from masts. It provides data on wind speed and direction, turbulence, thermal structure, and mixing, through heights ranging from 25 to 1500 metres rather than just a fixed point.

Long track-record in irrigation systems

Since the late 1990s, Instrument Systems has developed and installed monitoring and control systems at 18 sites on irrigation schemes in Canterbury and South Canterbury.

This year, we built, installed, and commissioned a series of flow monitoring and control stations on the Benmore Irrigation Scheme, McKenzie Basin, for the main contractors, Attewell Irrigation Ltd. The automation systems are designed to ensure that the operational consents granted for the scheme are satisfied and each property gets the required amount of water.

www.niwascience.co.nz/instrumentsystems

Unidata

environmental monitoring & industrial measurement

Unidata Pty Ltd is an 80% subsidiary of NIWA Group, based in Perth, Western Australia. We specialise in the design, manufacture, supply, and support of new technologies for environmental monitoring.

Neon is on the horizon

The next generation of Unidata's flagship data acquisition and processing system, Crossramp, is now under development. The redeveloped system, to be known as Neon, will include new features such as real-time, two-way communications, satellite communications, and an improved field unit.

The longest-running Crossramp customer is Alinta Gas, Western Australia, which has been using the system for gas metering over the past four years.

Crossramp uses a series of 'XRT' (Crossramp Remote Terminal) field units which collect and regularly 'push' data to a secure server via a cellular network. The timetable for pushing data is preprogrammed, but allows for alert and ad hoc reporting. As well as data storage, the Crossramp server can format data for easy uploading into the client's data processing or billing systems.

Unidata in China

The Hong-Shui-He Irrigation Catchment in Gansu province, northwest China, covers about 210 000 square kilometres – almost twice the size of the North Island of New Zealand. There are 5 main irrigation channels, and 43 secondary channels, largely servicing crop farmers.

Unidata's Starflow ultrasonic Doppler flow meters are now being used in the network, as part of a pilot project developed with the Chinese Ministry of Water Resources. Starflow is a complete hydrographic data collection system, combining water velocity, depth, flow, and temperature instruments integrated with Unidata's Starlog micrologger.

Unidata products have been available in China for several years. Our representatives there are Australian Water Management, Sydney.

Unidata staff demonstrating a typical gauging station in the Perth metropolitan area.

www.unidata.com.au

great services

NIWA Vessel Management

RV Tangaroa *reached her most southerly latitude yet: 75° S.*

Intrepid *Tangaroa* surveys Ross Sea

Tangaroa visited Antarctic waters for the sixth time, conducting geophysical, hydrographic, and biodiversity surveys of the Ross Sea and neighbouring islands for Land Information New Zealand and the Ministry of Fisheries.

The ship carried 37 personnel on a 48-day, 8525 nautical mile voyage across one of the world's most inhospitable stretches of ocean.

'Conditions in the Ross Sea were tricky, with swathes of thick pack ice, and visibility often reduced by fog or snow,' says voyage leader John Mitchell. 'The captain and crew did an excellent job of manoeuvring the ship and seismic survey equipment through the ice.'

Explorers of the deep

A new deepwater video camera system deployed on *Tangaroa* captured stunning images of the Graveyard seamounts complex on the Chatham Rise. The camera and frame were purpose-built in NIWA workshops to record deepsea habitats and living things. The images are being used to describe seamount biodiversity, and to help assess impacts of bottom trawling on seamount communities.

The video system had a real-time feedback to the vessel, enabling the camera to be monitored and adjusted as it was 'flown' within a few metres of the seafloor, at depths down to 1200 m.

The research is funded by the Ministry of Fisheries and the Foundation for Research, Science & Technology, and supported by the Census of Marine Life seamount programme.

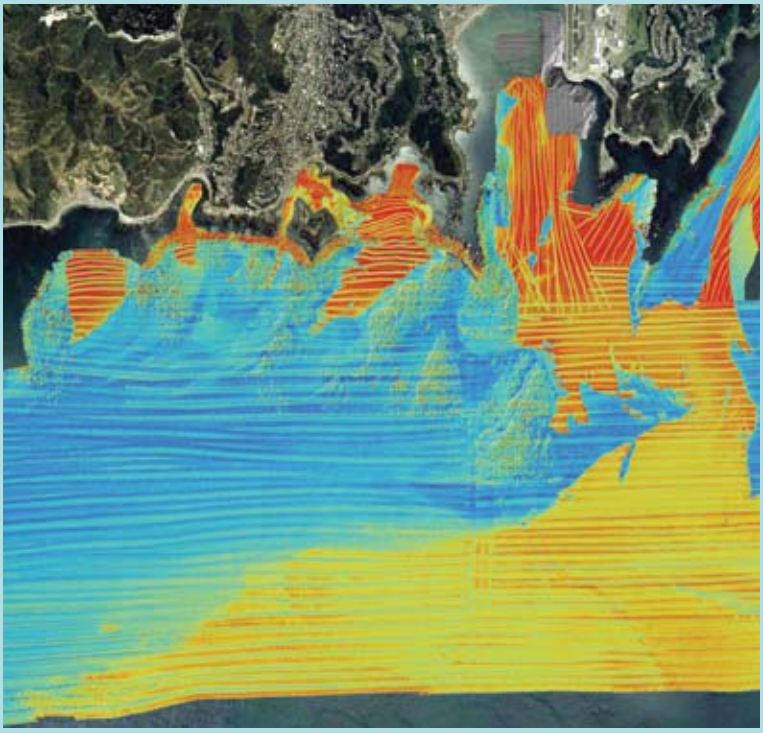
www.niwavessels.co.nz

Sophisticated sonar reveals marine habitats

NIWA vessels' multibeam sonar capabilities offer a rapid, accurate, and objective means of mapping marine habitats, with myriad applications.

NIWA recently applied this technology to map 46 square kilometres of seafloor habitats in and around the proposed Taputeranga Marine Reserve on Wellington's south coast, in conjunction with Victoria University and the Department of Conservation. Combining the shallow water capabilities of survey launch *Pelorus* and research vessel *Kaharoa* enabled the team to map close to the shoreline and cover the entire subtidal area.

The vessels were equipped with an EM3000D high resolution echosounder. This sends out 254 beams of sound to provide unsurpassed detail of the seafloor, even distinguishing between coarse and fine gravel substrates.



Map of seafloor habitat types on Wellington's south coast. Red-yellow areas indicate coarse and medium-fine sands; light blue, fine gravel; dark blue, coarse gravel; isolated red-yellow areas, rock.

NIWA Research Vessels

RV *Tangaroa*

Tangaroa is New Zealand's premiere research and survey vessel, equipped for hydrographic, bathymetric, oceanographic, and biological surveys, and both trawl and acoustic fisheries surveys. *Tangaroa* has an ice-strengthened hull, enabling it to operate in Antarctic waters.

RV *Kaharoa*

Kaharoa is primarily a coastal and inshore vessel with hydrographic, bathymetric, oceanographic, biological, and fisheries survey capacities, but over recent years has deployed Argo floats across the Pacific to North and South America and Hawaii.

Pelorus

Pelorus is a purpose-built rugged science support and hydrographic survey launch, which has been fitted out to operate in Antarctic conditions. It can be carried on and launched from *Tangaroa*.

Type:	Deepwater research vessel	Coastal research vessel	Survey launch
Year built:	1991 (Mjellem & Karlsen Verf, Norway)	1981 (Whangarei Engineering Co.)	1977 (fully refitted 2000)
Owner:	NIWA Vessel Management	NIWA Vessel Management	NIWA Vessel Management
Length:	70.0 m	28.0 m	10.5 m
Beam:	13.8 m	8.2 m	3.0 m
Draft:	7.2 m	3.2 m	1.0 m
Hull:	Ice strengthened		
Cruising speed:	12 knots	10.5 knots	12 knots
Endurance:	60 days	30 days	
Crew:	14	5	
Accommodation:	30 scientific staff	6 scientific staff	
Miles steamed:	c. 900 000 nautical miles	c. 490 000 nautical miles	

NIWA Natural Solutions

NIWA Natural Solutions commercialises products and technologies developed by NIWA. It bridges the early-stage development and finance gap by:

- *identifying product opportunities;*
- *undertaking and facilitating technological or commercial feasibility;*
- *funding product and market development;*
- *creating and implementing partnership and commercial arrangements.*

Kingfish go commercial

We are providing the springboard for New Zealand's first commercial marine finfish production with the supply of 170 000 yellowtail kingfish fingerlings to customers in the Marlborough Sounds this year.

The finger-sized fish were reared at NIWA's Bream Bay Aquaculture Park, the only hatchery to produce commercial quantities of kingfish fingerlings. This breakthrough was achieved through refinement of early feeding and husbandry techniques, resulting in a five-fold improvement in survival and production numbers this year.

Kingfish is the first of several high-value aquaculture species NIWA is developing. Our aim is to help diversify the New Zealand aquaculture industry, and enhance earnings from existing aquaculture space.

A natural solution to weed control

NIWA Natural Solutions has joined forces with a leading US weed control company to target New Zealand's growing freshwater weed problem.

Freshwater weeds are costing this country an estimated NZ$18–40 million per annum, with serious impacts on biodiversity, hydroelectricity generation, water extraction, and amenity values.

Mycoherbicides offer an effective, environmentally-friendly solution to this problem. Based on naturally occurring pathogens extracted from fungi, they target specific weeds, leave no toxic residues, and are completely biodegradable.

We are in the early stages of developing a mycoherbicide from a candidate fungus with our US collaborators.

NIWA International

Overseas, NIWA provides research and consulting services of a similar nature to those it provides in New Zealand. These range from fisheries strategies for Iran and Chile to assistance with climate, water resources and quality, and natural hazard issues and capacity building in the Asia-Pacific region. We also have subsidiaries in Australia and the US to facilitate our work there.

Reducing cyclone damage to the Tokelau atolls

Tropical cyclone Percy, a category 3 to 4 cyclone, caused widespread damage to the atolls of Tokelau on 25 February 2005. Particularly hard hit were Fakaofo and Nukunonu, with storm surge and large waves causing significant flooding on both atolls.

In the aftermath of Percy, the UN Development Programme in Samoa commissioned NIWA to provide technical support to the Government and people of Tokelau to help reduce both the impacts of future cyclone-related inundation and also adapt to longer-term issues, such as climate change.

In collaboration with each community, we developed a variety of short- to long-term risk reduction activities incorporating a wide range of social and environmental objectives. We also looked at incorporating risk reduction considerations within the decision-making processes at all levels – individual, community, and national. Adopting a proactive and strategic approach results in more resilient communities and is a far more cost-effective strategy than managing disasters such as cyclones after they occur.

The extent of the inundation on Nukunonu atoll during Cyclone Percy.

Hydroelectric project a key for Laos

The almost US$2 billion hydroelectric power project on the Nam Theun River, a tributary of the Mekong, is a key project for the economic and social development of Laos. The scheme involves diverting the flow of the Nam Theun River from the Nakai Plateau down to the Xe Bang Fai River.

NIWA Australia is supervising the collection of data – extensive rainfall and stream flow measurements – required to optimise the generation capacity of the scheme. Our role is to ensure the high quality of the measurements and to analyse the data on an annual basis. We are also assisting with instrumentation and telemetry of remote stations.

NIWA Australia consultant Llyod Smith and a Lao technician measuring discharge on the Nam Theun River.

great staff

our success is a team effort

together, and with a wide range of collaborators,
our staff make a huge contribution to:
scientific knowledge around the world;
the environment, both in New Zealand and globally;
the community, social and cultural development;
economic development and successful, environmentally sustainable business;
local, regional, and central government decision-making;
New Zealand's commitments under international conventions and obligations.

www.niwa.co.nz

this section celebrates some of the achievements a few of our staff made during 2005–06

Lisa Peacock examines a neglected mooring rope for signs of the invasive sea squirt Styela clava *at Opua, Bay of Islands.*

Staff highlights

Revealing coastal habitats

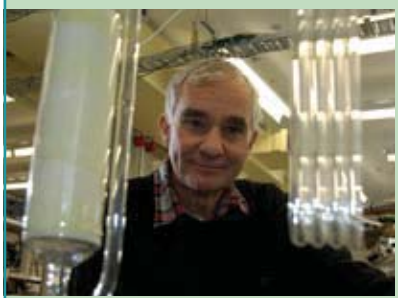
Marine ecologist **Dr Mark Morrison** is leading a research programme that has generated fascinating seafloor habitat maps of two very different coastal systems – the Poor Knights Islands and the inner Hauraki Gulf – using multibeam and sidescan sonars.

These maps, which will be supplemented with underwater video surveys, are being used to underpin targeted research on the impacts of ecotourism and recreational fishing (respectively) on coastal ecosystems. 'The exciting technologies available now are allowing scientific initiatives that weren't feasible even 5–10 years ago', says Mark.

Mark also led a major nationwide survey of seagrass meadows, collecting crucial data on these important, but poorly studied, coastal habitats.

Greenhouse gas expertise in demand

Dr Dave Lowe leads our tropospheric chemistry group at Greta Point which specialises in greenhouse gases, particularly analysis of their isotopic composition to determine their source. After the sudden death of the highly respected American climate scientist Dr Charles David Keeling in 2005, Dave has become mentor of Dr Keeling's research group. He has been visiting the group in San Diego every couple of months to provide direction, raise funds, help search for a permanent leader – and catch a wave or two when there's time. Back home, he's juggling his roles assessing greenhouse gas research for the Intergovernmental Panel on Climate Change, continuing other research and staff leadership at NIWA, and teaching at Victoria University.



On the hunt for marine pests

Dr Graeme Inglis outlines the dive plan for a reconnaissance survey of the port of Nha Trang, Vietnam, during a training workshop.

Dr Graeme Inglis is our science leader for marine biosecurity, and an expert in specialised survey designs and detection tools for finding unwanted species in the marine environment. It's a new field of research: 'Some of the things we're doing haven't been tried anywhere else in the world', he says.

Graeme's work includes leading two major programmes for Biosecurity New Zealand, looking for unwanted species in ports and marinas. The techniques Graeme helped develop were also used extensively this year in our surveys for the invasive sea squirt, *Styela clava*.

Coastal hazards at home and away

In the late 1990s, **Doug Ramsay** was the coastal management advisor on Kosrae, a small island in the Federated States of Micronesia, just north of the equator.

At NIWA, Doug leads the Natural Hazards Centre and coordinates coastal consultancy work in our Hamilton office, but he continues to work on Pacific projects. This year, he was commissioned by the United Nations Development Programme to develop a long-term strategy for reducing coastal hazard risks on Tokelau. 'We're there to provide the local communities with ideas and methods to aid their own risk reduction decision-making,' he says.

Data in good hands

Kathy Walter manages the National Hydrometric Database. The database provides time series of water level, river flow, and related data, and is classified as a 'nationally significant database'. Through it, NIWA delivers lake level and hydro inflow data to M-co, for the wholesale electricity market, and directly to electricity generators.

Kathy handles requests, audits data, and troubleshoots. During the June 2006 snowstorm, for example, Kathy was busy liaising with clients and field teams about when and how the data transfer could continue from places which were snowed in.

Electricity and fishing do mix

Marty Bonnett is a freshwater fish ecologist. He spends much of his time studying the effects of hydropower developments on native fish, but he's probably best known for a more direct impact of electricity on fish – electric fishing.

This technique uses high voltage, pulsed current to attract and momentarily immobilise fish in fresh water, so that they can be collected and returned unharmed. Over the years Marty has trained more than 500 people, from Warkworth to Te Anau, on the safe, ethical, and effective use of the electric fishing machines that are designed and manufactured by NIWA Instrument Systems.

Introducing Mr Lauder

When NASA wants to bring a 40-foot container complete with ozone-measuring lasers, laboratory consoles, and diesel generator to New Zealand, **Graeme Strang** makes the arrangements.

Graeme is the admin support person for NIWA's atmospheric research station at Lauder, Central Otago. The job involves almost everything except IT, from import and export of scientific equipment to accounts payable, project management, and maintenance. When we spoke in June, Graeme was heading across country to retrieve equipment sent up by balloon into the stratosphere and returned to earth by parachute.

Graeme also chairs NIWA's national health and safety committee, where the challenges can be just as diverse.

Seaweed expert in demand

As New Zealand's foremost expert on seaweeds, **Dr Wendy Nelson's** skills are in demand for making marine resource decisions, recognising and assessing threats from foreign species, and developing seaweed aquaculture and commercial uses. With about 1000 known species in New Zealand and many more nameless ones, the taxonomic work alone could keep her busy for several lifetimes.

That's why Wendy launched the New Zealand E-flora project this year, enlisting the help of overseas experts to describe and document New Zealand's entire seaweed flora over the next 10–15 years.

Wendy also leads NIWA's FRST biodiversity and biosecurity programme, serves on the New Zealand Conservation Authority, and has editorial responsibilities for three journals.

Making climate products accessible

Dr Andrew Tait is a lynchpin in the development of ClimateExplorer, our new online service for delivering climate-based products. He has helped produce the hundreds of climate maps available on ClimateExplorer, and led the project overall, working with other NIWA climate scientists and our data management team.

Most of Andrew's work involves producing climate information to suit specific client needs, from gridded daily wind speed data for wind energy development to maps of crop potential. Other recent projects include work with Infometrics and the Ministry of Economic Development on the effect of climate on energy supply and demand and the economy.

To Antarctica by FredEx

When RV *Tangaroa* suffered a parts failure in Antarctic waters, **Fred Smits** (NIWA Vessels General Manager, Operations) came to the rescue. How to get spare compressor springs from the manufacturers in Houston to our ship in just four days?

FedEx wasn't an option, so Fred turned courier, making a 62 hour trip from Wellington to Houston to Christchurch, where he delivered the springs to a waiting Hercules. The springs reached *Tangaroa* via the Italian base at Terra Nova Bay (Ross Sea), just a few hours before the base was closed for the winter.

'It really was touch and go. If I'd missed a connection, *Tangaroa* would've had to abandon her Ross Sea survey and come back to New Zealand', says Fred.

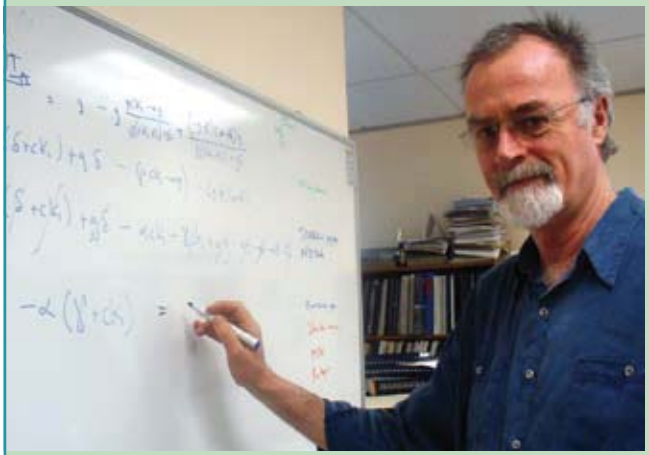
From basic science to practical public policy

Dr John Zeldis's expertise revolves around why and how coastal waters become productive. His brief ranges from leading research on fundamental processes such as coastal upwelling (which brings nutrient-rich water to the surface) to developing novel frameworks for sustainable management of marine farming. John was instrumental, for example, in the development of the 'Limits of Acceptable Change' framework which Environment Waikato uses in the Wilson Bay aquaculture management area. 'It's really neat to work on fundamental and seemingly esoteric science and see it eventually produce concrete outcomes for society and environmental sustainability,' he says.

Statistics for the real world

To discover **Graham McBride's** expertise, start with the title of his textbook, published in 2005 by the prestigious science publishing house John Wiley & Sons: 'Using Statistical Methods for Water Quality Management: Issues, Problems and Solutions'.

Graham helps agencies address such health and environmental issues as polluted water, sewage treatment, and their association with any illnesses. He says three 'very enjoyable, interlinked, aspects' to his work are: research on mathematical and statistical ideas and procedures to grapple with real water and environmental management issues; involvement with resource management agencies in the implementation of new water and wastewater schemes; and involvement in the development of public policy.



It's about priorities

Kā pūwaha te tai nei hoe tahi tātou

'When Māori stand up at a hui, begin by saying this is my mountain, my river, my ancestor, and only after that talk about ourselves, it's about priorities. The importance of the environment, genealogy, and relationships: if we don't look after these things, we're nothing,' says **Weno Iti**. Weno (Ngāti Maniapoto, Te Atiawa, and Ngāti Tauāiti) is NIWA's Māori Development Assistant, supporting our Māori Development Manager, Apanui Skipper. His role is to provide advice and support for staff, and assist in iwi and hapū development. As part of this, Weno and Apanui run regular Noho Marae (marae-based language and culture courses) to give NIWA's staff confidence in building links with Māori. He talks with pride about seeing scientists and local people respectfully sharing knowledge and working together as a result.

Things to do on your OE

You're young, smart, and bored out of your brains in an office job, what do you do? If you're **Steve de Lima**, you develop software to support Unidata's entire product range.

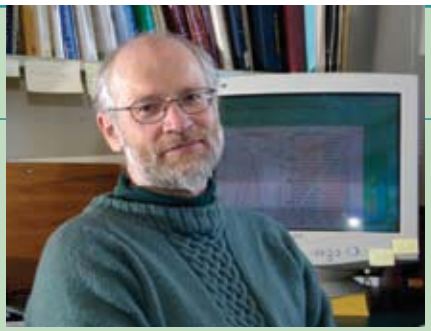
Steve was in fact on his OE, between stints with NIWA Instrument Systems, when he started developing the Starlog software. Now he's back home. NIWA purchased the intellectual property and funded development so Starlog could replace the previous outdated software. Starlog enables users to configure complicated environmental monitoring systems easily without any in-depth computer programming knowledge.

Meanwhile, Steve continues to develop software to meet NIWA and external client needs.

Multi-tasking marvel

As the Nelson regional office's sole support person, **Jenny McLean** wears many hats. Receptionist, project administrator, accounts manager, site safety advisor, PA to the Regional Manager – Jenny relishes the variety in her job and does it all cheerfully and efficiently.

Jenny has had a long association with the Nelson office, going back about 20 years. She's affectionately known round the office as 'Mother', keeping everyone in line and making sure they get back from fieldwork safe and sound.



Connecting maths with fisheries

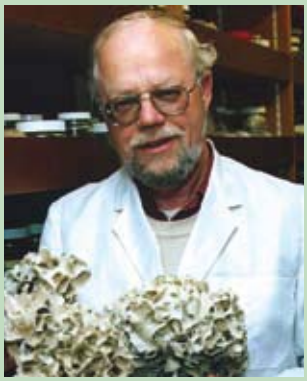
Chris Francis is one of a rare breed: a mathematician who can apply his understanding of numbers to real world problems. 'Making this connection is what I find really interesting', says Chris, a Principal Scientist with NIWA.

Chris has primary responsibility for assessing New Zealand's hoki stocks (our largest fishery), and also advises on orange roughy stock assessments.

'Chris is the best stock assessment scientist New Zealand has', says Ministry of Fisheries Chief Scientist Dr Pamela Mace. 'His work has provided the basis for harvest strategies in many New Zealand fisheries'. He's also frequently called in to review fisheries stock assessments in other countries.

Award-winning marine scientist

NIWA Principal Scientist **Dr Dennis Gordon** won the prestigious New Zealand Marine Sciences Award for his outstanding contribution to marine sciences. Dennis is a global authority on living and fossil Bryozoa (coral-like organisms), which are particularly diverse in New Zealand.



Dennis has published nearly 100 refereed papers and is a spokesman for marine biodiversity nationally and internationally. A Fellow of the Linnean Society, his professional roles include chairing the Royal Society of New Zealand's Biodiversity Committee and serving on two international editorial boards.

He plays a leading part in NIWA's marine biodiversity and biosecurity programme, and is the driving force behind Species 2000: New Zealand – a review and inventory of all life through all time in New Zealand.

Taking New Zealand skill to Europe

Dr Ton Snelder has won a prestigious Marie Curie Fellowship from the European Union to spend two years at France's national institute for research in agriculture and the environment, CEMAGREF.

Ton is a leader in the development of Geographic Information Systems-based environmental classification systems, including New Zealand's River Environment Classification (REC), which is widely used for river management.

One remarkable innovation of the REC is that it classifies sections of a river according to important ecological attributes of that segment or its upstream catchment. While in France, Ton will adapt and apply this approach for European situations where most environmental classification systems at present merely subdivide the landscape into large blocks.

Community support vital in fight against didymo

Neil Blair is part of our Alexandra field team, but has spent about 6 months this year away from home. He established the research site at Monowai, Southland, where we are testing biocides for Biosecurity New Zealand to control didymo without unacceptable environmental side-effects.

Of course, there have been many long days of sampling and scientific observation in cold rivers, but a vital part of Neil's brief has been to gain full and wide community support for the project. Neil has worked particularly closely with Fish & Game Southland, Bubba Thompson (Ngāi Tahu), the staff of Pioneer Generation Ltd, staff from several universities, as well as the rest of the team at NIWA.

Climate clues from marine mud

Palaeoceanographer and marine geologist **Dr Helen Neil** is part of a global collaboration to investigate past climate change using marine data. She was one of the prime movers in this year's multinational research voyage on the French oceanographic research vessel *Marion Dufresne*, which bored deep into New Zealand's seafloor to get a picture of past climate change. Helen applies stable isotope techniques to a range of materials – from corals to ancient seafloor sediments – to reconstruct New Zealand's climate history, and also uses them as a novel way to age fish and shellfish.

Forty-two and a half years

Bob Murray joined the Ministry of Works as a cadet fresh out of high school in the 1960s. There he was introduced to hydrology: 'I thought it was the ultimate environmental job, and that's never left me.'

Through various restructurings, Bob came to NIWA. He managed all our Hamilton region branches, providing data and hydrological solutions to commercial clients as well as scientists.

In June 2006, Bob retired after 42 and a half years in the field, with his enthusiasm intact: 'I enjoyed every minute of it.'

Men of the sea

Mike Steele and **Peter Healey** are bosuns on RV *Tangaroa*. Bosuns are in charge of all deck operations, including driving the winches during trawling. Mike's been on research vessels for 29 years, and Peter's now spent 15 years with us.

'It's different from a fishing vessel,' says Peter. 'We use a huge variety of equipment, and you've got to think of practical ways to deploy gear which scientists may never have operated at sea before.' Mike agrees: 'Never put it in the too hard basket. We talk to the captain, officers, and scientists about how to deploy and retrieve things safely and undamaged.'

Kingfish get the Midas touch

Steve Pether is a senior aquaculture technician at NIWA's Bream Bay Aquaculture Park.

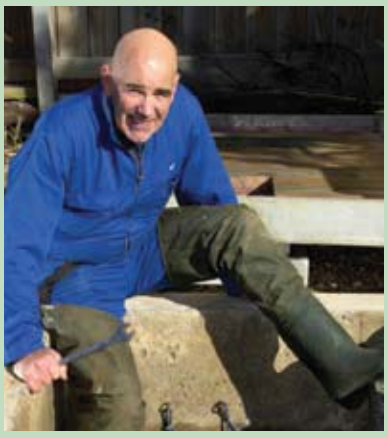
Steve was instrumental in taking juvenile kingfish production to a commercial level this year, producing more than 250 000 fingerlings. This involved, among other things, producing 1.4 billion rotifers and 400 million brine shrimps per day to feed the larvae, reducing larval deformities, and developing techniques to transport thousands of oxygen-hungry fish to customers in the Marlborough Sounds.

Steve says he never gets tired of eating fish and shellfish, despite working with them all day.

The man who gets into the sewer tank

Ray Nunns is site services manager for NIWA's largest campus, Greta Point, Wellington. He looks after all the buildings and vehicles, assisted by Dale Bowers.

Without any prompting, Ray claims 'It's the most satisfying place I've ever worked. Staff appreciate what we do, and we're always getting positive feedback. We've made lots of changes, and things never stop.' Coming up, there's new space required for geological and biodiversity collections, upgrading a microbiology lab, and installing an emergency generator.



Probably the worst job is working in the sewer tank when the pump fails: 'I can't find a contractor in the whole of Wellington who's prepared to do it.'

Education & Training

NIWA contributes substantially to the promotion of science in schools and universities and to the general public.

In 2005–06 we continued as the major sponsor for **Regional Science & Technology Fairs** in Auckland City, Waikato, Bay of Plenty, Nelson, and Wellington. We also assisted with sponsorship of the Central Northland, North Harbour, Taranaki, Marlborough, Central South Island, and Otago Science Fairs. These sponsorships promote science in secondary and intermediate schools, with over 1600 students taking part in the NIWA-sponsored fairs.

We continued our sponsorship of marine educational facilities at Kelly Tarlton's Underwater World by supporting the development of the new children's Interactive Room. The **NIWA Interactive Room** offers hands-on learning about the marine and Antarctic environments, including the opportunity to study shark skin and other marine samples under the microscope and to climb inside a remote underwater vehicle. Kelly Tarlton's estimate that almost 60 000 children visit the room each year during school visits alone, with feature activities during school holidays further boosting visitor numbers.

Our support of education initiatives is strengthened by association with the Royal Society of New Zealand's Sciences, Mathematics, & Technology **Teacher Fellowship** scheme. In the 2006 school year we hosted two Teacher Fellows working in fish genetics and stream ecology. We also continued our involvement in the development and implementation of the **SEREAD** project which has developed teaching resources for use in Pacific Island schools on weather, climate, and sea level rise.


NIWA's Interactive Room


Training electric fishers

NIWA's strong relationship with several universities continues. We have joint postgraduate **Centres of Excellence** with the University of Auckland (Institute of Aquatic and Atmospheric Sciences), Canterbury (Centre of Excellence in Aquaculture and Marine Ecology) and Otago (Centre of Excellence in Chemical Oceanography).

NIWA staff supervised 58 **postgraduate students** in six universities, 49 at PhD level. We provided one PhD scholarship and several of our supervised students have received funding from the Foundation for Research, Science & Technology's Enterprise Fellowships, Tūāpapa Pūtaiao Māori Postgraduate Fellowships or Bright Futures Fellowships. We also provide infrastructure and operational support for many of the jointly supervised students.

We funded eight **postdoctoral fellowships** in areas where we need a rapid input of high quality expertise to help develop new directions. These included biodiversity, water resources, simulation modelling, bioactive chemicals, and coastal processes. NIWA also provided supervision and operational support for another five postdoctoral fellows who are supported by the Foundation for Research, Science & Technology, Biosecurity New Zealand, and the Sloan Foundation.

In **public education**, we continued to offer a range of courses within our core areas to assist in the professional development of staff in regional councils, government departments, and consultancies and iwi. These courses transfer NIWA's technology and information to users, with topics including electric fishing, identification of sedges and rushes, and freshwater invertebrates. We ran 12 courses this year, attended by more than 240 people. We also ran three workshops (on marine benthic habitats, coastal hazard mitigation, and effects of land-based activities on the coastal environment) that provided training for 145 people.

Internally, we have provided educational opportunities for capacity-building in NIWA with awards to 11 staff for technical training in overseas institutions.

NIWA's Executive team

Rick Pridmore
Chief Executive Officer
Rick became Chief Executive Officer of NIWA in August 2002 after having served as Deputy Chief Executive (Strategic Development) and Research Director of NIWA. Born in the USA, Rick came to New Zealand in 1976. He completed his PhD at the University of Otago in 1980, and from 1980 to 1993 he worked as a government scientist, specialising in marine and freshwater ecology.

Bryce Cooper
Director, Strategic Development
Bryce has a PhD in microbiology and is a graduate of the London Business School Senior Executive Programme. He has held research leader and Regional Manager roles in NIWA, and is currently responsible for overseeing NIWA's strategic initiatives, including commercialisation of research and building partnerships with central and local government and industry.

great staff

General Managers

Clive Howard-Williams
GM Freshwater & Coasts
Clive is an aquatic ecologist with a PhD from the University of London. He was a research scientist at the Max Planck Institute for Limnology, has specialised in research on water quality, water plants, and wetlands, and has a wide interest in freshwater degradation and change and in Antarctica. He is a Fellow of the Royal Society of New Zealand, and an Adjunct Professor at the University of Canterbury.

Andrew Jeffs
GM Aquaculture & Biotechnology
Andrew has a research background in marine ecology and aquaculture, with a strong interest in applied research. He has a PhD from the University of Auckland and worked as a scientist for the Cawthron Institute and the Department of Conservation before joining NIWA in 1997.

John McKoy
GM Fisheries
John is a marine zoologist with a PhD from Victoria University of Wellington. He has contributed in a range of roles to fisheries research in New Zealand since 1973, in MAF, MAF Fisheries, and, since 1995, NIWA. He has worked in crustacean and molluscan aquaculture, fisheries biology, and resource management in New Zealand, Australia, the Middle East, and the Pacific.

Mark James
Director, Operations
Mark completed his PhD in aquatic ecology at the University of Otago, and spent more than 20 years as a scientist specialising in lake and coastal ecology research and consulting. In 2000 he moved from Christchurch to Hamilton to take up the position of Regional Manager, NIWA, Hamilton, and he was appointed as NIWA's Director of Operations in September 2002.

Rob Murdoch
Director, Research
Rob has a PhD in marine science from the University of Otago and has specialist interests in oceanography and marine ecology. He held the positions of research leader and Regional Manager at NIWA in Wellington before taking on roles overseeing NIWA's strategic research and NIWA Vessel Management Ltd.

Kate Thomson
Chief Financial Officer & Company Secretary
Kate is a chartered accountant with a BCom from the University of Canterbury. An experienced Chief Financial Officer, she held similar roles with Learning Media and in the private sector before joining NIWA in 2006. Kate was previously a policy analyst with the Treasury.

Murray Poulter
GM Atmosphere, Natural Hazards, & Energy
Murray has a PhD from the University of Canterbury and worked in England and Germany on wave propagation in the atmosphere and space. He returned to New Zealand where he applied radar methods to determine the role of ocean waves in coastal and air-sea interaction processes, working in New Zealand, Canada, the USA, and Antarctica, before taking on a management role in NIWA.

Don Robertson
GM Aquatic Biodiversity & Biosecurity
Don holds a PhD in marine biology from the University of Otago and has spent much of the last 30 years in marine fisheries research, including deepwater fisheries around New Zealand, and Antarctic marine resource management. He has had roles in marine science leadership, regional management, and information services in MAF Fisheries and NIWA. More recently, Don took on the lead role for NIWA's marine and freshwater biodiversity and biosecurity research and services.

Charlotte Severne
GM Māori Development & Oceans
Tēnei te mihi mahana o NIWA ki ngā iwi huri noa i te motu. Ko Charlotte Severne tōku ingoa. Ko ahau tētahi o ngā uri o Tūwharetoa me Tūhoe Pōtiki. Heoi anō he Tumu Whakarae ahau mō ngā tūranga e rua, arā, tētahi mō te roopu rangahau Māori, e kiia nei ko Te Kūwaha, ā, ko tētahi atu mō te takutai me te moana. Ko te tino kaupapa o Te Kūwaha he mahi rangahau pūtaiao hei tautoko i ngā tūmanako, wawata o te iwi Māori. I whiwhingia e au tōku Tohu Kairangi mai i Te Wānanga-o-Tāmaki Makaurau. Ko taku kaupapa matua te rangahau i ngā tātaitanga mō ngā puia o Tokaanu me Waihī. I mua i taku taenga mai ki NIWA i te MfE ahau e mahi ana.

Regional Managers

Ken Becker *Andrew Forsythe* *Barry Biggs* *Charles Pearson* *David Roper*

Terry Hume *Ken Grange* *Andrew Laing* *Rosemary Hurst*

great staff

Auckland: Ken Becker
Ken is a marine biologist with a BSc (Hons) from the University of Liverpool. He spent 24 years as a scientist and project manager with Auckland Regional Council, working on marine ecology, water quality, wastewater treatment and disposal, stormwater management, and water resource management, before joining NIWA as Regional Manager in July 2005.

Bream Bay: Andrew Forsythe
Andrew Forsythe is a veterinarian with a BSc in marine biology from the University of New Brunswick and a DVM from the University of Prince Edward Island. Andrew came to NIWA in 2005 as Regional Manager Aquaculture Facilities with more than 20 years of aquaculture industry experience from North America and Europe.

Christchurch: Barry Biggs
Barry is an environmental scientist with a PhD from the University of Canterbury. He worked in environmental science management with the Ministry of Works & Development in Wellington and the DSIR in Christchurch before joining NIWA in 1992, specialising in the effects of hydropower development on river ecosystems, water allocation, stream periphyton, and bioinvasions.
[Barry was appointed General Manager, Environmental Information & International on 3 July 2006]

Christchurch: Charles Pearson
Assistant RM Christchurch & RM Lauder
Charles is a hydrologist with an MSc (Hons) from the National University of Ireland. He specialises in the analysis of hydrological and other geophysical and climate data for purposes such as estimating flood risks. He is an executive member of NZ's Hydrological and Meteorological Societies and the World Meteorological Organization's Hydrological Advisor for its Asia-Pacific region.
[Charles was appointed Regional Manager on 3 July 2006]

Hamilton: David Roper
David has a PhD in marine science from the University of Otago. He has worked as an environmental scientist for the past 27 years, specialising in environmental impact assessment and resource management with NIWA and then ECNZ (later Mighty River Power), before returning to NIWA as Regional Manager in 2002.

Hamilton: Terry Hume
Assistant RM
Terry is a marine geologist/coastal oceanographer with a PhD in earth sciences from the University of Waikato. He holds an Hon Assoc. Professorship at the University of Auckland and an Hon Lectureship at the University of Waikato. He has more than 30 years' experience in environmental research and consulting for government departments, local authorities, and private companies.

Nelson: Ken Grange
Ken is a marine ecologist with a PhD in marine ecology from Florida International University. He initially researched the marine environment in NZ fiords, particularly the ecology of black corals, with the Oceanographic Institute, DSIR, in Wellington, before moving to Nelson as Regional Manager in 1994.

Wellington: Andrew Laing
Andrew is a marine meteorologist and physical oceanographer with a PhD in fluid mechanics from the University of Canterbury. He had more than 20 years' experience with the NZ Meteorological Service, in the UK, and at NIWA, before becoming a Regional Manager in 2000.

Wellington: Rosemary Hurst
Rosie is a fisheries scientist with a PhD from Victoria University of Wellington. She worked for MAF Fisheries from 1979 before joining NIWA in 1995, becoming a Regional Manager in 2000. She is also the science leader for hoki and middle depth fisheries research.

sustainable development report

sustainable development is our core business

environmental
we minimise our effect on the environment and help others minimise the effect they have

social & cultural
we look after our staff and operate responsibly, and we help improve the lives of others

economic
we operate in an economically sustainable manner, and our research provides benefits for all of New Zealand

Sustainable Development Report

We are committed to operating in a sustainable manner and working with others to achieve our environmental, social, and economic goals and those of the Government. Many of our core business activities contribute directly to the sustainable development of New Zealand's natural environment and its resources through the provision of scientific advice, products, and services.

We take particular care to minimise the impact of our activities on the environment and to ensure that individuals and communities potentially affected by our actions are well informed and consulted. A growing component of our work is directed at creating new business and job opportunities. We contribute extensively to non-government organisations and community groups, and to the education of primary, secondary, and tertiary students, local and central government agencies, and the wider public. Our involvement with universities and international networks is essential in developing human capital for New Zealand's wider long-term interests in our key science sectors. Internationally, we represent New Zealand at a vast array of scientific meetings and inter-government forums.

NIWA is committed to:

- undertaking research for the benefit of New Zealand;
- pursuing excellence in all activities;
- complying with all ethical standards;
- promoting and facilitating the application of the results of research and technological developments;
- being a good employer;
- maintaining financial viability.

These principles are the basis of our non-financial performance measures which are agreed each year with the shareholding Ministers as part of our Statement of Corporate Intent. From 2006–07, we will report on new indicators developed by the Crown Company Monitoring & Advisory Unit to demonstrate our role and effectiveness in our target sectors and our impact on New Zealand's society, environment, and economy.

In the following pages we summarise our 2005–06 Sustainable Development Report. The full version, verified by URS, including highlights, targets, and achievements, is presented on our website: www.niwa.co.nz.

Our science helps ensure the sustainable development of New Zealand's natural resources

Our core business is providing scientific advice, products, and services that underpin the sustainable development of natural marine, freshwater, and atmospheric resources.

We contribute significantly to developments in agriculture, aquaculture, energy, fisheries, and marine and freshwater resources. Key issues include concerns about water quality and allocation, increased atmospheric and aquatic pollution, declining fish stocks, and increased pressure on freshwater and marine resources. Some examples of how we contributed to sustainability in these sectors are given below; many more are presented in the science and services sections (see pp. 10–43).

West Head at the opening of Tory Channel.

Sustainable management of marine resources

- Understanding the factors driving variation in the productivity of coastal waters helps improve predictability and sustainable management of the aquaculture industry and long-term sustainability of the environment. Multi-year variations in nitrogen concentrations are driving variations in plankton production in the Marlborough Sounds via upwellings from Cook Strait and inflows from the Pelorus River.
- Stock assessments for the Ministry of Fisheries this year, targeted because of current or potential sustainability issues, included hoki, orange roughy, oreo, and paua.

Sustainable use of freshwater resources

- Harvesting from rivers is one solution to restricted water availability for agricultural development in water-deficient areas. We are developing a model to run future development scenarios for sustainable water use.
- We are developing a web-based tool, 'Water Resources Explorer', which models stream water resources information by catchment, and includes models to estimate, for example, mean annual suspended sediment yield, water runoff, and water quality. Users only have to zoom to and mouse-click on the part of the stream they are interested in.

Sustainable land use

- We now have a new model to predict nitrogen and phosphorus losses from single properties in the Rotorua Lakes area. It will be used for land-use consenting under the Environment Bay of Plenty 'Land and Water Plan' to ensure the long-term sustainability of valuable land and freshwater resources in the region.
- We again ran workshops to help farmers make more informed decisions, both in the paddock and at the water's edge, when considering farm intensification and sustainable use of resources.

NIWA agricultural climatologist Alan Porteous (right) and North Canterbury farmer Roel Wobben discuss the high value supplementary feed available through effective irrigation management.

Sustainable management of biodiversity and biosecurity

- The invasive river alga *Didymosphenia geminata* could cost $58–285 million in lost production and decreased biodiversity values over the next six years. We first identified the alga and have now carried out trials on biocides to control the species.
- We have further developed an epidemiological model to simulate the transport of non-indigenous fouling species around New Zealand by yacht movements. It will help evaluation of the most effective methods of preventing the spread of key invasive marine species.

Improving the quality of life in urban and rural areas

- Kilometres of stream length are lost each year in the Auckland region through land development and roading. NIWA researchers are part of a team of experts developing a method to evaluate the value of streams in the urban environment and to show how adequate replacement or restoration can be achieved with 'no net loss' of stream function.
- When a NIWA remote sensor tested emissions from more than 73 000 vehicles at 24 sites in the Auckland region, emissions from about 4000 vehicles (8.5% or 1 in 12) were above an acceptable level. The owners of these vehicles were sent a letter by the ARC, as part of their Big Clean Up programme, encouraging them to tune their vehicle.

Renewable and alternative energy sources

- Conventional anaerobic ponds release considerable quantities of greenhouse gases. Our research has shown that the methane content (typically 67%) has excellent energy recovery potential and could reduce the running cost of small waste treatment plants.
- Regional councils and power companies are supporting our investigations into the feasibility of using algae from wastewater treatment ponds as a fuel source.

Working with Māori

- In collaboration with Te Arawa Māori Trust Board, and using both western science and traditional methods, we are helping develop a sustainable management framework for customary fisheries of the Te Arawa lakes.
- We have been working with Taumutu Rūnanga to teach safe, efficient, and ethical usage of both backpack and bank-mounted electric fishing equipment to upskill Māori to help us in various research projects.

Environmental sustainability

We recognise that our activities have an impact on the environment. We aim to minimise any harmful effects and to help maintain or enhance the state of the environment.

Our 2006 Honda Civic Hybrid provides better fuel economy as well as lower emissions.

Highlights for 2005–06 included:

- we established video conferencing at the four major sites, with limited coverage at four smaller sites;
- we carried out energy audits at all major sites and aquaculture facilities to identify areas where energy consumption could be reduced;
- we purchased our first hybrid vehicle;
- we expanded our recycling facilities;
- we conducted a waste audit at the Hamilton office;
- we increased our recycling and decreased our waste production;
- we increased staff awareness and involvement in minimising the impacts of our activities;
- we had no incidents of non-compliance with discharge regulations;
- we reduced carbon emission equivalents from our vessel operations.

Resource use

Electricity use per fulltime staff equivalent increased this year compared with previous years, but our efficiency efforts during the last few years helped constrain this increase. A major contributor was certainly our increased productivity: compared with the baseline in 2001–02, electricity use increased by 2.8%, but staff productivity increased by 23%.

Emission of carbon dioxide through the consumption of fossil fuels to support our business (our use of motor vehicles and air travel) rose this year to 4407 t. The increase was expected and was due to the full use of the aquaculture facilities at Bream Bay.

Carbon dioxide emissions per full-time staff member increased from 6.99 t in 2004–05 to 7.49 t in 2005–06, mainly because of the expansion-driven increase in electricity use in Wellington and Bream Bay.

Despite the greater use of our research vessels, they consumed 25% less fuel, and carbon dioxide emissions decreased by more than 1700 t, as a result of a reduction in target cruise speed. Both vessels have stringent, planned maintenance routines and practices which provide high operational efficiency, including underwater hull scrubbing to improve fuel consumption.

Every 6 months the vessels are inspected for introduced species, such as *Undaria*, and are cleaned. This is also done before they enter areas where *Undaria* and other noxious plants have not been recorded, such as Antarctica.

In 2006–07 we are considering:

- investing in more energy efficient systems and building management systems;
- purchasing more hybrid vehicles;
- installing further video conferencing facilities at other sites.

Our social and cultural responsibilities

NIWA's social responsibility starts with the well-being of its greatest asset – its staff. Without the commitment and expertise of a highly skilled and dedicated workforce, we would not be able to meet our financial and scientific goals. We are committed to providing a safe and healthy working environment that enhances professional and career development, enhances capability in core areas, promotes a positive work/life balance, ensures that staff are treated in a fair and equitable way, rewards staff within the financial constraints of the company, and promotes innovation and excellence in scientific research, services, and the commercialisation of intellectual property.

We are equally committed to promoting social and cultural sustainable development and fulfilling our responsibilities to the wider public through our education initiatives at all levels, linking closely with local communities, and working with staff, iwi, hapū, and Māori organisations to promote partnerships in areas such as renewable energy systems.

How we help our staff

Highlights for 2005–06 included:

- implementing a recruitment strategy focused on proactively marketing NIWA Science to potential recruits and updating our succession plan for leaders in core research and support areas;
- introducing new key performance indicators for science and technical staff as part of their career development and to manage expectations better;
- providing a safe and healthy working environment, maintaining our high workplace safety record and premium discount in the ACC Partnership Programme;
- creating and appointing 34 new positions to grow capability in core areas of aquaculture production, bioactives, environmental data management and forecasting, taxonomy, hazards, and sustainable energy.
- completing an internal audit of human resources policies against Equal Employment Opportunities Trust standards, policies, and practices and updating these to ensure best practice;
- undertaking a wide range of training, including leadership training and commercial skills training for key staff.

Rewarding staff

A tight labour market, skills shortage, and talent war placed considerable pressure on our ability to maintain competitive levels of remuneration. On average, and based on the Hay Survey of Pure and Applied Research, we have remained ahead of the science market across most levels. However, on some levels the gap between our remuneration levels and the Hay survey results is narrowing. To continue to recruit and retain high quality staff, and deliver excellent science and high quality products and services, we must aim to continue to keep remuneration levels above the market median, within our financial constraints.

Our remuneration system provides for an annual review and aims to reward people by appropriately recognising their contribution to the business and their individual performance. We have an annual profit share scheme that allows all permanent staff to share equally in the success of the organisation. This year the profit share was the largest in NIWA's history, a reflection of the achievements, increased productivity, and dedication of our staff.

Permanent staff are also entitled to:

- a subsidised superannuation scheme;
- provision of life insurance;
- sick leave and bereavement leave as necessary;
- a personal training and development leave programme;
- ex gratia payments after returning from parental leave;
- support for sabbaticals, technical training awards;
- access to overseas travel grants;
- access to subsidised crèche facilities at our largest site.

Staff development

We worked with staff to develop and implement a new framework for career development.

We reran our staff management, communication, and commercial skills training programmes, and introduced a new leadership programme to ensure that we had a pool of talented, experienced leaders available in the future.

We developed new social performance measures and achieved the following:

- 300 staff received internal and external training;
- 61% of staff have personal development plans;
- 88 (including replacements) permanent job opportunities were created: 72 in main city centres, 16 in rural areas);
- 33 different types of financial and non-financial benefits available to staff.

Employee well-being and work-life balance

A staff survey showed the overall satisfaction in NIWA had dropped slightly to 48%, still within the margin of error of the science benchmark of 49%. The survey highlighted that staff are proud to work for NIWA, NIWA provides a supportive and friendly work environment, staff tell their friends that NIWA is a great place to work, and managers are friendly, easy to approach, and receptive to ideas and suggestions. Areas of concern include pay and benefits (perceived as being below that of other organisations), treating staff fairly, high workload, and pressure on staff.

NIWA pulling together: Ken Grange (Nelson) and Owen Bunter (Bream Bay)) pull along Carina Sim-Smith (Auckland) and Chris Woods (Christchurch) at a team race during the Mussel Festival in Nelson.

To help staff maintain a healthy work-life balance, we allow flexible work hours where possible, generous sick leave provisions (which include family), provisions for parental leave in addition to the standard government provisions, and a training and personal development programme with paid leave and some reimbursement of costs. The personal development leave has a wide range of options, including yoga classes, photography seminars, and golf lessons. We also provide special paid leave for staff to take part in civil defence, search and rescue, volunteer fire fighting, and coastguard activities.

Reported workplace accidents rose slightly from 90 to 93, with lost-time accidents dropping from 6 to 5. Improvements in our management of rehabilitation and support for an early return to work saw the lost time drop from 157.6 FTE days to 73.9 FTE days, corresponding to 0.05% of total work days per year for science staff. We reinforced our safety culture this year by creating an annual Health and Safety Champion Award to recognise a staff member who made a substantial contribution to workplace health and safety.

Kate Neil and Jeff Foreman negotiate Hell's Gate at the end of the soft surface 4WD training course held on Wellington's south coast.

Fifty-one percent of NIWA's employees belong to our major union, the PSA. We facilitate partnership, openness, trust, and involvement with the PSA through quarterly meetings with delegates at our 'Partnership Forum'.

Staff composition

Staffing levels increased over the year, reflecting a period of growth for the company. We established 34 new science positions, spread through our main centres and also in more rural areas, such as Bream Bay, Greymouth, and Turangi. Turnover remained constant at 9.8% for the Group and dropped for NIWA Science from 9.6% to 9.0%.

How we help others

Education and training

We are committed to education that advances science, particularly in our core areas. We do this through targeted sponsorship for schools, joint research and teaching ventures with universities, and training courses for the public. We are also the major sponsor of the regional school science and technology fairs in Auckland, Waikato, Bay of Plenty, Wellington, and Nelson. We help with sponsorship of several other regional science fairs and the national 'Realise the Dream' fair. And we fund the 'NIWA Interactive Room' at Kelly Tarlton's Underwater World, which is aimed at primary school pupils, and attracts at least 60 000 children each year.

We have strong links with New Zealand universities, including postgraduate Centres of Excellence at Canterbury and Otago, and the Institute of Aquatic and Atmospheric Sciences at Auckland, and we supervised 58 postgraduates this year. We also funded eight postdoctoral fellowships in core areas.

We also ran 12 public training courses and 3 training workshops, ranging from environmental monitoring and aquaculture to biodiversity.

(see also 'Education and Training', p. 51)

Graeme Smart, NIWA Christchurch, showing staff from regional councils how the stopbanks on the Waimakariri River protect Christchurch from inundation.

Working with Māori

NIWA supports the Vision Mātauranga policy framework designed to unlock the innovation potential of Māori knowledge, resources, and people. The Māori Development portfolio encourages capacity building of Māori researchers and measurable research outcomes identified by Māori. Our Māori Research and Development Unit, Te Kūwaha, focuses on research that underpins Māori aspirations for business development and sustainable resource management. Collaboration has continued between Te Kūwaha scientists and iwi in the development of strategic research plans which help prioritise the research aspirations of iwi, hapū, and Māori organisations. Our Māori researchers and scientists specialise in the core areas of climate and energy, freshwater, marine, and aquaculture research.

A key aim for Te Kūwaha is to improve all staff interactions with iwi partners, based on 'tikanga tangata' and 'kawa atua', thus making NIWA an attractive place for Māori researchers to work. Te Kūwaha now comprises a General Manager and 15 key Māori scientists and technicians. We have daily interactions with iwi, and currently have 85 iwi relationships, 13 letters of understanding, 19 draft proposals, and 9 signed memorandums of understanding.

Te Kūwaha has engaged in several hui and wananga with their iwi research partners, users, and stakeholders. Particular highlights include the 2nd Māori Climate Forum at Hongoeka Marae in Plimmerton, Wellington, where Māori stakeholders, including many of our iwi partners, discussed regional issues and research priorities regarding climate change, and a customary fisheries wananga discussed the use of traditional methods as monitoring tools for taonga species in lakes, to ensure the sustainability of these important fisheries.

We operate in an economically sustainable manner

Economic sustainability is not just about the company's financial performance, it is also about carrying out research which provides benefits and improvements to our community, the environment, and the whole of New Zealand.

The NIWA Group needs to generate sufficient operating surpluses to enable it to continue to grow and invest in capital expenditure and areas that extend its current base beyond fee-for-service. This year we purchased 50% of CRL Energy Ltd, creating what is now the largest energy research provider in New Zealand. The investment is an obvious extension to our core business in sustainable energy solutions – one of the most critical issues challenging New Zealand's future development and economic growth.

Economic highlights this year included:

- NIWA Group exceeded its financial targets;
- record high revenue of $106 million;
- net surplus, at $10 million, producing a return on average equity of 24.4%;
- expanded the energy research capabilities of the Group by acquiring 50% of CRL Energy Ltd.

Direct customers

Our direct customers are those who fund our science and research. The Government is our largest customer, but we also conduct research for, and provide advice and information to, many others, ranging from international conglomerates to local commercial fishers and schools. We consider the New Zealand public to be our most important customer.

Total revenue

NIWA Group for the year ended 30 June

2004	$84,631,000
2005	$91,137,000
2006	$106,414,000

Revenue was received from:

Public Good Science and Technology	
Contract funding	$42,895,000
Capability funding	$7,479,000
Ministry of Fisheries	$16,060,000
Other Crown Research Institutes	$1,015,000
Central government and subsidiaries	$11,069,000
Local government	$5,665,000
Private sector	$6,459,000
Other sales	$15,772,000

Contracts to supply information to New Zealand users

NIWA Group for the year ended 30 June

2006	$35,196,000

Contracts to supply information to international users

NIWA Group for the year ended 30 June

2006	$4,444,000

To continue to provide the best science for all customers, we have to grow with the market. The continued increase in our revenue shows the ongoing growth in demand for the science, products, and services we provide and our ability to respond to new opportunities and issues facing New Zealand.

A client survey was conducted during 2005–06 to determine the quality and effectiveness of our consulting services. While issues around price are always a concern, the overall impression of respondents is that NIWA is a highly credible science-based organisation employing highly skilled and competent staff. The competency of our staff and quality of work appears to be the principal drawcard for our services. Monthly publications from our National Centres are widely read and have helped considerably in increasing knowledge of NIWA's research and consulting services.

Suppliers

We aim to be good customers ourselves by supporting our suppliers and subcontractors by paying them in a timely manner in accordance with agreed terms.

Cost of all goods, materials, and services

NIWA Group for the year ended 30 June

2004	$36,153,000
2005	$38,071,000
2006	$42,824,000

Employees

Total payroll and benefits

NIWA Group for the year ended 30 June

2004	$41,864,000
2005	$43,214,000
2006	$47,188,000

Providers of capital

NIWA had interest bearing debt at 30 June 2006 of $600,000 (2005: $1,700,000). Changes in economic value to our shareholders are:

Operating surplus before tax

NIWA Group for the year ended 30 June

2004	$7,036,000
2005	$9,654,000
2006	$15,706,000

Return on equity (%)

NIWA Group for the year ended 30 June (net surplus/average shareholders' funds)

2004	10.7
2005	13.5
2006	24.4

Public sector

Most of our research is aimed at addressing issues of relevance to the general public – the sustainability of our society and civilisation.

As a commercial entity, we also contribute by paying tax. Taxes paid in other countries were minimal.

Taxes paid

NIWA Group for the year ended 30 June

2004	$1,506,000
2005	$3,000,000
2006	$5,606,000

The future economic challenges include:

- continuing to meet NIWA's economic targets in the face of increasing competition and increasing resource costs;
- continuing to find new investment and growth opportunities that add value to our organisation and extend beyond straight fee-for-service;
- maintaining our profitability and continuing to produce acceptable returns to our shareholders, balanced against increasing operating costs and the rising costs of retaining the best scientists in an increasingly tight labour market;
- increasing commercialisation and adding value that turns our research outcomes into new products, services, and industries for New Zealand;
- increasing the contribution of the products and commercialisation components of NIWA's revenue.

The full version of our Sustainable Development Report is presented on our website: www.niwa.co.nz.

Performance against Statement of Corporate Intent (for NIWA Group)

The following table summarises performance against measures in our Statement of Corporate Intent.

We have maintained publication rates over the last 5 years, but with a greater focus on international, externally refereed journals. The number of conference papers and presentations and media articles is significantly higher than in recent years, partly because of our greater focus on promoting activities. We also funded 200 presentations at international conferences.

We have worked hard to improve access to our nationally significant databases. The climate database, for example, is now a web-based fully automated system, and this is reflected in the significant increase in the number of requests we serviced.

Financial performance measures

	2005–06 Actual	2005–06 Target	2004–05 Actual
Revenue ($ millions)	106.4	100.6	91.1
Current ratio	0.90	0.81	1.0
Quick ratio	1.20	0.87	1.3
Return on equity (%)	24.4	14.2	13.5
Return on assets (%)	22.7	12.8	13.4
EBIT margin (%)	14.5	8.8	10.2
Non-financial performance measures			
Staff composition (including subsidiaries)			
Number of staff			
Research teams (including postdocs)	475	462	437
Research support	46	44	44
General support	104	103	106
Management	26	24	24
Staff turnover (%)	9.8	<8	9.6
Good employer			
Lost time injuries (% of work days)	0.05	<0.05	0.07
Days lost to injury (NIWA Science)	73.9		157
Research output*			
Papers in international, externally refereed journals	369	300	347
Papers in local, internally-, or editor-refereed journals	102	180	127
Conference papers and other presentations	1020	800	781
Research monographs and books	83	70	88
Popular books	1	2	0
Client reports	609	510	606
Application and promotion of science			
Value of consultancies to NZ users ($ millions)	35	28	24
Achievements of technology transfer objectives in FRST contracts (%)	98	95	95
Number of external training courses	15		13
Number of joint ventures with NZ users	2		2
Value of TBG and Technet contracts ($ thousands)	649	800	758
Requests serviced for information from NIWA's nationally significant public good databases			
• National Climate Database[1]	88 690	9000	8500
• Water Resources Archive	10 200	800	1120
• NZ Freshwater Fish Database	1309	1200	1452
Magazine and newspaper feature articles plus TV and radio interviews	231	250	194
Number of patents or licensed products owned[2]	11		6
Number of representatives on international committees	107	–	–
International visits (including conferences)[3]	136		
Visiting scientists	18		

* *Measured for a calendar year.*

[1] *These are individual data requests by 122 external subscribers who regularly access the database and do not include data requests for internal NIWA users.*

[2] *The number of patents includes patents granted (4) or at application stage. They cover three products, but exclude Unidata and other products which are licensed to distributors.*

[3] *Visits and conferences funded by NIWA.*

URS New Zealand
Engineering and Environmental Management

ASSURANCE STATEMENT

Scope and Methodology

URS New Zealand Limited (URS) has carried out an independent audit of the National Institute of Water and Atmospheric Research (NIWA) Sustainable Development Report 2005/6, to provide readers assurance on the accuracy and completeness of the Report content.

The audit was designed to investigate whether NIWA has provided adequate evidence to support the information contained in the Report and to assess how well the AA1000 Assurance Standard (March 2003) principles of Materiality, Completeness, and Responsiveness are applied.

The audit methodology was to:

- Review the draft Report – to identify statements of fact/ claims and data requiring verification;
- Identify key environmental/social performance areas and issues (based on understanding of NIWA operations in New Zealand and identified stakeholder interest);
- Conduct interviews with key personnel at NIWA;
- Speak with key stakeholders to gauge NIWA's responsiveness to their interests and any concerns;
- Sight documented information, computer and hardcopy files, data sources and data;
- Identify errors or weakness in data, provide feedback to NIWA and verify the final Report.

The scope of assurance covered all sections of the NIWA Sustainable Development Report 2005/06.

Independence

URS worked on a small number of projects with NIWA during the period covered by the Report. There is no aspect of the relationship that has influenced the independent nature of the verification findings.

Accuracy

On the basis of the described audit methodology, URS verifies that the content of the NIWA Sustainable Development Report 2005/06 provides an accurate description of the company's performance.

NIWA's Report provides a high level of exactness and low margin of error. Reporting and information systems are very robust and transparent. Some minor discrepancies were identified during the process, however these were corrected by NIWA.

Materiality

NIWA's Report provides a balanced representation of the organisation's sustainability issues and related activities with appropriate reference made to the previous NIWA Report to provide stakeholders with information on progress over time.

NIWA sets clear targets for environmental and social performance to drive continuous improvement. Some of these targets were set in 2002 and we would recommend a review of these to reflect NIWA's current operations.

NIWA presents a balanced view to stakeholders, reporting on targets not achieved and challenges. We note that more commentary on why these occurred would add value in some areas.

Completeness

Appropriately detailed information and data are included in the Report, especially with regard to NIWA's wider contribution to sustainable development, its physical infrastructure, staff challenges and stakeholder feedback.

There is a further opportunity to work more closely with project partners and suppliers to explore sustainability issues with them.

Responsiveness

As reflected in the report, NIWA works closely with its stakeholders across a range of projects related to sustainable development and reports on areas of interest to both external and internal stakeholders.

An opportunity exists to engage more closely with stakeholders to help NIWA ensure all areas of significance are included within future reports.

It was evident throughout the verification process that NIWA's culture and values are well aligned with the concepts of socially and environmentally responsible practices. We commend NIWA on their commitment to sustainable development and look forward to seeing further progress towards fully integrated sustainability.

URS New Zealand Limited
6th September 2006

Kerry Griffiths
Principal Sustainability Consultant

URS New Zealand Ltd
Lambton House, Level 4
160 Lambton Quay,
P.O. Box 3367, Wellington, New Zealand
Direct: 64 4 496 3750
Fax: 64 4 496 3755

sustainable development

financial information

- NIWA Group exceeded its financial targets
- record revenue of $106 million
- net surplus of $10 million
- return on average equity of 24.4%
- acquired 50% of CRL Energy Ltd

NIWA Directors

Sue Suckling *Carolyn Burns* *Miranda Cassidy* *John Hercus* *Graham Hill*

Ed Johnson *Troy Newton* *David Sharp* *John Spencer*

Sue Suckling (*Chair*), OBE, BTech (Hons), MTech, is a Christchurch-based director and strategic business consultant. She is Chair of The New Zealand Qualifications Authority and a number of private companies, a director of Restaurant Brands, and a member of the Takeovers Panel. Previously, she was Chair of AgriQuality Ltd and Deputy Chair of the Institute of Geological and Nuclear Sciences Ltd. Sue was appointed NIWA Chair in July 2001.

Professor Carolyn Burns is a distinguished limnologist at the Department of Zoology, University of Otago. She holds a doctorate from the University of Toronto, was awarded the CBE in 1984, and is a Fellow of the Royal Society of New Zealand. She has held visiting research professorships in US universities and was a research scientist at the Max-Planck Institute for Limnology. In 1999 she was honoured with the University of Canterbury Distinguished Alumni Award.

Miranda Cassidy, has a BA in sociology, an MSc (Hons) in resource management, and is an Auckland-based company director and consultant. She is a former customary fisheries manager of Ngāi Tahu Development Corporation and is currently Director of FOLKUS Ltd, an environmental consulting company.

John Hercus has an MSc in physics from Victoria University of Wellington and has been a leading figure in polytechnic, technology, and science education, serving as Director of the Christchurch Polytechnic from 1974 to 1993. He has worked for the UN Development Programme in higher education and training, and on projects with UNESCO and the Asian Development Bank. He has held directorates with several companies involved in international education and technology development.

Dr Graham Hill is an astronomer and astrophysicist currently lecturing in astronomy at the University of Auckland. From 1967 to 1996 he was a research scientist at the National Research Council of Canada – Dominion Astrophysical Observatory in Victoria, BC, and is a scientific computer software consultant and collaborator with colleagues at several overseas universities. He is an invited member of the International Astronomical Union and holds a PhD in astronomy from the University of Texas. He is a director of the Meteorological Service of New Zealand, and a council member of Unitec.

Ed Johnson, BA (Hons) Finance and Accounting, MBA (Hons), is a Marlborough-based company director and advisor. He is currently Chair of Fulton Hogan Ltd and Goldpine Industries Ltd, and a director of several entities, including the Bank of New Zealand, Port Otago Ltd, MDC Holdings Ltd, and Marlborough Airport Ltd. He retired as Chairman and Chief Financial Officer of Shell New Zealand in 2002 after having senior management roles in New Zealand, the USA, and the UK. In 2001 Ed was appointed the inaugural Honorary Fellow of Massey University's Centre for Business and Sustainable Development. In 2003 he was made a Fellow of the Institute of Directors in New Zealand.

Troy Newton is a director of KPMG Corporate Finance, where he advises clients on mergers and acquisitions, valuation, regulatory reform, and financing matters in New Zealand, Australia, and the Pacific Rim. He is a chartered accountant and was a director of Industrial Research Ltd from 1997 until September 2002. He has particular industry experience in telecommunications, information technology, and energy and transport operations.

David Sharp, BSc, is Chairman of the New Zealand Seafood Industry Council, and holds a number of other positions in the seafood industry. He was previously executive director of a major New Zealand primary produce exporting and seafood company.

John Spencer is Chairman of Tainui Group Holdings Limited and Telfer Young Ltd. He is Deputy Chairman of Solid Energy and a Director of Tower Limited, Waikato Regional Airport Ltd, and WEL Networks Ltd. He was the Chief Executive of New Zealand Dairy Group prior to the formation of Fonterra, and has held a number of senior management positions in New Zealand and overseas. A Fellow of the Institute of Chartered Accountants, he is Deputy Chairman of the Accounting Standards Review Board.

Report of the Directors to the Shareholders

The Directors take pleasure in presenting the National Institute of Water & Atmospheric Research Ltd (NIWA) and Group Annual Report for the financial year ended 30 June 2006.

Business activities

The NIWA Group provided scientific research and consultancy services in New Zealand and overseas during the financial year. In New Zealand, services were provided to the Foundation for Research, Science & Technology, the Ministry of Fisheries, and a range of other public and private sector customers. Internationally, services were provided by NIWA and its subsidiaries to public and private sector customers predominantly in the USA and Australia.

Results

This financial year the NIWA Group has exceeded its Business Plan objectives, as set out in the Statement of Corporate Intent (SCI), with a net surplus of $10.3 million (2005: $6.4 million), against a budgeted net surplus of $5.8 million. This was achieved on a turnover of $106.4 million (2005: $91.1 million), against budgeted revenue of $100.6 million.

Shareholders' equity at 30 June 2006 totalled $41.2 million (2005: $43.7 million). Total assets were $68.8 million at 30 June 2006 (2005: $66.9 million). Shareholders' equity declined against the previous year as a result of the payment of dividends.

Donations

No donations were made during the year.

Dividends

Dividend payments of $13.0 million were made to the Government of New Zealand (the Crown), as the sole shareholder.

Directors

The retirement of Dr Carolyn Burns on 30 June 2006 was the only change to the Board of Directors for the year ended 30 June 2006. Dr Wendy Lawson was appointed to the Board of Directors from 1 July 2006.

Auditors

In accordance with Section 21(1) of the Crown Research Institutes Act 1992, the auditors, Deloitte, on behalf of the Auditor-General, continue in office. Their audit remuneration and fees paid for other services are detailed in note 4 of the 'Notes to the Group Financial Statements'.

Group actual performance versus Statement of Corporate Intent (SCI)

Years ended 30 June	**Actual 2006 $'000**	SCI 2006 $'000	Actual 2005 $'000
Revenue	106,414	100,647	91,137
Operating expenses and depreciation	90,348	91,481	81,627
Operating surplus before tax	15,707	8,366	9,654
Net surplus	10,342	5,763	6,434
Average total assets	67,804	69,490	69,558
Average shareholders' funds	42,461	40,475	47,817
Profitability			
EBIT margin (%) (EBIT/revenue)	14.5	8.84	10.2
Return on average equity after tax (%) (net surplus/average equity)	24.4	14.24	13.5
Return on assets (%) (EBIT/average total assets)	22.7	12.76	13.4
Liquidity and efficiency			
Current ratio	0.9	0.81	1.0
Quick ratio	1.2	0.87	1.3
Financial leverage			
Debt to average equity (%)	65	77	48
Gearing (%)	2	22	5
Proprietorship (%) (shareholders' funds/total assets)	63	58	69

Interests Register

The following are transactions recorded in the Interests Register for the year.

(a) Parent and subsidiary companies

Interested transactions

Any business the NIWA Group has transacted in which a director has an interest has been carried out on a commercial 'arms-length' basis.

Directors' remuneration

Details of the Directors' remuneration are provided in the Remuneration of Directors section of the governance statement.

Use of company information by Directors

Pursuant to section 145 of the Companies Act 1993 there were no recorded notices from Directors requesting to use company information received in their capacity as Directors that would not otherwise have been available to them.

Share dealings

During the year no Directors purchased or disposed of any equity securities of the NIWA Group.

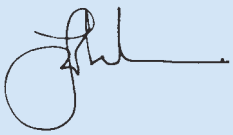
Directors' loans

There were no loans by the NIWA Group to any Directors.

The Directors are pleased with the state of affairs of the NIWA Group.

For and on behalf of the Board:

Sue Suckling
Chair



Troy Newton
Director
23 August 2006

Statement of management responsibility

The following statement is made in accordance with section 42 of the Public Finance Act (1989).

1. The management of the company is responsible for the preparation of these Financial Statements and the judgements used therein.
2. The management of the company is responsible for establishing and maintaining internal control procedures designed to provide reasonable assurance as to the integrity and reliability of financial reporting.
3. In the opinion of management, these Financial Statements fairly reflect the financial performance, movements in equity, financial position, and cash flows of the National Institute of Water & Atmospheric Research Ltd and Group for the year ended 30 June 2006.

Sue Suckling
Chair
23 August 2006

Rick Pridmore
Chief Executive

Corporate governance

Approach to corporate governance

Corporate governance is concerned with how companies are directed and controlled and, in particular, with the role of the Board of Directors ('the Board') and the need to ensure a framework of effective accountability and transparency.

The Company is a Crown Research Institute, established under the terms of the Crown Research Institutes Act (1992) and the Public Finance Act (1989), with all its shares held by the Minister of Finance and the Minister for Crown Research Institutes on behalf of the Crown.

The Board's authority and accountability is based on the two Acts noted above and the Statement of Corporate Intent (SCI). The SCI is produced annually, and sets out the Board's strategic objectives, specific goals, and performance targets. The SCI is submitted to the shareholding Ministers for acceptance.

The Company reports annually to Parliament on its performance in its annual report. A half yearly report and quarterly progress reports are also prepared for shareholding Ministers, and performance is measured against the objectives in the SCI.

In addition to the above Statutes and the SCI, the Board also operates under a number of other governance instruments, which include:

- periodic letter of expectation from the Shareholder;
- Director's undertakings at the time of appointment;
- Directors' interests register;
- Policy on Directors' expenses.

The Board and management of the company are committed to ensuring that the company adheres to best practice governance principles and maintains the highest ethical standards.

This governance statement outlines the company's main corporate governance practices as at 30 June 2006. Unless otherwise stated, they reflect the practices in place throughout the financial year ending on that date.

Responsibilities of the Board and management

The Board of Directors of the National Institute of Water & Atmospheric Research Ltd (NIWA) is appointed by the shareholding Ministers to guide and monitor the business of NIWA and its subsidiaries, NIWA Vessel Management Ltd, NIWA Environmental Research Institute, NIWA (USA), Incorporated, NIWA Australia Pty Ltd, NIWA Natural Solutions Ltd, EcoConnect Ltd, and Unidata Pty Ltd, which constitute the NIWA Group.

The functions of the Board include:

- establishing the company's objectives;
- reviewing and approving major strategies for achieving the company's objectives;
- managing risks;
- determining the overall policy framework within which the business of the company is conducted;
- monitoring management's performance with respect to these matters.

The Board delegates management of the day-to-day affairs and management responsibilities of the company to the executive team under the leadership of the Chief Executive Officer to deliver the strategic direction and goals determined by the Board. A formal delegations authority framework establishes the operational and expenditure delegations within which the Chief Executive Officer must operate.

Board composition and activity

During the financial year ended 30 June 2006 the Board comprised nine independent non-executive Directors (including the Chair). The Director's profiles are presented on page 64. Board meetings are held monthly. The Board formally met twelve times during the year.

Remuneration

Directors' remuneration is annually reviewed and approved by the shareholding Ministers. Directors' remuneration received, or due and receivable during the year, is:

Parent	2006 $'000	2005 $'000
Directors of the National Institute of Water & Atmospheric Research Ltd		
S H Suckling (Chair)	52	52
C W Burns	26	26
M K Cassidy	26	26
J D Hercus	26	26
G Hill	26	26
E Johnson	26	–
T W Newton	26	26
D C Sharp	26	26
J Spencer	33	33
Group		
Directors of NIWA Natural Solutions Ltd		
J Baird	16	8
Directors of NIWA Australia Pty Ltd		
P Twynham	–	1

No fees were paid in respect of Directors of the subsidiaries NIWA Vessel Management Ltd, NIWA Environmental Research Institute, NIWA (USA), Incorporated, NIWA Australia Pty Ltd, NIWA Natural Solutions, EcoConnect Ltd, and Unidata Pty Ltd, other than those shown above.

Board committees

Audit and Legislative Compliance Committee

The Audit and Legislative Compliance Committee is a sub-committee of the Board. During the financial year, the Audit and Legislative Compliance Committee comprised three members of the Board and met formally three times with the NIWA Chair as an ex-officio member.

The function of the Audit and Legislative Compliance Committee is to assist the Board in carrying out its responsibilities under the Crown Research Institutes Act 1992, the Crown Entities Act 2004, the Public Finance Act 1989, the Companies Act 1993, and the Financial Reporting Act 1993 in respect of the Group financial accounting practices, policies, and controls, and to review and make appropriate enquiry into the audits of the Group Financial Statements by both internal and external auditors.

Remuneration Committee

The Remuneration Committee is a sub-committee of the Board and comprised two members, the NIWA Chair and Deputy Chair.

The Remuneration Committee reviews the remuneration policies applicable to the Chief Executive Officer on an annual basis and makes recommendations on remuneration packages and terms of employment to the Board. The Remuneration Committee also ratifies the remuneration packages of the direct reports to the Chief Executive Officer.

Remuneration packages are reviewed with due regard to performance and other relevant factors.

Directors' insurance

The NIWA Group has arranged policies for Director's Liability Insurance which, with a Deed of Indemnity, ensures that generally Directors will incur no monetary loss as a result of lawful actions undertaken by them as Directors. Certain actions are specifically excluded; for example, incurring penalties and fines which may be imposed in respect of breaches of the law.

Remuneration of employees

The numbers of employees (not including Directors) whose total remuneration exceeded $100,000 is:

Group $	2006	2005
100,000–109,999	21	23
110,000–119,999	7	10
120,000–129,999	5	4
130,000–139,999	2	2
140,000–149,999	2	2
150,000–159,999	4	2
160,000–169,999	–	2
170,000–179,999	1	–
180,000–189,999	–	2
190,000–199,999	1	–
200,000–209,999	1	1
330,000–339,000*	–	1
350,000–359,000*	1	–

* Chief Executive Officer's remuneration band.

Risk management

Risk management has been incorporated into the normal business processes of the company, with practices such as business planning and budgeting, operational management, and project management.

The Board annually reviews the delegations authority framework. The delegations authority framework sets authorities for operational and expenditure delegations, including authority for undertaking treasury activities of the company.

The Audit and Legislative Compliance Committee receives reports on internal risk management reviews, and also meets with the external auditors to discuss findings from the annual audit.

Auditor independence

The appointment of auditors to conduct statutory work, and the annual audit fees, are approved annually by the Auditor-General.

To ensure the independence of the external auditors, NIWA does not consult the external auditor for tax or management related services and takes care not to make use of the external auditors for any work which they may need to evaluate as part of the external audit.

Membership and attendance

Director	Date of appointment	Appointment term expires	Board	Audit Committee	Remuneration Committee
Sue Suckling (Chair)	1 March 2001	30 June 2007	10	3*	1
Carolyn Burns	31 October 2000	30 June 2006	12		
Miranda Cassidy	28 June 2001	30 June 2007	11		
John Hercus	27 October 2000	30 June 2007	9		
Graham Hill	27 May 2002	30 June 2008	11		
Ed Johnson	9 June 2005	30 June 2008	10	1	
Troy Newton *(Audit Committee Chair)*	18 June 2002	30 June 2008	10	3	
David Sharp	4 July 2001	30 June 2007	11		
John Spencer *(Deputy Chair)*	16 June 2003	30 June 2007	11	3	1
Wendy Lawson	1 July 2006	30 June 2009	–		

* The Chair is an ex-officio member of the Audit Committee.

Membership of subsidiary Boards

Director	NIWA Vessel Management Ltd	NIWA Natural Solutions Ltd	NIWA Australia Pty Ltd	NIWA (USA), Inc. & NIWA Environmental Research Institute	Unidata Pty Ltd
Sue Suckling		✓			✓
John Baird [1]		✓*			
Carolyn Burns			✓*	✓*	
Miranda Cassidy			✓		
Bryce Cooper [2]		✓			✓
John Hercus	✓				
Graham Hill				✓	
Ed Johnson	✓			✓	
Troy Newton		✓			
Rick Pridmore [2]	✓	✓	✓	✓	✓
David Saunders [3]					✓
David Sharp	✓*				
John Spencer		✓			✓*
Paul Twynham [1]			✓		

* Chair.

[1] Independent Directors.

[2] Executive members of the parent company.

[3] Director representing minority interest.

National Institute of Water & Atmospheric Research Ltd and Group

Statement of Financial Performance

for the year ended 30 June 2006

	Note	Group 2006 Actual $'000	Group 2006 Budget $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Revenue	3	106,414	100,647	91,137	108,512	86,807
Operating surplus before taxation	4	**15,706**	**8,366**	**9,654**	**19,874**	**4,765**
Taxation expense	6a	5,364	2,603	3,220	4,121	2,357
Net surplus		**10,342**	**5,763**	**6,434**	**15,753**	**2,408**
Net surplus comprises:						
Parent interest		10,422	5,731	6,437		
Minority interest	9	(80)	32	(3)		
		10,342	**5,763**	**6,434**		

The accompanying 'Notes to the Financial Statements' are an integral part of, and should be read in conjunction with, this 'Statement of Financial Performance'.

National Institute of Water & Atmospheric Research Ltd and Group

Statement of Movements in Equity

for the year ended 30 June 2006

	Note	Group 2006 Actual $'000	Group 2006 Budget $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Net surplus for the year:						
Parent interest		10,422	5,763	6,437	15,753	2,408
Minority interest		(80)	32	(3)	–	–
Foreign currency translation reserve movement	7b	200	–	312	–	–
Total recognised revenues and expenses		**10,542**	**5,795**	**6,746**	**15,753**	**2,408**
Distributions to owners						
Dividends	8	(13,000)	(13,000)	(15,000)	(13,000)	(15,000)
Movements in equity for the year		**(2,458)**	**(7,205)**	**(8,254)**	**2,753**	**(12,592)**
Equity at the beginning of the year		**43,690**	**44,077**	**51,944**	**28,778**	**41,370**
Equity at the end of the year		**41,232**	**36,872**	**43,690**	**31,531**	**28,778**

The accompanying 'Notes to the Financial Statements' are an integral part of, and should be read in conjunction with, this 'Statement of Movements in Equity'.

National Institute of Water & Atmospheric Research Ltd and Group

Statement of Financial Position

as at 30 June 2006

	Note	Group 2006 Actual $'000	Group 2006 Budget $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Equity						
Share capital	7a	24,799	24,799	24,799	24,799	24,799
Equity reserves	7b	16,452	12,026	18,830	6,732	3,979
Shareholders' interest		41,251	36,825	43,629	31,531	28,778
Minority shareholders' interest	9	(19)	47	61	–	–
Total equity		**41,232**	**36,872**	**43,690**	**31,531**	**28,778**
Non-current liabilities						
Unsecured loans	10	452	404	403	–	–
Employee entitlements	11	1,551	1,620	1,598	1,468	1,522
Intercompany	24	–	–	–	12,119	14,285
Total non-current liabilities		**2,003**	**2,024**	**2,001**	**13,587**	**15,807**
Current liabilities						
Payables and accruals	12	17,192	13,334	13,163	15,847	12,599
Short-term advance facility	13	600	10,500	1,700	600	1,700
Employee entitlements	11	7,705	3,625	6,278	7,115	5,498
Taxation payable		26	–	18	–	–
Total current liabilities		**25,523**	**27,459**	**21,159**	**23,562**	**19,797**
Total equity and liabilities		**68,758**	**66,355**	**66,850**	**68,680**	**64,382**
Non-current assets						
Property, plant, & equipment	14	42,740	43,072	43,295	30,770	30,580
Identifiable intangibles	16	117	44	59	–	–
Investments	20	491	272	47	13,246	12,746
Future income taxation benefit	6b	1,816	725	1,460	3,476	3,338
Receivables and prepayments	17	765	–	208	765	208
Loans to associates	23	106	–	–	26	–
Total non-current assets		**46,035**	**44,113**	**45,069**	**48,283**	**46,872**
Current assets						
Cash and short-term deposits		1,143	4,770	1,357	488	923
Receivables and prepayments	17	17,539	13,589	15,721	16,777	13,290
Taxation receivable		–	498	109	138	107
Uninvoiced receivables		2,217	1,915	2,313	2,203	2,303
Inventories	18	1,824	1,470	2,281	791	887
Total current assets		**22,723**	**22,242**	**21,781**	**20,397**	**17,510**
Total assets		**68,758**	**66,355**	**66,850**	**68,680**	**64,382**

For and on behalf of the Board:

Sue Suckling
Chair
23 August 2006

Troy Newton
Director

The accompanying 'Notes to the Financial Statements' are an integral part of, and should be read in conjunction with, this 'Statement of Financial Position'.

National Institute of Water & Atmospheric Research Ltd and Group

Statement of Cash Flows

for the year ended 30 June 2006

	Note	Group 2006 Actual $'000	Group 2006 Budget $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Cash flows from operating activities						
Cash was provided from:						
Receipts from customers		105,215	100,485	90,442	105,543	86,702
Interest received		386	131	355	373	351
		105,601	100,616	90,797	105,916	87,053
Cash was disbursed to:						
Payments to employees and suppliers		(76,925)	(80,816)	(71,048)	(77,226)	(72,456)
Interest paid		(50)	(798)	(1)	(50)	(1)
Taxation paid		(5,606)	(2,641)	(3,000)	(4,290)	(2,060)
		(82,581)	(84,255)	(74,049)	(81,566)	(74,517)
Net cash inflow from operating activities	**19**	**23,020**	**16,361**	**16,748**	**24,350**	**12,536**
Cash flows from investing activities						
Cash was provided from:						
Sale of property, plant, & equipment		76	300	169	75	161
Loans advanced from subsidiary company		–	–	–	–	3,937
Cash was applied to:						
Purchase of property, plant, & equipment		(8,480)	(7,596)	(7,348)	(7,485)	(6,974)
Purchase of intangible assets		(95)	(300)	–	–	–
Investment in associates	22	(535)	–	(107)	(500)	(37)
Net cash outflow in investing activities		**(9,034)**	**(7,596)**	**(7,286)**	**(7,910)**	**(2,913)**
Cash flows from financing activities						
Cash was applied to:						
Dividends paid to shareholders	8	(13,000)	(13,000)	(15,000)	(13,000)	(15,000)
Short-term advance facility received/(repaid)	13	(1,100)	4,500	1,700	(1,100)	1,700
Associate loan proceeds/(payment)		(100)	–	–	–	–
Subsidiary loan proceeds/(repaid)		–	–	–	(2,775)	–
Net cash outflow from financing activities		**(14,200)**	**(8,500)**	**(13,300)**	**(16,875)**	**(13,300)**
Net increase/(decrease) in cash held		**(214)**	**265**	**(3,838)**	**(435)**	**(3,677)**
Add opening cash balance		1,357	4,505	5,195	923	4,600
Closing cash balance		**1,143**	**4,770**	**1,357**	**488**	**923**
Made up of:						
Cash		1,135	4,770	1,350	488	923
Short-term deposits		8	–	7	–	–
Closing cash balance		**1,143**	**4,770**	**1,357**	**488**	**923**

The accompanying 'Notes to the Financial Statements' are an integral part of, and should be read in conjunction with, this 'Statement of Cash Flows'.

Notes to the Financial Statements

for the year ended 30 June 2006

1 Nature of activities

The National Institute of Water & Atmospheric Research Ltd (NIWA) and Group conducts research in water and atmospheric sciences in New Zealand and internationally.

2 Statement of accounting policies

The NIWA Financial Statements and Group Financial Statements are presented in accordance with the requirements of the Crown Research Institutes Act 1992, the Crown Entities Act 2004, the Public Finance Act 1989, the Companies Act 1993, and the Financial Reporting Act 1993. The NIWA Financial Statements are for the Parent Company as a separate entity. The consolidated (or 'Group') Financial Statements comprise NIWA (the 'Parent Company'), its subsidiaries, and the Group's interest in associates and joint ventures.

Measurement base

The Financial Statements have been prepared in accordance with Generally Accepted Accounting Practice (GAAP) in New Zealand. The measurement and reporting of financial performance, movements in equity, financial position, and cash flows are based on historical cost. The reporting currency used in the preparation of these Financial Statements is New Zealand dollars.

Specific accounting policies

The following specific accounting policies, which materially affect the measurement of financial performance, movements in equity, financial position, and cash flows, have been established and consistently applied.

(a) Basis of consolidation

i) Consolidation of subsidiaries

Subsidiaries are those entities controlled by NIWA. The Group Financial Statements have been prepared using the purchase method of consolidation. This involves adding corresponding assets, liabilities, revenues, and expenses on a line-by-line basis. All intercompany transactions, balances, and unrealised profits are eliminated on consolidation. The results of any subsidiaries that become or cease to be part of the Group during the year are consolidated from the date that control commenced or until the date that control ceased.

The interest of minority shareholders is stated at the minority's proportion of the fair values of the identifiable assets and liabilities recognised on acquisition together with the minority interests' share of post-acquisition surpluses.

ii) Accounting for associates

An associate is an investee, not being a subsidiary or joint venture arrangement, over which the Group has the capacity to exercise significant influence, but not control, through participation in the financial and operating policy decisions of the investee.

The Group Financial Statements incorporate the Group's interest in associates, using the equity method, as from the date that significant influence commenced or until the date the significant influence ceased. The investments are recorded at the lower of carrying value and recoverable amount.

The Group recognises its share of the associates' net surplus or deficit for the year as operating revenue in its Statement of Financial Performance. The Group recognises its share of other post-acquisition movements in reserves in its Statement of Movements in Equity. Dividends received from associates are recognised directly against the carrying value of the investment. In the Statement of Financial Position the investment and the reserves are increased by the Group's share of the post-acquisition retained surplus and other post-acquisition reserves of the associates. In assessing the Group's share of earnings of associates, the Group's share of any unrealised profits between group companies and associates is eliminated.

iii) Accounting for joint ventures

Joint ventures are joint arrangements between NIWA and another party in which there is a contractual agreement to undertake a specific business project in which the venturers share several liabilities in respect of the costs and liabilities of the project and share in any resulting output. NIWA's share of the assets, liabilities, revenues, and expenses of the joint ventures is incorporated into the Parent Company and Group Financial Statements on a line-by-line basis using the proportionate method.

(b) Revenue recognition

Contract revenue is recognised based on the lower of the stage of completion of the contract or the value of work done. The amount of revenue unbilled is represented by 'uninvoiced receivables', which is stated at cost in the Statement of Financial Position. Revenue received but not earned is recognised as revenue in advance in 'payables and accruals' in the Statement of Financial Position.

(c) Goods and Services Tax (GST)

These Financial Statements are prepared on a GST-exclusive basis, except for receivables and payables, which are stated GST inclusive.

(d) Taxation

Taxation expense is charged in the Statement of Financial Performance in respect of the current year's operating surplus after allowing for permanent differences. The provision for taxation for the year includes both current and deferred tax on income after taking into account all available deductions.

Deferred tax arising from timing differences in recognition of income and expenditure for tax purposes has been accounted for using the liability method on a comprehensive basis. A debit balance in the deferred tax account (hereafter called 'future income taxation benefit'), arising from timing differences or taxation benefits from taxation losses, is recognised only if there is virtual certainty of realisation.

(e) Identifiable intangible assets

Purchased identifiable intangible assets, comprising copyrights and trademarks, are recognised at cost and amortised in the Statement of Financial Performance on a straight-line basis over their estimated useful lives. When the carrying amount of an identifiable intangible asset exceeds its recoverable amount, it is written down to its recoverable amount.

(f) Development costs

Development costs that meet the following criteria are recognised as an asset in the Statement of Financial Position:

- the product or process is clearly defined, and the costs attributable to the product or process can be identified separately and measured reliably;
- the technical feasibility of the product or process can be demonstrated;
- the Group intends to produce and market, or use, the product or process;
- the existence of a market for the product or process or its usefulness to the Group, if it is to be used internally, can be demonstrated;
- adequate resources exist, or their availability can be demonstrated, to complete the projects and market or use the product or process.

Capitalisation is limited to the amount which, taken together with further related costs, is likely to be recovered from related future economic benefits.

When the criteria above no longer apply, the unamortised balance of development costs is written off and recognised immediately as an expense.

Development costs recognised as an asset are amortised in the Statement of Financial Performance on a straight-line basis over the period of expected benefits.

When the unamortised balance of development costs exceeds the probable amount of future recovery from related future economic benefits less related future costs, the excess is written down and recognised immediately as an expense.

All other development and research costs are expensed as incurred.

(g) Investments

Non-current investments are valued at cost. Where the carrying amount of an investment exceeds its recoverable amount, it is written down to its recoverable amount.

(h) Property, plant, and equipment

Property, plant, and equipment, except land, are valued at historical cost less accumulated depreciation to date. Provision is made for any impairment. Land is valued at cost. Property, plant, and equipment purchased from the Crown at 1 July 1992 and 1 July 1995 are stated at the transfer price at those dates, adjusted for subsequent disposals and depreciation.

Expenditure incurred on property, plant, and equipment is capitalised where such expenditure will increase or enhance the future economic benefits provided by the assets' existing service potential. Expenditure incurred to maintain future economic benefits is classified as repairs and maintenance.

(i) Depreciation

Property, plant, and equipment, except for freehold land, are depreciated on a straight-line basis at rates estimated to write off the cost (or transfer price) of the property, plant, and equipment over their estimated useful lives. Maximum useful lives used are:

RV *Tangaroa* hull	26 years
RV *Kaharoa* hull	16 years
Buildings	40 years
Leasehold improvements, freehold property	10 years
Leasehold improvements, rented property	5 years
Supercomputer	5 years
Scientific equipment	4 years
Plant & equipment	10 years
Other electronic data processing equipment	3 years
Furniture & fittings	10 years
Office equipment	5 years
Motor vehicles	4 years
Small boats	5 years

(j) Receivables

Receivables are stated at their estimated realisable value after providing for doubtful and uncollectable debts.

(k) Inventory

Inventory is stated at the lower of cost and net realisable value. Cost is calculated on the weighted average basis for consumables and first in first out (FIFO) for finished goods and work in progress.

(l) Foreign currencies

i) Transactions

Transactions in foreign currencies are converted at the New Zealand rate of exchange ruling on the date of the transaction. Monetary assets and liabilities are converted to the New Zealand rate of exchange ruling at balance date, and any exchange gains or losses are taken to the Statement of Financial Performance.

ii) Translation of independent foreign operations

Revenues and expenses of independent foreign operations are translated to New Zealand dollars at the exchange rates in effect at the time of the transactions, or at rates approximating them. Assets and liabilities are converted to New Zealand dollars at the rates of exchange ruling at balance date. Exchange rate differences arising from the translation of the independent foreign operations are recognised in the foreign currency translation reserve.

(m) Leases

The Group has not contracted for any leases which would be classified as finance leases.

Operating lease payments are recognised on a systematic basis that is representative of the benefit to the Group.

(n) Statement of Cash Flows

The Statement of Cash Flows is prepared exclusive of GST, which is consistent with the method used in the Statement of Financial Performance. Operating activities comprise the provision of research services, consultancy, and manufacture of scientific instruments. Investing activities comprise the purchase and disposal of property, plant, and equipment and advances to subsidiaries. Financing activities are those which result in changes in the size and composition of the capital structure of the Group. Cash includes cash and short-term deposits.

(o) Provision for dividends

Dividends are recognised in the year that they are authorised and approved.

(p) Financial instruments

Forward exchange contracts entered into as hedges of foreign exchange assets or liabilities are valued at the exchange rate prevailing at year end. Any unrealised gains or losses are offset against forward exchange gains or losses on the related asset or liability. Unrealised gains or losses on forward exchange contracts entered into as future sales or purchasing are deferred and included in the measurement of the purchase or sale.

(q) Changes in accounting policies

There have been no changes in accounting policies this year.

(r) Implementation of New Zealand equivalents to International Financial Reporting Standards

New Zealand reporting entities are required to comply with the New Zealand equivalents of International Financial Reporting Standards ('NZ IFRS') for reporting periods commencing on or after 1 January 2007, with optional adoption for reporting periods commencing on or after 1 January 2005.

NIWA intends to adopt NZ IFRS for the year ending 30 June 2008, and accordingly the first report using NZ IFRS will be for the half year ended 31 December 2007. The transitional rules for the first time adoption of NZ IFRS require NIWA to restate its comparative financial statements using NZ IFRS. The majority of the adjustments required on transition will be made to opening retained earnings in the opening NZ IFRS balance sheet as at 1 July 2006.

During the year ended 30 June 2006 NIWA completed a preliminary review of its accounting policies and financial reporting against the requirements of NZ IFRS. NIWA recognises that it will be required to restate the Statement of Financial Position of the comparative period Financial Statements in accordance with the version of NZ IFRS applicable at the first NZ IFRS reporting date. Changes continue to be made to NZ IFRS, and there may be further changes to the information disclosed. It should therefore be noted that the actual impact of adopting NZ IFRS may vary from the information presented, and this variation may be material.

NIWA has compiled an opening balance sheet based on the current version of NZ IFRS as at 1 July 2006. Based on the results of the information gathered in this process and the review of policies, NIWA does not expect its financial results or financial position to be materially different under NZ IFRS from that currently reported, other than in the format and level of disclosure as presented in this report.

Set out below are the key areas where accounting policies may change and have an impact on the financial reports of NIWA.

(i) Income taxes

A 'balance sheet' approach will be adopted, replacing the 'income statement' approach under NZ GAAP. This method recognises deferred tax on most temporary differences between the carrying value of an asset or liability and its tax base.

Adoption of NZ IFRS is not expected to impact significantly on the tax expense reported.

(ii) Carrying value of land and other assets

On first time adoption of NZ IFRS, entities are permitted to adjust the carrying value of selected fixed assets to the current fair value without creating a need for ongoing revaluations.

NIWA is currently reviewing its assets to determine which, if any, should be revalued as one-off adjustments.

(iii) Impairment of assets

An asset is impaired if its carrying value exceeds its recoverable amount, being the higher of the asset's fair value less costs to sell or 'value in use' to NIWA. Fixed assets must be reviewed each year to determine whether there are any indications that they may be impaired. Any impairment identified should be recognised immediately in the Statement of Financial Performance.

Adoption of NZ IFRS will require additional procedures to perform the impairment testing required, but is not expected to impact significantly on the carrying values currently reported.

(iv) Financial instruments: recognition and measurement

NZ IFRS requires NIWA to recognise the derivatives held by the Group to hedge exposures to foreign currencies and interest rates on the balance sheet at fair value. Gains or losses on such contracts, even if unrealised on unsettled transactions, will be reported in the Statement of Financial Performance.

NIWA has elected not to hedge account. Therefore, any derivatives held will be recognised at fair value in each period. Given the current level of hedging and short-term nature of most hedges, no significant impact is anticipated. Higher volatility of earnings from period to period may result as the reported impact of a hedging instrument may now fall in a different reporting period to the impact of the underlying risk.

(v) Intangible assets

NZ IFRS requires computer software that is not an integral part of the related computer hardware to be treated as an intangible asset, provided certain criteria are met.

On conversion to NZ IFRS, such items will be reclassified from tangible to intangible fixed assets. There will be no net impact on equity.

(vi) Foreign currency translation reserve

On translation of a foreign operation, certain exchange differences are recognised as a separate component of equity, in the foreign currency translation reserve. A first-time adopter may elect to reset these cumulative translation differences to zero.

On transition to NZ IFRS, these cumulative translation differences will be transferred to opening retained earnings. There will be no net impact on opening equity or earnings as a result of this adjustment.

Translation differences in operating activities are currently recognised in the currency translation reserve.

3 Revenue

	Group 2006 Actual $'000	Group 2006 Budget $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Public Good Science and Technology:					
Contract funding	42,895	41,142	39,469	42,845	39,469
Capability Fund	7,479	7,506	4,260	7,479	4,260
Ministry of Fisheries	16,060	16,746	16,626	16,060	16,626
Commercial	39,685	34,956	30,487	33,755	26,101
Share of associate's net deficit	(91)	166	(60)	–	–
Dividends from subsidiaries	–	–	–	8,000	–
Interest income	386	131	355	373	351
	106,414	**100,647**	**91,137**	**108,512**	**86,807**

All revenue was derived from continuing activities.

4 Operating surplus before taxation

	Note	Group 2006 Actual $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
The operating surplus before taxation is stated after charging/(crediting):					
Depreciation	5	8,743	9,204	7,189	7,282
Amortisation of identifiable intangible assets		39	9	–	–
Rental and operating lease costs		973	1,093	883	997
Remuneration of Directors		284	260	268	248
Net (gain)/loss on sale of property, plant, & equipment		310	(147)	32	(140)
Bad debts written off		3	92	3	82
Movement within doubtful debt provision		(59)	–	(59)	–
Provision for doubtful debts		–	76	–	76
Net realised foreign currency (gain)/loss		15	(338)	(35)	(320)
Interest expense		50	1	50	1
Remuneration of the auditors of these Financial Statements:					
Audit fees		109	104	93	88
Other services		–	15	–	15
Provision for intercompany advances		–	–	584	2,332

5 Depreciation

	Group 2006 Actual $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Buildings & improvements	1,225	1,289	1,203	1,265
Vessels	756	758	–	–
Plant & equipment	3,816	3,995	3,503	3,249
Electronic data processing equipment	1,796	1,933	1,398	1,653
Office equipment	459	477	438	462
Furniture & fittings	43	90	43	52
Motor vehicles	545	536	532	516
Small boats	103	126	72	85
Total	**8,743**	**9,204**	**7,189**	**7,282**

6 Taxation

6a. Taxation expense

	Group 2006 Actual $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Operating surplus before taxation	**15,707**	**9,654**	**19,874**	**4,765**
Prima facie tax @ 33%	5,183	3,186	6,558	1,573
Add/(less) tax effect of permanent differences	8	14	(2,440)	783
Share of associate's net deficit	30	20	–	–
Tax losses (recognised)/carried forward	117	(1)	–	–
Under/(over) provision in previous year	26	1	3	1
Income taxation expense	**5,364**	**3,220**	**4,121**	**2,357**
The income taxation expense is represented by:				
Current taxation	5,720	3,701	4,259	2,477
Deferred taxation/(future income taxation benefit)	(356)	(481)	(138)	(120)
	5,364	**3,220**	**4,121**	**2,357**

6 Taxation (continued)

	Group 2006 Actual $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
6b. Future income taxation benefit				
Balance at the beginning of the year	1,460	979	3,338	3,218
Prior period adjustment	85	39	(22)	23
Current year movement	271	442	160	97
Balance at the end of the year	**1,816**	**1,460**	**3,476**	**3,338**
6c. Tax losses carried forward				
Balance at the beginning of the year	–	–	–	–
Current year movement	117	–	–	–
Balance at the end of the year	**117**	**–**	**–**	**–**

All tax losses available to be carried forward and offset against future taxable income are held in Unidata Pty Ltd.

7 Equity

7a. Share capital				
Issued and fully-paid capital				
24 798 700 ordinary shares	**24,799**	**24,799**	**24,799**	**24,799**

All shares carry equal voting and distribution rights.

7b. Equity reserves				
Equity reserves include:				
Retained earnings	16,188	18,766	6,732	3,979
Foreign currency translation reserve	264	64	–	–
Total equity reserves	**16,452**	**18,830**	**6,732**	**3,979**
Movements in reserves during the year were:				
Retained earnings				
Balance at the beginning of the year	18,766	27,329	3,979	16,571
Add net surplus	10,422	6,437	15,753	2,408
Less dividend paid	(13,000)	(15,000)	(13,000)	(15,000)
Balance at the end of the year	**16,188**	**18,766**	**6,732**	**3,979**
Foreign currency translation reserve				
Balance at the beginning of the year	64	(248)	–	–
Add foreign exchange gain (loss) on translation of independent foreign operations	200	312	–	–
Balance at the end of the year	**264**	**64**	**–**	**–**

Foreign currency translation occurs as a result of the incorporation of the net assets of the international subsidiaries into the Group Financial Statements. The international subsidiaries are NIWA (USA), Incorporated, NIWA Environmental Research Institute, NIWA Australia Pty Ltd, and Unidata Pty Ltd (note 20).

8 Dividend payments

Payments were made on:				
5 January 2005	–	(7,500)	–	(7,500)
28 June 2005	–	(7,500)	–	(7,500)
9 January 2006	(6,500)	–	(6,500)	–
30 June 2006	(6,500)	–	(6,500)	–
	(13,000)	**(15,000)**	**(13,000)**	**(15,000)**

These dividend payments were made to the Government of New Zealand (the Crown) as the sole shareholder.

9 Minority shareholders' interest

Balance at the beginning of the year	61	64	–	–
Share of surplus/(deficit) for the year	(80)	(3)	–	–
Balance at the end of the year	**(19)**	**61**	**–**	**–**

10 Unsecured loan

	Group 2006 Actual $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Shareholder loan	**452**	**403**	**–**	**–**

The loan is unsecured and relates to a vendor finance agreement on the acquisition of a subsidiary, Unidata Pty Ltd. The loan is not subject to any interest charge. Repayment will be made when, and in such amounts as, the cash flow and profitability of Unidata Pty Ltd permit, with full repayment due on 7 May 2014. The change in the value of the loan from the previous year is a result only of foreign currency translation.

11 Provision for employee entitlements

Balance at the beginning of the year	7,876	6,577	7,020	6,258
Additional provision recognised	5,134	3,665	4,250	3,101
Amount utilised	(3,754)	(2,366)	(2,687)	(2,339)
Balance at the end of the year	**9,256**	**7,876**	**8,583**	**7,020**
Classified as:				
Non-current	**1,551**	**1,598**	**1,468**	**1,522**
Current	**7,705**	**6,278**	**7,115**	**5,498**

The provision for employee entitlements relates to employee benefits such as accrued wages, holiday pay, long service, and retirement leave. The provision is affected by a number of estimates, including the expected employment period of employees and the timing of employees using the benefits.

12 Payables and accruals

Trade payables	9,125	6,519	7,900	5,986
Revenue in advance	8,067	6,644	7,947	6,613
Total	**17,192**	**13,163**	**15,847**	**12,599**

13 Short-term advance facility

A short-term advance facility is available from Westpac Banking Corporation.

Advance facility	**600**	**1,700**	**600**	**1,700**

The facility is unsecured, but subject to various covenants that were complied with during the year. The facility is operated on an on-call basis. The relevant interest rate for the period was 7.45% (2005: 6.95%).

14 Property, plant, and equipment

	2006 Cost $'000	2006 Accum depn $'000	2006 Book value $'000	2005 Cost $'000	2005 Accum depn $'000	2005 Book value $'000
Group						
Land	2,206	–	2,206	2,217	–	2,217
Buildings & leasehold improvements	24,120	9,070	15,050	23,410	7,873	15,537
Vessels	18,423	8,042	10,381	18,869	7,464	11,405
Plant & equipment	50,312	38,349	11,963	45,881	35,270	10,611
Electronic data processing equipment	20,859	19,281	1,578	19,863	18,045	1,818
Office equipment	6,626	6,317	309	6,268	5,992	276
Furniture & fittings	1,971	1,826	145	1,979	1,793	186
Motor vehicles	3,252	2,302	950	3,066	2,054	1,012
Small boats	1,283	1,125	158	1,273	1,040	233
Total	**129,052**	**86,312**	**42,740**	**122,826**	**79,531**	**43,295**
Parent						
Land	2,206	–	2,206	2,217	–	2,217
Buildings & leasehold improvements	23,925	8,949	14,976	23,190	7,746	15,444
Plant & equipment	43,963	33,151	10,812	39,660	29,710	9,950
Electronic data processing equipment	19,551	18,234	1,317	18,677	17,287	1,390
Office equipment	6,456	6,172	284	6,066	5,804	262
Furniture & fittings	1,540	1,428	112	1,548	1,397	151
Motor vehicles	3,134	2,204	930	2,935	1,951	984
Small boats	1,053	920	133	1,029	847	182
Total	**101,828**	**71,058**	**30,770**	**95,322**	**64,742**	**30,580**

14 Property, plant, and equipment (continued)

14a. Property, plant, and equipment valuation
Independent valuers, DTZ New Zealand Limited, undertook a valuation of land and buildings in June 2006. This valuation totalled $45.9 million, and, while the Directors consider this value to be relevant, they have elected not to revalue for reporting purposes.

14b. Vessels
As agreed with the shareholders, an amount has been identified within the Group for any shortfall between the current insured value of $40 million and the estimated replacement cost of RV *Tangaroa*, in the event of the loss of that vessel.

15 Heritage assets

NIWA has one collection and three databases that have been defined as heritage assets. Heritage assets are those assets held for the duration of their physical lives because of their unique scientific importance.

NIWA has the following heritage assets:

Type	Description
Marine Benthic Biology Collection	A national reference collection for marine invertebrates.
National Climate Database	A national electronic database of high quality climate information, including temperatures, rainfall, wind, and other climate elements.
Water Resources Archive Database	A national electronic database of river and lake locations throughout New Zealand, including levels, quality, and flows.
New Zealand Freshwater Fish Database	A national electronic database of the occurrence of fish in the fresh waters of New Zealand, including major offshore islands.

The nature of these heritage assets, and their significance to the science NIWA undertakes, makes it necessary to disclose them. In the Directors' view the value of these heritage assets cannot be assessed with any reliability, and accordingly these assets have not been valued for reporting purposes.

16 Identifiable intangibles

	Group 2006 Actual $'000	Group 2005 Actual $'000	**Parent 2006 Actual $'000**	Parent 2005 Actual $'000
Copyrights and trademarks				
At cost	165	68	–	–
Accumulated amortisation	(48)	(9)	–	–
Book value	**117**	**59**	**–**	**–**

Identifiable intangibles such as copyrights and trademarks are amortised over their estimated useful lives.

17 Receivables and prepayments

Trade receivables	17,783	15,520	17,044	13,174
Provision for doubtful debts	(41)	(100)	(41)	(100)
Prepayments	562	509	539	424
Total	**18,304**	**15,929**	**17,542**	**13,498**
Classified as:				
Non-current	**765**	**208**	**765**	**208**
Current	**17,539**	**15,721**	**16,777**	**13,290**

The non-current component of receivables relates to the long-term portion of contract retentions included in trade receivables.

18 Inventories

Consumables	269	391	–	–
Finished goods	1,420	1,550	731	797
Work in progress	135	340	60	90
Total	**1,824**	**2,281**	**791**	**887**

Inventories are not pledged as security for liabilities, nor are any inventories subject to retention of title clauses.

19 Reconciliation of net surplus after taxation to net cash inflow from operating activities

	Note	Group 2006 Actual $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Net surplus		**10,342**	**6,434**	**15,753**	**2,408**
Add/(less) items classified as investing activities					
Net loss/(gain) on disposal of property, plant, & equipment		310	(147)	32	(140)
Add/(less) non-cash items					
Share of associate's deficit for the year		91	60	–	–
Depreciation		8,743	9,204	7,189	7,282
(Surplus)/deficit attributable to minority interests		80	3	–	–
Amortisation of identifiable intangibles		39	9	–	–
Unrealised changes in the value of subsidiaries		200	313	–	–
(Gain)/loss on foreign currency loan		(115)	(21)	–	–
Increase/(decrease) in employee entitlements		(47)	(154)	(54)	(154)
Increase/(decrease) in provisions	24	–	–	584	2,332
(Increase)/decrease in future income taxation benefit		(356)	(481)	(138)	(120)
		8,635	**8,933**	**7,581**	**9,340**
Add/(less) movements in working capital items					
Increase/(decrease) in payables and accruals		4,029	(177)	3,247	(363)
Increase/(decrease) in employee entitlements		1,427	1,453	1,617	916
(Increase)/decrease in receivables and prepayments		(2,377)	(361)	(4,046)	172
(Increase)/decrease in inventory and uninvoiced receivables		553	(87)	196	(215)
(Increase)/decrease in taxation receivable		101	700	(31)	418
		3,733	**1,528**	**983**	**928**
Net cash inflow from operating activities		**23,020**	**16,748**	**24,350**	**12,536**

20 Investments

Investment in subsidiaries	21	–	–	12,709	12,709
Investment in associates	22	491	47	537	37
		491	**47**	**13,246**	**12,746**

21 Investments in subsidiaries

Name	Principal activities	Ownership and voting interest 2006 %	2005 %
NIWA Vessel Management Ltd	Vessel charters for scientific research	100	100
NIWA Natural Solutions Ltd	Commercialisation of NIWA products	100	100
NIWA Australia Pty Ltd	Scientific research and consultancy services	100	100
NIWA Environmental Research Institute	Scientific research and consultancy services	100	100
NIWA (USA), Inc.	Scientific research and consultancy services	100	100
Unidata Pty Ltd	Supplier of environmental technology products	80	80
EcoConnect Ltd	Real-time environmental forecasting services	100	50

All subsidiaries have a balance date of 30 June.

NIWA Vessel Management Ltd, NIWA Natural Solutions Ltd, and EcoConnect Ltd are the only subsidiaries incorporated in New Zealand. NIWA Australia Pty Ltd and Unidata Pty Ltd are incorporated in Australia. NIWA (USA), Incorporated and NIWA Environmental Research Institute are incorporated in the USA.

NIWA has an A$100 equity investment in NIWA Australia Pty Ltd, a US$1 equity investment in NIWA (USA), Incorporated, and an A$250,000 equity investment in Unidata Pty Ltd. NIWA has no equity investment in NIWA Environmental Research Institute (non-stock corporation). NIWA Environmental Research Institute is a not-for-profit entity which has been classified as a publicly supported organisation by the Internal Revenue Service, and as such is exempt from US Federal income tax. NIWA Environmental Research Institute conducts scientific research with a Federal or State focus in the USA.

NIWA acquired the remaining 50% of the shares in EcoConnect Ltd during the year for $nil. EcoConnect Ltd has an authorised share capital of $300,000, divided into 300 000 ordinary shares of $1.00 each, all of which have been issued, are unpaid, and are beneficially owned by NIWA at 30 June 2006. EcoConnect Ltd had not commenced trading by 30 June 2006.

No shares in subsidiaries were disposed of during the year ended 30 June 2006.

22 Investments in associates

Ensid Investments Ltd and Ensid Technologies Ltd were both incorporated on 9 March 2005.

The NIWA Group acquired 50% ownership in CRL Energy Ltd on 1 April 2006.

Name	Principal activities	Group ownership and voting interest 2006 %	Group ownership and voting interest 2005 %	Group carrying amount 2006 $'000	Group carrying amount 2005 $'000
Ensid Investments Ltd	Intellectual property investments	50	50	24	34
Ensid Technologies Ltd	Commercialisation of intellectual property	50	50	(30)	13
CRL Energy Ltd	Energy & environmental research	50	–	497	–
				491	**47**

The reporting dates of all associates are 30 June, except for CRL Energy Ltd, which has a reporting date of 31 March. The Group's share of the results of operations for the periods ended 30 June 2006 has been included in the Group Financial Statements. All associates are incorporated in New Zealand.

	Group 2006 Actual $'000	Group 2005 Actual $'000
Carrying value of associates		
Carrying value at the beginning of the year	47	–
Shares purchased	535	107
Share of net loss	(91)	(60)
Carrying value at the end of the year	**491**	**47**

The associates did not have contingent liabilities or other commitments contracted for as at 30 June 2006, other than for the supply of inventories. The Group is not jointly or severally liable for any liabilities of the associate companies.
The value of investments in associates is carried in the Parent Company at cost.

23 Loans to associates

	Group 2006 Actual $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Ensid Investments Ltd	26	–	26	–
Ensid Technologies Ltd	80	–	–	–
	106	**–**	**26**	**–**

The loan to Ensid Investments Limited is unsecured, has an interest rate of 0%, and is repayable on 30 September 2006.

The loan to Ensid Technologies Limited is unsecured and is repayable on 30 September 2006. This loan has an effective interest rate of 30% p.a.

24 Intercompany

	Parent 2006 Actual $'000	Parent 2005 Actual $'000
NIWA non-current liability	**12,119**	**14,285**

An amount of $13.6 million is held by the Parent Company (NIWA) on behalf of NIWA Vessel Management Ltd. This is consistent with the Group policy that all surplus funds are managed by NIWA. This amount is offset by Parent Company receivables and advances to NIWA Australia Pty Ltd of $310,000, NIWA Environmental Research Institute of $122,000, NIWA (USA), Incorporated of $18,000, NIWA Natural Solutions Ltd of $247,000, and Unidata Pty Ltd of $806,000, resulting in a net non-current liability of $12.1 million. All balances are unsecured and have no set repayment terms, but are not expected to be repaid within one year of balance date.

The Directors considered it prudent to raise a further provision of $584,000 in the Parent Company against the value of advances to subsidiaries that currently have a negative net asset position. The advances were used to fund the establishment of the subsidiaries. During the year the Parent Company agreed to a partial defeasance of the loans advanced to NIWA (USA), Incorporated, to the value of US$97,000 (NZ$145,101). The Directors still expect the remaining advances to subsidiaries to be fully recovered, but not in the short term. The provision is included in the NIWA intercompany non-current liability of $12,093,000.

During the year NIWA contracted vessel charters from its subsidiary NIWA Vessel Management Ltd totalling $9.4 million (2005: $9.4 million) and purchased workshop services totalling $38,224 (2005: $37,851). NIWA Vessel Management Ltd contracted services from its Parent, NIWA Science, totalling $1.2 million (2005: $250,719).

During the year NIWA contracted scientific research from its subsidiary NIWA Australia Pty Ltd totalling $267,523 (2005: $135,489) and provided research services to NIWA Australia Pty Ltd of $53,245 (2005: $258,800).

NIWA earned revenue of $62,410 (2005: $102,000) from research subcontracts with NIWA Environmental Research Institute.

NIWA Natural Solutions Ltd purchased products from NIWA for $633,910 (2005: $454,000).

24 Intercompany (continued)

NIWA charged its subsidiaries for administration expenses and management services totalling $1.3 million for the financial year (2005: $1.3 million).

There were no other significant transactions between any of the companies in the Group. All transactions with subsidiaries are carried out on an arms-length basis.

25 Joint ventures

The Group has a 50% participating interest in Riskscape NZ, an unincorporated joint venture of equal interests with Geological Risk Limited (a wholly owned subsidiary company of GNS Science Ltd). Riskscape NZ commenced operations in April 2005 and had a first balance date of 30 June 2005. The Group's interests in this joint venture had an immaterial effect on the Financial Statements.

26 Related party transactions

The Government of New Zealand (the Crown) is the ultimate shareholder of the NIWA Group. All transactions with other Government-owned entities are carried out on an arms-length basis.

Research activities revenue includes amounts received from the Crown or Crown-owned entities as follows:

	Group 2006 Actual $'000	Group 2005 Actual $'000	**Parent 2006 Actual $'000**	Parent 2005 Actual $'000
Public Good Science and Technology				
Contract funding	42,895	39,469	42,845	39,469
Capability Fund	7,479	4,260	7,479	4,260
Ministry of Fisheries	16,060	16,626	16,060	16,626
Ministry for the Environment	443	505	443	505
Department of Conservation	781	755	781	726
Land Information New Zealand	6,405	1,507	973	926
Genesis Energy	1,030	968	1,030	968
Meridian Energy	1,788	1,050	1,788	1,050
Mighty River Power	832	834	832	834
Ministry of Agriculture & Forestry	1,578	474	1,578	474

No related party balances were written off or forgiven during the year.

27 Segment information

The Group operates predominantly in New Zealand in two industries – research and vessel charter.

Industry segments	**Total**		**Research**		**Vessel charter**		**Eliminations**	
	2006 $'000	2005 $'000	**2006 $'000**	2005 $'000	**2006 $'000**	2005 $'000	**2006 $'000**	2005 $'000
Revenue:								
From customers outside the Group	106,414	91,137	100,969	87,469	5,445	3,668	–	–
Inter-segment	–	–	1,261	225	9,403	9,481	(10,664)	(9,706)
Total revenue	**106,414**	**91,137**	**102,230**	**87,694**	**14,848**	**13,149**	**(10,664)**	**(9,706)**
Surplus before taxation	15,706	9,654	11,203	6,502	4,310	3,272	(193)	(120)
Unallocated expenses	–	–						
Total surplus before taxation	**15,706**	**9,654**						
Segment assets	68,758	66,850	42,506	52,158	26,252	14,692	–	–
Total assets	**68,758**	**66,850**						

The major products or services from which the above segments derive revenue are:

Segment	**Products and services**
Research	Atmospheric and aquatic research, consultancy, and associated products and services
Vessel charter	Charter of vessels for scientific research

All inter-segment pricing is on an arms-length basis.

28 Financial instruments

(a) Currency and interest rate risk

Nature of activities and management policies with respect to financial instruments:

(i) Currency

Currency risk is the risk that the value of a financial instrument will fluctuate due to changes in foreign exchange rates.

The Group undertakes transactions denominated in foreign currencies from time to time, and, resulting from these activities, exposures in foreign currency arise. It is the Group's policy to hedge foreign currency trading transaction risks as they arise, unless explicitly authorised by the Board. To manage these exposures, the Group uses forward foreign exchange contracts. At balance date the Group had no forward foreign exchange arrangements in place (2005: $nil).

28 Financial instruments (continued)

(ii) Interest rate

Interest rate risk is the risk that the value of the financial instrument will fluctuate because of changes in market interest rates. This could particularly affect the cost of borrowing and the return on investments.

The interest rates on NIWA's borrowings during the year were:

	2006	2005
On call	7.45–11.35%	7.0–10.9%
Short term	–	–

The interest rates on NIWA's investments during the year were:

	2006	2005
Cash (on call)	6.75–7.25%	6.0–6.75%

Short-term deposits have maturity dates of less than 6 months. The Directors do not consider there is any significant exposure to interest rate risk on investments. All investments are managed by NIWA on behalf of the Group.

NIWA has regularly reviewed its treasury policy to ensure the appropriate management of currency and interest rate risk.

(iii) Credit risk

Credit risk is the risk that a third party will default on its obligations to NIWA and the Group, causing a loss.

In the normal course of business, the Group incurs credit risk from trade receivables and transactions with financial institutions (cash and short-term deposits). The Group has a credit policy that is used to manage this risk. As part of this policy, limits are placed on the amounts of credit extended to third parties, and care is taken to ensure the credit-worthiness of third parties dealt with. All credit risk exposures are monitored regularly.

The Group does not require any collateral or security to support financial instruments, because of the quality of financial institutions and trade receivables dealt with.

There are no significant concentrations of credit risk. The maximum exposure to credit risk is $18,723,000 (total exposed to credit risk, which is bank, short-term investments, and debtors, net of provisions).

(b) Fair values

The estimated fair values of the Group's financial instruments approximate their carrying values, as disclosed in the Statement of Financial Position.

29 Foreign currency denominated monetary assets and liabilities

	Group 2006 Actual $'000	Group 2005 Actual $'000	Parent 2006 Actual $'000	Parent 2005 Actual $'000
Current assets not hedged:				
Australian dollars	979	1,033	73	5
European euro	52	4	52	4
Japanese yen	144	142	144	142
US dollars	170	122	29	6
Current liabilities not hedged:				
Australian dollars	92	363	–	–

Current assets include foreign currency bank balances, deposits, and accounts receivable. Current liabilities include foreign currency accounts payable and accrued expenses.

30 Commitments

30a. Operating lease obligations

Obligations payable after balance date on non-cancellable operating leases:				
Within 1 year	984	938	923	822
Between 1 and 2 years	885	786	825	786
Between 2 and 5 years	2,237	2,175	2,237	2,175
Over 5 years	3,468	4,271	3,468	4,271
	7,574	**8,170**	**7,453**	**8,054**

30b. Capital commitments

Commitments for future capital expenditure:				
Contracted, but not provided for	98	119	23	79
	98	**119**	**23**	**79**

31 Contingent liabilities

New Zealand companies have a contingent liability in respect of the Accident Compensation Commission's residual claims levy. The levy will be payable annually from May 1999 for up to 15 years. Each company's future liability depends on ACC's unfunded liability for past claims and future payments to employees by the companies. There are no other significant contingent liabilities that require disclosure in the Financial Statements.

32 Subsequent events

There were no subsequent events.

Audit Report

Deloitte.

TO THE READERS OF

NATIONAL INSTITUTE OF WATER ATMOSPHERIC RESEARCH LIMITED AND GROUP'S FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2006

The Auditor-General is the auditor of National Institute of Water and Atmospheric Research Limited (the company) and group. The Auditor-General has appointed me, Andrew Burgess, using the staff and resources of Deloitte, to carry out the audit of the financial statements of the company and group, on his behalf, for the year ended 30 June 2006.

Unqualified Opinion

In our opinion:

- The financial statements of the company and group on pages 70 to 82:
  - comply with generally accepted accounting practice in New Zealand; and
  - give a true and fair view of:
    - the company and group's financial position as at 30 June 2006; and
    - the results of operations and cash flows for the year ended on that date.
- Based on our examination the company and group kept proper accounting records.

The audit was completed on 29 August 2006, and is the date at which our opinion is expressed.

The basis of the opinion is explained below. In addition, we outline the responsibilities of the Board of Directors and the Auditor, and explain our independence.

Basis of Opinion

We carried out the audit in accordance with the Auditor-General's Auditing Standards, which incorporate the New Zealand Auditing Standards.

We planned and performed our audit to obtain all the information and explanations we considered necessary in order to obtain reasonable assurance that the financial statements did not have material misstatements, whether caused by fraud or error.

Material misstatements are differences or omissions of amounts and disclosures that would affect a reader's overall understanding of the financial statements. If we had found material misstatements that were not corrected, we would have referred to them in the opinion.

The audit involved performing procedures to test the information presented in the financial statements. We assessed the results of those procedures in forming our opinion.

Audit procedures generally include:

- determining whether significant financial and management controls are working and can be relied on to produce complete and accurate data;
- verifying samples of transactions and account balances;
- performing analyses to identify anomalies in the reported data;
- reviewing significant estimates and judgements made by the Board of Directors;
- confirming year-end balances;
- determining whether accounting policies are appropriate and consistently applied; and
- determining whether all financial statement disclosures are adequate.

We did not examine every transaction, nor do we guarantee complete accuracy of the financial statements.

We evaluated the overall adequacy of the presentation of information in the financial statements. We obtained all the information and explanations we required to support the opinion above.

Responsibilities of the Board of Directors and the Auditor

The Board of Directors is responsible for preparing financial statements in accordance with generally accepted accounting practice in New Zealand. Those financial statements must give a true and fair view of the financial position of the company and group as at 30 June 2006. They must also give a true and fair view of the results of operations and cash flows for the year ended on that date. The Board of Directors responsibilities arise from the Crown Research Institutes Act 1992, the Public Finance Act 1989 and the Financial Reporting Act 1993.

We are responsible for expressing an independent opinion on the financial statements and reporting that opinion to you. This responsibility arises from section 15 of the Public Audit Act 2001, section 21(1) of the Crown Research Institutes Act 1992 and the Public Finance Act 1989.

Independence

When carrying out the audit we followed the independence requirements of the Auditor-General, which incorporate the independence requirements of the Institute of Chartered Accountants of New Zealand.

Other than the audit, we have no relationship with or interest in the company or any of its subsidiaires.

A G Burgess
DELOITTE
On behalf of the Auditor-General
Auckland, New Zealand

Directory

NIWA Group

Directors

Sue Suckling *(Chair)*
John Spencer *(Deputy Chair)*
Dr Carolyn Burns
Miranda Cassidy
John Hercus
Dr Graham Hill
Ed Johnson
Troy Newton
David Sharp

Executive Management

Dr Rick Pridmore
Chief Executive Officer

Dr Bryce Cooper
Director, Strategic Development

Dr Mark James
Director, Operations

Dr Rob Murdoch
Director, Research

Kate Thomson
Chief Financial Officer & Company Secretary

Dr Barry Biggs
General Manager, Environmental Information & International
(appointed 3 July 2006)

Dr Clive Howard-Williams
General Manager, Freshwater & Coasts

Dr Andrew Jeffs
General Manager, Aquaculture & Biotechnology

Dr John McKoy
General Manager, Fisheries

Dr Murray Poulter
General Manager, Atmosphere, Natural Hazards, & Energy

Dr Don Robertson
General Manager, Aquatic Biodiversity & Biosecurity

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Aquatic Biodiversity & Biosecurity
www.niwascience.co.nz/ncabb

Climate
www.niwascience.co.nz/ncc

Climate – Energy Solutions
www.niwascience.co.nz/ncces

Coasts & Oceans
www.niwascience.co.nz/ncco

Fisheries & Aquaculture
www.niwascience.co.nz/ncfa

Natural Hazards
www.naturalhazards.net.nz

Water Resources
www.niwascience.co.nz/ncwr

Service centres

Te Kūwaha
www.niwascience.co.nz/maori

NIWA Instrument Systems
www.niwascience.co.nz/instrumentsystems

www.niwa.co.nz

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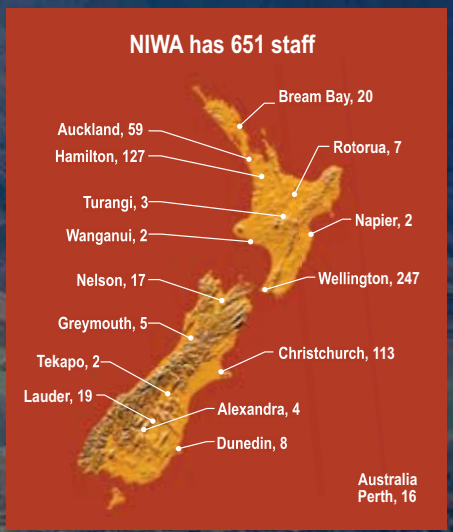

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