

National Report to the 14th General Assembly of ICA



Cartographic Activities in New Zealand 2003-2007

New Zealand Cartographic Society



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Moscow, Russian Federation, August 2007

Edited by
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New Zealand Cartographic Society

Each national member of the International Cartographic Association (ICA) is required to submit a report on cartographic activities for the period between General Assemblies. This report has been prepared by the New Zealand Cartographic Society to meet the above requirement for the 2003-2007 period.

Introduction

A number of organisations and individuals have been invited to present a general perspective on cartographic activities in New Zealand. These contributions are either formal or simply offering personal views of individual contributors. It is believed that this approach gives another dimension to understanding the cartographic endeavours undertaken recently in New Zealand. Due to the limited resources of time and money, unfortunately not all parties have been contacted. Also, some of those contacted have not responded to the invitation.

The report provides a 'snapshot' of some of the activities being carried out within the cartographic establishments and professional communities. It aims to bring together and highlight the accomplishments of the professionals and researchers who advance cartography in the private, military and governmental sectors, as well as in education. The support provided by specialised cartographic libraries and map trade is acknowledged.

The report is arranged thematically. The themes include:

1. Cartographic and Mapping Societies
2. Central Government Organisations
3. Local Government Organisations
4. Military Mapping
5. Crown Research Institutes
6. Commercial Cartographic Firms
7. Cartographic Education
8. Resources for Research in Cartography
9. Map Trade

1. Cartographic and Mapping Societies

There are three active map-oriented professional societies in New Zealand; the New Zealand

Cartographic Society (NZCS), the New Zealand Map Society (NZMS) and the Spatial Sciences Institute (SSI), New Zealand Region. These are non profit organisations that gather a wide range of individuals - professionals, educators, curators and map enthusiasts. Despite their similar focus, there has been limited interaction between these societies over the last four years. One such interaction involved SSI's sponsorship and support in the organisation of NZCS's premiere event, the National Cartographic Conference in 2006.

The New Zealand Cartographic Society

www.cartography.org.nz

The New Zealand Cartographic Society (SGGES, The University of Auckland, Private Bag 92019, Auckland) was founded on 23 February 1971 and its mission is to promote the development of cartography.

The Society is an open association for those individuals and organisations with an interest, passion and excitement in the study, production and use of maps. The membership is open to all interested persons and organisations.

Volunteer members manage all Society activities. Services provided include the biennial National Cartographic Conference *GeoCart*, support for students to attend the Conference, biennial National Cartographic Exhibition, coordination of the National Children's Map Competition (part of the ICA Barbara Petchenik Children's Map Award), maintenance of the Society's website, organisation of cartographic workshops, seminars and courses, and general cartographic information and advice. The Society publishes a newsletter *CartoGRAM*, *GeoCart* proceedings and materials, and occasional publications.

The Society's executive committee includes Robin Phillips (President), Igor Drecki (Vice President), Chris McDowall (Secretary), Gareth Evans (Treasurer) and seven committee members: Geoff Aitken, Sarah Williams, David Mole, Lesley Murphy, Pip Forer, Tim Nolan and Tony Moore. The Society is currently reviewing its constitution to better reflect conceptual and technological advances in cartography, particularly over the last two decades.

The New Zealand Cartographic Society is the official New Zealand representative to the ICA (since the 5th General Assembly in Moscow in 1976). Over the last four years, it has maintained its strong relationship with ICA by attending all General Assemblies and actively participating in the International Cartographic Conferences, International Cartographic Exhibitions and ICA Commission's meetings. At the 2005 International Cartographic Exhibition in A Coruna, Spain, Land Environments of New Zealand cartographic poster produced by Landcare Research New Zealand Ltd won the Excellence in Thematic Cartography award. Igor Drecki is the New Zealand principle delegate to the ICA General Assembly and a corresponding member of the ICA Commission on Visualisation and Virtual Environments, ICA Commission on Maps and the Internet and ICA Commission on Mountain Cartography. Recently, he was appointed Editor of the ICA News.

In October 2003 the Society hosted Dr Vanessa Lawrence, Chief Executive and Managing Director of Ordnance Survey, UK. The seminar, featuring her talk on *Information Frameworks for Nations: The evolving role of Geographic Information* was attended by almost 100 participants. Two years later (September) the Society, together with the ICA Commission on Maps and the Internet, organised the equally successful *Internet Cartography Seminar*. The speakers included Michael Peterson, USA and Georg Gartner, Austria, the Chair and Co-chair of the Commission respectively. A DVD recording of the seminar was produced and is available from NZCS.

The third National Cartographic Conference *GeoCart'2006* was held in September last year. Attended by 100 delegates, the programme included over 40 paper and poster presentations, including four keynote addresses. A special presentation on *The Antipodes and the ICA* delivered by Professor William Cartwright, Vice-president of ICA was a highlight of the Conference. Immediately after the event, the ICA Commission on Maps and the Internet delivered an exciting and current *Internet Cartography Workshop*. The workshop focused on methodological and technical

concepts, design principles, and tools for publishing and distributing interactive maps on the Internet.

Earlier this year the Society launched a new cartographic outreach initiative *EduCart*, comprising three different inaugural educational projects. The first involved delivering a customised 42-hour cartography course to geospatial professionals at the NZ Defence Force by the Society members Barry Bradley and Igor Drecki. The second included a talk about cartography and maps to young children from a number of Auckland's primary schools. The last project Maps for Schools is concerned with the design and production of wall maps for New Zealand schools. The first in the series is the Physical Map of New Zealand and is expected to be completed by the end of the year. Editorial and design team includes Geoff Aitken, Barry Bradley and Phil Dickson.

The Society coordinated New Zealand's contribution to the International Cartographic Exhibition and, for only the second time, to the Barbara Petchenik Children's Map Award. A total of nine cartographic items will feature in Moscow together with two works by New Zealand children.

The New Zealand Map Society

www.mapsociety.org.nz

Known originally as the New Zealand Map Keepers' Circle, the Society was established in February 1977, with its objectives being to further the development and promotion of high standards in map collections in New Zealand; to encourage communication between map users, map librarians and map producers; and to liaise with similar organisations overseas. The society changed its name to New Zealand Map Society in 1987, as part of a move to broaden its membership to include not only those working with maps, but map collectors, map users, map makers and people with an interest in New Zealand geography and history.

The Society attempts to publish an annual Journal, which is wide ranging in the material it includes for publication. Material of interest to both map curators and cartographers is included, along with papers of interest to those who simply have a love of maps. In the past annual seminars have been held, but these have been replaced over the last two to three years with annual one day meetings in Wellington, where the formal business of the Society is conducted, and wide-ranging informal discussions take place. A joint meeting with the Australian Map Circle was held in 2004, and a further joint meeting, involving the New Zealand Map Society, the Australian Map Circle, and

the International Map Collectors Society, is planned for Wellington in 2008.

Datum, a newsletter which appears twice a year, has been published since 1995. It keeps members up to date with current developments in map publishing in New Zealand, map curatorship, and provides a forum for contacting the dispersed membership of the Society.

The Society has on a number of occasions made representations to Government when it has been unhappy with proposed changes to map publishing policies.

2. Central Government Organisations

In New Zealand, there are several government departments that engage in cartographic activities, mainly in map publishing, assembly and maintenance of various spatial databases and dissemination of maps on the Internet. These include Land Information New Zealand (LINZ) – the national mapping organisation, Department of Conservation and Statistics New Zealand. LINZ is the national mapping organisation that publishes all topographical and nautical maps in New Zealand. Department of Conservation publishes park maps and recreation maps. Statistics New Zealand provides a wide range of statistical and administrative mapping products.

Land Information New Zealand

www.linz.govt.nz

Since 2003 LINZ has continued to maintain and update the New Zealand Topographic database for the purpose of providing data for defence, emergency services and other constitutional purposes. The data has been disseminated in the form of traditional paper maps at 1:50 000 and over the past five years via the internet as the 'NZTopoOnline' product.

Preparatory work is now well under way to replace the existing map series with a new NZTopo50 series due for release in 2009. The new series will be based on the New Zealand Geodetic Datum 2000 (NZGD2000), and a new projection: New Zealand Transverse Mercator 2000 (NZTM). While the NZTM2000 projection and NZGD2000 are now incorporated into the LINZ digital topographic database, and through NZTopoOnline, the current printed maps still use the older New Zealand Map Grid projection and NZGD49 Geodetic Datum.

Although the map projection and geodetic datum will be different, the maps will be similar in appearance and content to the current map series, which is internationally recognised and uses cartographic conventions that are well established around the world. The most noticeable change is the switch from landscape to portrait format, with each map in the new series covering a slightly smaller area than before.

Work on the new series is being undertaken within LINZ using customised software provided by *1Spatial* (formally *Laser-Scan*). While the bulk of the cartographic representations will be automated, there will be approximately 18 months work of text editing.

Stakeholders consulted to date have expressed a preference for a "big bang" approach to the launch of the new map series. Consequently, LINZ is planning to implement the change within a short timeframe, whilst supporting the migration to NZTM2000 through a comprehensive communication and education programme. The current plan is to have new printed maps available in 2009, however LINZ is planning to confirm all target dates towards the end of 2007.

Statistics New Zealand

www.stats.govt.nz

The Statistics Act 1975 sets out the Government Statistician's role in, and responsibilities for, all official statistics whether produced by Statistics New Zealand or by other government departments. To meet its responsibilities under this Act, Statistics New Zealand's main roles are to:

1. Provide leadership for New Zealand's official statistics
2. Be the key contributor to the collection, analysis and dissemination of official statistics relating to New Zealand's economy, environment and society
3. Build and maintain trust in official statistics
4. Ensure that official statistics are of high integrity and quality and are equally available to all

The administrative geographic hierarchy of New Zealand is for statistical, electoral and enumeration purposes. This is a fundamental framework within which censuses and surveys operate. This geographic framework underlies the basis for the analysis of the data which is gathered, especially for regional research.

The Geographic Frame is the basis for the production of sub-national statistics. It is a database which records street attribute data and various geographic

areal data. The basic building block for the hierarchical areal system held in the Geographic Frame is the meshblock.

Statistically defined areas such as area unit and urban area were designed by Statistics New Zealand to allow for efficient and complete collection of information, in addition to the production of statistical data. This system also allows data to be compared over time for relatively stable geographic boundaries. Legally defined areas, such as territorial authorities, wards, regional councils and electoral districts arise from the boundaries of various specific administrative and government entities.

The 2006 Census of Population and Dwellings required an extensive field collections team who would use maps of respective areas of New Zealand for distributing and collecting questionnaires. Prior to the 2006 Census Statistics New Zealand worked with Terralink International Limited to generate area, district and sub-district maps for the census field force. The maps were based on meshblocks and included Land Information New Zealand's Core Records System data (CRS) and New Zealand Topographic data (NZTopo). For Census 2006 New Zealand consisted of 6,500 collector areas in which 7,000 maps were created.

Boundary maps of New Zealand were created and placed on the web for users to identify areas used to collect 2006 Census information. Geographic information systems are often used to create thematic maps which are often used in Statistics New Zealand publications.

Statistics New Zealand is aiming to provide information in an innovative and informative manner. A potentially successful way to convey statistical information to a non-statistical audience is by means of a visualisation tool. An investigation into the potential of such tools and techniques is set to begin over the next three years.

The digital era requires a rethink of Statistics New Zealand's current geographic infrastructure, so as to better position ourselves for the twenty-first century. Linking statistics to location enables statistics to be disseminated in a more visual way. In order to do this, Statistics New Zealand is developing a geospatial strategy. This strategy looks at ways to make use of emerging technologies to present statistical information. The proposed strategy will also provide the opportunity to link statistical information with geospatial information at a more accurate level. It will improve the quality of existing standards by providing

users with a framework within which to search, access, use and analyse statistics alongside geospatial information.

The development of this geospatial strategy is aligned with the New Zealand geospatial strategy, an all-of-government initiative led by Land Information New Zealand. As the national strategy develops, Statistics New Zealand will be a key contributor of its resources (data and people) to help develop and implement it, with a focus on projects, such as developing a national address register.

On 23 May the Minister of Statistics Hon Clayton Cosgrove, announced that Statistics New Zealand will receive funding to make over 250 million pieces of information freely available in an easily accessible form. On the 6 July he announced that Digital Boundaries (the geographic hierarchy) and standard *StreetLink* files are available at no cost. This initiative provides a huge opportunity to showcase official statistics and make them more accessible to all New Zealanders. The freeing up on this information is also a great contribution to the development of New Zealand's Spatial Data Infrastructure (SDI).

3. Local Government Organisations

Most local government organisations in New Zealand are similar in their approach to cartographic activities. Cartography is carried out by either GIS, Planning or Drafting departments. They produce and publish maps of their areas of responsibility on a variety of themes. District and City Councils are primarily concerned with the production of zoning, planning and infrastructure maps, while Regional Councils focus on environmental control and resource mapping.

Some local government organisations adopted a novel approach to meet mapping requirements, where dedicated cartographic sections, or suitable individuals, are undertaking cartographic production. Presented below are personal views by three members of the Bay of Plenty Regional Council's Information Services section on the state of New Zealand cartography.

Environment Bay of Plenty

www.envbop.govt.nz

Tick tick tick time...

With all the improvements in software, hardware - time is still the enemy of all cartographers. In today's

GeoSpatial workplace I want IT NOW, I want it YESTERDAY.... is still a common refrain that destroys any chance of producing quality work.

A few years ago I was relatively upbeat about the prospects of cartography as a profession; working closely with Igor will do that to you - now I'm not so confident. Despite my team producing and displaying many a good work, I am not seeing much uptake across the councils in New Zealand, not many new staff calling themselves "Cartographer".

I have a sport I love and am good at – waveski surfing. It seems to parallel my profession. In both a "young" participant is in their 30's. Both seem to be quite uninterested in attracting new blood. There is nowhere in New Zealand you can go to get cartography training. Some of the universities offer a paper in cartography, but these are aimed at people who have trained in another profession and are not likely to pursue cartography as a career. If someone trains as a "cartographer" that is probably what they will take pride in calling themselves, if they train in GIS and make maps they will probably continue to call themselves a GIS analyst even if they haven't analysed anything for years. In years to come I can see that any "cartographers" will either be trained in-house by someone like me (with limited training themselves) or imported from countries that still train "cartographers".

Cartography is a far wider field than it was. A field that is technical and challenging, impossible for self-trained people to be expert at. PDF, SVG, Flash, Virtual Globes, mash-ups, SDK's are all common territory for disseminating maps in the modern world and essential for a modern cartographer to not only understand but be able to use competently so that they can create not only the map but the true cartographic visualisation. To create people who are technologically competent as well as creative requires professional training. Cartography used to be THE term for Geospatial professionals. Now these professionals go by many specialist terms so cartography needs to redefine its area of speciality and make it a sought after designation.

On the upside, there seems to be a steady increase in the quality of maps produced by Geospatial professionals in general and an increasing awareness of some of the issues of scale, projection and visualisation. ESRI is taking cartography seriously through their software and training courses; with their software market share this reaches a huge number of geospatial professionals.

So how do you create a situation where GIS technicians making maps ASPIRE to gain the title and qualification of cartographer? That is the challenge.

By Gareth Evans, GeoSpatial Administrator, trained in basic cartography under Igor Drecki, supervises 2 cartographers and 4 GIS staff

The state of cartography in Environment Bay of Plenty (The Bay of Plenty Regional Council) is extremely prosperous. Currently we have two full-time Cartographers meeting the stretched needs of Council requirements. The cartography section is ideally situated as an extension to the GIS section. Combining these two disciplines enables us to provide mapping work at all levels.

Without question, Environment Bay of Plenty recognises and supports the need for cartographic work to a higher level. Councils function, to guide and support the sustainable development of the Bay of Plenty region, encourages the need to think, plan, and report. Cartography, for many fields, will be an integral part of this process.

Environment Bay of Plenty also provides cartographic services to several local territorial authorities and strategic planning groups. Resource sharing in this manner has proved to be successful and cost effective and may continue to grow in the future.

Of a more technical nature, it is interestingly enough to observe GIS software developers such as ESRI adhering to map maker's requests for improved cartographic capability to assist with the production of better map products. No matter which way you look at it, this will assist with the development of the profession at all levels.

I am fortunate that Council continues to recognise this need and I am confident that this will continue.

By Richard (Trig) Yates, Cartographer, many years of cartography and graphics design

The council I currently work for is very well set up for cartography and supplies the service at a high standard. We have all the programmes needed to complete a high standard map and training is also available to us. There is a demand for high quality maps and this is driven by the type of work required by the Regional Council, e.g. external publications, poster mapping and report maps. We also provide support to the Department of Conservation and other territorial authorities if the work was initiated by a Council's staff member.

I have been to cartography conferences and workshops and met my peers from other territorial

authorities. A lot of them did not call themselves cartographers, some would like to call themselves cartographers and a lot of them were 'one man bands' doing everything from data creation to cartography. They were most envious of the programmes I have available to me and the type of work that I have the opportunity to produce. The biggest problem for most of the people I spoke to was 'funding', the programmes we use are not cheap and the time it takes to produce a high level map is not justified. So I feel this puts this onus back to the management of these work places, if there is a demand for good quality maps by the staff and the community then there is a need for funding and training to be allocated for cartography. If this is not possible then maybe shared services really is the way to go?

Since the introduction of GIS, there seems to be a community of people in the mapping industry who don't feel the need for cartographers or cartography anymore, which I find frustrating. GIS and cartography work well together and in a lot of cases GIS is ineffective without a good cartographic output. It is encouraging when ESRI, one of the biggest GIS application companies worldwide, introduces cartography tools to their product. To me this is saying there is a growing need and demand for cartography.

As far as qualifications go, it is not such a straight forward process to become a qualified cartographer, but it's not necessarily an impossible one. All of the relevant papers are available such graphic design, geography and GIS. OK, put together they do not provide a complete "Degree in Cartography" as such, but that could also be said for other tertiary qualifications.

Taking all my observations over the last 2.5 years into consideration, the 'State of Cartography' in territorial local authorities is 'average' and the problem is funding and poor management. As far as my situation goes I think the other territorial authorities could take a note out of our book.

By Sarah Williams, Cartographer, Ex Scientist (with flair) turned Cartographer and learning fast

4. Military Mapping

The New Zealand Defence Force has recently established the Joint Geospatial Support Facility that services New Zealand Army, Air Force and Navy.

New Zealand Defence Force Joint Geospatial Support Facility

www.nzdf.mil.nz/corporate/jgsf/

The 2003-2007 period saw a significant diversification in geospatial data and product generation and dissemination throughout the New Zealand Defence Force (NZDF). Much of this activity occurred at the Joint Geospatial Support Facility, established in November 2002, as detailed below.

For the Royal New Zealand Navy (RNZN), in addition to paper and raster hydrographic products, a portfolio of New Zealand Electronic Navigational Charts (ENC) was developed during the period for the Electronic Chart Display and Information System (ECDIS). Aeronautical cartographic products for the Royal New Zealand Air Force (RNZAF) are in continual development, ranging from Plotting Charts to Military Exercise Charts.

The NZDF's involvement in the Multinational Geospatial Co-production Program (MGCP) also continues to progress. The 1:50,000 scale topographic data produced through this programme will provide the foundation for many future cartographic products and its value in Topographic Line Maps, based on international military specifications, has already been proven.

There has been a significant expansion in the volume of imagery and imagery-derived cartographic products utilized by the NZDF and, in-line with industry trends, many of these products are generated and disseminated on-line to the ever-increasing numbers of geospatial users within NZDF. The increased and planned use of moving-map displays throughout the NZDF, in platforms ranging from helicopters to ships, is also driving much of the demand for geospatial data and new cartographic products. Geospatial analysis in support of military exercises and operations is an evolving area, as is the provision of geospatial data for simulation environments.

The NZDF Map Library continues to play an important role in the provision of cartographic products, holding almost half a million maps of both New Zealand and locations around the world. The cataloguing and provision of metadata online for geospatial data and cartographic products continues to play an ever-increasing role in data discovery and dissemination.

The NZDF is also involved in a number of national geospatial activities. One of the more significant is the All of Government Imagery Project. The NZDF will

be the custodian and lead agency for this project, which is intended to acquire and deliver to participating central and local government agencies imagery of New Zealand, and its territories and areas of responsibility.

5. Crown Research Institutes

Crown Research Institutes (CRIs) are government-owned businesses with a scientific purpose. Each institute is based around a productive sector of the economy or a grouping of natural resources. Three CRIs in particular are actively engaged in cartographic activities. These are: Institute of Geological and Nuclear Sciences (GNS), National Institute of Water and Atmospheric Research (NIWA) and Landcare Research New Zealand.

GNS publishes a range of New Zealand geological and magnetic maps (predominantly at the scales of 1:250 000 and 1:50 000), as well as other related scientific maps. More recently, GNS developed a series of modeling tools for natural hazard predictions and monitoring. NIWA publishes a variety of oceanic and bathymetric charts. Their posters and maps are characterized by innovation and cartographic fidelity. In the last few years NIWA has won several awards, including ICA's Excellence in Cartography Award in 1997 and 1999. Landcare Research New Zealand publishes a range of innovative and research-driven cartographic products. Their Land Environments of New Zealand won several awards, including ICA's Excellence in Cartography Award in 2005.

Landcare Research New Zealand Ltd

www.landcareresearch.co.nz

Landcare Research is a predominantly government funded research agency of the terrestrial environment, and cartography in Landcare Research is synonymous with production of map-based outputs from analyses using GIS and satellite image processing (IP). Landcare Research is the custodian of nationally significant public good datasets that describe New Zealand's natural resources and environment. So any examination of cartographic activity has to be seen in the context of Landcare Research's use of GIS and IP as research tools and of their role as data custodian.

During the period 2003-2007 Landcare Research has launched a series of web-based specialist subject portals covering subjects such as NZ Fungi, Soils, Indigenous Vegetation Survey, Animal Distributions

and Ants. Where the information associated with each of these subjects has a spatial component it is presented through a single GIS Portal that provides a common mapping capability for all the subject areas. The GIS Portal is also a vehicle for publishing other spatial data that isn't associated with the subject portals. Launched in mid 2006, the public GIS Portal currently has over seventy data layers, available with New Zealand, Antarctic or World-wide extents. Many more datasets are planned to be made available over the coming years, with the current focus on expanding the number of animal species distribution datasets.

From a cartographic perspective Landcare Research is also developing a central repository for the definition of simple scale dependant layer symbology. Use of the central repository ensures that the same cartographic representation is used in both Desktop GIS applications and the web based GIS Portal.

6. Commercial Cartographic Firms

The commercial cartographic industry in NZ is continuing to expand overall, with more small firms taking advantage of computerised technology and access to a variety of spatial databases to produce a widening variety of map products. The background to the selection of actors in the mapping arena, big and small, follows.

Terralink International Ltd

www.terralink.co.nz

Terralink International provides Geographic Information Systems (GIS) and mapping solutions to help improve their client's business management. Terralink can assist organisations in integrating their own data sets to create effective, simple and sophisticated GIS systems, and specialise in delivering mapping, property information and imagery, as well as geographical and spatial information. Their comprehensive and accurate land database means they produce and update many of New Zealand's official topographic, city and scientific maps.

Terralink International's vision is to be the leading provider of integrated and intelligent land and spatial information solutions that are timely, accurate and complete. These will be delivered how, when and where customers require them.

This vision drives the new *NZMasterMap* data product, which is the most comprehensive, up to date and trusted land information package in New Zealand. This powerful database has been developed

and populated in accordance with the requirements of the New Zealand Government Emergency Services and Government Administration (ESA) Geospatial Locator Standard. The data is now widely used in the real estate, emergency services, travel and tourism, utilities, telecommunications, government, location-based services, forestry, agriculture and farming sectors throughout New Zealand.

Industry trends now show a significant shift from hard copy mapping to internet-based mapping. Very rapid technological advances are made in this space. Market research shows that 2 out of 3 map users now access information on-line rather than using hard copy mapping and 24x7 access is requested. Terralink has now a number of web mapping platforms and a considerable portion of its mapping projects are supplied in this media. The company can serve up to 11 million map requests per month for one client only.

Terralink also focuses in delivering its *NZMasterMap* product and addressing data through a variety of on-line mapping platforms to meet specific client or market requirements. Flagship Terralink's on-line products include *Property Guru* and *Terranet*. *Property Guru* is a powerful new tool that delivers New Zealand's most up-to-date, accurate and complete property information to real estate professionals, via the internet. It is designed for the way Real Estate Agents work and provides them with comprehensive property information including sales, valuation, aerial photos, titles, ownership, and more. *Terranet* is also a quick, easy and cost effective way to obtain current, detailed property information over the Internet for people buying or selling a house, managing properties, or needing immediate access to land information. Terralink leverages its mapping products from the use of its addressing and geocoding data, the most comprehensive address database in New Zealand. The company is accredited by New Zealand Post for its *SendRight*[™] programme.

Terralink has moved in the three-dimensional space with its real-estate and farm mapping 3D modelling and visualisation services. Terralink data is used by property developers such as Wellington Waterfront Ltd to show proposed developments to the waterfront area in a 3D movie. 3D simulations are used by property investors to help gain resource consent, aid the public consultation process and visualise how the changes would affect the environment and resolve potential access concerns. Terralink also provides data and expertise to create 3D visualisation of live international golf tournaments such as the US Open and as viewed on ESPN.

Terralink International has one of the largest teams of experienced professional cartographers and GIS specialists in Australasia. It utilises this core expertise to provide services relating to photogrammetry, data acquisition, and map, chart and atlas production. Terralink is one of seven companies on a panel of mapping service providers to Geoscience Australia, the Federal Government's national mapping agency, since its formation in 1997. It is also the main data provider to well-known New Zealand street maps and books publishers such as Wises and Universal Publishers.

AgriQuality New Zealand

www.agriquality.com

AgriQuality is the most accredited provider of independent auditing, inspection and testing services to the food and agricultural sectors in the Southern Hemisphere. With a comprehensive portfolio of over 22 accreditations AgriQuality can certify food products and processes from the farm right through to the supermarket shelf, and meet the requirements of the most demanding of international markets.

The future of food safety across a global supply chain lies in traceability, and the key to traceability is Web-accessible information systems. It is AgriQuality's vision to provide customers with Australasia's first paperless quality assurance data capture and recall system, fully integrated across the supply chain and enabling customers to participate in the world's most lucrative markets.

To realise this vision AgriQuality has developed a unique database infrastructure designed to reflect the various stages of the supply chain – capturing and managing data at each step. What is more, this network of information systems has been enabled with state-of-the-art geospatial technology that interprets data visually to produce analytical information that can be tailored to meet customer specific needs.

Sophisticated mapping, investigative and reporting systems allow AgriQuality's scientists, epidemiologists, and GIS specialists to analyse, report and provide solutions for accurate and effective management of emergency response situations, food quality or environmental issues and national policy formulation.

With nine laboratory facilities spread across Australasia, AgriQuality combines cutting edge science and independent quality assurance capabilities with a team of more than 850 people, located at 52

offices throughout New Zealand and Australia, to provide the most technically capable food safety and biosecurity services possible.

Explorer Graphics Ltd

www.egl.co.nz

Explorer Graphics Ltd (EGL) was set up in 1987 from a solid cartographic basis and now offers a comprehensive 'one stop shop' for Geographic Information Systems (GIS) applications development and system integration built upon ESRI technology. EGL is an ESRI Authorised Business Partner. EGL also works in the US through its joint venture NorthSouthGIS LLC (NSG) set up in November 2005 with Elroi Consulting Inc (ECI) of Colorado. NSG is also an Authorised Business Partner in the United States.

EGL has enjoyed a stable and managed growth over a number of years and is recognised as an industry leader. EGL leverages the resources of more than 25 GIS experts and cartographers to offer best of breed mapping services and unrivalled software development skills across the complete suite of ESRI technology, capitalizing on an enormous breadth and depth of GIS consulting experience. We develop across the entire ESRI suite and have EDN, development, commercial, and ASP licenses. We are skilled in .NET and Java on both desktop and the web, ArcSDE on SQL Server and Oracle. Our clients include local, regional, and national government bodies; commercial software vendors; and companies in the mining; oil and gas, real estate, agriculture, forestry, civil and geotechnical engineering, transport and cartographic production sectors.

Map making and charting – particularly aeronautical charting - has been a core EGL service since the company's inception 20 years ago. The principals of the company met as cartographers at the Department for Lands and Survey and have been producing maps in some form or another for the past 35 years. Specifically with regard to atlas and map series cartographic experience and in addition to a special focus in the aviation sector, EGL has undertaken numerous projects for New Zealand local government over the last 8 years which rely extensively on cartographic expertise for the production of District Plans which are published as the equivalent of an atlas compendium. EGL has for over 15 years adopted a computer generated database approach to cartography using Geographic Information Systems (GIS). This approach has been based upon technology from ESRI the worldwide leader in GIS technology.

In 2002 EGL proposed to Airways and Civil Aviation Authority (CAA) that they adopt a database approach to cartography and specifically the adoption of this technology from ESRI for the production of the Visual Navigation Charts. EGL's approach to aeronautical chart production built using ESRI's ArcGIS technology is revolutionary in that one single database drives the production and updating of the Visual Navigation Charts. This methodology can also be used for informative planning of new airspaces or 3D modelling of airspace. The charts include a specially created topographic base to support aviation requirements supplemented with a digital terrain model for relief. The project has extended to include publication of map series at the scales ranging from 1:250 000 to 1:1 000 000..

The Visual Navigation Charts display a background digital terrain image created by Geographx, which has been specified for display in line with ICAO (International Civil Aviation Organisation) standards for colour and elevation steps. The topographical detail displayed on the Visual Navigation Charts has been developed for scale specific display in line with ICAO standards, and includes an emphasis on features of a particular visual nature with respect to Visual flight. The aeronautical overlay depicts airspace detail and elevations, navigational aids, obstructions and airport detail all pertaining to visual flight. All spatial data is managed as an ESRI geodatabase

EGL was acknowledged by ESRI with the award of 1st place in "Best Cartographic Design Atlas or Map Series" at the 2003 annual International user conference in the United States, attended by more than 10,000 users of ESRI technology. ESRI has acknowledged EGL as a centre of excellence for the production of aeronautical charting based upon ESRI technology. EGL continues to maintain and manage the production of the Visual Navigation Charting project on behalf of the CAA. Since 2005 EGL has proposed and prototyped the extension of the Visual Navigation Chart database to include the creation of a centralised database environment that could support the production of all aeronautical charting requirements in New Zealand.

EGL's seamless database approach to district plan mapping built using ArcGIS technology provides planning officers with visual recognition of district planning data and the ability to deploy district plan data via browser technology. The application incorporates Core Record System (CRS) - cadastral parcel database - linkages to zoning classifications for the output of the district plan mapping. The process also involves much printed chart work such as the

production of District Plans for six municipalities. This work involves the production of a map series routinely publishing between 150 and 500 copies of anywhere between 25 and 120 pages of A3 format thematic mapping. This involves applying the best in cartographic expertise to digital-driven production using technology from ESRI.

EGL is now a total service Information Technology consultancy service dedicated to the provision of services based around ESRI technology. It applies its cartographic experience in support of key application delivery for Internet Mapping especially for public enquiry systems, based upon ArcIMS and ArcGIS Server and as the basis for desktop ArcGIS applications in support of land management, animal and plant pest management as well as civil defence and emergency management.

NewTopo (New Zealand) Ltd

www.newtopo.co.nz

A new company on New Zealand's cartographic landscape is NewTopo (NZ) Ltd. Since 2005 the company has been producing high quality topographic maps setting high standards of cartographic excellence and utility. A retired cartographer, Geoff Aitken of Lower Hutt, has perceived the need for quality cartographic products and, with the assistance of cartographic software from Lorienne in Paris, has developed maps that are uniquely suited to the New Zealand map user's needs and environment.

The maps are designed to encourage walking in urban and peri-urban areas around Auckland and Wellington. On a scale of 1:75 000 the maps give wide coverage while showing essential topographic information without clutter. A realistic landform provides a useful geographic context. The road network is very detailed and yet is clear and easy to follow. They are the first topographic maps to be produced on the New Zealand Transverse Mercator Projection. Five maps have been published in the last three years.

Printed on robust, waterproof synthetic paper, and presented folded in a clear plastic wallet, the maps reflect the highest level of cartographic technology and production standards, resulting in a very high quality long-lasting product. A CD of each map may also be purchased for personal use to enable users to enlarge small areas and print them or to incorporate the extracts in other documents.

The maps explore the utility of the LINZ LIFF topographic data and the graphic possibilities

Lorienne's cartographic software while producing a useful product for walkers. A paper describing these features was presented to the Society's *GeoCart'2006* conference.

7. Cartographic Education

This section focuses on cartographic education in secondary schools and universities. Amongst the eight universities in New Zealand, only the University of Waikato has a dedicated course in cartography, which was recently introduced. Other academic centres (i.e. Auckland and Otago) offer several courses with a strong cartographic content (details below). Cartography has not been taught at any New Zealand polytechnic since 1994.

Due to the absence of academic cartographers and funding opportunities, cartographic research in New Zealand is somehow limited. *GeoCart*, National Cartographic Conference is the only national cartographic forum specifically dedicated to share research ideas and facilitate networking amongst cartographic community. Contributions from New Zealand authors rarely appear in the international cartographic literature.

Cartographic Education in Secondary Schools

Historically, cartography has been a required skill in the secondary sector, taught and externally assessed in the Geography curriculum for years 11-13 (13 to 16 year old students). Cartography was introduced earlier in the Social Studies programmes, but was not a requirement. 2006 saw the introduction of a new draft curriculum in which cartographic skills are required in two Essential Learning Areas (ELAs), Place and Environment in the Social Sciences ELA, and Planet Earth and Beyond in the Science ELA. Cartography will remain as a component of a key Achievement Standard in Social Sciences, and (given that some Geography teachers may teach in Science ELA), there are prospects that it may be developed as a skill in the Science ELA (although GIS may offer some competition here).

The key agency in the development of cartography in the secondary sector is the Ministry of Education. Professional teachers continue to request and commit to the use of cartography in their teaching and learning, but struggle to get support for professional development in this area. There are options like teacher fellowships that the New Zealand Cartographic Society can use to promote the interests

of these teachers, and relevant cartographic papers at major tertiary providers.

Cartographic Education and Research at Universities

University of Auckland

School of Geography, Geology and Environmental Science

www.auckland.ac.nz

Cartography at the University of Auckland has been a strong feature of what is now the School of Geography, Geology and Environmental Science (SGGES), but aspects of teaching and research related to cartography and visualisation can also be found in other areas, specifically in Planning, Architecture, Fine Arts, Computer Science, Anthropology, Engineering and Community Health. The greatest concentration of teaching and research is associated with the geography programme and the Geo-graphics Unit and Spatial Analysis Facility within SGGES. However, courses dedicated solely to cartography and geovisualisation remain absent, even though there is a strong presence in a number of graduate courses and in thesis research. Undergraduates also get exposure to cartographic techniques and the development of geovisualisation through aspects of the GIS curriculum, but largely at a level which introduces the field without exploring it at depth. Changing this situation is a priority, but progress towards such a goal at this time is complicated by general constraints on curriculum development.

In spite of the absence of a dedicated core course, there has been a significant increase in cartographic education and the exploration of geovisualisations of various kinds. This has been in part due to continuing student interest in maps, and a growing use of GIS in their thesis projects. Equally significant, if not more so, has been the role of the Geo-graphics Unit, established in November 2002 under the direction of Igor Drecki. In addition to its cartographic production and advice role the unit itself has worked to increase outreach to both students (through internships) and the wider public (through an occasional seminar and workshop program and its support for the biennial conferences of NZCS). The most ambitious development project to be undertaken by the unit has been a fully interactive campus map which goes live soon. The most heartening teaching development has been the delivery of external (non-credit courses) to members of the armed forces in April-June 2007 through a collaboration between School's Geo-graphics Unit

(supporter) and the New Zealand Cartographic Society (organiser and facilitator).

Research has continued to be levered largely on the issues of the cartographic representation of human movement, and the use of interactive visualisations for decision support. The mapping of individual and aggregate human movement has generated several theses in the last five years, generally exploring the use of three dimensions for movement visualisation. Doctoral work on this topic and on generalisation issues for flow mapping is ongoing, and outcomes from previous research have been integrated into official sites that deploy web-mapping of tourism flow patterns in New Zealand. In the area of spatial decision support interest has focused on services for Location Based Services, both for large format screens and for wayfinding on small-screen mobile devices. Arising from a separate line of research work has been published on the description and visualisation of vague objects using pointillist methods.

Innovative geovisualisation has been represented in eight geography theses in the last four years, two doctoral and six at Masters level. To these should be added contributions to a new atlas of cancer mortalities (2004), the introduction to a national atlas (Reeds 2004) and an upcoming atlas of wine production.

In summary, the last four years have seen a major strengthening of cartographic activity at Auckland, but a substantive foundation of cartographic education has still to be fully pursued. In that these current shortcomings and many ongoing opportunities have both been identified it is to be hoped that this new level of activity will prove to be the foundation for significant consolidation in the next four years.

University of Waikato

Department of Geography, Tourism and Environmental Management

www.waikato.ac.nz

The Cartography Unit at the University of Waikato is located in the Department of Geography, Tourism and Environmental Management. Max Oulton leads this Unit. Over the last four years the output has been dominated by the production of maps used in hearings of the Waitangi Tribunal and in geological and environmental mapping, but the versatility of the Unit is in the varied production of maps to support the faculty research and publications. The department

supports a good range of software used in cartography and visualization applications.

In 2007 the cartographic capacity of the department was enhanced by the purchase of multiple licences for Freehand and Illustrator. The Cartographic Unit will now be able to provide support for graduate and research cartography in a much more integrated manner. The graduate teaching of cartography will build on an undergraduate programme that uses cartography primarily as an adjunct to work in Geographical Information Systems.

In 2007 the department was pleased to introduce a graduate paper in cartography for the first time. Enrolments were good, and Russell Kirkpartick was able to deliver an effective programme to a group of students with a range of backgrounds, all of whom recognised the importance of cartography in their career training and development of their research skills.

University of Otago

www.otago.ac.nz

Cartographic activity at the University of Otago for the reporting period has been concentrated in four groups on campus: Information Science (Spatial Information Research Centre - SIRC), Surveying, Marine Science and Geography.

Although there is no dedicated course for cartography or geovisualisation, both are topics of Geographical Information Science and Hydrographic Surveying courses from second year undergraduate level to fourth year level. The entry level GIS course has introductory lectures on map design and generalisation, themes that are expanded upon by the intermediate GIS course at 3rd Year. Cartography is one of two major elements of the intermediate course, also containing lectures on thematic maps and an introduction to the theory and practice of geovisualisation. The advanced course at 4th Year level has a lecture on topics in current geovisualisation research. Most of the cartography content for the Hydrographic Surveying courses is at 4th Year level, in the context of nautical charting. Students produce professional quality nautical charts, supported by cartography lectures and a preparatory hydrographic field sheet completed at 3rd Year level. There is a plan to compile the charting efforts of students over several years to produce an atlas of nautical charts of the small boat harbours and anchorages in Otago Harbour. The Hydrographic Surveying courses are run by Peter Knight in the School of Surveying. The GIS courses are jointly run by the Department of

Information Science and School of Surveying (with Bruce McLennan and Tony Moore as the cartography lecturers).

Cartographic projects at postgraduate level over the last four years have been mostly run from Information Science and include 3 PhD theses (one in progress), 2 Masters theses and 3 honours dissertations (one in progress). In 2005 a PhD was completed on the developing and testing of a geovisualisation method, based on the quadtree spatial data structure, for representing spatial and attribute uncertainty. Also just submitted is a PhD investigating the cognitive processes of ambulance dispatchers related to the computer displays they use (which are to a greater or lesser degree geographical or map-based in nature) and testing alternative displays, one of which is based on a novel dual-layer monitor. There is an ongoing PhD study on the 3D conceptualisation and visualisation of human anatomy. Completed Masters projects include the development and testing of extensions to Time Geography (3D cartography) to reflect the increasingly complex nature of modern transportation (with the School of Surveying); also a spatial scale-based analysis of online 3D desktop Virtual Reality applications. Completed honours dissertations on aspects of cartography include the use of GPS to analyse distortions in peoples' mental maps; the use of cartograms in a GIS context to reflect a user's interest in regions of a map display. Finally, there is a dissertation project in progress, run out of the School of Surveying, on the use of Virtual and Augmented Reality for Hydrographic Surveying.

In the period covered by this report there have been three journal papers, two book chapters and nearly twenty conference papers published on some aspect of cartographic or geovisualisation research in Information Science. Specifically these are from projects exploring the use and usability of tangible augmented reality as a means of delivering digitised tiled street maps; certain aspects of cartographic generalisation, including development of a circle-based algorithm for line reduction (with Geography), also the proposition of an holistic model-based approach to generalisation which incorporates uncertainty; use of the time geography visual language for the representation of team sport (with Physical Education); as well as the postgraduate projects outlined above. Throughout the period of the report, the annual SIRC conference held locally (in November / December) has hosted presentations on cartographic research from this university, and other universities in New Zealand.

Professional cartographic products coming out of the university include map output for reports produced by a team at the Department of Marine Science for a major scientific project on the underwater habitats of Fiordland (for the Ministry for the Environment). Physical habitat maps have also been produced for the Department of Conservation for a proposed marine reserve (Hamish Bowman, Steve Wing). Free software has been heavily used for this work, and new mapping software was developed for GRASS GIS to accomplish presented cartographic tasks. Two articles in the open source literature describe these tools. Other professional outputs across the university include maps to support an inventory and analysis of the conservation status of New Zealand's Indigenous Grasslands, produced as part of a worldwide project for the World Conservation Union (IUCN). They were presented at the World Parks Congress in 2003 and won a prize at the NZ ESRI Users' conference the same year (Bruce McLennan, Department of Information Science in collaboration with the Department of Botany). A side scan sonar mosaic of a proposed marine reserve was prepared for New Zealand's Department of Conservation and a digital terrain model survey plan of Te Ruaone Beach on Otago Harbour was produced for the Natural Hazards Office of Dunedin City Council (Peter Knight, School of Surveying). Finally, Marine Science, Information Science and Geography (Tracy Connolly) also produce map output for publication as part of books, book chapters, journal articles and scientific reports.

8. Resources for Research in Cartography

There are a number of map collections in New Zealand which have sufficient depth in their collections to be able to provide materials for serious research.

Auckland City Libraries

www.aucklandcitylibraries.com

The Auckland City Libraries map collection consists of around 7,000 maps, mainly of New Zealand and the Pacific with special emphasis on the Auckland provincial area, from the early nineteenth century to the present. The collection contains both manuscript and printed maps. A major part of the collection is early land sale maps of Auckland City and suburbs.

The library also holds maps from Governor Grey's collection, valuable to any student of 19th century New Zealand history. The library has digitized almost

1300 maps and these are available on a database, Maps Online, available through its website.

University of Auckland Library

www.library.auckland.ac.nz

The University of Auckland Library's map collection consists of approximately 50,000 sheets, with particular strengths in New Zealand and Pacific material. Most of the maps in the collection have been published since the Second World War. The map collection is housed in the new Map Room of the General Library of the University, and consists of the former Geography Library and Geology/Science Library map collections, which came together when the Geography and Science Libraries were incorporated into the General University Library early in 2002. A collection of maps held by the University's Anthropology Department was incorporated into the collection in 2006. Associated with the Map Room are collections of air photographs and atlases.

A good start has been made on classifying the New Zealand maps in the collection, with a view to having them catalogued at a later date.

There is a collection development policy for the map collection, and efforts are made to collect virtually all New Zealand and Pacific Island material. The map collection is jointly managed by two subject librarians.

University of Waikato Library

www.waikato.ac.nz/library

The University of Waikato's map collection is based in the University Library. Like the University, the collection dates from the early to mid 1960s. The Library was fortunate to acquire the collection of the New Zealand Geographical Society, which formed the backbone of the subsequent collection. It is looked after by a Map Librarian, who is present weekday mornings only. The collection is available during normal opening hours of the Library but in the afternoons no staff is present.

The collection comprises about 50,000 items, mostly in hard copy. Online access is now provided to various cartographic tools and databases. Books about maps, cartography, GIS, gazetteers and a wide range of atlases are also held. The emphasis is on New Zealand and the collection includes topographic, geology, soil, forestry, hydrographic, and oceanographic maps. The collection aims to be current and comprehensive in these areas. A small historical collection, concentrating on the Waikato, has been built up.

Alexander Turnbull Library Cartographic Collection

www.natlib.govt.nz/atli/

The Alexander Turnbull Library Cartographic Collection contains over 60 000 manuscript and printed maps, principally of New Zealand, from the 17th Century to the present day. Some international maps are included: mainly of Antarctica, the Pacific and those countries that New Zealanders have fought in during the 20th Century. The collection also includes atlases and map-related DVDs, CDs, books and serials. The Library receives current map material under the New Zealand legal deposit regulations.

The New Zealand material compliments the collections of Archives New Zealand and Land Information New Zealand and is particularly strong in printed maps from all time periods and in the early charting, exploration and development of the country.

Remote access to the collection is through several online catalogues. Bibliographic records and some images of printed maps are available through the National Library Catalogue (nlncat.natlib.govt.nz). Records of unpublished maps are held on TAPUHI (tapuhi.natlib.govt.nz) and the images of these are to be found on Timeframes (timeframes.natlib.govt.nz).

University of Canterbury Department of Geography Library

The Geography Department's Library (also known as "The Map Library") contains around 150,000 maps, an extensive collection of aerial photographs, several hundred atlases, and over 30,000 other items - mainly report-type literature, theses, and reprints of journal articles.

The aerial photographs are of New Zealand only, but the coverage of maps, atlases, and the remainder of the collection is world-wide, with an emphasis on the Geography Department's areas of teaching, namely New Zealand, Antarctica, Southeast Asia, Europe and the Pacific. Through its former status as a depository for United States and Canadian government maps the library holds a large collection of large-scale topographic maps of these two countries. It also holds Antarctica New Zealand's map collection and its reprint collection.

University of Otago Hocken Collections

The map collection has approximately 10,000 items built up from Dr Hockens' original collection of less

than 80 items. The collection consists of maps, charts, aerial photos and atlases, and relevant periodicals. The collection focus is particularly on New Zealand, with selective coverage of Australia the Pacific and southern Polar regions. Holdings are particularly strong for Dunedin sales plans and material relating to Southern New Zealand. There is a small but good collection of early world and Pacific maps and charts (1650 - 1850). The focus is historical but the library does collect current material and holds the major series maps of New Zealand.

The Map Curator works mornings. The library, which is part of the University Library but also open to the public, is housed in a modern building in Anzac Avenue, Dunedin.

9. Map Trade

The map trade in New Zealand is operated mainly through bookstore chains. The selection is very limited, primarily street and travel maps, and focused on each store's local area. Souvenir shops in tourist areas frequently offer a better selection, which includes topographical maps. There are only a handful of specialised map shops, most notably Auckland Map Centre, The Map Shop (Wellington), Map World New Zealand (Christchurch) and Map and Chart Shop in Hamilton.

Auckland Map Centre

www.aucklandmapcentre.co.nz

As one of the largest specialized Map Retailers in New Zealand, we are often at the forefront of the changing needs and demands of customer consumption for cartography and related products. We often see trends evolve, and find ourselves a facilitator between customers, map suppliers and Cartographers. In the eight years we have been in business, we have tested our adaptability, to be able to supply not only the general public and commercial business but keep up with the latest technologies presented in the field of mapping.

Long gone are the days, that we have one medium of a single printed map, customers have the access to new medias, whether it be through the internet, handheld or in car navigation GPS units, print on demand, mapping direct to phone mobiles or Google Earth. It certainly is a digital world.

There has been much discussion about the impact of consumerism, concerning carbon footprints, especially on global scale, and this has certainly not

escaped us in the mapping field. A savvy European tourist will often ask if the map is printed on recycled paper, and also where New Zealand produces its maps.

As off setting becomes a common word, people are now becoming more aware, how very small things affect the carbon footprint we leave behind. New Zealand is always perceived as a clean green image, and that should be at the forefront of our initiatives. As print on demand becomes more popular, and New Zealand mapping more readily available on a digital format, we are seeing new papers hitting the market in waterproof, tear proof paper. These will last a lot longer, but at the other end of the scale we are looking at products that can be potentially in a land fill for years to come. Even our Government maps are produced in Australia, and that takes into consideration the weight, and fuel conception, just to get the maps into the country.

Tourism New Zealand preserves our country as a luxury destination that may affect our influx of tourism being a long haul distance. Local map producers will find there roll changing as we concentrate on the domestic market, as opposed to the tourist trade. Already as a retailer it is difficult to change a customer's mind, from buying only a North Island road atlas, which is where most of the population will concentrate on their leisure time, from the traditional full atlas of New Zealand, where half the atlas is going unused 90% of the time.

Sustainability also features as a key component in what we do. We only survive in a retail environment if we have repeat business. To understand what our customers require as technologies present themselves, we are often proactive in passing on feedback about products on the market back to the suppliers and like to work closely with map publishers to ensure the right needs are being full filled.

One day, in the future, perhaps we too will only be a virtual store with no bricks and mortar, going straight to the map publishers, emailing out a product with the latest changes being corrected hours before. Or perhaps the need and desire for a good old fashioned map to hold in your hands will still be the back bone of the market. It will be interesting times ahead.

Acknowledgements

This report has been produced with the assistance of many authors. Without their contributions the production of this report would not have been possible.

The contributing authors are: Geoff Aitken (NewTopo (NZ) Ltd), Hamish Bowman (University of Otago), Marni Cavis (AgriQuality New Zealand), Lex Chalmers (University of Waikato), Tracy Connolly (University of Otago), Sarah Cowell (Statistics New Zealand), Karen Craw (University of Otago), Gareth Evans (Environment Bay of Plenty), Pip Forer (University of Auckland), Robert Gibb (Landcare Research), Kathy Hogarth (University of Canterbury), Peter Knight (University of Otago), Brian Marshall (University of Auckland), Bruce McLennan (University of Otago), Tony Moore (University of Otago), Fanny LaRiviere (Terralink International), David Pimblott (Explorer Graphics Ltd), John Robson (University of Waikato), Rochelle Scoones (Auckland Map Centre), Dave Small (Alexander Turnbull Library), Ian Snowdon (Auckland City Libraries), Richard Wells (New Zealand Defence Force), Sarah Williams (Environment Bay of Plenty) and Richard Yates (Environment Bay of Plenty).

Special thanks go to Dr Chris McDowall (University of Auckland) for editorial help.