

# National Report to the 16th General Assembly of ICA



## Cartographic Activities in New Zealand 2011-2015

New Zealand Cartographic Society Inc



# Cartographic Activities in New Zealand 2011-2015

## National Report to the 16th General Assembly of ICA

### Rio de Janeiro, Brazil, August 2015

*Edited by*

**Igor Drecki**

*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 2011-2015 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 resources, 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 professionals and researchers who advance cartography in the government, military, research and private 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

**The New Zealand Cartographic Society is the national member of the ICA for New Zealand since 1976, while Land Information New Zealand became an affiliate member of the ICA in 2009.**

## 1. Cartographic and Mapping Societies

There are three active map-oriented professional societies in New Zealand; the New Zealand Cartographic Society (NZCS), the Australian and New Zealand Map Society (ANZMapS) and the Surveying & Spatial Sciences Institute (SSSI). These are non profit organisations that gather a wide range of individuals – professionals, educators, curators and map enthusiasts. Despite their similar focus, only recently NZCS and ANZMapS shared events and developed interactions of mutual interest. One example involved organisation of a joint conference in September 2014 in Auckland.

### The New Zealand Cartographic Society

[www.cartography.org.nz](http://www.cartography.org.nz)

The New Zealand Cartographic Society (Map Room, The University of Auckland Library, Private Bag 92019, Auckland 1142) 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, available as an individual or corporate, 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 World 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 current Committee includes Igor Drecki (President), Roger Smith (Vice President), Antoni Moore (Secretary), Lesley Murphy (Treasurer) and six Committee members: Marney Brosnan, Michelle Cooper, Mairead de Roiste, Tim Nolan, Geoff O'Malley and Andrew Steffert. During the 2012-2014 term, the following individuals also served on the Committee: Lars Brabyn, Christian Fremd, Graeme Jupp and Geoff Aitken.

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 General Assemblies and actively participating in the International Cartographic Conferences, International Cartographic Exhibitions and ICA Commission's meetings.

At the 2011 edition of the Barbara Petchenik Children's World Map Awards, Hayden Livingstone from Tauranga Boys College won the 13-15 years old category, while Amy Wang from Te Kauwhata College was a double laureate (jury and public) in 2013 edition in the same age category. At the 2013 International Cartographic Exhibition in Dresden, Germany, the *Tongariro National Park* oblique map produced by Roger Smith from Geographx (NZ) Ltd won third place in the Paper Maps category.

Tony Moore is the New Zealand principal delegate to the ICA General Assembly and a member of the ICA Commission on GeoVisualization and ICA Commission on Geospatial Analysis and Modeling. Geoff O'Malley is the deputy delegate to the ICA General Assembly. Igor Drecki is the current Editor of the *ICA News*, newsletter of the ICA, and a member of the ICA Commission on Digital Technologies in Cartographic Heritage and ICA Commission on Map Design. Roger Smith and Geoff Aitken are members of the ICA Commission on Mountain Cartography. Michelle Cooper is the national coordinator of the Barbara Petchenik Children's World Map Award, although from 2017 the coordination will pass to Geoff O'Malley.

In the last four years, the NZCS members attended several ICA events:

- ♦ 25th International Cartographic Conference and 15th General Assembly of ICA in Paris, France, July 2011
- ♦ 2nd ICA Symposium on Cartography for Australasia and Oceania in Auckland, New Zealand, August 2012
- ♦ 8th ICA Mountain Cartography Workshop in Taurewa, New Zealand, September 2012
- ♦ 26th International Cartographic Conference in Dresden, Germany, August 2013
- ♦ 8th International Workshop on Digital Approached to Cartographic Heritage in Rome, Italy, September 2013
- ♦ 9th ICA Mountain Cartography Workshop in Banff, Alberta, Canada, April 2014
- ♦ 3rd ICA Symposium on Cartography for Australasia and Oceania in Auckland, New Zealand, September 2014

The sixth National Cartographic Conference *GeoCart'2012*, and the second ICA Regional Symposium on Cartography for Australasia and Oceania was held in August 2012. Attended by 62 delegates from eleven countries, the programme delivered 38 paper and poster presentations, including four keynote addresses and a special presentation by Professor Georg Gartner, President of ICA. Internationally reviewed conference Proceedings were published on a CD-Rom.

At the Society's General Meeting held during the *GeoCart'2012* Conference, Geoff Aitken was awarded Life Membership for his contribution to cartography in New Zealand and internationally. Geoff is a foundation member of the Society (established in 1971) and only sixth recipient of this prestigious honour. On behalf of the ICA, President Gartner and Past President William Cartwright congratulated Geoff on receiving the honour.

Immediately before *GeoCart'2012*, the Society delivered an exciting and current *Map Design with ArcGIS – Thematic Cartography* Workshop within its EduCart initiative launched in 2007. The workshop focused on how users can harness Esri ArcGIS to produce high quality thematic maps. It explored a range of desktop GIS tools to create rich thematic maps, demonstrated how to prepare data and select appropriate thematic map types, and make informative and compelling information products. The main presenter was Dr Kenneth Field (USA) supported by Igor Drecki.

Immediately after *GeoCart'2012*, the Society

hosted the 8th ICA Mountain Cartography Workshop organised jointly with the ICA Commission on Mountain Cartography. It was held at Taurewa, adjacent to the Tongariro National Park. The theme of the Workshop was *Mapping Mountain Dynamics: From glaciers to volcanoes*, in recognition of the unique natural environment of the host country - New Zealand. The Workshop focused on current developments in mountain cartography and present state of the art approaches to cartographic representations in large scale topographic mapping, symbolization and map design, as well as discussed technological issues, map use and links with Location-based Services (LBS). Fully reviewed workshop Proceedings, edited by Antoni Moore and Igor Drecki, were published by the Society in August 2013, as the first volume of the *CartoPRESS* Occasional Publication series.

Another *EduCart* event organised by the Society was a customised cartography course delivered to geospatial professionals at the New Zealand Defence Force by the Society members Lesley Murphy and Igor Drecki. It included delivery of teaching material and practical assignments in a modular form over two 1-week blocks, one in July 2013 and the other in January 2014. Each 1-week block was designed to be self-contained by having clearly defined material forming body of knowledge on specific areas of cartography. The first block covered principles of cartographic design and introduction to thematic mapping. The second 1-week block focused on topographic mapping, including map projections, the role of cartographic instructions and standards, production processes, and quality control.

In December 2013, our oldest Life Member Doug Francis passed away aged 93. Doug was a foundation member of the Society who spent his professional career working in the Cartographic Branch of the Department of Lands and Survey until his retirement in 1979. Even in his retirement, Doug maintained a strong interest in mapping. He was a guest of honour at the Society's 40th Anniversary in February 2011, where his contribution to the Society and cartography was celebrated again with the presentation of a special certificate.

The seventh National Cartographic Conference, *GeoCart'2014*, and the third ICA Regional Symposium on Cartography for Australasia and Oceania was held in Auckland in September 2014.

The Conference was organised jointly with the Australian and New Zealand Map Society (ANZMapS). Attended by 74 delegates from seven countries, the programme delivered 51 paper and poster presentations, including four keynote addresses and a special presentation by Professor Georg Gartner, President of ICA. Internationally reviewed conference Proceedings were published on a CD-Rom with a print version being prepared as the second volume of the *CartoPRESS* Occasional Publication series. A selection of full papers from the conference appeared in *The Globe*, journal of the ANZMapS.

At the Society's General Meeting held during the *GeoCart'2014* Conference, Professor William Cartwright was awarded an inaugural Honorary Membership of the New Zealand Cartographic Society for his outstanding contribution to cartography and mapping in New Zealand. Professor Cartwright is recognised as Australasia and Oceania Region's ambassador and active advocate of cartography and mapping in the region. He participated in all seven biennial National Cartographic Conferences – *GeoCart*, and contributed numerous keynote addresses and papers, both as a researcher and an ICA official. He participated in the 40th Anniversary celebrations of our Society (2011) representing ICA as its President. He attended several General Meetings of the Society as a guest of honour and contributed to the ICA Internet Cartography Workshop as facilitator (2006).

Immediately before *GeoCart'2014*, the Society delivered well received *Map Design with ArcGIS – Mapping the 3rd Dimension* Workshop within its *EduCart* initiative. The workshop focused on different techniques to map the 3rd dimension using Esri ArcGIS Platform. The course explored a range approaches for manipulating elevation and terrain data to create a range of compelling maps. It considered the data requirements, manipulation and cartographic design considerations for default, advanced and alternative ways of representing terrain. Participants learned how to use ArcGIS tools for terrain representation and 3D modelling and how to publish the work to create innovative, interactive 3D web scenes. The workshop was presented by Dr Kenneth Field (USA).

Shortly after *GeoCart'2014*, the Society hosted the Gallipoli Symposium organised jointly with the University of Otago and RMIT University, Melbourne, Australia. The event was held on 9th

September 2014 in Dunedin. The theme of the Symposium was *Gallipoli 1915: Recording stories*. It brought-together New Zealand and Australian scholars, curators and professionals to provide “a cross-disciplinary interchange on the value of artefacts as resources for research into ANZACs at Gallipoli 1915”. The focus was on harnessing different disciplinary strengths of research into better understanding the campaign itself, ANZAC troops and the wider New Zealand and Australian views on this theatre of warfare in the early days of World War I.

In April 2015, the Society President Igor Drecki attended a joint Australian and New Zealand Map Society, and Mapping Sciences Institute of Australia Conference in Canberra, ACT, Australia. Apart from a solid and interesting programme, the conference launched the International Map Year (IMY) celebrations in our part of the world. New Zealand is planning to launch IMY later this year and our Society will actively contribute to planned activities and celebrations.

Another customised cartography course was delivered in August 2015 to the geospatial intelligence personnel of New Zealand Defence Force. The course covered similar material to that conducted in 2013/2014, but it was condensed to one week only without practical assignments. The course was facilitated by Igor Drecki and organised within the Society’s highly successful *EduCart* initiative.

The Society coordinated New Zealand’s contribution to the International Cartographic Exhibition and to the 2015 edition of Barbara Petchenik Children’s World Map Award. A total of eleven cartographic items will feature in Rio de Janeiro together with six works by New Zealand children.

### The Australian and New Zealand Map Society [www.anzmaps.org](http://www.anzmaps.org)

The Australian & New Zealand Map Society (ANZMapS) is an amalgamation of the former New Zealand Map Society (NZMS) established 1977, and the Australian Map Circle (AMC) established 1973. ANZMapS promotes all aspects of cartography to a wide range of potential users, and membership includes publishers, designers, GIS specialists, academics, map producers, librarians and curators of libraries and state mapping agencies in Australia and New Zealand.

ANZMapS promotes communication between producers through regular conferences and workshops, to improve the skills and status of persons working with maps and geospatial data, and acts as a forum for development and effective use of map collections.

Topics of particular interest to the Society are the history of cartography and exploration as relating to the South-West Pacific and Antarctica, military mapping for the war efforts of Australia and New Zealand, and general map production, digitisation, use and design in each country. ANZMapS publishes a refereed journal, *The Globe*. Individual members are regular contributors to other cartographic journals and publications.

The Society holds a conference each year on different aspects of map use and mapping:

- ♦ Brisbane 2012: *Brisbane International Geospatial Forum*, was held jointly with the Mapping Sciences Institute (MSIA) and the International Map Trade Association (IMTA Asia-Pacific). Opened by Charles Regan, head of National Geographic mapping, the focus was on digital delivery of mapping in emergencies
- ♦ Melbourne 2013: *The Metropolis and Beyond: mapping the built and natural environments*. In addition to papers on the theme, the conference included a significant technical tour component, *Landscapes and mapping: the Werribee Plains and Uplands to the West and North of Melbourne*, presented by Professor Bernie Joyce (Honorary Principal Fellow, School of Earth Sciences, University of Melbourne) and Dr Bill Birch, Senior Curator, Museum of Victoria
- ♦ Auckland 2014: *GeoCart’2014*. ANZMapS partnered the New Zealand Cartographic Society to deliver the 3rd ICA Symposium on Cartography for Australasia and Oceania
- ♦ Canberra 2015: *The Power of Maps*, was held at the National Library of Australia, 29th April to 1st May, 2015. The conference was jointly organised with the Mapping Sciences Institute, Australia (MSIA). Twenty six papers were present on topics ranging from military mapping, map curatorship and mapping technologies. In recognition of ICA International Year of the Map, maps from children around Australia created for the Barbara Petchenik Children’s Map Competition, 2015 were on display

In 2012-13, the executive of ANZMapS convened a project for National and State Libraries Australasia (NSLA). The project comprised consultation and survey of all Australian state and territory libraries, and the national libraries of Australia and New Zealand. Areas surveyed included most aspects of collection management, acquisition, disposal policy, cataloguing, digital collecting, professional development etc. NSLA's role is collaboration among libraries, and the maps focus is the first ever attempt to document how map collections are managed and maintained across these libraries. The NSLA report delivered in 2013 established guidelines across collecting, disposal, project management and an ongoing blog for participating libraries.

The Society provides a monetary award and certificate for excellence in cartography, specifically to third-year students in the cartography course at RMIT University in Melbourne. The Society is keen to extend support to tertiary cartography courses both Australia and New Zealand.

## 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), Department of Conservation and Statistics New Zealand. LINZ is the national mapping organisation that publishes all topographic maps and nautical charts for New Zealand. Department of Conservation maintains a wide range of databases on conservation lands, including tourist infrastructure. Statistics New Zealand provides a wide range of statistical and administrative mapping products. Other government organisations produce maps on irregular basis and maintain a vast array of spatial databases relevant to their area of operation.

### Land Information New Zealand

[www.linz.govt.nz](http://www.linz.govt.nz)

#### Mapping

Earlier this year, Land Information New Zealand (LINZ) released a strategy to guide its topographic

work over the next five years. This recognises the need for accuracy in topographic products and data, but also aims to reflect changes in technology. Rather than a focus on paper-based maps, it puts emphasis on LINZ's topographic work to maintain New Zealand's topographic database, and to then release updated data in digital formats as well as printed maps.

Alongside this, LINZ has changed emphasis over the last two years, so that it has a greater focus on improving the spatial accuracy and currency of roads and other high visibility / important features rather than a full sheet update. High resolution satellite imagery and aerial photography is the primary source of this information with current data also being sourced from other authoritative agencies.

In the period 2011 – 2015, LINZ has achieved the following:

- 40 NZTopo50 map sheets have undergone a full maintenance (all features). New digital versions, ie Tiff and Geotiff files have been produced for these sheets
- 624 NZTopo50 map sheets have undergone a partial update and new digital versions for all have been produced
- All 31 sheet in the NZTopo250 series have been updated for high visibility features and new digital versions produced
- Topographic data for New Zealand's offshore islands, including the Campbell, Auckland, Snares, Bounty and Antipodes islands, and those in the Kermadec Group, were updated from satellite imagery and released as 13 first edition map sheets in both digital and printed format
- 19 first edition map sheets, in the Topo50 style, covering the Cook Islands, Tokelau Islands and Niue were produced after a full update of the Pacific Island dataset; LINZ worked with the governments of these countries to ensure location and place name details were correct
- LINZ released 55 map sheets as first editions in Tiff and Geotiff formats for the Darwin Glacier, Dry Valleys, and Ross Island in Antarctica based on the new McMurdo Sound Lambert Conformal 2000 (MSLC2000) projection
- Of the 782 map sheets that have been released as new versions or 1st release maps, 350 have subsequently been printed as new edition maps

- LINZ produced 'gridless' versions of all 451 geotiff files covering the NZTopo50 series. This was in response to a request from the New Zealand Defence Force who had a need to re-project geotiff images into a military grid system. 'Gridless' versions of the 31 geotiff files covering the NZTopo250 series have also been released. All 482 geotiff files have since been made available to the public through the LINZ Data Service, an online service that allows free download and reuse of LINZ's data. There has been a very positive response to these from the GIS user community

### Data Collection

The Topographic Strategy sets a goal for LINZ to "coordinate other sources of topographic data into open national datasets to maximise opportunities for its reuse." This recognises that datasets managed and maintained by other organisations such as territorial and local authorities could be included in LINZ's core topographic dataset.

Since the release of the strategy, LINZ has developed a process to compare two line geometry datasets, select the features that best represent the real world, and integrate these features into a single dataset.

As roads are one of the most useful datasets for customers, the new conflation process is currently being applied to produce a national roads dataset. The first step is to conflate two LINZ road datasets into one - the Topo50 road centrelines and the electoral road centrelines. This will be followed by conflating external road datasets such as those from the NZ Transport Agency and local authorities.

The aim is for the national roads dataset to feed feature geometries back into the Topo50 road centrelines to supplement LINZ's work to maintain data using aerial photography. The national roads dataset will also be developed into its own product, as the conflation processes will produce data that is richer in attribute information.

### Historic Imagery

LINZ manages the Crown historic imagery archive containing over 600,000 photos on film from nearly 7,000 aerial surveys captured from 1936 to 2005. This imagery was captured for a range of

purposes including mapping and land management. Information on the content of the archive and the approximate area covered by each photograph is currently available on the LINZ Data Service (LDS).

LINZ is now working with local government to digitise this imagery archive in the interest of long term preservation, easier access, and better use of this valuable national resource.

As of March 2015, over 45,000 photos have been digitised. The scanning project will make a greater range of products available, such as high and low resolution digital photos (the negatives are scanned at 14 or 21 microns, depending on film quality), metadata, survey charts and camera calibration files. Release of scanned surveys by LINZ is expected to begin sometime in 2015 and will be released as complete surveys available under Creative Commons licensing.

### Hydrography

LINZ is also home to the New Zealand Hydrographic Authority (NZHA), which is responsible for official nautical charts and publications for New Zealand, the South West Pacific nations of Tokelau, Cook Islands, Niue, Tonga and Samoa, and the Ross Dependency in Antarctica. It produces traditional paper charts, equivalent raster charts in un-encrypted BSB format and Electronic Navigational Charts (ENCs) for use with Electronic Chart Display & Information Systems (ECDIS). Official charts and publications are updated by fortnightly Notices to Mariners.

The International Maritime Organisation (IMO) Safety of Life at Sea (SOLAS) Convention means vessels must carry ECDIS, and all hydrographic authorities are required to produce ENCs of major ports and approaches used by SOLAS class vessels by 1 July 2012. LINZ has released all ENCs required to meet the IMO ECDIS carriage requirements. Additionally, it has published ENCs of its area of responsibility in the South West Pacific and Antarctica.

LINZ publishes and maintains all of its ENCs and traditional paper charts through a fully populated, single source, production database called the Hydrographic Production Database. In the future, LINZ expects the Hydrographic Production Database to contain the source data and charts (traditional paper/raster and vector ENC) for all the official NZ folio of charts.

## Statistics New Zealand

[www.stats.govt.nz](http://www.stats.govt.nz)

Statistics New Zealand conducted a nationwide census of the population in 2013, the first since 2006. This spawned a variety of spatial data and visualisation products. The first web services with statistical-spatial data were published in 2014 along with the first of a suite of StatsMaps products that allow users to visualise statistical data.

In 2014, Statistics NZ published *Design principles for maps using New Zealand's statistical data*. It provides basic cartographic guidelines for making thematic maps that Statistics NZ's data is most suited for.

In 2016, Statistics NZ will be reviewing the geographic areas that statistical data is aggregated to. This is likely have a big impact on cartographers and data analysts wanting to present data in different ways.

Statistics NZ is providing cartographic services to the Ministry for the Environment's 2015 *Environmental indicators Te taiao Aotearoa* state of the environment report. The report will also make use of interactive maps made possible by ArcGIS Online.

### 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 Draughting 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.

#### Auckland Council

[www.aucklandcouncil.govt.nz](http://www.aucklandcouncil.govt.nz)

Auckland Council was formed on the 1st November 2010 from the unification of Auckland Regional Council, Auckland City Council, Manukau City Council, Waitakere City Council, North Shore City Council, Papakura District Council, Rodney District Council and the majority of Franklin District Council.

The unification created a large Geospatial team that inherited different applications, processes, and datasets for the Auckland region. The past five years have had a large focus on the consolidation of these disparate elements, whilst continuing to provide the mapping and visualisation required by the business at the same time.

Auckland Council uses Esri ArcGIS as its primary GIS software suite. Today there are 168 ArcGIS users throughout the organisation, of which a little over 50 are in the Geospatial teams.

The majority of Auckland Council's cartographic work is carried out by the organisation's Geospatial team, some federated users in CCOs, and in some cases by our Design team based in the Communications unit.

At the start of 2014 the Geospatial group signed off the Spatial Data Framework (SDF), a document that sets the direction and service delivery of the Geospatial team. The SDF includes defined cartographic standards and are part of Council's commitment to improving cartographic output. Some elements, labelling standards in particular, draw on the work done by the Department of Conservation's SDF and the NZMS 260 series products.

Major cartographic work over the last five years include:

- ♦ The Auckland Plan, one of Auckland Council's first major cartographic exercises, showing conceptual ideas outlining possible growth patterns for Auckland
- ♦ Auckland's Unitary Plan; this document will replace 8 different statutory plans. Challenges included combining more than 40 zone types and more than 60 overlay types into legible maps
- ♦ Marine Spatial Plan, emphasising the marine environment instead of the landward mapping we are normally tasked with
- ♦ Lee Kuan Yew award; our team created the maps contained in the Auckland Council entry honours outstanding achievements and contributions to the creation of liveable city

Future initiatives that are planned in the cartographic space include the establishment of a cartographic working group to improve the overall quality of cartographic work produced by the team.



## 4. Military Mapping

The Geospatial Intelligence New Zealand (GNZ) of the New Zealand Defence Force services the geospatial requirements of New Zealand Army, Air Force and Navy.

### New Zealand Defence Force Geospatial Intelligence Organisation [www.nzdf.mil.nz/](http://www.nzdf.mil.nz/)

Since last reporting to the General Assembly in 2011, the New Zealand Defence Force (NZDF) Geospatial Intelligence Organisation (GIO) has transitioned into GEOINT New Zealand (GNZ). Still operating under the New Zealand Defence Force, its primary role remains GEOINT support to NZDF and other approved clients but it now has an 'All of Government' remit and leadership responsibilities.

Topographic, briefing and analysis maps are produced in-house which could centre on any part of the world where NZDF personnel operate or Ministers and planners have an interest. Maps are typically at 1:50 000 or 1:250 000 scale, using international standard military mapping formats. GNZ also continues to contribute SW Pacific data to the Multinational Geospatial Co-production Programme (MGCP), currently working in partnership with France, capturing vector data of New Caledonia. Briefing maps tend to feature a specific area of interest and are greatly simplified to quickly convey a strong message. Analysis maps generally present geographical information such as line-of-sight 'view sheds' or safety radii in a readily digestible portrayal.

Analytical products modelling terrain, vegetation and infrastructure data are also currently being produced. These are designed to identify characteristics such as helicopter landing zones, drop zone suitability, travel times, vehicle mobility and flood potential and enable the planning of activities supporting Humanitarian Assistance and Disaster Relief (HADR) events.

A human geography overview mapping programme of the SW Pacific nations within the NZDF Area of Interest (AOI) is also currently underway, with four standard themes of Demographics, Religion, Language and Ethnicity. To date, the Solomon Islands study is complete and the Kingdom of Tonga has progressed to the final stages.

Aeronautical data and chart support to the

Royal New Zealand Air Force (RNZAF) includes the production of two bespoke aeronautical navigation chart series: the R470, a 1:500,000 Tactical Pilotage Chart series made up of four sheets (currently in its 6th Edition) and the newer R571 Low Flying Chart series at a scale of 1:250,000, with two of eleven proposed sheets having been produced. The topographic data for both series is derived from LINZ, Landcare Research and GroupEAD (Asia Pacific).

Maritime support to the NZDF includes the ongoing development and production of Littoral Planning Charts (LPC) and Special Tactical Operational Information Charts (STOIC).

LPCs are a 1:50,000 scale product, covering the interface between land and sea, displaying both topographic and hydrographic data. They are designed to provide operational users with a single product that meets multiple needs when planning operations in the littoral zone.

STOICs support the tactical user, presenting potential beach landing site characteristics and contain multiple geospatial source data sets in one graphic including bathymetry, satellite imagery, hand-held imagery, tidal data and hydrographic charts.

Maps and charts are delivered on a variety of media, depending on user requirements, ranging from paper products through to online web-mapping and hand-held GPS devices.

## 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: GNS Science, Landcare Research New Zealand and National Institute of Water and Atmospheric Research (NIWA).

GNS publishes a range of New Zealand geological and magnetic maps, as well as other related scientific maps. Landcare Research New Zealand publishes a range of research-driven cartographic products. NIWA publishes a variety of oceanic and bathymetric charts.

## GNS Science

[www.gns.cri.nz](http://www.gns.cri.nz)

GNS Science is a government-owned agency specialising in earth and isotope science research. Public Good Science funding has supported continued geological mapping that was previously undertaken by GNS's predecessor, the New Zealand Geological Survey.

A long term programme to map the onshore geology of New Zealand at 1:250 000 scale, *QMAP* (Quarter million MAP) which compiled new and existing mapping into a GIS, and produced 21 regional maps and accompanying texts, was completed in late 2011. The digital data from these maps has been combined into a seamless dataset and the resulting digital map and data was published on DVD in 2014, providing essential geological information to local and central government, planners and business interests. These data are also available through a Web Map Service (WMS) and are viewable through a web map application.

A derivative product of this GIS data is the 1:1 000 000 Geological Map of New Zealand, published as a DVD in 2014 and is also available online through a WMS and Web Feature Service (WFS). This geological map is available in a familiar, traditional format, as well, with the publication in 2015 a two sheet set of geological maps at a scale of 1:1 000 000 providing a national geological map, and includes New Zealand's offshore islands, Antipodes Island, Auckland Islands, Bounty Islands and Chatham Islands.

GNS's capability in geological mapping extends further offshore to New Zealand's Ross Dependency in the Antarctic. The Geology of Southern Victoria Land, Antarctica 1:250 000 scale geological map and text were published in early 2013 as the final map in the *QMAP* series. A digital map and data were published as a DVD in 2014.

Currently in preparation is the first of a new series of publications devoted to the geology of New Zealand's urban areas. The focus of these new urban geological, geotechnical and geomorphological map and data packages is to provide detailed digital geological information for planning purposes in towns and cities where urban, business or industrial land-use is intensive and infrastructural investment substantial.

Planning for the urban geological mapping

programme was well underway when a strong earthquake struck the Canterbury region on 4th September 2010, causing substantial property damage in Christchurch and the surrounding area. This earthquake, coupled with the effects of the even more damaging aftershock of 22 February 2011, and further earthquakes on 13 June and 23 December 2011 provided a powerful rationale to initiate this map series with up-to-date geological information for the Christchurch urban area.

This data package will be published in electronic form only, and comprises three main components, the first being an explanatory text. The second component is a geomorphological map, presented at a scale of 1:50,000, showing an interpretation of the nature, origin and age of landform features in the study area. The final component are three, three dimensional models, developed to represent materials beneath the study areas on a regional geological, city-wide geological and central city geotechnical scales.

## Landcare Research New Zealand

[www.landcareresearch.co.nz](http://www.landcareresearch.co.nz)

As a Crown Research Institute, Landcare Research (LCR) has a core purpose to drive innovation in the management of terrestrial biodiversity and land resources. It is a diverse organisation with research specialisation in four main themes (biodiversity, land resources, greenhouse gases and sustainability). LCR has a history of hard copy map publication through predecessor organisations, particularly with respect to soils and land resource information. However, the period of 2011–2015 has seen the maturing of online presentation of data and knowledge. The LRIS Portal (built on the Koordinates platform) was launched in August 2010 to make LCR data available for download to GIS users, but with minimal cartographic representation. In 2011 the launch of both S-map Online (launched August 2011) and Our Environment (launched December 2011) followed. These portals were created by staff using OSGeo tools, and along with a commitment to delivering web services adhering to OGC standards, represented a major investment in effort to deliver high quality, interactive online map and data query services, with the additional ability to generate maps up to A3 as high quality PDF files specifically rendered for printing. The underlying base map service delivers scale-appropriate views of LINZ Topo50k base data and supports faithful representation of

its cartographic text. Novel cartographic features of the science data mapping services include the ability to switch attribute categories on/off independently within a data layer, to control layer transparency, and to create legends that respond to the layer content within the visible map extent. In implementing these features, LCR has contributed enhancements to OSGeo packages, and is a leading participant in and advocate for NZ's slowly emerging Spatial Data Infrastructure.

Further developments of online cartographic services were marked by the launch of the upgraded New Zealand Soils Portal (April 2013), which demonstrated delivery of the fundamental soils data (FSL) using adaptive web design to deliver cartographic content across a range of devices from large screen desktops to mobile phones from a single web service. These adaptive design features have been applied most recently in the Antarctic Environment Portal (launched in June 2015) that LCR designed and developed in a collaboration with Antarctica New Zealand to assist the Committee for Environmental Protection's work in supporting the Antarctic Treaty.

### National Institute of Water and Atmospheric Research

[www.niwa.co.nz](http://www.niwa.co.nz)

NIWA's three core areas of expertise, where they have the responsibility as New Zealand's predominant science provider, are climate and atmosphere, freshwater, and oceans – natural environments that are interconnected in innumerable ways. But these also present economic and social opportunities which require comprehensive scientific understanding for New Zealand to take advantage of them responsibly.

Through its Coasts and Oceans portfolio NIWA is tasked with the mapping of New Zealand's nearshore and open ocean environments using the latest technology including multibeam echosounders. As a means of getting this research into the public domain NIWA produces a range of high-quality informative posters for schools, industry groups, and the general public.

### Wellington South Coast

The Wellington South Coast is an exposed, rocky shoreline influenced by the strong tidal currents of Cook Strait and the large swells of the Southern Ocean. More than 400 million soundings were

collected to survey an area of 5727 hectares. In August 2008 a 854 hectare portion of the South Coast was declared Taputeranga Marine Reserve. This survey and the resulting poster reveals features such as the artificial reef - HMNZS Wellington, nearshore rocky outcrops, and sediment ripples formed by waves and tidal currents moving finer-grained sediments.

### Hauraki Gulf

The island-studded Hauraki Gulf is a backdrop to the work and play of New Zealand's biggest city. Transport hub, commercial port, communications route, tourism venue, sailing paradise, marine park, and recreational, customary and commercial fishing ground, this shallow, sheltered sea has been many years in the making. The embayed coastline, estuaries and islands were shaped by volcanism, tectonic upheaval and changing sea levels. The seafloor of this shallow, semi-enclosed sea has a sweeping signature of sediment erosion, transport and deposition. Bringing together knowledge from NIWA, Land Information New Zealand and the Royal New Zealand Navy a framable high resolution seafloor map has been produced.

### Undersea New Zealand

A new edition of the popular Undersea New Zealand poster, released November 2012. A high quality colour poster that vividly illustrates the variability and complexity of the New Zealand ocean floor. The first edition was an award-winning publication that has proven to be extremely popular for scientific, educational, and general use. Published in 2012, this edition covers the New Zealand region at a scale of 1:5,000,000 and incorporates all the latest data sets including numerous multibeam surveys.

### New Zealand's Marine Realm

New Zealand's Marine Realm poster, released June 2015. A high quality colour poster that vividly illustrates New Zealand as a small remote island nation with interests over one of the world's most extensive marine areas, encompassing widely differing environments from subtropical to Antarctic climes. Published in 2015, this edition covers New Zealand's Exclusive Economic Zone (NZ EEZ), the Outer Limits of the Extended Continental Shelf (NZ OLECS), and the proximal Antarctic region, at a scale of 1:7,000,000.

### Undersea New Zealand – Delineated Boundaries

A new edition of the popular Undersea New Zealand – delineated boundaries poster, released June 2015. A high quality colour poster that vividly illustrates the variability and complexity of the New Zealand ocean floor and depicts the boundaries of New Zealand's Territorial Sea (12 NM), New Zealand's Exclusive Economic Zone (NZ EEZ), the Outer Limits of the Extended Continental Shelf (NZ OLECS). Published in 2015, this edition covers the New Zealand region at a scale of 1:5,000,000.

### New Zealand Digital Bathymetry

NIWA also provides gridded bathymetric datasets and imagery, including a 250m resolution gridded bathymetric data set encompassing New Zealand's Exclusive Economic Zone which is available in multiple high-resolution file formats to suit a range of imagery and mapping needs. A project providing coverage maps where NIWA has high resolution multibeam and seismic data around New Zealand is also available via the Coastal and Marine data portal. The data is captured from New Zealand and international vessels undertaking research in the region for a variety of projects. Associated metadata provides information about voyage number, vessel used and systems used, it also directs the user to the data custodian from whom the actual data and further information can be sourced

## 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.

### GroupEAD

[www.groupead.com](http://www.groupead.com)

GroupEAD Asia Pacific Ltd (“GroupEAD”) was launched on the 1st of July 2014 and is a joint venture between Airways and GroupEAD based in Europe. GroupEAD provides next-generation

aeronautical information and aeronautical data quality services across the Asia Pacific region.

These services include:

- ♦ advanced aircraft procedure design services
- ♦ aeronautical information publications (AIP)
- ♦ aeronautical charting products and services
- ♦ aeronautical data services, systems and consulting services (AIM)

GroupEAD produces a number of Aeronautical Information Publications (AIP) for countries in the Asia/Pacific region and is certified by the Civil Aviation Authority (CAA) of New Zealand under Civil Aviation Rule Part 175 to produce the AIP for New Zealand. This is a four volume series containing ground movement charts, aerodrome charts, instrument approach charts, Standard Instrument Departure (SID) charts, and Standard Arrival (STAR) charts. The AIP is designed to be a manual containing thorough details of regulations, procedures and other information pertinent to flying aircraft in the country to which it relates. It is the official source of aeronautical information of lasting character essential to air navigation within the relevant country.

The charts produced for the New Zealand AIP are based on guidelines developed by the International Civil Aviation Organisation (ICAO).

**Visual Navigation Charts (VNCs).** These are detailed topographical charts showing relevant airspace and obstacles and are used by pilots planning and flying under Visual Flight Rules (VFR). This series includes two 1:125,000 charts covering the Auckland and Christchurch areas; fourteen 1:250,000 charts covering the entire country for low-level navigation purposes; six 1:500,000 charts covering the entire country for higher level navigation.

**Visual Planning Charts (VPCs).** These are also topographical charts, but showing limited topographical data and all airspace. Pilots use these for flight planning of visual flights. This series includes two 1:1,000,000 charts covering the North Island and the South Island with Stuart Island.

**Enroute charts (ENRCs).** These are charts containing only information relevant to instrument flight, including information on radio navigation aids, navigational fixes, high-level standard airways and airport locations. This series includes:

- ♦ a National Enroute chart at 1:500,000 covering most of New Zealand

- a North and South Enroute charts at 1:1,000,000 covering most of the North Island and most of the South Island respectively
- a Chatham Island Enroute chart at 1:4,000,000 covering the routes between the North and South Islands and the Chatham Islands
- an Antarctic Enroute chart at 1:12,000,000 covering the main route between New Zealand and McMurdo Station in Antarctica
- an Oceanic Enroute chart at 1:6,000,000 covering the main routes between New Zealand the Pacific Islands as far east as Tahiti, as far north as Vanuatu and as far west as the 160° meridian

#### **The Enroute Area charts (ENRACs).**

These charts are the low-level version of the ENRCs, containing only information relevant to flights under instrument flight rules (IFR). This series includes three area charts at 1:540,000 covering the Upper North Island from New Plymouth to Whangarei and as far east as Rotorua, the Lower North Island from Taupo south, as far east as Napier, as far West as New Plymouth, and the Upper South Island as far south as Ashburton.

GroupEAD also provide customised client-specific aeronautical information for use by airlines, general aviation, flight training organisations, ANSP's (Air Navigation Service Providers), military units, mobile application providers and other aviation industry participants.

Customised data can be provided in the form of datasets, flight information publications, and aeronautical charting. GroupEAD currently provide a range of customised charts to various customers in a variety of digital formats.

#### **Airways**

Airways are a State-owned Enterprise (SOE), a fully-owned subsidiary of the New Zealand Government operating as a commercial business. Airways deliver the following services to both New Zealand and the international community:

- Control all air movements within New Zealand's 30 million sq. km's of controlled airspace (over 1 million movements annually)
- Develop, install and maintain critical infrastructure and flight path systems throughout New Zealand

- Manage air traffic control towers and radar centres across New Zealand
- Provide technical and engineering services to New Zealand airports
- Train air traffic controllers for both the domestic and international market
- Provide flight inspection services for airports throughout Australasia and the South Pacific

Airways operate under rules set down by the CAA of New Zealand, which are developed using ICAO guidelines.

#### **CoreLogic NZ Ltd**

[www.corelogic.co.nz](http://www.corelogic.co.nz)

CoreLogic is a leading property information, analytics and services provider in the United States, Australia and now New Zealand. Bringing together leading property intelligence and geospatial companies, PropertyIQ and Terralink International, CoreLogic helps clients identify and manage growth opportunities, improve performance and mitigate risk. CoreLogic provides clients with data and geospatial consultancy, as well as innovative, technology-based solutions such as *Emap*.

CoreLogic cartographers provide a range of high quality and specialised cartographic services including custom mapping, urban street mapping and cartographically represented GIS analysis. Maps can be produced for all types of output including hard copy print and web .

CoreLogic maintains and provides one of the most comprehensive and up-to-date cartographic databases available in New Zealand. The core cartographic datasets are based on stringent specifications and established processes, and are fully maintained and updated on a daily basis. These datasets and layers are able to be easily and seamlessly integrated to create customised topographic and/or thematic services that can be accessed via the web or in common mapping applications such as ArcGIS Desktop. The 1:20,000 scale urban cartographic dataset provides a base for a range of client specific custom mapping projects and is used to create a series of georeferenced raster tiles that are available for purchase .

CoreLogic's cartographic web product, *Emap*, provides businesses with instant access to different layers of geographic, land and property information covering New Zealand. *Emap* combines CoreLogic's core scale-less datasets and

cartographic databases with publicly available data to create enhanced base-maps for client use. The cartographic data within is updated via a change detection process and maps are updated weekly. This allows feedback and changes to be incorporated into *Emap* quickly due to the flow through of data maintenance changes to the final maps. Automatic labelling and symbology has been set up in two complementary map styles. Data is offered at scales ranging from 1:250 to 1:16,000,000 screen scales, is interactive and provides user friendly query capabilities.

### Geographx NZ Ltd

[www.geographx.co.nz](http://www.geographx.co.nz)

Geographx is a small privately-owned cartographic design company based in Wellington.

At the time of the last report in 2011, Geogrphx was focused on the *Earth Platinum World Atlas* project. The company was tasked with overseeing and coordinating production of the cartography and was additionally responsible for the design and production of the relief mapping. Craig MacAlpine acted as the Cartographic Production Manager on this project whilst Roger Smith was the Chief Cartographer. The atlas was published in 2013 and it went on to win international awards including the 2013 IMIA Global Award for Best Overall Map Product. The *Earth Platinum World Atlas* is now listed by Guinness World Records as being the largest ever produced, and Geographx was rewarded for its contribution to the production with a Special Commendation at the 2014 NZ Spatial Excellence Awards.

The 2011 report also reported that Geographx was developing new basemap data and a new terrain model for New Zealand. The completed terrain model, of 8m cell resolution, was subsequently released into the public domain under a creative commons licence thanks to assistance from Land Information New Zealand (LINZ). The basemap dataset was also completed with a pixel resolution of 4m. The basemap data has since featured in numerous Geographx map products and is available (at cost) to the wider industry.

In 2012 Geographx was appointed NZ distributor for Skyline Systems software products. Skyline offers a powerful suite of tools and applications for working in dynamic virtual 3D environments. Its products have special application to the defence and intelligence

communities, to urban planning, transport, mining and utilities.

Geographx underwent a restructuring in late 2013 and staff numbers were reluctantly reduced. An unfortunate consequence of this was termination of the internship program which had seen a number of European under-graduate and graduate cartography students hosted over previous years.

In 2014 the company released its first series of printed fieldmaps, comprising nine track maps to cover each of the New Zealand “Great Walks”. Geographx continues to offer premium custom cartography services and has been recognised with international awards over each of the past four years.

### NewTopo NZ Ltd

[www.newtopo.co.nz](http://www.newtopo.co.nz)

Since 2005 NewTopo has produced 39 topographic maps setting high standards of cartographic excellence and utility. A ‘retired’ cartographer, Geoff Aitken of Takaka, 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 peri-urban areas around Auckland, Wellington and Christchurch, and tramping on the many public tracks within the New Zealand National Parks. On scales appropriate to the area of interest, the maps have a realistic landform which provides a useful geographic context for the essential topographic information. The road network is very detailed and yet is clear and easy to follow.

NewTopo’s maps were the first topographic maps to be produced on the New Zealand Transverse Mercator Projection. Printed on synthetic paper, high-wet-strength, or quality coated papers, the maps are presented folded in a clear vinyl wallet. They reflect a high level of cartographic technology and production, resulting in very high quality long-lasting products. Digital copies may be purchased for personal use to enable users to enlarge small areas and print them or to incorporate the extracts in other documents or software.

The maps explore the utility of Land Information New Zealand's LIFF 1:50 000 topographic data and the graphic possibilities of Lorient's cartographic software while producing a useful map product for walkers. Papers describing these features and the development of NewTopo's unique graphic presentation were presented to the Society's GeoCart conferences in 2006, 2010 and 2014.

## 7. Cartographic Education

This section focuses on cartographic education at universities. Amongst the eight universities in New Zealand, only the University of Otago, Victoria University of Wellington, the University of Auckland and the University of Canterbury offer courses with a strong cartographic content. 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 and recently established New Zealand Geospatial Research Conference are the only national cartographic fora specifically dedicated to share research ideas and facilitate networking amongst cartographic and geospatial community. Contributions from New Zealand authors rarely appear in the international cartographic literature.

### University of Otago

[www.otago.ac.nz](http://www.otago.ac.nz)

Cartographic activity at the University of Otago for the reporting period has been concentrated in 3 groups on campus: at the National School of Surveying, Department of Geography and Department of Geology.

At postgraduate level, the last four years at the National School of Surveying has seen completion of two postgraduate diploma and one honours dissertation specifically related to cartography and geovisualisation. Topics included an investigation of the applicability of online virtual environments to the Surveying, specifically Urban Design profession (Sisi Zhang, now with the national mapping agency LINZ – she is finishing a Masters thesis that extends the study to a usability comparison with GIS and CAD 3D environments). There was also a usability study comparing the

application of traditional 2D topographic maps with 2.5D relief maps for the purpose of navigation by trampers (Nick Plimmer) and development of a mobile augmented reality visualisation interface for the New Zealand cadastral survey system (Campbell Hills, with Information Science). Otherwise, a PhD in its final stages is investigating the application of a new space-time representation technique to generalising complex dolphin trajectories (Judy Rodda, with Zoology). A Masters thesis student is in the early stages of performing a comparative investigation of this technique (Valentin Kiselev, with Information Science).

For coursework, a geovisualisation and cartography paper has been taught annually to postgraduates and undergraduates since 2010, coordinated by Tony Moore (School of Surveying). It supports the University's Bachelor of Applied Science in GIS and Postgraduate Diploma of Applied Science (PGDipAppSci) in GIS and now (since its inception in 2014) the coursework-based Master of Applied Science in GIS. This year has seen a move to a major project assessment within the paper, eliciting the construction of 3D urban planning scenarios with Esri City Engine, 3D virtual environments for future landscape design (artificial islands in a shallow natural harbour), bridge construction and virtual fieldwork in remote sand dune habitats. An interface for live modification of terrain data in a GIS from active morphing of virtual terrain was also built, as an initial study for a planned Sandscape-style (MIT) interface – a collaboration with Computer Science and Information Science.

In the period covered by this report there have been four journal papers, two book chapters, 24 conference and workshop contributions, and 3 professional magazine articles from Otago researchers in Surveying conducting cartography / geovisualization research. Specific topics include the spatialisation of project workload in Virtual Geographic Environments (with Mike Bricker, now with Porirua City Council), a hybrid art-map interface depicting the evolution of the kea (with artist Diana Marinescu), scoping a mobile interface that uses tilt to explore 3D terrain (with Mariusz Nowostawski, now at Gjøvik University College, Norway), generalisation using circles, and comic

representation in space-time, as well as the topics in the aforementioned postgraduate projects. In addition to this there has been a book edited by Tony Moore with Igor Drecki of the University of Auckland (*Geospatial Visualisation* published by Springer, 2012) containing selected papers from the *GeoCart'2010* conference. There was also an edited publication (Moore and Drecki, 2013) from the 8th ICA Mountain Cartography Workshop in Taurewa, North Island of NZ.

The School of Surveying was privileged to host ICA past-president Prof. Bill Cartwright from the School of Mathematical and Geospatial Sciences at RMIT University, as a William Evans Fellow, during a number of visits in 2014 and 2015. As well as undergraduate / postgraduate paper contributions and a couple of seminars, the major output was the co-organised Gallipoli symposium (maps and geographic artifacts) held in Dunedin in September 2014, featuring a public lecture from Bill and Tony Moore on the research (geographic content of Gallipoli cartoons) that was the main objective of Bill's time at Otago, with contributions from ICA president Prof Georg Gartner and ICA commission head Dr Kenneth Field. Otago was also host to the SIRC NZ 2013 conference, the national geospatial research conference which featured a number of geovisualisation / cartography papers already referred to.

Professional cartographic outputs coming out of the university includes the map output that forms part of publications such as books, book chapters, journal articles and scientific reports (Geography – Chris Garden / Tracy Connolly, Geology – Luke Easterbrook, and Surveying). Specifically, GIS and basic cartography are taught in some Geology courses and tutorials, with an emphasis on geological applications. Digital geological mapping techniques are increasingly being used and taught. The university is also represented on the committee of the New Zealand Cartographic Society with Tony Moore (as secretary) performing research coordination tasks.

### Victoria University of Wellington

[www.vuw.ac.nz](http://www.vuw.ac.nz)

#### **Cartography on the Masters in Geographic Information Science.**

The MGIS ([www.mgis.ac.nz](http://www.mgis.ac.nz)) are collaborative masters and postgraduate diploma programmes taught across three New Zealand universities: AUT, Victoria University of Wellington and the University of

Canterbury. On the programme, GISC 403: *Cartography and Geovisualization* is a core course taught by Dr Mairead de Roiste at Victoria University of Wellington and delivered remotely to students at AUT and the University of Canterbury.

The course blends technical, theory and practical applications of cartography. The course's primary emphasis is on the development of appropriate, creative and effective cartography supported by both theory and suitable technology. Laboratory sessions cover using open source and proprietary GIS for cartography as well as web mapping and geovisualisation. Student numbers are strong and have grown substantially since the implementation of the programme in 2012. The course builds on undergraduate GIS courses which introduce students cartography at the three collaborating institutions.

Current student research in cartography includes the impact of complexity on the use of basemaps (Rory McPherson, University of Canterbury). Staff research primarily comprises of de Roiste's cartographic usability research and previous work has been published by *Statistics New Zealand and Government Information Quarterly*. De Roiste also reviewed Statistics New Zealand's Design Principles for maps using New Zealand's statistical data. Staff and students from the programme have also attended and presented at *GeoCart* in 2014 and 2012.up.

### University of Auckland

[www.auckland.ac.nz](http://www.auckland.ac.nz)

#### **Historic Maps Reveal Island Stability**

Professor Paul Kench and Dr Murray Ford are spearheading efforts to map atoll island change throughout the Pacific. Typically the analysis revolves around the comparison of shorelines interpreted from historic aerial photos and modern high resolution satellite imagery. Many atolls in the Marshall Islands, Micronesia and Kiribati were sites of key military facilities and battles during World War Two. As a result, high quality aerial photos from throughout the war exist within various archives. Within Tuvalu the opportunity to assess island change has been strengthened by the acquisition of detailed geologic maps of Funafuti Atoll produced after surveys in 1897 by the Royal Society of London expedition. The geological maps provide an unprecedented opportunity to examine planform changes in islands that span more than a century



of sea level rise. Comparison between the 1897 maps and modern shorelines showed the islands have persisted and in many cases grown the last century. The results of the analysis were recently published in the journal *Geology* and have received considerable media attention since publication.

### Mapping Research Projects

An example of cartographic work in the School of Environment is mapping of Auckland urban built-area and changes from 1842 to 2014. Some of the work is just digitisation of existing data while others are mapping from satellite imagery. The newly urbanised areas were detected in ArcGIS. The spatial extent of new urban area was analyzed in relation to existing infrastructure such as railway and motorway to identify the drivers of urban sprawl. The newly urbanized area is also correlated with population data to identify mutual influence between them. The rate of urban growth was linked to rise in house price. It is found that the attempt to contain urban sprawl is responsible for a sharp rise in population density and section price over the last two decades.

Other work involved mapping wetlands in the Qinghai-Tibet Plateau. Wetlands were mapped from satellite images recorded over the last three decades visually. These maps were overlaid with DEM to identify the topographic settings of wetlands. It is found that alpine wetlands can be located on steep slopes in this mountainous region.

Amit Kokjo' doctoral research focuses on detailed mapping of land cover in central Auckland via fusion of very high resolution satellite imagery with LiDAR data in a step-wise method. This method eliminates those covers that can be mapped accurately and easily first. Then the focus is on difficult to map covers that share similar spectral responses. For example, such vegetative covers as parks/green fields and shrubs were differentiated through height. Height was also used to differentiate residential and commercial buildings that are much taller than residential buildings. This data fusion method improved the accuracy of mapping for certain covers. Recently, a Master's research project on mapping historic landslides in the Southern Landslide Zone, South Auckland from LiDAR and field data was undertaken. Landslide hazard was assessed from the likelihood of potential sliding in light of heavy rainfall.

### University of Canterbury

[www.canterbury.ac.nz](http://www.canterbury.ac.nz)

GIS is taught in the Geography Department at Canterbury University at undergraduate and postgraduate levels, with an introductory course at the second year followed by two third year courses that cover spatial analysis and wider issues in GIS such as map design, spatial databases and projections and metadata and standards. Twelve postgraduate courses are taught in GIS, as part of a GIS Masters programme ([www.mgis.ac.nz](http://www.mgis.ac.nz)) that is taught across three New Zealand Universities: Victoria University of Wellington, Auckland University of Technology, and The University of Canterbury.

The research undertaken by academic staff includes usability issue of GIS software and pedestrian navigation by Ioannis Delikostidis, visualisation of health research by the GeoHealth lab, and crowdsourcing interface design by Femke Reitsma. Research seminars are also held, the Geospatial Research and Innovation Seminar Series (GRISS) is a monthly seminar series held at the University of Canterbury for spatial professionals and students interested in hearing about the latest ideas in geospatial research and innovation.

The University of Canterbury will also be hosting the 2015 NZ Geospatial Research Conference on the 7th-9th December 2015. The audience will comprise researchers and experts from the geospatial field working across GIS, mapping, mobile technologies, spatial data and business- anyone with an interest in the future of geospatial information and technology, and the opportunities it brings. The conference will focus on themes, research, and issues pertinent to the whole of New Zealand's geospatial industry. Its mission is to provide an opportunity for sharing, inspiring and connecting the exciting new developments in the industry in what will be a premiere event for geospatial innovation and leadership in New Zealand.

## 8. Resources for Research in Cartography

There are a number of map collections and repositories in New Zealand, which have sufficient depth to provide materials for serious research.

### University of Auckland Library

[www.library.auckland.ac.nz](http://www.library.auckland.ac.nz)

The University of Auckland Library's print map and chart collection comprises around 50,000 items. It focuses primarily on New Zealand, the South Pacific and Antarctica, with other parts of the world maintained at a reference level. It includes general, topographic, cadastral, photo mosaic, planning and scientific (geology, soil, land utilisation, bathymetry) maps, as well as street maps, tourist maps, hydrographic charts and a selection of aeronautical charts. The collection is housed in the Map Room, General Library building, at the heart of the University's City campus. It is predominantly used by staff and students from the Schools of Environment, Architecture and Planning, Fine Arts, Engineering, and Business, as well as Anthropology, History and Law.

The previous custodians of the Map Room, the School of Environment subject librarians, maintained the print collection and developed visual aids to enhance discoverability of maps and charts. The cataloguing effort continued, but remained limited with less than 10% of the collection captured, mainly maps of New Zealand and the South Pacific.

In 2012, the GIS and Geospatial Librarian was appointed, alongside the subject librarian, with the task of designing, managing and delivering a geospatial data and geographic information service. This resulted in consolidation of geospatial information distributed around the University into one repository and development of the web-based geospatial data guide to provide basic information about geospatial resources and databases available at the University.

These developments heralded a further restructure in the provision and management of cartographic resources at the University of Auckland. From 2015, the Curator of Cartographic and Geospatial Resources was appointed, combining the map custodianship role of the subject librarian with the GIS and geospatial librarian role.

The next steps in the collection development are to catalogue the balance of New Zealand and the Pacific print maps and charts, and development of a comprehensive web portal that provides multifaceted access to digital cartographic and geospatial resources. It is anticipated that the print collection will continue to be used alongside the digital one, at least for the near future. The challenge is to provide integrated location-centred access to print and digital resources to enable all resources to be used to their full potential.

Since 2010, the Library, in partnership with the National Library of New Zealand, has been involved in a significant government maps and charts digitisation programme. So far, over 16,000 maps and charts have been scanned at archival quality and made available to the University community of users and the general public. The purpose of the programme is to augment a repository of authoritative cartographic and geospatial resources to support knowledge building and dissemination concerning New Zealand's physical and social environment. These resources are not only to provide a reference, but also to support a dynamic, innovative and leading edge historical and geographical information science research.

The programme supports the national digital preservation effort and contributes significantly to building and informing about New Zealand mapping heritage. It showcases the conceptual developments in cartography, surveying, photogrammetry and other mapping, earth and social science disciplines, and highlights their contribution to the development of the nation.

### Auckland War Memorial Museum Library

[www.aucklandmuseum.com](http://www.aucklandmuseum.com)

Since the last report to the ICA (2007-2011), the Museum has undergone an IT overhaul to reform and upgrade its digital content platform, and collection management systems, to cope with higher user demands expected in the future. The update responds to two challenges: providing online access to the public collections catalogue available as one encyclopaedic collection with a single search interface, and, enabling direct access to live public collections catalogue as Linked Open Data. This was successfully launched in May 2015.

The online visibility of the map collection has steadily increased, along with more cartographic

items being digitised; not just from the sheet map collection, but interesting, unique or pertinent cartographic material bound into books or from other paper-based collections. The First World War commemorative period has allowed contemporary maps and plans to come to the fore, being in high demand for viewing, exhibitions, and requests for digital data; surrogate copies were made for handling purposes in the Reading Room.

In terms of physical care, the map collection is now almost exclusively held in horizontal plan chests as all the vertical hardware has been replaced. This has permitted rationalisation of the 20th century sheet maps, and prompted collaboration with cartographic colleagues at the University of Auckland School of Environment and the Alexander Turnbull Library joint project working on the digitization of historic Department of Lands & Survey maps series.

Conservation and preservation of large flat-sheet items is routinely applied before the digitising process; assessments are based on the intrinsic value and cartographic relevance of the item, with priority given to maps and plans of Auckland (city and province), items destined for exhibition, scarce items, and those that have reproduction value.

The Museum Library Reading Room is open to the public 6 days a week, and encourages researchers to explore Collections Online before making a visit.

### **Auckland Central City Library** *[www.aucklandlibraries.govt.nz](http://www.aucklandlibraries.govt.nz)*

The map collection in Sir George Grey Special Collections, at Auckland Central City Library, consists of approximately 8000 items. This collection contains significant maps from throughout New Zealand, from the 1830s onwards. These are hydrographic charts, street maps, topographic maps (including maps in series), scientific maps, aerial maps, architectural plans, cadastral maps, tourist maps and early real estate maps. Some of the maps are unique manuscripts, or have manuscript annotations. Maps found in books in the printed book collections, the British Parliamentary Papers, and in the general manuscript collections are catalogued as part of this collection. The Church map collection consists of land auction maps from the 1860s to the early years of the 20th century. Most are for land sales in the Auckland region.

The library bought the collection from the bookseller George Church in 1916. For the period from the 1950s to the present day collecting has focussed primarily on comprehensive coverage of Auckland and the old Auckland Province area.

Additions are made through purchase, often at auction, donation, and transfer from the general collections of outdated editions.

The map collection also includes some world, Pacific region and Australian maps, including atlases, nineteenth century and World War I battlefield maps. There are also maps bound within books in the pre-1800 printed collection. Most of the nineteenth century world and Australian maps come from the donation of Sir George Grey. Additions to this part of the collection are mostly through donation.

About 1500 maps have been digitised and are accessible via Auckland Libraries' Heritage Images database. A project is underway to have all the map records, including records without digitised images, accessible via Heritage Images. Current digitisation work has focussed on Auckland aerial photograph maps, architectural plans and New Zealand tourist maps. Sir George Grey Special Collections is on the second floor of the Auckland Central City Library and is open to the public six days a week.

### **University of Waikato Library** *[www.waikato.ac.nz/library](http://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 part of the collection of the New Zealand Geographical Society, which formed the backbone of the subsequent collection. It is looked after by a Map Librarian. The collection is available during normal opening hours of the Library

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.

Like in many other parts of the library operation, direct usage of material has fallen. Online provision of resources has resulted in far fewer actual visitors to the collection. A very limited budget (plus the fact that we no longer receive any maps as a depository library) means we have to be far more selective when purchasing new material - purchasing a set of new local aerial photographs quickly eats up that budget.

### Alexander Turnbull Library Cartographic Collection

[www.natlib.govt.nz/at/](http://www.natlib.govt.nz/at/)

Alexander Horsburgh Turnbull's (1868-1918) own collection of early maps of New Zealand by settlers, sailors, missionaries and government surveyors was the foundation of the library's Cartographic Collection in 1920. In 1972, when the Alexander Turnbull Library as part of the National Library gained legal deposit status, there were about 11,000 items in the Cartographic Collection. The collection now has over 60,000 items and continues to grow through legal deposit, purchase and donation.

Since 2009, the library has undertaken several projects to provide better collection management of and client access to cartographic materials. Firstly, a project to describe fully in separate catalogue records individually titled maps and atlases in the collection is almost complete. Secondly, all atlases and folded maps were rehoused into sleeves or bookfolders to better protect items and to ensure a better standard of labelling of individual items. Thirdly, in partnership with University of Auckland Library and School of Environment, Land Information NZ, the library has been digitising and cataloguing NZ Government produced cartographic materials. Approximately 3/4 of these images are now available through the library and University of Auckland websites.

At end of 2015, two exhibitions on cartography will be on display. From October 2015, a year-long exhibition entitled "Unfolding the map: the cartography of NZ" will be on display in the main exhibition gallery of the National Library. Roger Smith, Director of Geographx in Wellington, is curating the exhibition and is using maps and atlases from the library's Cartographic Collection to showcase the development of NZ cartography. Between December 2015 - March 2016, in the

library reading room gallery a smaller exhibition called "Measured works" will explore the beginnings of the city of Wellington through the maps, plans, artworks and writings of early surveyors.

### University of Otago Hocken Collections

[www.otago.ac.nz/library/hocken/](http://www.otago.ac.nz/library/hocken/)

The map collection includes maps, hydrographic charts, aerial photographs, atlases and reference material related to cartography, including books and periodicals. There are approximately 13,000 items in the map collection built up from Dr Hockens' original collection of less than 80 items. Maps are also found in other collections in the library including the book collection, official publications, photographs and archives collections.

Material in the collection ranges from 17th century to present day. Early maps in the collection give a world view, but the bulk of the collection, from early 19th century onwards, focuses on New Zealand, the South Pacific and Antarctica. The collection is particularly strong on coverage of Otago and Southland. Approximately 80% of the maps in the collection can be found in the publications catalogue.

The library, which is part of the University of Otago Library system but also open to the public, is located in Anzac Avenue, Dunedin. Maps can be viewed in the Special Reading Room of the library. Copying of maps from the collection is at the discretion of the curator or reference desk staff. The Map curator works weekday mornings.

## 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 The Map Shop (Wellington), MapWorld (Christchurch) and Map and Chart Shop in Hamilton.

## MapWorld

[www.mapworld.co.nz](http://www.mapworld.co.nz)

MapWorld has been in existence since 1997 selling maps and all sorts of map related products to Christchurch, New Zealand and the world. MapWorld is New Zealand's largest map retailer, and even though the events of February, 2011, left us without a place of business or any stock, we've managed to reestablish ourselves.

The maps that still sell the best are the New Zealand topographic maps. If I had even 20 cents for every time someone complains about the way in which the maps are divided up which leads to their needing multiple maps, I would be very wealthy. Topo50 maps are most popular in the summer, and around long holiday breaks like Easter.

When the discussions were taking place about the switch to GeoDatum2000, there was much talk about the Topo50 maps only being printed for emergency services and the armed forces. In my opinion, there is still a need for these maps to be printed and made available to the New Zealand public. Although there's been a slight decline in the number of topographic maps we've sold since 2010 (which was the peak because people were replacing their NZMG maps with NZTM maps), the number has remained constant since then.

I do notice however, that people under 30 are not as keen to purchase maps. They seem to think that the maps on their smart phones will suffice. They do not understand the importance of the "big picture" from a full sized map.

Maps of countries other than New Zealand are still very popular. During the New Zealand winter, we sell many maps for all parts of Europe and North America, as well as Australia. Customers still ask for and expect us to carry in stock, topographic maps for all sorts of parts of the world and seem surprised when we don't carry their requirements in stock. This week I've been asked for 1:50,000 scale maps of the Atlas mountains in Morocco. And of course, they are always needed by next week.

Digital mapping of New Zealand's topomaps is also still very popular. There's nothing quite like being able to plan your trip on the computer, add comments to the map, and then print it off to take with you.

We sell Garmin GPS, and all varieties are very popular, but the outdoor ones in particular with mapping are most popular. The in-car GPS are not

as popular as they once were because everyone with a smart phone can have this information on their phones.

MapWorld is the only store in New Zealand selling a large selection of high quality globes. They are popular all year round, but especially in December as gifts for the festive season. There are a couple of other businesses in New Zealand who sell a few globes.

## 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), Mark Bagnall (Alexander Turnbull Library), James Barringer (Landcare Research New Zealand), Zoe Colling (Auckland Central City Library), Michelle Cooper (GroupEAD / Airways), Karen Craw (University of Otago), Mairead de Roiste (Victoria University of Wellington), Igor Drecki (New Zealand Cartographic Society and University of Auckland), Murray Ford (University of Auckland), Jay Gao (University of Auckland), Jane Handley (CoreLogic NZ Ltd), Karl Majorhazi (Statistics New Zealand), Antoni Moore (University of Otago), Lesley Murphy (Geospatial Intelligence New Zealand), Helen Neil (National Institute of Water and Atmospheric Research), Madeleine Rainer (MapWorld), Femke Reitsma (University of Canterbury), Brent Robertson (Land Information New Zealand), John Robson (University of Waikato), Julie Senior (Auckland War Memorial Museum), Kerrin Sime (Auckland Council), Roger Smith (Geographx NZ Ltd), Belinda Smith Lyttle (GNS Science) and Martin Woods (Australian and New Zealand Map Society).