Toitu te whenua
Land Information
New Zealand

# Ross Sea Region: Strategy

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# 1 Context

## 1.1 Vision

LINZ will provide quality geospatial information that contributes to New Zealand's stewardship of the Ross Sea Region of Antarctica.

## 1.2 New Zealand's role

### 1.2.1 Background

Antarctica dominates the higher latitudes of the Southern Hemisphere—surrounded by the Southern Ocean, dominated by glacial ice, with unique landscapes and extreme conditions. The Ross Sea Region is one of the most important areas of Antarctica and a leading gateway to the continent. It has features unique on the continent: the greatest percentage of ice-free terrain, a vast sea extending to 85º South, active volcanoes, the longest Antarctic river, pristine freshwater lakes, a diversity of flora and fauna, and the largest ice shelf on earth.

The region covers the area bounded by and including the Siple and Shirase Coasts in the east and the Trans-Antarctic Mountains in the west, as far south as the South Pole.

### 1.2.2 New Zealand's interest in the Ross Sea Region

The New Zealand Government has maintained a long-term commitment to, and strategic interest in, the Ross Sea Region since the first British exploration in 1839 by Sir James Clark Ross. Maintaining a credible presence and research programme in the region demonstrates a commitment to the stewardship of the continent, and to meeting New Zealand's obligations under the Antarctic Treaty of 1959.

The Government's revised Statement of Strategic Interest released in 2002 is as follows:

"New Zealand is committed to conservation of the intrinsic and wilderness values of Antarctica and the Southern Ocean, for the benefit of the world community and for present and future generations of New Zealanders. This will be reflected in active and responsible stewardship, under the Antarctic Treaty System, that promotes New Zealand's interests in:

- National and international peace and security through a commitment to keeping Antarctica peaceful, nuclear free, and its environment protected;
- Continued influence in Antarctic governance through maintaining an effective role in the Antarctic Treaty System, and maintaining its long term interest and credible presence in, and commitment to, the Ross Dependency;
- Conserving, protecting, and understanding the biodiversity of Antarctica and the Southern Ocean, in particular the biodiversity of the Ross Sea region, including promotion, protection and management of representative special areas, and enhancing biosecurity;
- Conservation and sustainable management of the marine living resources of the Southern Ocean, and in particular the Ross Sea, in accordance with CCAMLR and the Antarctica Environmental Protocol, and within this context supporting strong environmental standards and sustainable economic benefits;
- Supporting and where appropriate leading, high quality Antarctic and Southern Ocean science that benefits from the unique research opportunities provided by Antarctica;
- Demonstrating and advocating for best practice in environmental stewardship and all other activities throughout Antarctica, and in particular the Ross Sea region;

- Ensuring that all activity is undertaken in a manner consistent with Antarctica's status as a natural reserve devoted to peace and science."

### 1.2.3 Legal framework

By an Order-in-Council in 1923, Great Britain formally claimed a sector encompassing the Ross Dependency and placed it under the administration of New Zealand. Now, an independent State, New Zealand claims the Ross Dependency, defined as all islands and territories below latitude 60ºS and between longitude 160ºE and 150ºW, for itself.

New Zealand's activities and involvement in Antarctica occur within a framework of international agreements and through a system of governance known as the Antarctic Treaty System. The Antarctic Treaty of 1959 involved 12 original signatory nations, including New Zealand, who agreed to:

- set to one side disputes over territorial sovereignty
- demilitarise Antarctica
- promote scientific co-operation

Today the Treaty has 27 Consultative Parties and over 20 further signatories, and has been joined by further significant agreements and hundreds of legally binding decisions at the annual Antarctic Treaty Consultative Meetings. The Treaty system has provided a stable, secure and peaceful regime for international co-operation in all areas of activity in Antarctica. As one of the original Treaty signatory nations, New Zealand has always played an active role in the international management of Antarctica.

New Zealand ratified the Treaty in the Antarctica Act 1960, and the Protocol on Environmental Protection to the Antarctic Treaty in the Antarctica (Environmental Protection) Act 1994.

## 1.3 LINZ's role

Land Information New Zealand and its predecessor agencies (the Department of Lands & Survey until 1987 and the Department of Survey and Land Information until 1996) have operated surveying, charting and mapping programmes in the Ross Sea Region, as well as place naming administration, for some 30 years. Over the earlier years the activity was mainly focused on field survey work in support of specific science programmes. The department entered into an arrangement with the United States Geological Survey, which provided for co-operation in these activities and in particular joint topographic mapping and place naming programmes. In more recent years the survey programme has moved away from the support of individual science programmes to the provision of a multi-purpose geodetic referencing system. The topographic mapping programme also moved away from the production of printed maps to the provision of digital topographic information. Place naming supports a range of activities in the Ross Sea Region.

LINZ is responsible for maintaining and delivering the Government's land and seabed information; the Ross Sea Region falls within this mandate. LINZ geodetic survey, place naming, topographic maps and hydrographic charts collectively provide key elements of a spatial infrastructure for the Ross Sea Region. The infrastructure provides spatial referencing for the New Zealand Antarctic Programme, for needs including science, environmental protection, safety, rescue, navigation, and monitoring global change.

The spatial infrastructure developed and maintained by LINZ facilitates the Government's activities in and around Antarctica that contribute to New Zealand's stewardship of the Ross Sea Region. Accordingly, LINZ functions make a direct contribution to that stewardship and support the Government's responsibilities in Antarctica.

## 1.4 Constraints

Antarctica's remoteness and extreme environment result in a number of major operational constraints, which impact on the implementation of work programmes. These include:

- Limited time frame to carry out work programmes, being largely restricted to the summer field season;
- Long supply lines demanding detailed logistical planning in co-operation with other agencies; and
- Long lead-in times for organising international collaboration

# 2 LINZ Strategy

LINZ supports New Zealand's and other nations' activities in the Ross Sea Region by:

- collaborating with other national and international agencies
- managing a geodetic reference system
- managing place naming
- providing topographic and hydrographic digital data, maps and charts
- providing geospatial standards and advice

## 2.1 Collective interagency efficiency

### 2.1.1 Background

Antarctica has long been a focus for international collaboration, co-operation and research. The continent's dedication as a natural reserve devoted to peace and science has made this possible. Collaboration occurs in all areas of science, research, logistics and support. Resources and information are shared, and data are freely available to all nations operating in the Ross Sea Region. Collaboration enhances New Zealand's ability to undertake work in the Ross Sea Region and raises the profile and effectiveness of New Zealand's Antarctic activity. New Zealand would be unable to undertake the current level of activities without the benefits of shared costs and resources, and access to expertise, new technology, and logistical support.

As a member of the international community, LINZ collaborates with other agencies through nation-to-nation co-operation, involvement in the Scientific Committee on Antarctic Research, membership of the International Hydrographic Organisation, and participation in various working groups. It co-operates on specific projects with bodies such as United States Geological Survey (USGS). Place naming also involves nation-to-nation co-operation such as with the United States Board of Geographic Names (USBGN) and the Advisory Committee on Antarctic Names (ACAN).

As a member of the New Zealand Antarctic community, LINZ co-operates closely with the Ministry for Foreign Affairs and Trade, Antarctica New Zealand, the Royal Society of New Zealand, Crown Research Institutes, and the Universities of Auckland, Waikato, Victoria University of Wellington, and Canterbury.

Three nations operate permanent Antarctic research programmes in the Ross Sea Region: New Zealand, the United States and Italy. These nations operate large stations to house and support scientists and other staff. The Italians are based at Terra Nova Bay. The Americans and New Zealanders are situated in close proximity on Hut Point Peninsula, at McMurdo Station and Scott Base respectively.

### 2.1.2 New Zealand Antarctic Programme

The Commonwealth Trans Antarctic Expedition in 1957 and the International Geophysical Year (1957/58) provided the impetus for the initiation of the New Zealand Antarctic Programme. Built in 1957, Scott Base became the permanent base for the New Zealand Antarctic programme from the 1959/60 summer season. In addition to operating a science programme, New Zealand has played a leading role in the international stewardship of Antarctica and in Antarctic Treaty initiatives.

The Government agency which manages Scott Base and most of the New Zealand's Government-supported activities in Antarctica is Antarctica New Zealand. Antarctica New Zealand was set up by the New Zealand Antarctic Institute Act 1996, with its functions being:

- To develop, manage, and execute New Zealand activities in respect of Antarctica and the Southern Ocean, in particular in the Ross Dependency:
- To maintain and enhance the quality of New Zealand Antarctic scientific research:
- To co-operate with other institutions and organisations both within and outside New Zealand having objectives similar to those of the Institute.

Antarctica New Zealand is able to provide logistical support for LINZ activities in the Ross Sea region and coordination with the New Zealand Antarctic scientific and support community.

### 2.1.3 United States Antarctic Programme Collaboration

New Zealand's Antarctic activities are closely associated with those of the United States Antarctic Program (USAP). This relationship is fundamental to carrying out work in the Ross Sea Region. The United States and New Zealand operate joint logistical support, helicopter and aircraft pools, and collaborate extensively on and off the ice. An Arrangement, signed in 1999, sets out the long-established working relationship between the USGS and LINZ. This relationship covers mapping, charting, surveying, and place naming.

### 2.1.4 Italian Antarctic Programme Collaboration

The Italian research programme provides a permanent GPS tracking station and tide gauge at Terra Nova Bay, and undertakes precise GPS and other geodetic measurements as part of their scientific programme. Data from Italian projects and GPS network have been made freely available to LINZ for the datum project and to enhance the spatial referencing system. LINZ, and in particular its predecessor agencies, have at times had close working arrangements for specific projects.

### 2.1.5 Scientific Committee on Antarctic Research

The Scientific Committee on Antarctic Research (SCAR) is an interdisciplinary committee of the International Council of Science. SCAR is charged with initiation, promotion and co-ordination of scientific research in Antarctica and provides scientific advice to the Antarctic Treaty System. SCAR has a range of specialist scientific working groups including the Geospatial Information Group of Experts (GIG). The GIG was established to foster the spatial infrastructure required to support the needs of science. Although it has no official mandate, SCAR has taken on the task of collecting all nations' place names for the whole of Antarctica and publishing them in the SCAR Composite Gazetteer of Antarctica.

## 2.2 Geodetic survey information

The limited number of physical and manmade reference landmarks in Antarctica, and the large areas covered by ice and snow, mean navigation, positioning and monitoring global change are very dependent on accurate spatial referencing. The Spatial Reference System provides the ability to determine spatial location accurately in 3 dimensions and enables spatial information about the continent's land, ice and resources and their changes, to be made compatible.

The SCAR-GIG co-ordinates geodetic activities in Antarctica, with a major objective of developing an Antarctica-wide geodetic network of control marks. New Zealand is an active contributor to this programme. SCAR's geodesy goals are to:

- provide a common geographic reference system for all Antarctic scientists, administrators and operators;
- contribute to global geodesy for the study of the earth's physical processes and maintenance of the present terrestrial reference frame; and

- provide information for monitoring the Antarctic's horizontal and vertical motion

In addition to SCAR requirements, there are significant efficiency gains from providing a uniform common survey infrastructure for Antarctica. Future New Zealand requirements include providing a spatial infrastructure for the Ross Sea Region that will support:

- topographic mapping and hydrographic charting;
- reference systems for definition of sites requiring special protection and management;
- the ability to spatially align different datasets in geographic information systems; and
- safety, rescue, environmental protection, navigation, change monitoring and science.

To provide a uniform infrastructure that satisfies both national and international requirements, it has become necessary to update the current spatial network in the Ross Sea Region. Prior to 1996, geodetic activities had concentrated on supporting specific scientific programmes and the existing spatial infrastructure consisted of numerous and often unconnected datums.

In 2000, the Ross Sea Region Geodetic Datum 2000 (RSRGD2000) was implemented. This new datum is consistent with New Zealand Geodetic Datum 2000, meets SCAR requirements and is aligned to the International Terrestrial Reference System (ITRS). Work jointly carried out by USGS and LINZ provides data that extends this network. There are also opportunities to collaborate with other groups working in the region, such as the Italians.

## 2.3 Place name information

Place names are not only spatial reference points to identify, locate and describe where one is on the land, they are also important signposts of the influences and values of the people and countries that name them. There are many unnamed geographic and hydrographic features in the Ross Sea Region. New place names on topographic maps are generally provided by both New Zealand and the United States on a 50/50 share basis.

The process of accepting or rejecting New Zealand place names in the Ross Sea Region is administered by the New Zealand Geographic Board Ngä Pou Taunaha o Aotearoa (the Board). The Board recognises that place names should be the product of careful and informed decision making. It has developed policies and guidelines with input from Antarctica New Zealand, the Royal Society of New Zealand, international discussion, and recommendations from the Scientific Committee on Antarctic Research Geospatial Information Group of Experts (SCAR-GIG). The Board Secretary maintains a database of all official New Zealand place names in the Ross Sea Region.

Antarctica New Zealand encourages New Zealand scientists, other researchers and field support staff to submit place names of generally significant features that meet the Board's criteria, so they can be officially recognised. Submissions are made to the Board Secretary. On acceptance, the Board publishes the place names in the *New Zealand Gazette*, on the Internet, and eventually in the SCAR Composite Gazetteer (published every 2–3 years). The Board also notifies the Advisory Committee on Antarctic Names (ACAN) who makes recommendations to the United States Board of Geographic Names (USBGN) for comment. In carrying out its place naming activities in the Ross Sea Region, the Board reacts to proposals generally resulting from either new mapping activity or scientific research in specific areas.

## 2.4 Topographic and hydrographic information

The Ross Sea Region, as a leading gateway to the continent, has experienced increasing air, maritime and terrestrial traffic. This has increased demand for more accurate maps and charts that support:

- The constitutional framework for all New Zealanders;
- Safety of people operating in Antarctica and the Southern Ocean;
- Emergency services and search and rescue operations; and
- The needs of science and environmental protection

### 2.4.1 Topographic information

Digital topographic information is increasingly important in meeting the needs of users. It can be easily shared and promulgated between people and integrated into systems. LINZ maintains the Ross Sea Region Topographic Database, which contains vector data captured at a scale of 1:50,000 covering the Dry Valleys and Ross Island.

LINZ maintains a library of Antarctic aerial photographs and maps that includes:

- aerial photography supplied by USGS to support recent mapping projects in the Ross Sea Region;
- vertical photographs which supported field parties in the late 1950s and 1960s; and
- copies of the New Zealand and United States 1:250,000 scale topographic mapping series of the Ross Dependency and various other topographic and geological Antarctic maps at various scales, from New Zealand, United States, British Antarctic Survey and Australian Antarctic Division.

All copies of the 'Trimet' aerial photography supplied to Lands and Survey Department by USGS and US Navy US VX-6 Squadron were relocated to Antarctica New Zealand during the disestablishment of the Department of Survey and Land Information in 1996.

In looking at future New Zealand requirements, LINZ will continue to consult key stakeholders about extending Ross Sea Region digital topographic coverage and work to priorities that reflect concentrations of activity or interest.

### 2.4.2 Hydrographic information

New Zealand's area of hydrographic responsibility extends into the Southern Ocean and includes the Ross Sea Region of Antarctica. Its responsibility in the region is the provision of charting for safe navigation, search and rescue. As a member state of the International Hydrographic Organisation (IHO), New Zealand makes navigation hazard information that it holds readily available to all IHO members. LINZ is also a member of the IHO Antarctic Committee, which co-ordinates hydrographic activities in Antarctic waters.

LINZ's international chart folio includes small and large scale charting extending from Balleny Islands in the north to Ross Island in the south.

During 2001/02 LINZ carried out hydrographic surveys in the north Ross Sea Region in the area of Cape Adare, Cape Hallett, the Possession Islands and the Balleny Islands. These are the areas of more frequent maritime traffic, including research and commercial tourist vessels. The improved hydrographic information from these surveys will be used in compiling new charts to aid safe passage and landing, and will be added to the Raster Navigational Chart (RNC) portfolio, ***NZMariner,*** when they become available**.** LINZ intends to continue to look for joint opportunities to continue this work. Electronic Navigational Charts (ENC) for the Ross Sea Region may also be developed if there is a justified demand, eg for safety.

Prior to the 2001/02 survey, LINZ produced two international (INT) charts of the Southern Ocean and Ross Sea Region. These charts were compiled using IHO information shared among member countries.

## 2.5 Sea level information

There is considerable interest by the marine sciences community in the tidal behaviour and patterns in the Ross Sea and McMurdo Sound. In addition, sea level data is used for determining tidal models and sea level for hydrographic charting and geodetic heighting.

A tide gauge has successfully operated at Scott Base from 1957–1959, from 1988–1990 and since 2000, yielding some useful data on sea levels.

A permanent tide gauge has operated at Cape Roberts since 1990. The gauge was set up by Victoria University of Wellington (VUW) to monitor tide levels during the Cape Roberts Drilling Project. LINZ has contributed to the operation of the gauge, performing calibrations and maintenance work and connection to the geodetic network. This has provided a valuable, and possibly the longest, record of sea level and tidal monitoring in Antarctica. Operation of this site provides an important reference data set for developing tidal models and determining sea level for future hydrographic charting and geodetic heighting.

## 2.6 Continental shelf project

Pursuant to the United Nations Convention on the Law of the Sea, in order to establish the outer limits of its continental shelf beyond 200 nautical miles, New Zealand must submit particulars of such limits to the Commission on the Limits of the Continental Shelf before 13 May 2009. The rules of the Commission allow states to make partial submission when issues of delimitation of boundaries between states have not been resolved. The Ministry of Foreign Affairs and Trade is the lead agency for continental shelf boundary negotiations and for the presentation of New Zealand's continental shelf submission to the Commission. MFAT is working with other interested states to develop a means of dealing with the issue of maritime boundaries in Antarctica.

There are long lead times and limited windows of opportunity to undertake data acquisition in the Ross Sea Region. LINZ is waiting for specific direction from MFAT as to New Zealand's approach to submissions in respect of its Antarctic continental shelf. However, it may be prudent to consider options for collecting information for key baseline points critical to the determination for any maritime boundary. In cooperation with MFAT, LINZ will look to other nations that have undertaken equivalent work in Antarctica and seek to gain from their experience as appropriate.

# 3 Goals for realising the strategy

Effective information collection, management and dissemination are the prime factors in successfully realising the Ross Sea Region Strategy. The objective is to give all users easy access to authoritative land and seabed information for the region, at cost and at any time. Consistent with LINZ strategic goals to be authoritative, accessible and capable, LINZ will implement and maintain work programmes to achieve the following goals.

## 3.1 Collective interagency efficiency

Build and maintain the required working relationships to support co-operation and collaboration among agencies and nations, in a way that:

- Results in a consistent spatial infrastructure for the Ross Sea Region
- Promotes and facilitates sharing and exchange of data and expertise
- Enhances logistical support, resource deployment and management
- Makes effective use of Antarctic geospatial information working groups and forums

## 3.2 Geodetic survey information

Provide world class geodetic spatial referencing for the Ross Sea Region, in a way that:

- Extends the present geodetic network to support new mapping, charting, scientific and operational activity
- Gives a common reference system consistent with international standards for defining sites of high conservation or historic value
- Develops and implements programmes to tidy up old reference mark sites and rationalise field records
- Facilitates multi-purpose science use of spatial referencing technologies, for example to locate and study changes in ice shelf physics, ice sheet cover and sea level
- Relates the vertical component of GPS to sea level

## 3.3 Place name information

Ensure place names are assigned in the Ross Sea Region in a manner that reflects New Zealand activity and interest, in a way that:

- Is consistent with place naming conventions set by the NZGB and international guidelines
- Promotes authoritative, meaningful naming of significant features in areas where conservation or research projects are active
- Encourages New Zealand scientists, other researchers and field support staff to propose new place names that meet the Board's naming criteria
- Makes the New Zealand Antarctic Place Names Database easily and widely available, including via the web and to Antarctic-wide initiatives

## 3.4 Topographic and hydrographic information

Provide world class land and seabed information for the Ross Sea Region, in a way that:

- Maintains, enhances and expands coverage in accordance with the multipurpose requirements of the New Zealand Antarctic Programme
- Makes topographic and hydrographic information easily and widely accessible, including via the web
- Fulfils all international topographic and hydrographic responsibilities

## 3.5 Sea level information

Provide sea level information to support geodetic, hydrographic and scientific activities in the Ross Sea Region, in a way that:

- enables an accurate vertical datum in respect to sea level to be developed and monitored
- enables tidal information to be derived and used in the process of Hydrographic Charting