

LINZ Geodetic Strategy

2003-2008



April

2003

Foreword

I am pleased to present the Land Information New Zealand 2003-2008 Geodetic Strategy. This strategy builds on the previous Geodetic Strategic Business Plan released in 1998, which focused on the development of the geodetic system to meet cadastral survey and **Landonline** requirements.

This revised strategy reflects a process of transition and the successful implementation of the **Landonline** survey and title automation project. It builds on the government's achievements of transforming a geodetic system developed and maintained over the past 150 years, to become more flexible and responsive in addressing the challenges and opportunities of the 21st Century.

The information age is about society making greater use of information and knowledge. An important component of information is the spatial relationship between places, resources and people at local, national and global levels. Collecting and managing data within a consistent spatial framework improves decision making, facilitates land settlement and enables the monitoring and analysis of changes in land use. We are seeing the emergence of a seamless geodetic cadastre, providing the accurate spatial representation of land and seabed rights and restrictions. This will increase the uses and users of cadastral spatial data for better management of land, the seabed and utilities within the environment.

The geodetic system includes the national survey control system. It is the spatial infrastructure that enables New Zealanders to acquire, manage, disseminate and exchange information about the location of our land and seabed and their resources. The geodetic system makes a sustained infrastructural contribution to economic and social growth and development, with benefits accruing and emerging over very long time-spans.

We are seeing rapid changes in technology, which are making positioning an everyday accessible capability. These changes, coupled with the rapidly growing use and exchange of spatial information, place greater reliance on the importance of a consistent and comprehensive geodetic framework to allow the location and correlation of all resources and facilities. Spatial positioning is becoming integral to a wide range of sectors in the New Zealand economy, recreational markets and everyday use.

This plan reflects LINZ's understanding of New Zealand's growing dependence on spatial information and the consequent recognition of the importance of providing a modern geo-spatial reference system. It is important that it meets user needs and is one that users can contribute to, now and in the future. With this plan, we are embarking on an exciting future by adopting new technologies, implementing new systems, and creating new ways of accomplishing our mission and goals.



Tony Bevin

Surveyor-General

Introduction

This revised Geodetic Strategy for 2003-2008 reflects Government's commitment to provide and maintain a modern geodetic system for New Zealand. Behind us we have seven years as LINZ and we have successfully completed the implementation of a geodetic system that supports and underpins the New Zealand cadastral survey system and **Landonline**¹, and topographic mapping and hydrographic charting. LINZ is now implementing its *Virtual Agency (eLINZ) Strategy* which will contribute towards the Government's vision that New Zealand will become a world leader in e-Government. This strategy ensures the geodetic system will meet the eGovernment Interoperability Framework (*eGIF*) standards to ensure interoperability of systems and services. This provides the ability for government organisations to share information and integrate information and business processes by use of common standards and a common geo-spatial reference system.



A modern geodetic system, including the national survey control system, which is authoritative and accessible to all New Zealanders, is a key component of the *Virtual Agency (eLINZ) Strategy*. LINZ plans to work closely with its stakeholders and customers to develop a geodetic system that will make real the possibilities of exciting new location based technologies. This will dramatically enhance our everyday lives and economic, environmental and social growth of our community. In implementing this strategy, we will ensure that while technological changes should not disadvantage users without the resources to use the system, they should also provide an advantage to those that move with the technology.



¹ **Landonline** is a system designed to manage survey and title transactions and associated data, including the geodetic database.

Why have a geodetic system?

Imagine a world with continual disputes over the location of property boundaries, of storm water and sewage services not draining, of tunnels and bridges not meeting in the middle, of ships running aground, and of planes landing next to, rather than at, airports. This is just a glimpse of what our lives would be like without a geodetic system.



Since the dawn of civilisation, people have found it necessary to measure and map their domain. During very early times this concern was limited to the immediate vicinity of their home; later it expanded to the distance of markets; and finally, with the development of means of transportation and communication people became interested in the whole world. Much of this early 'world interest' was demonstrated by speculation concerning the size, shape, and composition of the Earth.

Geodesy is the science of measuring the shape and size of the earth and precisely locating points on the surface of the Earth. As our society and economy has become increasingly dependent on complex technologies and the careful management of the space we live in, the need for precise positioning and consistent, reliable spatial data intensifies. The use of a modern geodetic system means that everything can be mapped in terms of its true position on the surface of the Earth.



As we move to a world where new technologies allow us to rapidly determine the accurate position of features and points we are developing the concept of everything 'geodetic', that is the development of a seamless survey accurate cadastre (geodetic cadastre) and all spatial datasets in terms of a common geodetic system. For a country such as New Zealand subject to the effects of ground movements due to earthquakes and volcanoes, and plate tectonics movements, the ability to survey and record these movements to maintain accuracy of the geodetic system is an important task. The New Zealand geodetic system includes the national survey control system of permanent ground reference points and the associated intellectual and positional data that enables us to ensure all data about land, resources, and location is managed in a systematic and orderly manner.

LINZ recognises and acknowledges the growing dependency on knowing the spatial component of information and that the geodetic system needs to adapt accordingly to meet changing user requirements.

LINZ's mandate to provide a geodetic system

A national geodetic system, and its associated national survey control system, are fundamental components of a nation's infrastructure. The unique property of the geodetic system is its ability to integrate multiple geographically dependent data sources into a single geographic reference frame. This forms the underlying spatial infrastructure to enable LINZ meet its outcomes and statutory requirements under the Cadastral Survey Act 2002.

The primary mandate for a geodetic system comes from the Cadastral Survey Act 2002 that has a key purpose:

'to provide for a national geodetic system and a national survey control system to be maintained'.

As a consequence of this purpose, the functions and duties of the Surveyor-General include:

'to maintain a national geodetic system; and to maintain a national survey control system.'

The Act also provides the following definitions:

geodetic system means a system that enables positions on the surface of the Earth to be determined by reference to a mathematical model that describes the size and shape of the Earth.

national survey control system means a system used to determine the position of points, features, and boundaries in cadastral surveys, other surveys, and land information systems.

The Cadastral Survey Act includes interests and tenures over land and marine areas.

In this document the key components of the **geodetic system** are defined as:

- network design and physical marks
- data comprising survey data and associated information
- intellectual information (business rules, standards, defining parameters and associated constants).

Examples of this are:

- geodetic datum(s)
 - vertical datum(s)
 - map projections
 - transformations between datums and/or projections
 - geoid model
- a legislative requirement.

The **national survey control system** is the physical representation of the geodetic system in New Zealand. It includes the physical marks and the associated positional data that enables spatial users to connect their information to it.

Vision, mission, and strategic direction

The geodetic system will provide the authoritative spatial reference system to enable the accurate measurement and location of features in the physical world and ensure that diverse spatial datasets can be accurately correlated and compared within a consistent framework.

Vision

LINZ will provide a 'world class' geodetic system that underpins New Zealand's economic, environmental and social development.

Mission

The geodetic system will meet New Zealand's land and seabed information needs by providing an accurate modern spatial reference system that is:

- **authoritative**
- **accessible**
- **delivered efficiently and effectively.**



The geodetic strategic direction

The geodetic strategic direction is consistent with the LINZ vision statement *'we will provide world-class land and seabed information services that will:*

- *Ensure the security of New Zealand land rights and interests*
- *Enable the people of New Zealand to fully enjoy the benefits of our land and seabed resources*
- *Meet (and often exceed) the expectations of the Government and customers.'*

This strategic direction contributes towards LINZ achieving key goals and the specific outcomes required by Government, and also the needs of our stakeholders, customers and all New Zealanders.

Our strategic goals for the next five years are aimed at developing and maintaining an accurate and authoritative geodetic system for all New Zealanders. The goals are also aimed at enhancing our capability to meet the tasks the Government requires of us, and implementing the Virtual Agency strategy to improve access and delivery of geodetic information.

Our three goals are:

Authoritative LINZ

Goal: Provide and maintain an accurate, authoritative geodetic system for New Zealand that meets Government and user needs.

Accessible LINZ

Goal: Enable all users to efficiently and effectively access the authoritative geodetic physical network, data and intellectual information at the cost of dissemination and at any time for any application.

Capable LINZ

Goal: LINZ has skilled, knowledgeable and adaptable people, and robust management systems necessary to meet Government and user expectations for the provision of a world class geodetic system.

1. Authoritative LINZ - provide and maintain an accurate, authoritative geodetic system for New Zealand that meets Government and user needs.

We will provide and maintain a geodetic system that is the authoritative spatial referencing (locational) system for New Zealand. Spatial identification and referencing of legal and administrative features, rights and interests will be provided by the land and seabed cadastre and physical spatial referencing by topographic and hydrographic databases.

We will develop the national survey control system that will enable the development of a seamless geodetic cadastre and the ability to locate all features and points in terms of this framework. This spatial framework will allow the definition of land rights, and changes in land use and settlement to be recorded accurately with the ability to monitor the effects and over time. It will support topographic mapping and hydrographic charting.

To maintain the spatial accuracy of the geodetic system we will monitor and analyse the effects of crustal dynamics (horizontal and vertical deformation) to ensure that the spatial integrity of the geodetic system does not degrade with time.

We will be innovative and look towards new technologies and international developments to ensure that we follow best practice and provide an authoritative world class geodetic system that meets changing user needs and demands, and accommodates various technologies.



Our geodetic system will:

- Provide a modern authoritative national survey control system through the realisation of **New Zealand Geodetic Datum 2000 (NZGD2000) and Ross Sea Region Geodetic Datum 2000 (RSRGD2000)**.
- Provide a modern authoritative integrated **national vertical reference system** for New Zealand.
- Enhance and strengthen the alignment between the geodetic and cadastral systems through the concept of a **geodetic cadastre** and its extension to cover the seabed.
- Manage the effects of **geodynamics** on NZGD2000 control stations to ensure their spatial accuracy is maintained.
- Comply with **international best practice** policy, standards and techniques.

2. Accessible LINZ - Enable all users to efficiently and effectively access the authoritative geodetic physical network, data and intellectual information at the cost of dissemination and at any time for any application.



We will make the geodetic system, including the physical network, data, and intellectual information, more readily available and accessible to users.

We will develop new ideas and improve the management, technical development, and delivery of the geodetic system to ensure that it continues to meet existing, new and developing user needs and requirements.

We will enable all users to efficiently and effectively access the geodetic physical network and data.

We will look to improve the communication with our users to ensure that their needs are met.

To enable access to the geodetic system we will:

- Develop and maintain an appropriate **network of marks in the ground** as a method for users to access the Geodetic System.
- Enhance the **active control network** to allow on-line processing of data and near real time access to data.
- Provide **access to geodetic data** in accordance with the *LINZ Virtual Agency (eLINZ) Strategy*, eGovernment principles and eGIF standards.
- Communicate with the **spatial data user community** to ensure that they understand, use, and gain benefit from the geodetic system.



3. Capable LINZ - LINZ has skilled, knowledgeable and adaptable people, and robust management systems necessary to meet Government and user expectations for the provision of a world class geodetic system.

The development and maintenance of an authoritative, accessible geodetic system depends on the skill, quality, commitment and attitude of those working for LINZ, including geodetic providers.

We will train our staff and promote adaptability, flexibility and inter-disciplinary teamwork.

We will work with our contractors and providers to ensure that they fully understand our requirements and deliver quality work that meets our needs.

Where appropriate, we will enter into strategic alliances and partnerships to maintain and develop geodetic skills to the benefit of all parties.



We will enhance our capability to:

- Ensure the availability of the **skills and resources** necessary to provide a World Class Geodetic System.
- **Respond to changing needs** and the working environment of users of the geodetic system.
- Enter into local and international **strategic alliances and partnerships** to develop, maintain and evolve the Geodetic System.
- Provide **leadership** in the development and application of geodesy and precise positioning.





OUR FIVE YEAR PLAN

Goals and strategies 2003–2008

The strategies described here are achieved by a combination of ongoing tasks required to maintain the system and its standards, as well as indicative projects directed at implementing new standards and systems to meet emerging needs and to find more efficient means of maintaining the geodetic system. In practice some of these projects and tasks will be combined or integrated. Funding of some of the indicative projects will be subject to decisions made as part of the LINZ strategic budget approval process.

Authoritative LINZ

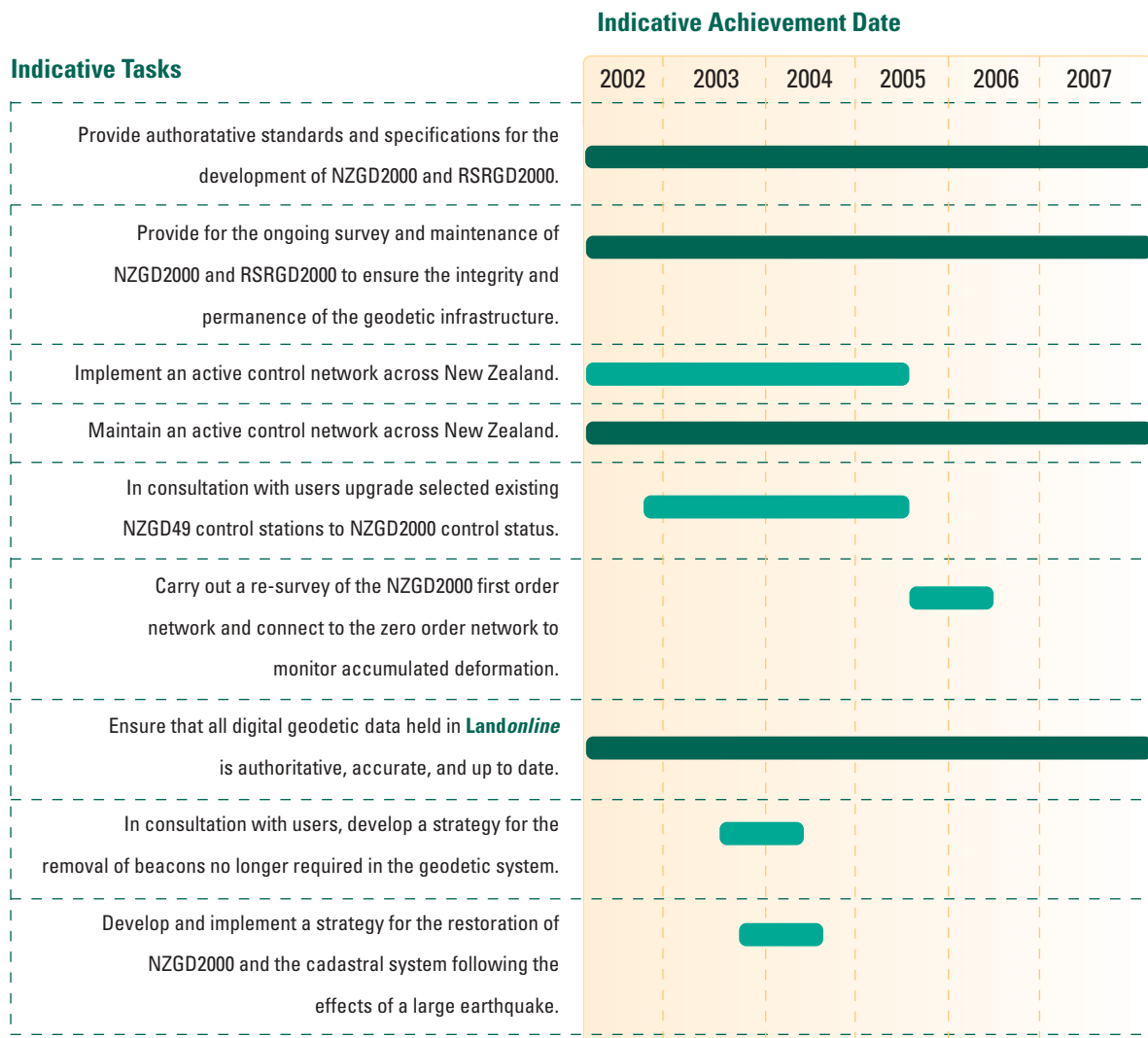
Goal: Provide and maintain an accurate, authoritative geodetic system for New Zealand that meets Government and user needs.

Strategy one:

- Provide and maintain a modern authoritative national survey control system through the realisation of **New Zealand Geodetic Datum 2000 (NZGD2000) and Ross Sea Region Geodetic Datum 2000 (RSRGD2000)**. This strategy will see the continued development and maintenance of NZGD2000 and RSRGD2000 as the national survey control system in New Zealand and the Ross Sea Region of Antarctica.

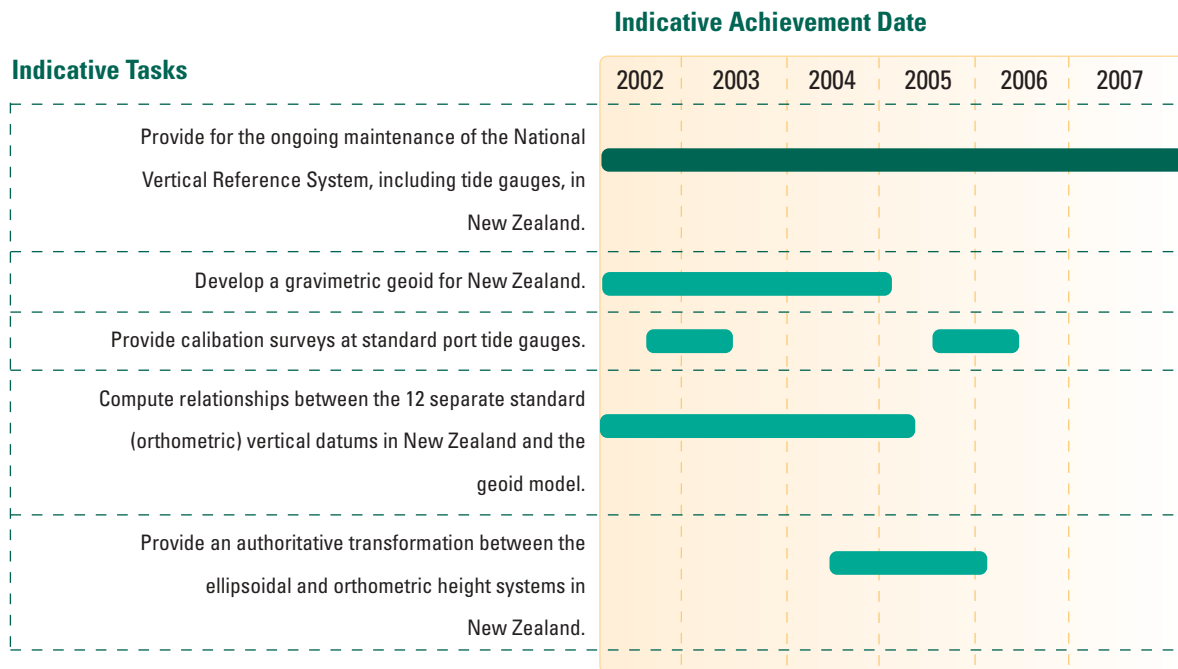
 Ongoing task

 Project task



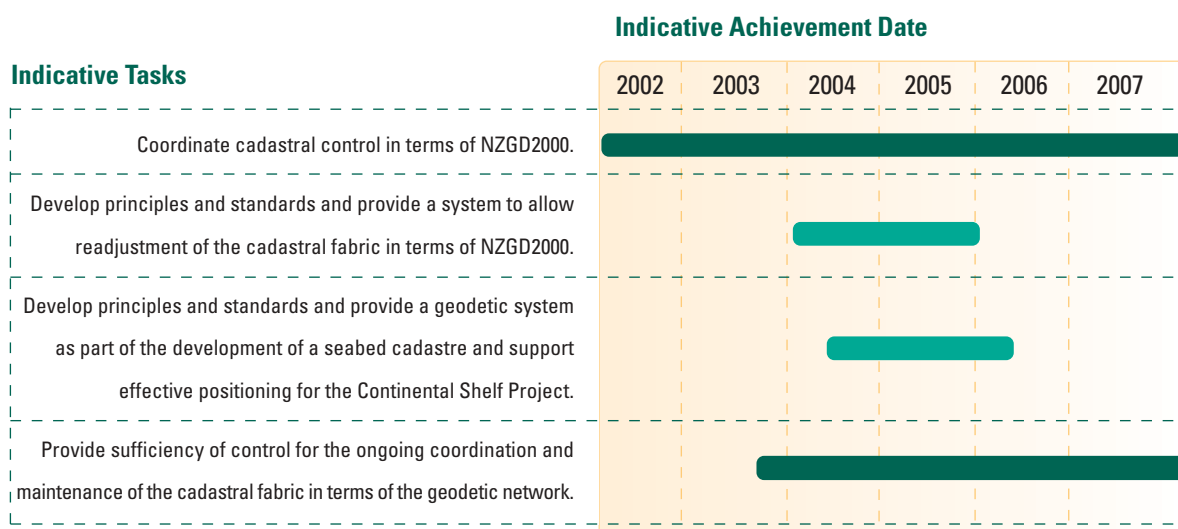
Strategy two:

- Provide a modern authoritative integrated **national vertical reference system** for New Zealand. This strategy will focus on the development of a national gravimetric geoid for New Zealand and integration of the 12 separate standard vertical datums in New Zealand to enable more efficient use of new technologies while still ensuring the maintenance of the current system.



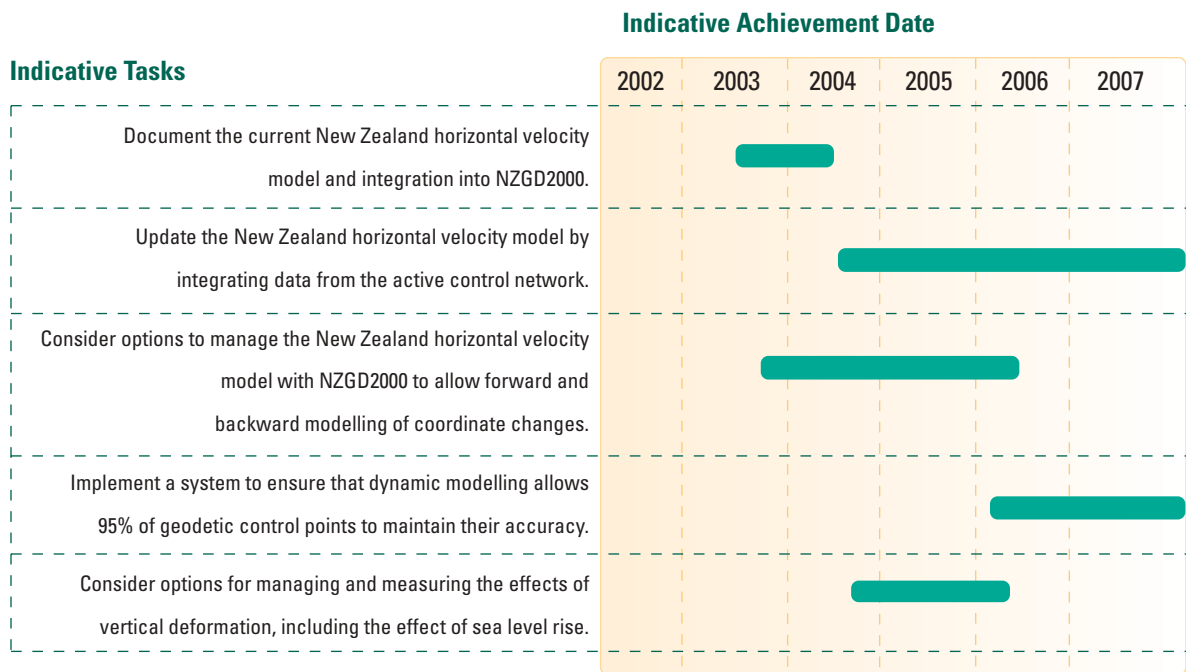
Strategy three:

- Enhance and strengthen the alignment between the geodetic and cadastral systems through the concept of a **geodetic cadastre** and its extension to the seabed. This strategy will ensure that all cadastral surveys can be connected to and integrated within the geodetic system.



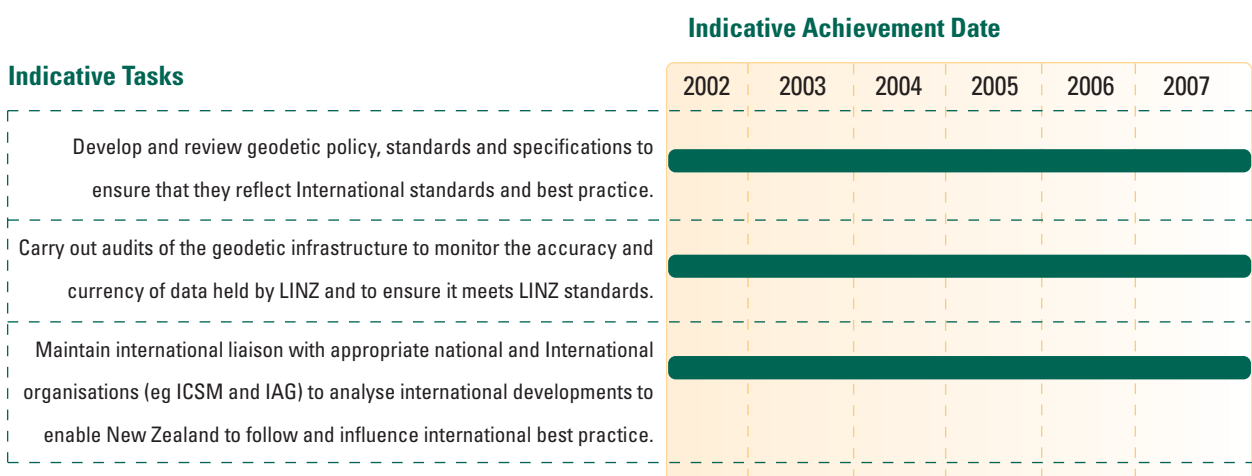
Strategy four:

- Manage the effects of **geodynamics** on NZGD2000 control stations to ensure their spatial accuracy is maintained. This strategy will ensure that the accuracy of the geodetic system does not degrade with time due to the accumulated effects of geodynamics.



Strategy five:

- Comply with **international best practice** policy, standards and techniques. This strategy will ensure that the geodetic system will comply with international best practice so that the system is compatible with, and can use international systems.



Accessible LINZ

Goal: Enable all users to efficiently and effectively access the authoritative geodetic physical network, data and intellectual information at the cost of dissemination and at any time for any application.

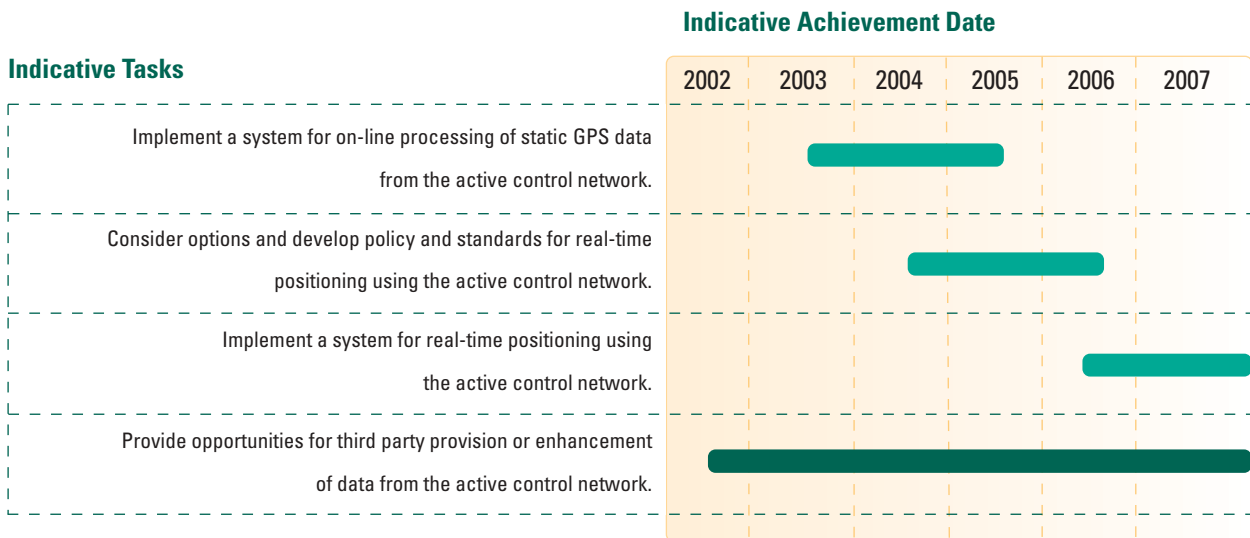
Strategy six:

- Develop and maintain an appropriate **network of marks in the ground** as a method for users to access the Geodetic System. This strategy will ensure that we maintain and provide a sufficient network of physical marks that meets user requirements.

Indicative Tasks	Indicative Achievement Date					
	2002	2003	2004	2005	2006	2007
Provide an authoritative up-to-date record of geodetic survey marks and data in Landonline and through the Internet.	█					
Provide an advisory service to ensure the protection of important survey marks and consider options as to how this may be better managed.	█					
Consider options and develop policy and standards for the level of survey marks that must be protected and the ongoing maintenance of those marks.		█				
Consider the safety issues around non maintenance of redundant geodetic marks and develop a policy for removal and disposal of unwanted trig beacons and material.		█				
Reassess the density of marks required to support primary users in light of development of an active control network in New Zealand and develop new policy and standards.					█	

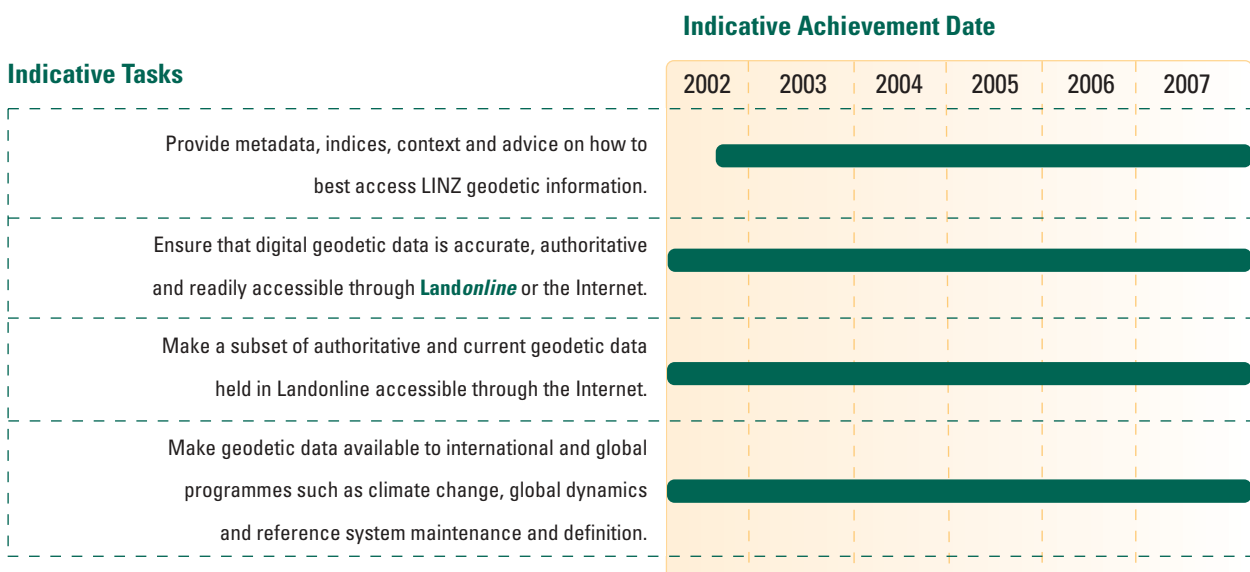
Strategy seven:

- Enhance the **active control network** to allow online processing of data and near real time access to data. This strategy will focus on the development of an active control network that will meet user requirements and allow for efficiencies in the management of the geodetic system.



Strategy eight:

- Provide **access to geodetic data** in accordance with the *Virtual Agency (eLINZ) Strategy, eGovernment principles, and eGIF standards*. This strategy will ensure that authoritative geodetic data is made easily and readily to users of the geodetic system.



Strategy nine:

- Communicate with the **spatial data user community** to ensure that they understand, use, contribute to, and gain benefit from the Geodetic System. This strategy will ensure that users will be able to use and gain benefit from the geodetic system and can also contribute to its future development and maintenance.

Indicative Tasks	Indicative Achievement Date					
	2002	2003	2004	2005	2006	2007
Develop a communication strategy for informing users of new geodetic developments within LINZ.		█		█		
Enable LINZ to be proactive in updating and maintaining the geodetic system by encouraging users to provide information on the status of the system.	█	█	█	█	█	█
Provide regular updates on geodetic developments through LINZ internal and external publications.	█	█	█	█	█	█
Provide fact sheets on changes to, or new applications available within the geodetic system.	█	█	█	█	█	█
Provide technical papers for national and international journals on significant developments within the geodetic system for peer review.	█	█	█	█	█	█

Capable LINZ

Goal: LINZ has skilled, knowledgeable and adaptable people, and robust management systems necessary to meet Government and user expectations for the provision of a world class geodetic system.

Strategy ten:

- Ensure the availability of the **skills and resources** necessary to provide a world class geodetic system. This strategy will ensure that LINZ maintains the skills and capability for providing a national geodetic system.

Indicative Tasks	Indicative Achievement Date					
	2002	2003	2004	2005	2006	2007
Ensure that LINZ has the right staff with the appropriate skills to manage the geodetic system.						
Review and enhance succession planning to ensure that appropriate geodetic skills are acquired and maintained.						
Provide and implement training and development programmes to ensure appropriate geodetic skills are acquired and maintained.						
Collaborate with other agencies to share geodetic skills and develop services.						

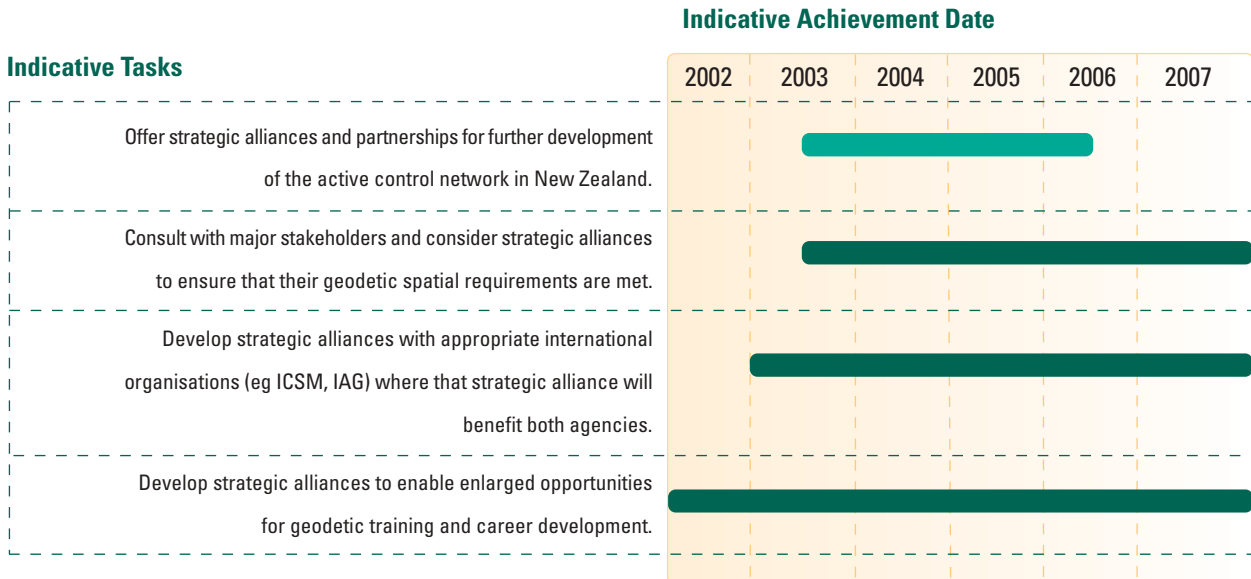
Strategy eleven:

- Respond to changing needs** and the working environment of users of the geodetic system. This strategy will ensure that LINZ maintains a capability so that the geodetic system can evolve to meet changing needs of users of the geodetic system.

Indicative Tasks	Indicative Achievement Date					
	2002	2003	2004	2005	2006	2007
Maintain effective liaison with stakeholders to ensure that changing requirements are identified and met.						
Maintain technical capability to be able to respond and manage the geodetic system to meet the changing needs of users.						
Maintain awareness and analyse international geodetic developments, and where appropriate, adopt and/or modify those developments to meet New Zealand requirements.						

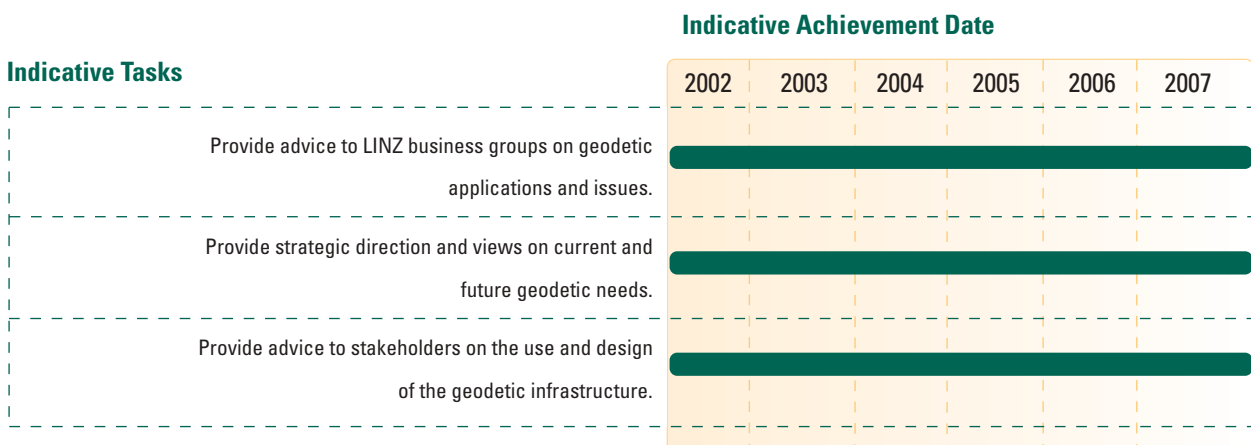
Strategy twelve:

- Entering into local and international **strategic alliances and partnerships** to develop, maintain and evolve the geodetic system in response to new developments and user needs. This strategy will ensure that LINZ can form collaborative agreements that will benefit development of and enable efficiency gains within the geodetic system.



Strategy thirteen:

- Provide **leadership** in the development and application of geodesy and precise positioning. This strategy ensures that LINZ will continue to be a leader in the maintenance of the geodetic system in New Zealand.



Summary

Our goal is to ensure the maintenance of a geodetic system that is world class, authoritative, accessible and is provided by a capable LINZ.

In putting this strategy into practice, we will be working closely with our users to define our next five-year work programme. The indicative tasks identified to achieve our goals will be evaluated and reviewed as part of a LINZ process critical to maintaining our reputation for providing services that meet our user expectations. We will regularly review the continuing maintenance of the national survey control system.

We will know that we are successfully achieving our vision when we:

- are recognised as providing a world class geodetic system that is consistent with international best practice in the New Zealand environment
- are accepted as the official source of geodetic information in New Zealand
- have strengthened the alignment between the geodetic and cadastral systems through the concept of a continuous geodetic cadastre and its extension to the seabed
- provide geodetic control that is reliable, useful, and accessible to users
- have installed and maintained a network of physical marks in the ground and active control stations that are accessible to all customers and stakeholders
- communicate with our users so that they understand how to use the geodetic network to improve their use of locational data and add value to their own applications
- attract and develop people with geodetic skills who are best in their field.

In achieving these aims we will assist in underpinning New Zealand's economic and social development.



