

Principles for a Seabed Cadastre

OSG Technical Report 9
Office of the Surveyor-General

24 June 1999

Introduction

The mid to long term strategic goals of Land Information NZ in the 1998/1999 Business Plan include:

- Information and advice to enable the Government to decide how future rights to the seabed will be defined and held

Related to this goal, though its role in defining the extent of New Zealand's territorial seabed interests is the strategic goal:

- Seabed information that will enable New Zealand to maximise its continental shelf claim under United Nations Convention on the Law of the Sea (UNCLOS)

These are both supported by a third strategic goal

- A national spatial referencing system that meets New Zealand's core land and seabed information needs.

A first step towards achieving this goal is to establish a set of draft principles for the management of a seabed cadastral survey system in line with milestone 5f:

“Develop principles for a seabed cadastre by 30 June 1999”.

This report documents a set of principles for a seabed cadastral survey system that have been developed in terms of Land Information NZ's roles and responsibilities. LINZ should next consult with agencies involved in managing rights to and over the seabed. From this consultation, a high level design can be developed for a seabed cadastre that efficiently and effectively meets the needs of New Zealand.

PRINCIPLES FOR A SEABED CADASTRE

1 Scope

This report is prepared in accordance with 1998/1999 Milestone 5f under Key Result Area 5

Key Result Area 5: I will improve stewardship of core land and seabed information through full compliance with Government information principles and guidelines.

Milestone: 5f

Description: Develop principles for a seabed cadastre by 30 June 1999

Responsible Surveyor-General

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Completion date: 30 June 1999

Within the context of this report, the seabed cadastre is defined as follows:

A system to enable the boundaries of seabed rights and interests, to be recorded, spatially managed and physically defined in relationship to the boundaries of other neighbouring or underlying rights and interests.

Within the context of this document, the management of seabed rights and interests which are not spatially defined or described (eg, fishing quotas, etc) is excluded. Also excluded, are considerations of the legal and administrative systems required for assigning rights and maintaining registers of the current right-holders.

Agencies in New Zealand responsible for managing spatially bounded rights over the seabed will determine whether to use the seabed cadastre or other systems in accordance with the efficient and effective management of their roles and responsibilities.

2 Principles

The principles are numbered and presented as bold indented text. In many cases, an explanation follows in normal text.

2.1 *Design*

- 1 The seabed cadastral system should be flexible enough to manage the spatial definition of marine rights other than those limited to the seabed - for example rights and interests over the water column or air-space above the seabed.**
- 2 The design and implementation of a seabed cadastre should seek to maximise the use of international systems so as to limit the cost of maintaining a New Zealand-specific system.**

Internationally accepted spatial referencing systems are available for use in marine areas and are consistent with those being used in the management of the land cadastre.

2.2 *Spatial Extent*

- 3 The seaward boundary of the seabed cadastre will be the Exclusive Economic Zone (EEZ) boundary until such time as New Zealand's Continental Shelf claim is accepted. Once this claim is accepted by the UN Commission on the Limits of the Continental Shelf, the seaward boundary will be the Continental Shelf boundary.**

New Zealand's Continental Shelf claim will be presented to the Commission by 2006.

Note that the design of the automated survey & title system, *Landonline*, is not inconsistent with potential future requirements to manage a cadastral system covering New Zealand's area of jurisdiction.

- 4 The seabed cadastre may also include marine areas appurtenant to the Ross Dependency in Antarctica.**

The New Zealand Government has not determined whether an EEZ or Continental Shelf boundary will be claimed in Antarctica.

2.3 *Land-Sea Boundary*

- 5 The management of land and seabed cadastres is not completely seamless because of differing legal principles of spatial definition.**
- 6 It may be necessary to allow for, and manage, spatial overlaps between the land-based cadastral survey system and the seabed cadastre in order**

to ensure that the NZ cadastre provides for all land and seabed within New Zealand's jurisdiction.

For historical and legal reasons, and as a consequence of international standards and obligations, there are marine boundaries which overlap boundaries in the land-based cadastral survey system. Others, such as marine reserves, are already defined in terms of the land-based system. These overlaps are expected to persist for some time to come.

For example, the foreshore as defined in the Resource Management Act (Mean High Water Springs) can overlap with cadastral boundaries which are based on historical definitions of Mean High Water. In addition, territorial sea basepoints depicted in hydrographic charts are based on lowest astronomical tide and have international recognition through being so depicted. These marine boundaries may overlap land cadastral boundaries in some cases because their methods of survey definition and maintenance over time have been largely independent.

However, a well managed cadastral survey system is able to determine and maintain the spatial alignment of these distinct boundaries.

It is desirable to unify as many aspects as possible in the spatial management of seabed and land cadastres. However this must be within the limitations imposed by:

- international agreements;
- historical legal precedents;
- the different characteristics of surveying and resource management on land and at sea - particularly differences in the access to and occupation of dry land vs seabed, survey cost and land value.

2.4 *Boundary Point Definition*

- 7 The following options are available for the authoritative definition, recording, and redefinition of seabed cadastre boundary points.**

Survey Definition	Seabed Cadastre	Land Cadastre
Surveyed natural feature	Yes - eg, land/sea boundary	Yes - eg, river banks, coastline
Surveyed man-made feature	Could be required for wharves and other man-made features	Yes - Flats & Units
Survey mark	Yes - eg, marine reserves. Note that the survey marks may be located on land in some cases.	Yes - boundary pegs
Boundary dimensions	Yes- some existing boundaries including those with a defined offset from another boundary	Yes - unmarked surveyed boundaries
Coordinates	Yes - future Continental Shelf boundaries and probably most other seabed boundaries	Not authoritative definition in the near future, but used to summarise other evidence
Graphical depiction on plan or chart	Yes - eg, maritime boundaries on hydrographic charts	Indirect - as representation of survey data on plans
Textual Description (metes & bounds)	Yes - some existing boundaries.	Yes - some unsurveyed boundaries including unsurveyed Maori partitions

For comparison, the application of these options in the land cadastre is given also.

- 8 The seabed cadastre should enable the recording of rights where the boundaries are defined only by textual description. However, it will not be able to provide spatial recording, management or certainty for these boundaries.**

Note that the last of these options (textual description), is the only one which, in the absence of other survey information, does not allow the boundary to be graphically depicted and spatially managed in a geographic information system (GIS).

2.5 *Boundary Lines*

- 9 The nature of the boundary line between defined boundary points needs to be specified. Where the form of existing boundaries are not specified, implied, or are described as a “straight line”, this will be taken, by default, to be a geodesic line.**

- 10 The reference ellipsoid used to define and calculate boundary lines needs to be specified. This may be implicit in the definition of a geodetic datum.**
- 11 Where a boundary line is defined as a straight line or arc on a projection, the projection, and its defining parameters, need to be specified. This may be identified in the panel details of a specified chart.**

The following lines are used in maritime boundaries:

Geodesic	The line following the shortest distance between 2 points on the surface of the reference ellipsoid.
Loxodrome	A line of constant azimuth on the surface of the reference ellipsoid.
Meridian	A line running due north or south. This is a special case of a loxodrome and is also coincident with a geodesic.
Parallel	A line running due east or west. This is a special case of a loxodrome but is not a geodesic.
Projection line	A straight line on a specified mapping or charting projection.
Offset line	An arc or line which is a specified distance from a defined point or line.
Irregular line	A line, generally following a natural feature. This may have been defined at a number of points. The boundary will not generally be straight between these points.

2.6 *Geodetic Datums*

- 12 Land Information NZ will need to provide and maintain transformations between commonly used marine geodetic and height datums so that boundaries defined authoritatively in terms of a variety of different datums can be managed in terms of a single datum specified by LINZ.**
- 13 If an agency wishing to use the seabed cadastre has defined boundaries in terms of a non-standard datum, it will need to provide an authoritative transformation to the datum used by LINZ for managing the seabed cadastre.**

In an ideal world, a single datum would be used for the authoritative definition of all seabed boundaries. In practice, there are historical and legal reasons why use of other datums need to be supported for some time to come.

- 14 The datum used for management of the seabed cadastre should allow 3 dimensional definition of boundaries.**

- 15 The datum used for management of the seabed cadastre should be consistent with the datum used for management of the land cadastral system. Following roll-out of Landonline, this will be New Zealand Geodetic Datum 2000.**

NZGD 2000 is consistent, for all practical purposes, with the datum (WGS84) used for new hydrographic charting

- 16 Where a boundary is defined by coordinates, the geodetic datum or reference system that the coordinates are in terms of, needs to be specified. If the coordinates are latitude or longitude, the reference ellipsoid also needs to be specified. The ellipsoid may be implicit in the definition of the datum.**
- 17 Where a boundary is defined in terms of height or depth components, the vertical datum needs to be specified. This may be either in terms of an ellipsoidal reference surface in a 3 dimensional geodetic datum or, alternatively, may be based on a sea-level datum surface.**

The definition of coordinates without specification of a datum and ellipsoid is ambiguous. Local and global geodetic datums can differ by several hundred metres. Different sea level datums can differ by 10 or more metres and may be 100 metres different from an ellipsoidal height datum.

There is a trend towards using a geocentric ellipsoid as the preferred vertical reference surface rather than one of the many sea level surfaces. However, for historical and legal reasons, there will be a need to support sea level surfaces for some time to come.

- 18 There will be a need to consider the time management of geodetic datums.**

Boundaries of rights and interests, especially international boundaries, can be expected to persist for many decades and even centuries. For various reasons, including earth deformation, the lifetime of geodetic datums is diminishing. In the past, datums have remained in use for up to 50 years but it is more common now for significant changes at intervals of 1 to 10 years. There will be an ongoing need to ensure that boundaries that were defined in terms of a now-obsolete datum, can be represented in terms of the datums currently used by mariners and managers of the seabed cadastre.

2.7 *Regulatory Environment*

- 19 A system for regulating and authorising the spatial definition of rights will be required to ensure that inconsistent or ambiguous definitions of boundaries that could result in conflict between rights, are not permitted.**

The technical regulatory requirements will, of necessity, differ from those of the land-based cadastre but the basic principles will be similar. Agencies wishing to take

advantage of the certainty of definition offered by the seabed cadastre will need to comply with the regulations that support that certainty. Conversely, the regulations should be flexible enough to account for a wide range of different spatial definition requirements.

Administrative systems for the land and seabed cadastres may be quite different, but the land and seabed cadastres should be spatially compatible to enable unambiguous management of rights in the vicinity of the land-sea interface.